West Southall Masterplan Environmental Statement Volume 2 Technical Appendices October 2008

On behalf of:
National Grid Property Limited

TECHNICAL APPENDICES 2

WEST SOUTHALL

FRAMEWORK CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

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SECTION 1: INTRODUCTION

a) Purpose

1.1 The purpose of this document is to set out the environmental measures that will be adopted during the construction of West Southall in order to prevent or reduce potential environmental effects associated with construction activities. This Framework Construction Environmental Management Plan (CEMP) sets out:

- an environmental management framework to which the Principal Contractor's management systems will comply;
- environmental management and monitoring measures to be adopted and implemented throughout the construction phase; and
- responsibilities for implementation of management and monitoring measures during construction.

1.2 This Framework CEMP forms an Appendix to Chapter 6: Construction and Phasing of Volume 1 of the West Southall Environmental Statement (ES).

1.3 Measures set out in this Framework CEMP are assumed to be adopted for the purposes of assessing likely environmental effects of construction as detailed in the ES. The final version of this Framework CEMP will require approval by the London Borough of Ealing (LB Ealing) and is likely to be the subject of a planning condition attached to the outline planning consent for West Southall.

1.4 A Remediation Strategy has been prepared detailing the technical logistics, control measures, monitoring, sampling, and stakeholder liaison relating to the remediation phase. This document forms Appendix 12.2 to Chapter 12: Ground Conditions of the ES. Some measures outlined in this Framework CEMP are also covered in the Remediation Strategy.

1.5 For the operational phases of the scheme, an General Management Plan has been produced outlining the framework for which West Southall will be managed on a day-to-day basis. This Estates Management Plan forms part of the suite of documents being submitted as part of the Planning Application.

1.6 The Remediation Strategy, the Framework CEMP and the General Management Plan may include some shared principles, objectives and procedures and these management systems will overlap to some degree due to the phased nature of the development (i.e. progressive occupation of the site whilst construction/remediation is ongoing).

b) Scope

1.7 The Framework CEMP applies to construction works forming part of the Proposed Development that will be under National Grid Property's (NGP) direct control. These include:

- on-site construction works (e.g. areas within the red line boundary); and
- off-site construction works (e.g. construction of bridges, drainage and other infrastructure).

1.8 Compliance with this Framework CEMP will be a mandatory requirement in all construction contracts with Contractors retained by NGP. This Framework CEMP is not applicable to third parties undertaking works under their own powers (e.g. utility works). However, NGP will communicate the requirements of the Framework CEMP to third parties and make reasonable endeavours to ensure that third parties abide by them.

c) Content and Structure

1.9 Section 1 of this document gives an overview of the purpose and scope of the Framework CEMP;

1.10 Section 2 contains environmental management measures, monitoring requirements and guidance.

d) <u>Legislation and Guidance</u>

1.12 Legislation and construction good practice change over time. This document has been written in the context of prevailing standards at the time of writing acknowledging that construction of West Southall will not start until 2009/2010. Prior to commencement of construction, this Framework CEMP will be reviewed to ensure all up-to-date legislative requirements are met.

1.14 References to guidance documents used in the development of this document and relevant to construction activities are provided throughout Section 3. These provide the context in which the environmental measures and monitoring requirements are set and are a source of further information where required.

1.15 General guidance applied throughout this Framework CEMP is found in:

- Environmental Good Practice Site Guide C650 (CIRIA, 2005)
- Sustainable Design and Construction: The London Plan Supplementary Planning Guidance (Greater London Authority, 2006)
- Code of Practice for Deconstruction and Construction Sites (City of London, 2007)

e) <u>Responsibilities</u>

1.16 The environmental management and monitoring measures outlined in this Framework CEMP will be adopted throughout the construction phase. Unless otherwise stated, the Principal Contractor will be responsible for the implementation of all measures.

1.17 The Principal Contractor will give LB Ealing and LB Hillingdon a list of key site personnel, their job titles and their key site responsibilities.

1.18 The Principal Contractor is responsible for obtaining the necessary permits and licences from the regulatory bodies. Information on the nature and timing of all key site activities relating to the Framework CEMP will be provided by the Principal Contractor to both Local Planning Authorities (LPAs), the emergency services and other Statutory bodies (e.g. Environment Agency and Health and Safety Executive) as required before work commences on the Site.

f) Consultation

1.19 Good public relations are important to the NGP, its contractors and the image of West Southall. The Contractor will be responsible for communication with members of the public and other interested parties. The local community will be kept informed of developments on the project on a regular basis, particularly where there are likely to be impacts abnormal events that could affect more regular day-to-day construction activities.

g) Health & Safety Management

1.20 This Framework CEMP does not include specific measures to manage health and safety issues associated with the construction of the Proposed Development. The management of health and safety of construction workers and others during construction will be detailed in a Health and Safety Plan as required by the new Construction (Design and Management) (CDM) Regulations (2007) and other legislation.

h) Environmental Incident Procedure

1.21 The Contractor will be required to establish and implement an environmental incident procedure as part of their documented management system on-site. This procedure will be designed to respond to an anticipated environmental hazards and risks at the site and will include emergency control measures that will take into account the Environment Agency's (EA) Pollution Prevention Guideline, PPG1 General Guide to the Prevention of Pollution and PPG21 Pollution Incident Response Planning.

1.22 The environmental incident procedure will include:

- an environmental incident / pollution reporting and response plan;
- measures to mitigate the adverse effects of an environmental incident;
- 24 hour emergency contact details and method of notifying Emergency Services, Local Authorities, Environment Agency (EA), other statutory authorities and key personnel; and
- measures to be adopted to investigate and prevent the recurrence of an environmental incident.

SECTION 3: ENVIRONMENTAL MANAGEMENT MEASURES

3.1 The environmental management and monitoring measures outlined in this Framework CEMP will be adopted throughout the construction phase. Unless otherwise stated the Contractor will be responsible for the implementation of all measures.

a) <u>Good Housekeeping</u>

3.2 The Contractor will ensure that the Site is kept in good order at all times and, following completion of construction, is left in a satisfactory condition.

<u>Resourcing and Training Development</u>

- an induction process for all construction workers detailing ways in which to respect the local community, as well as site logistics, health, safety and the environment;
- security measures including an ID card system for all construction workers;
- a behavioural safety programme to maximise safety performance during construction activities; and
- implementation of the Construction Skills Certification Scheme (CSCS) (or equivalents).

<u>Site Security</u>

3.3 Valuable items will be removed from public view and stored in locked areas.

3.4 Site boundaries will be secured when not in use using fencing and locks on gates.

3.5 Potentially hazardous materials will be well secured (e.g. fuel outlets will be locked).

3.6 Plant and equipment will be immobilised overnight.

3.7 The movement of people in and out of the site will be controlled with the use of site passes.

3.8 Main work sites will be manned for security on a 24 hour basis.

3.9 Site security cameras where used will be sited in locations which minimise disturbance to local residents.

3.10 The security of neighbouring sites will be taken into consideration. Scaffolding, ladders or any other site equipment will not be left in areas that may cause a nuisance to neighbouring properties.

General Good Housekeeping Measures

3.11 Good housekeeping will be maintained on-site and on access routes. Measures will include but are not limited to:

- clear access routes with appropriate signposting;
- segregation and regular removal of waste (including food waste) from site;
- keeping site tidy and clean;
- inspect hoarding frequently, repair and repaint as necessary;
- visual inspections of plant, equipment and material storage areas for leaks or spills
- toilet facilities will be kept clean;
- open fires will be prohibited at all times;
- hard standing for vehicles (parking and access / egress areas) will be cleaned frequently; and
- mud will be minimised on access routes.

Lighting

3.12 Lighting will be provided at site boundaries with illumination sufficient for the safety of the passing public. Precautions will be taken to avoid shadows cast by site hoarding on surrounding Public Highways, footpaths and amenity areas.

3.13 For all lighting on, or adjacent to, the Public Highway prior approval will be obtained from the Highway Authority.

3.14 Lighting will be positioned and directed so as not to unnecessarily intrude on adjacent buildings and land uses and prevent any unnecessary interference with local residents, railway operations, passing motorists and airport operations. This will particularly apply to sites where night working will apply.

3.15 BS 5489 Parts 1 and 9 (Road Lighting) and Institute of Lighting Engineers guidance notes for reduction of light pollution will be complied with.

Hoarding and Fencing

3.16 Hoarding or fencing will be used to separate all construction works from public access.

3.17 The extent and height of hoarding or fencing at a particular location will be selected to maintain effective security and achieve appropriate noise attenuation and visual screening.

3.18 Existing walls, fences, hedges and earth banks will be retained where possible.

3.19 Hoarding will be maintained in good condition and any unofficial advertising / graffiti will be removed as soon as possible.

Monitoring

3.20 Regular site inspections will be undertaken which will include a review of good housekeeping practices on site.

Relevant Guidance

- Dealing with vandalism - a guide to the control of vandalism (CIRIA Publication 91, 1994)
- The secure site – an impossible dream? (Chartered Institute of Building, Paper 44, 1991)

- BS 5489 Parts 1 and 9:2003 (Road Lighting)
- Institute of Lighting Engineers guidance notes for reduction of light pollution 2005

b) <u>Transport</u>

<u>Traffic Management</u>

3.21 Details of the following traffic management measures will be submitted for approval by the relevant local authorities and/or the Highway Authority:

- site boundaries and main access/egress points for the construction sites;
- temporary and permanent closures and diversions of highways and Public Rights Of Way (PROW);
- strategy for construction traffic management; and
- local routes to be used by Heavy Goods Vehicles (HGV) including lorry holding areas, lorry route signage strategy, means of monitoring lorry use and any routes prohibited for lorries.
- If short-term road closures are required, consents would be obtained from LB Ealing and/or LB Hillingdon prior to this occurring.
- Traffic management plans will be implemented to minimise the potential impact of the reduced highway capacity during the implementation of the off-site highway and access works.

3.22 Where practicable and consistent with the carrying out the Proposed Development, existing public access routes and rights of way will be maintained during construction.

3.23 Access routes to the site to be used by HGVs other construction traffic will avoid sensitive receptors.

3.24 Only those routes approved by the relevant bodies will be used by vehicles accessing the site.

3.25 Minimise movement of construction traffic will be minimised through the use of dedicated construction routes around the site and ‘just in time’ deliveries.

3.26 No long-stay, day-time or overnight parking of HGVs in the vicinity of the site will be permitted. Vehicles waiting to deliver or remove materials from the site will be directed to specified holding areas located within the construction site.

3.27 Where possible use of nearby rail/or waterways to transport materials to and from the site.

Mud on Roads

3.28 Easily cleaned hard standing will be provided for areas where vehicles enter and leave the site.

3.29 An mechanical road cleaner will be employed to regularly clean the site hard standing and the public highway in the vicinity of the site.

3.30 All lorries exiting or entering site and carrying materials that could spill onto the road will be adequately sheeted to prevent the spillage of material during transport.

3.31 Wheel washing facilities will be provided at work sites' access and egress points to public roads. All vehicles entering and exiting the site will have clean wheels.

Maintenance and Repair of the Public Highway

3.32 Where temporary alterations to the highway or repair works are required, the highway will be restored to a standard to be approved by the satisfaction of the Highway Authority.

3.33 Temporary or permanent reinstatement will be carried out in accordance with the Highway Authority's specification.

3.34 Pavement widths around worksites will be maintained and diversions clearly signposted.

3.35 Unless otherwise agreed, diverted rights of way will be provided prior to the commencement of the relevant parts of the works and maintained to a comparable standard of those they replace.

Staff Travel

3.36 All staff will be encouraged to use public transport and/or cycling as an alternative to vehicular transport to and from the site. Measures to encourage staff will include:

- Limiting the amount of car parking spaces for staff vehicles; and
- Provision of cycle parking to encourage cycling.

Monitoring

3.37 For monitoring of transport management measures during construction see air quality monitoring in Section c, noise monitoring in Section e and water monitoring in Section g.

Relevant Guidance

- Planning Policy Guidance 13: Transport, Department of the Environment 2001

c) Air Quality

3.38 Air quality effects will be controlled through the selection of appropriate plant and machinery, careful planning of works and effective site management. Planning of works will take into consideration local topography, prevailing wind patterns and local sensitive receptors (e.g. residential properties, schools, species, habitats and trees).

Haul Roads

3.38 Dedicated haul routes will be provided between the main construction site areas and compounds where appropriate, these will be covered in hardstanding.

3.40 Hard standing surfaces will be provided at site access and egress points.

3.41 Site haul roads and site access points will be regularly maintained and kept clean.

3.42 A 20 mph speed limit will apply within the site boundaries.

3.43 Haul roads will be damped down using water. Spraying will be repeated regularly and frequently during warm and sunny weather (including treatment for any run off containing suspended solids).

Plant and Vehicles

3.44 All loaded vehicles leaving site with the potential to cause dust will be sheeted.

3.45 Vehicles will not be overloaded.

3.46 Wheel washing facilities will be provided and used by all vehicles leaving the site to prevent mud spreading on surrounding roads.

3.47 Vehicle exhaust pipes will not discharge directly at the ground and all site vehicle engines, generators or site plant engines will be switched off when not in use.

3.48 There will be no idling vehicles (engines will be switched off when not in use).

3.49 Plant and equipment will be kept in good repair and regularly maintained in accordance with the manufacturer's specifications, including meeting statutory emissions standards where applicable. Maintenance will include visual checks to ensure black smoke is not emitted at times other than at ignition.

3.50 Plant, equipment and emission control apparatus will be selected to minimise the production of dust and engine exhaust emissions, allowing for economic constraints and practicability.

3.51 All crushing, grinding, concrete batching and coated roadstone plant will be the subject where necessary of a permit issued under the Environmental Permitting Regulations (2007) and will be operated and maintained in accordance with the conditions contained therein.

3.52 Plant and equipment maintenance records will be kept on site for the duration of the construction stage as relevant.

Earthworks

3.53 Completed earthworks will be sealed or seeded as soon as practicable.

3.54 Exposed earthworks will be kept damp at all times where required, to prevent air borne dust emissions.

Materials Handling and Storage

3.55 Stockpiles will be located out of the prevailing wind or windbreaks will be provided to minimise the potential for dust generation.

3.56 Construction materials will be stored within the site, away from the site boundary and downwind of sensitive receptors unless used for the purposes of screening.

3.57 Silos and stockpiles will be sited away from residential areas and places of public access or other sensitive receptors including watercourses.

3.58 Stockpiled materials will either be sprayed with water if appropriate, or if the mounds are likely to remain undisturbed for a significant duration they will be sprayed with an appropriate chemical dust suppressant, material covering or vegetated. Advice on their use will be sought from the EA prior to the use of chemical dust suppressants.

3.59 Materials stockpiled for later use within habitat creation programmes will be kept un-vegetated.

3.60 When potentially dust generating materials are delivered to site the tipping height will be kept at a minimum and if it is greater than 2 metres suitable dust suppression measures will be utilised to control dust emissions.

Concrete Work

3.61 Large quantities of concrete or bentonite slurries will be mixed in enclosed/shielded areas to prevent the escape of dust.

3.62 Before concrete pours, the pour structure will be cleaned in the following manner to minimise dust emissions:

- move debris into corner of the pour structure;
- remove ferrous material using a magnet; and

- suck out fine non-ferrous debris from pour area.

3.63 After concrete pours, the surface of the pour will be kept free of dust and mud until the surface is dry.

3.64 All areas of concrete hard standing will be kept free of dust and mud.

Demolition and Crushing

3.65 During demolition and crushing activities enclosed rubble chutes and water for damping down dust at rubble chutes will be used, skips will be covered and buildings screened with debris screens / sheets.

3.66 All crushing plant will be fitted with dust suppression equipment including water sprays. The suppression equipment will be used at all times during the crushing activities.

Smoke and Odours

3.67 Measures will be taken to avoid causing nuisance from smoke, odours, dust and other air emissions, which will include the following:

- there will be no fires on site;
- vehicles and plant will be maintained in accordance with manufacturers' guidance;
- waste will be managed and will be removed from site on a regular basis to avoid excessive accumulation; and
- the siting of activities with the potential to emit aerosols, fumes, odours and / or smoke, including refuelling and site ablution, will take account of prevailing wind conditions and will avoid where reasonably practicable the transmission of such emissions to locations where there are sensitive receptors.

Monitoring

3.68 An air quality monitoring programme will be developed and implemented for construction activities which will incorporate the following:

- real-time monitoring of dust at sensitive receptors particularly before and during construction activities as well as during dry periods;
- establishing response thresholds, taking into account best practice guidance, at which measures are taken to avoid exceedances, which could have adverse implications for local air quality management;
- setting trigger values as an indicator of response thresholds which will be informed by pre-construction air quality baseline monitoring;
- regular visual inspections of dust levels undertaken particularly during dry periods; and
- taking action to reduce levels where necessary to within the response thresholds.

Relevant Guidance

- Process Guidance Note PG3/1 (95) as amended Blending, Packing and Use of Bulk Cement (DEFRA, 2004)
- Control of dust from construction and demolition activities (BRE, 2003)
- Process Guidance Note PG3/16 (96) Mobile Crushing and Screening Processes and Control of Dust from Construction and Demolition Activities (BRE, 2003)
- Controlling Particles, Vapour and Noise Pollution from Construction Sites (BRE, 2004)
- The control of dust and emissions from construction and demolition. Best Practice Guidance Mayor of London, (November 2006) (http://www.london.gov.uk/mayor/environment/air_quality/docs/construction-dust-bpg.pdf)
- Environmental Permitting Regulations (2007)

d) Archaeology

3.69 Archaeological Evaluation measures, as outlined in the Archaeological Mitigation Strategy (Appendix 15.2 of the ES), will be complied with, where necessary, during remediation and construction.

3.70 The Evaluation Proposals will need to be linked and programmed into the Detailed Remediation Strategies for Contaminated Ground, once the details of and requirement for that work becomes clearer.

3.71 Detailed construction methodologies will be designed and implemented and monitored to ensure that the archaeological resources are protected from damage from remediation and construction activities.

3.72 Screening will be erected, compatible with the type of works being undertaken, around historic buildings or archaeological areas located within, or adjacent, to a working site or access route to ensure their protection during construction.

3.73 Procedures will be put in place to protect and preserve archaeological remains where they are encountered unexpectedly during construction works.

3.74 Condition surveys will be undertaken to define vibration limits for the protection of cultural heritage resources remaining *in situ* that are susceptible to damage by vibration from construction works.

Relevant Guidance

- Planning Policy Guidance 15 - Planning and the Historic Environment, Department of the Environment 1994
- Planning Policy Guidance 16 - Archaeology and Planning for England, Department of the Environment 1990
- Mitigation of Construction Impacts on Archaeological Investigation, First Edition, English Heritage, 2002

- Guidance on Assessing the Risk Posed by land Contamination and its Remediation on Archaeological Resource Management, English Heritage and the EA, 2005

e) Noise

General Measures

3.75 Measures will be identified and employed to reduce noise and vibration arising from construction activities. Specific measures will include:

- selection of construction method and programme to minimise noise and vibration at sensitive receptors;
- selection of routes and programming for the transport of construction materials, spoil and personnel to minimise noise and vibration at sensitive receptors;
- design and use of site hoardings and screens to provide acoustic screening at the earliest opportunity. Doors and gates will not be located opposite occupied noise-sensitive buildings;
- avoidance of vehicles waiting or queuing on the public highway with engines running; and,
- the design and construction of temporary infrastructure to minimise noise and vibration.

3.76 Only plant conforming to relevant national or international standards, directives and recommendations on noise and vibration emissions will be used.

3.77 Plant and equipment liable to create noise or vibration will be located away from sensitive receptors or will be controlled by the use of lined and sealed acoustic covers or enclosures to prevent or reduce risk of disturbance.

3.78 Where used, acoustic covers or enclosures will remain in place whilst the relevant noise generating equipment is in use, e.g. static pumps and generators.

3.79 Regular maintenance will be undertaken on all plant and equipment in accordance with manufacturer's guidelines. Maintenance records will be kept on site.

3.80 Low impact techniques, such as hydraulic splitters or hydraulically-operated jaw-crushers, will be used to remove foundations and other concrete structures beneath the surface of the Site

3.81 Exhaust silencers will be fitted, where appropriate, to all plant, machinery and vehicles.

3.82 Plant and equipment will be used, where practicable, in the mode of operation that minimises noise, and shut down when not in use.

3.83 Occupiers of nearby residential properties who are likely to be affected by changes in the schedule of working method will be informed of the relevant changes as soon as possible by the Principal Contractor.

3.84 Vibration will be controlled in order to minimise disturbance to residents and other users of buildings close to the works, to avoid adverse effects on vibration sensitive equipment, and to protect buildings from physical damage.

3.85 Vibration predictions will be used to guide the selection of steps to minimise vibration and other activities where it is not practicable to minimise vibration at source. Operations for which vibration prediction is likely to be required include, but are not limited to:

- demolition;
- impact breakers
- dynamic compaction;
- piling; and
- vibratory compaction.

3.86 There will be no blasting associated with the works.

3.87 Unless otherwise agreed with the local authority vibration levels will be predicted in accordance with the methods set out in BS 5228: 1992, Part 4. Guidance in BS 6472, BS 5228 and BS 7385 will be used to establish criteria, controls and working methods.

Working Hours

3.88 Normal working hours will be from

- 0700 to 1900 on weekdays;
- from 0700 to 1300 on Saturdays; and
- no working on Sundays or Public Holidays.

3.89 Where unforeseen circumstances result in works extending beyond working hours, the Principal Contractor will notify LB Ealing and/or LB Hillingdon regarding the nature, time, location and reasons for the over-run as soon as possible. Records will be kept of such events by the Principal Contractor.

3.90 Works extending outside normal hours will be undertaken in the following order of preference:

- during the daytime over the weekend;
- evening periods (1800 to 2100); and
- night working, which will be considered as a last resort or where the need is driven by other constraints (for example road closures).

Monitoring

3.91 The effect could be mitigated by selection of appropriate plant and/or techniques and/or use of noise barriers and noise monitoring at NSRs to ensure that the construction noise limit, which may be enforced by way of a planning condition, is not exceeded.

Relevant Guidance

- BS 5228 Noise and Vibration Control on Construction and Open Sites;
    i. Part 1:1997 Code of practice for basic information and procedures for noise and vibration control;
    ii. Part 2:1997 Guide to noise and vibration control legislation for construction and demolition including road construction and maintenance;

iii. Part 4:1992 Code of practice for noise and vibration control applicable to piling operations.

- BS 4142 Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas 1997, BSI
- BS 61672: 2003 Specification for Sound Level Meters, BSI
- BS 6472: 1992 Guide to evaluation of human exposure to vibration in buildings (1Hz to 80Hz), BSI
- BS 7385: Part 1 1990 Part 2 1993 Evaluation and Measurement for Vibration in Buildings, BSI
- Ground Vibration Caused by Mechanised Construction Works, D M Hiller and G I Crabb, TRL Report 429, Transport Research Laboratory, 2000
- Controlling particles, vapour and noise pollution from construction sites - set of five Pollution Control Guides (BRE, 2003)
- CIRIA PR070 How much noise do you make? A guide to assessing and managing noise on site, A J Wills and D W Churcher, 1999

f) <u>Ground Conditions</u>

3.92 The Remediation Strategy (Appendix 12.2 to the ES) details the technical logistics, control measures, monitoring, sampling, and stakeholder liaison relating to the remediation phase of the Proposed Development. The site remediation would be completed prior to construction of the Proposed Development. In summary, the Strategy comprises:

- Controlled excavation from the ground of identified primary source materials, as supported by quantitative risk analysis, followed by their treatment on-site and re-use wherever possible.
- Validation sampling and analysis of the excavation extremities and treated material to confirm that sufficient affected material is removed and the effectiveness of the treatment.
- Backfilling of voids using treated material where possible. A minimum of imported materials and re-grading will be used as necessary.

3.93 Although there will be some degree of overlap between the remediation stages and the construction stages, the Framework CEMP only includes controls to be implemented during the construction activities of the Development which will take place following the remediation of the site.

General Measures

3.94 All personnel working in the 'dirty' (contaminated) areas will wear appropriate personal protection equipment (PPE) and will receive detailed advance briefings on the hazards likely to be encountered and the procedures to be followed.

3.95 Measures will be implemented to prevent the contamination of ground and surface watercourses and aquifers during the works.

3.96 Measures will be implemented to prevent the emission of hazardous dusts during excavation, or from stockpiles.

3.97 Where contaminated materials are to be removed from the construction site they will be stored separately from 'clean' materials and controls put in place to prevent contaminants leaching into the ground or surface waters and to prevent the spread of contaminated dust.

Demolition Control Measures

3.98 Where underground or above ground tanks are to be removed during demolition works, all the liquid contents will be removed into a suitable container by a suitably qualified technician prior to the demolition of the tanks. The tank will be removed or bottomed in accordance with relevant EA Pollution Prevention Guidance Notes and DEFRA Guidance (see relevant guidance below). After removal of the tanks, sampling of the ground beneath and surrounding the tanks will be completed to ensure that the procedure has not caused soil or groundwater contamination.

3.99 All buildings will be surveyed for presence of asbestos before demolition. Asbestos will be removed by a specialist contractor and disposed of in accordance with the relevant legislation.

3.100 Measures, including fencing and/ or screening, will be implemented to ensure that demolition debris is kept within a controlled area, in order that the area of ground potentially affected by demolition works is kept to a minimum.

Earthworks and Spoil Management

3.101 Where appropriate topsoils and subsoils will be stripped and directly moved to the required location wherever possible. If storage is required, topsoils and subsoils will be loose tipped separately in identified heaps for reuse in landscaping and ecological restoration. Soils that are not required for landscaping or ecological restoration purposes that will be used in engineered fills will not be required to be stripped or stored separately and the height of these stored soils will not be restricted.

3.102 Topsoil and subsoil storage mounds will be located in an area where they will be kept free from compaction and contamination due to construction activity.

3.103 Topsoil and subsoil will be spread and graded in dry conditions on appropriately contoured ground.

3.104 Where it is necessary to store soil for more than 6 months the surface of storage mounds will be stabilised by seeding with a suitable mixture of grasses. Topsoil to be used for creating habitat and / or landscape uses will not be seeded and herbicides will not be used on these soils.

Monitoring

3.105 The Remediation Strategy details monitoring to take place prior to and during the remediation stage of works. On completion of remediation and during construction land gases such as methane, carbon dioxide, oxygen and Volatile Organic Carbon's (VOCs) will be monitored. These will be monitored on a monthly basis for three months following remediation and then at six months and twelve months.

Relevant Guidance

- A guide for safe working on contaminated sites, CIRIA Report 132, 1996
- Environmental good practice on site, CIRIA Report C 650, 2005

- HSG66 Protection of Workers and the General Public during the Development of Contaminated Land, HSE, 1991
- Model Procedures for the Management of Land Contamination: Contaminated land report 11. DEFRA/EA
- Brownfields – managing the development of previously developed land: A client's guide. CIRIA C578, 2002
- Contaminated Land Risk Assessment – A Guide to Good Practice. CIRIA C552, 2001.
- British Standard BS 10175:2001 Investigation of potentially contaminated sites - Code of Practice
- Remedial treatment for contaminated land, Volume IV: Classification and selection of remedial methods. CIRIA Special Publication 104, 1995
- BSI Draft for Development DD 175: 1988 Code of Practice for the Identification of Potentially Contaminated Land and its Investigation
- Planning Policy Statement (PPS) 23: Planning and Pollution Control (ODPM, 2004)
- EA Pollution Prevention Guidance Notes, PPG2 (Above Ground Oil Storage Tanks) and PPG27 (Installation, decommissioning and Removal of Underground Storage Tanks), EA, 2004.
- Groundwater Protection Code: Petrol Stations and other fuel dispensing facilities involving underground storage tanks, DEFRA 2002.

g) <u>Water</u>

3.106 The Remediation Strategy (Appendix 12.2 to the ES) details the technical logistics, control measures, monitoring, sampling, and stakeholder liaison relating to the remediation phase of the Proposed Development. Further to the treatment of the ground conditions, the Strategy comprises appropriate groundwater treatment to improve the quality of local controlled waters, including modelling following completion. This Framework CEMP includes controls to be implemented during the construction phases of the Development.

Consents

3.107 Where water is to be abstracted from surface water or groundwater a licence will be obtained from the EA. Where discharges are required to controlled waters or sewers, consent will be obtained from the EA or the statutory sewerage undertaker as applicable. De-watering operations will also require registration and/or a permit and this will be obtained from the EA.

3.108 Works in, over or under a watercourse or works altering or repairing any structure in, over or under a watercourse, and works within the Land Drainage Byelaw margin of the watercourse will require Land Drainage Consent from the EA.

Site Drainage

3.109 Site drainage will be discharged into sewers in accordance with relevant permissions obtained from the sewerage or statutory authority. Discharge to watercourses will only be permitted where discharge consent or other relevant approval has been obtained. Site drainage will meet the effluent standards required by the sewerage undertaker or EA as appropriate.

3.110 Site drainage plans will be submitted to the EA for approval prior to the commencement of works.

3.111 Where required, temporary site drainage during construction activities will be installed prior to commencement of those activities.

Pollution Control

3.112 All potentially polluting substances will be stored on impermeable surfaces with controlled drainage or at least 10m away from storm water sewers, grids, channels, watercourses and ditches.

3.113 All fuel, chemicals and oils will be stored within bunded areas in accordance with PPG 26 and PPG 2.

3.114 All tank discharge pipes, valves and trigger guns will be contained securely within the bund when not in use.

3.115 Bowsers will be stored within secure areas when not in use to protect from theft and vandalism.

3.116 Leaking or empty drums will be removed and stored in a suitably bunded area separating from other drums prior to disposal via an appropriately licensed waste disposal contractor.

3.117 All hazardous substances on site will be controlled in accordance with COSHH (2002) Regulations. The storage compound will be fenced off and locked when not in use to prevent theft and vandalism.

3.118 Refuelling of plant and machinery will take place on concrete hard standing with controlled drainage.

3.119 All water run off from designated refuelling areas will be channelled to an oil separator or an alternative treatment system prior to discharge.

3.120 Fuel storage tanks will be locked when not in use to prevent unauthorised access and reduce the risk of vandalism.

3.121 Wheel washing will be undertaken in a designated area. Water from wheel washing facilities and wash down areas will be recycled or fully contained and disposed of via tanker or through connection with the foul sewer (in accordance with relevant consent from the sewerage undertaker).

3.122 Washing out of concrete trucks, hoppers, and mixers will take place in areas away from storm water sewers, grids, channels and watercourses to prevent water pollution.

3.123 Spill kits will be held on site with a variety of absorbent materials to be used in the event of a spill of fuel, oil or chemicals.

<u>Protection of Surface Water and Groundwater</u>

3.124 Fuel oils and other chemicals stored in bulk will be located at least 10m from any watercourse.

3.125 Where works are required in or adjacent to watercourses, protection measures will be provided in accordance with the requirements of the relevant authority.

3.126 Approval from the EA and other appropriate bodies will be obtained for crossing of, diversions to and work within statutory buffer zones for watercourses.

3.127 Booms will be held on site for works near a watercourse.

Managing Run Off and Silty Water

3.128 Measures will be taken to ensure that run off from earthworks does not enter drains, watercourses or ditches; this may include the use of silt fences.

3.129 Areas of exposed ground and stockpiles will be minimised to reduce silty runoff. Geotextiles, chemical suppression or damping down will be used as necessary to shield spoil mounds.

3.130 Provision will be made for settlement areas to deal with silty water. The settlement facility will be designed for the volume of water and suspended particles within it.

3.131 Water, unpolluted other than with fairly coarse particles, and with relatively small flows, may be treated by passing through tanks or skips with a suitable filter such as gravel, geotextiles, straw bales or siltbusters.

3.132 Areas of hard standing and surface roads will be swept regularly to prevent the build up of material which could be washed into water courses.

3.133 Where periods of prolonged or heavy rainfall are forecast, appropriate additional measures will be taken to control surface run-off and move potentially polluting activities out of any areas susceptible to flood risk.

Monitoring

3.134 Four sample points will be installed along the Grand Union Canal and the Yeading Brook and thirty groundwater monitoring wells will be installed within the site, including boundary locations (many adjacent to the river/canal boundary). These shall be monitored prior to, during and following the period of the soil remediation works and samples recovered for subsequent chemical analysis.

3.135 Following the soil remediation works monitoring will be carried out monthly for the first three months and then at six months and twelve months.

3.136 The results would be used to assess both the effectiveness of the remediation works and also the potential for contaminant migration. Remediation works by their nature must disturb current equilibrium, and overall improvement will be the judging criteria rather than single results. The frequency has been discussed with the EA and “in principle” agreement to the above has been achieved.

3.137 Response plans to unacceptable results would be in place to be promptly activated if circumstances demand such.

3.138 All discharges will be monitored in accordance with the consents held.

3.139 The use of water will be monitored during construction.

Relevant Guidance

3.140 EA Pollution Prevention Guidance (PPG) Notes:

- PPG01 General guide to the prevention of pollution ;
- PPG02 Above ground oil storage tanks (2004);
- PPG03: The use and design of oil separators in surface water drainage systems (2006);
- PPG04 Treatment and disposal of sewage where no mains drainage is available (2007);
- PPG05 Works and Maintenance in or near Water (2007);
- PPG06 Working at construction and demolition sites;
- PPG07 Refuelling Facilities (2004);
- PPG08 Safe storage and disposal of used oils (2004);
- PPG13 High pressure water and steam cleaners (2007);

- PPG18 Managing fire water and major spillages;
- PPG19 Garages and vehicle service centres;
- PPG20 Dewatering underground ducts and chambers;
- PPG21 Pollution incident response planning (2004);
- PPG22 Dealing with spillages on highways;
- PPG23 Maintenance of Structures over Water;
- PPG26 Storage and Handling of Drums & Intermediate Bulk Containers (2004); and
- PPG27 Installation, decommissioning and removal of underground storage tanks.

3.141 CIRIA guidance

- CIRIA, Control of water pollution from construction sites: Guidance for consultants and Contractors, CIRIA 2001 (C532);
- CIRIA/EA joint guidelines: Concrete bunds for Oil Storage Tanks; and
- CIRIA/EA Joint Guidelines: Masonry Bunds for Oil Storage Tanks

3.142 Other guidance

- Making Space for Water, DEFRA, 2005; and
- DEFRA Groundwater Protection Code: Petrol Stations and other fuel dispensing facilities involving underground storage tanks. 2002
- PPS 25 - Development and Flood Risk, 2006, Communities and Local Government

h) <u>Ecology</u>

3.143 An Ecological Mitigation Strategy has been produced detailing the ecological mitigation and enhancements to be implemented in the vicinity of the access routes. The Strategy is included as Appendix 14.8 to the ES and will be adhered to throughout the construction of the development.

3.144 An Arboricultural Survey (Appendix 14.6 to Chapter 14: Ecology, of the ES) was undertaken in September 2007 to determine the size, condition and value of trees, shrubs and hedgerows on and immediately adjacent to the site and provide recommendations for remedial work and root protective distances to ensure the future health and stability of retained trees.

3.145 This Framework CEMP details general ecological mitigation to be undertaken during the construction phases across the entire site.

General Measures

3.146 Where construction works are adjacent to areas of nature conservation value, these will be fenced to prevent ingress of people, machines or materials into these protected areas.

3.147 Where possible compounds and work areas will not be located within 10m of sensitive areas of nature conservation and surface streams. Where this is unavoidable specific measures will be put in place to protect the nature conservation interest in accordance with relevant guidance.

3.148 Any soil removed for re-use in ecological mitigation will be carefully sorted and stored into sub soil and top soil stockpiles to avoid mixing and/or compaction.

3.149 All ecologically sensitive features which are to be retained will be fenced off prior to site clearance allowing for any agreed undisturbed buffer zones. BS 1722 British Standard for Fencing will be applied to fencing installed around trees and shrubs to safeguard the root zone.

3.150 Clearance of features of ecological value will be carried out under supervision of a competent and suitably experienced ecologist.

3.151 If protected species are discovered during construction, works in the affected area will stop and a management programme will be developed with assistance from a suitably experienced ecologist. Where necessary, appropriate licenses will be obtained for their translocation and these works will be completed in accordance with relevant legislation.

3.152 Lighting will be positioned and directed to minimise intrusion and disturbance of the Yeading Brook corridors and other areas of nature conservation value.

Birds

3.153 In the area around the bridge links, where the construction programme allows, measures will be taken to clear trees, scrub and tall herbaceous vegetation outside the bird-breeding season (i.e. between October and February). Where clearance works cannot be avoided during the nesting season, a survey will be undertaken prior to clearance to ensure the area does not contain active nests. If nesting birds are located, a buffer zone of existing vegetation around the nest will be designed and introduced in consultation with a competent and suitably experienced ecologist before the relevant works proceed.

- Screening of security fences with vegetation will be avoided.
- Effective site drainage will be maintained in order to prevent standing water resulting from heavy rain.
- Areas of open water will be kept to a minimum. Where open streams and ditches are unavoidable and pose a significant risk of attracting birds these will be netted or caged to prevent access by birds.
- Self-closing bins will be provided for the storage of all waste.
- Site tidiness will be maintained to ensure that birds are not attracted to discarded waste.

Reptiles

3.154 Although no reptiles were found during the surveys undertaken in June and July 2007, there is an area of grassland in the vicinity of the Proposed Pump Lane Bridge to the west of the site which was inaccessible during the surveying. This area contains a diversity of structure including open areas for basking, grassland for foraging and large piles of debris and soil that would serve as ideal refugia for reptiles. If reptiles are encountered on the site, construction works in the affected area will stop and a management programme will be developed with assistance from a suitably experienced ecologist

Japanese Knotweed

3.155 The control and disposal of Japanese Knotweed will comply with relevant guidance and legislation. A method statement will be submitted and agreed with the EA to ensure the most effective control and disposal of Japanese Knotweed prior to construction in affected areas. Methods that will be considered include:

- cutting, drying and composting stem material if suitable locations on site exist,
- treatment using herbicide from July to September over three growing periods,
- digging plants in winter and treating re-growth in spring and summer,
- digging and stockpiling material on site with subsequent re-treatment of growth, and
- off-site disposal.

Trees and Other Vegetation

3.156 Those trees indicated by the Arboricultural Survey (Appendix 14.6 in the ES) to be retained on-site will be protected from adjacent works during construction in accordance with BS 5837 2005.

3.157 All other vegetation to be retained will be clearly identified and measures put in place to protect against damage from construction activities. There will be no use of land underneath trees and shrubs/hedges which are being retained.

3.158 Those trees to be felled have been clearly identified in the Arboricultural Survey. Felling will be conducted under supervision of a competent and suitably experienced ecologist.

3.159 Weed control within the site will be managed to ensure that injurious weeds do not become established within the site.

3.160 The use of herbicides for the control of weeds will be controlled to protect the health of animals and other plants, to safeguard the environment and avoid pollution of surface or ground water.

Screening and Fencing

3.161 The landscape treatment and screening and fencing of the construction site will be provided on a site specific basis as necessary.

3.162 Screening and fencing will be sensitively designed to be both effective and sympathetic to the local environment.

Monitoring

3.163 Ecological monitoring will be undertaken by suitably experienced and competent ecologists during the construction period and that an ecological monitoring programme is agreed with the EA, LB Hillingdon, LB Ealing and other relevant bodies prior to the commencement of construction activities.

Relevant Guidance

- EA Managing Japanese Knotweed on Development Sites
- BS 1722:2006 British Standard for Fencing
- Planning Policy Statement 9: Biodiversity and Geological Conservation (ODPM, 2005)
- BS 5837:2005 Trees in Relation to Construction
- Bat Mitigation Guidelines, Natural England, formerly English Nature, 2004
- BS 5837:2005 Trees in Relation to Construction
- BS 3998:1989 Recommendations for Tree Work
- The CPSE (Committee for Plant Supply) guidelines contained in Part III ‘Handling and Establishing Landscape Plants’, November 1995
- Forestry Commission 2005 Tree Felling – Getting Permission.

i) <u>Waste</u>

Resource Management

3.164 In order to minimise the generation of waste and waste disposed to landfill, spoil, construction arisings and wastes will be managed in accordance with the waste hierarchy and relevant regulatory controls.

3.165 Measures to reduce excessive storage of materials on site (which can result in the generation of waste) will include (but are not limited to) adopting a just in time material delivery strategy during construction.

3.166 A comprehensive Site Waste Management Plan (SWMP) will be developed. The SWMP will be developed and owned by NGP, the Principal Contractor and all the supply chain partners. The SWMP will provide a structure for waste delivery and disposal at all stages during the construction phase. The purpose is to ensure that

- building materials are managed efficiently,
- waste is disposed of legally, and
- opportunities for materials recycling, reuse and recovery are maximised.

<u>Material Selection</u>

3.167 The SWMP will set out how building materials, and resulting waste, are to be managed during the project. Typically it will identify the following for all stages of the construction works:

- who is responsible for materials and waste management;
- the types of waste to be generated;
- how the waste will be managed. What are the opportunities for reduction, reuse or recycling;
- where waste will be treated, off-site or on-site; and
- the third party responsible for ensuring each waste type is managed as identified and legally.

3.168 Procurement of all timber used during construction will be from a credible certification system e.g. Forest Stewardship Council (FSC) certified timber or Programme for Endorsement of Forest Certification (PEFC).

Waste Management

3.169 Compliance with all aspects of the Duty of Care (Environmental Protection Act 1990) will be achieved during construction in order to protect the interests and safety of others from the potential effects of handling, storing, transporting and disposing of materials and wastes arising under the project.

3.170 Disposal of waste from site will be carried out by a licensed waste carrier.

3.171 All non-hazardous waste leaving site will be accompanied by a waste transfer note which will include the following information:

- description of the waste;
- European Waste Catalogue (EWC) code;
- how it is contained; and
- quantity of waste.

3.172 Copies of correctly completed waste transfer notes will be kept for a minimum of two years for non-hazardous waste.

3.173 If waste is to be deposited, kept or treated on the site, a Waste Management Licence or an exemption will be obtained.

3.174 Where concrete crushing is to be undertaken, the crushing plant will have a relevant local authorisation issued under the Environmental Permitting Regulations (2007).

Hazardous Waste

3.175 The site will be registered with the EA as a producer of hazardous waste in order to comply with Hazardous Waste legislation.

3.176 The waste producer will complete a hazardous waste consignment note that will accompany the waste to its final treatment or disposal destination. Information that will be recorded on the consignment note includes:

- premises code;

- description of waste;
- EWC code;
- quantity (kg);
- chemical / biological components of waste and their concentrations;
- physical form;
- hazardous code(s); and
- container type, number and size.

3.177 Copies of documentation for the transport of hazardous waste will be kept for five years.

Storage and Handling of Hazardous Waste

3.178 Liquid wastes will be stored in bunded areas in accordance with Pollution Prevention Guidelines (PPG) 26 and 2.

3.179 Liquids of a hazardous nature will also be controlled in accordance with Control of Substances Hazardous to Health (COSHH) Regulations (2002).

3.180 Liquid waste can accumulate from rainwater in bunded areas and this may need to be treated as hazardous waste.

3.181 If hazardous materials such as asbestos or lead are encountered and require disposal, this will be undertaken in accordance with Health and Safety legislation and Health and Safety Executive (HSE) guidance notes.

3.182 Packaging and labelling requirements will apply to the transport of asbestos and asbestos wastes as described in HSE guidance notes.

Storage of Soil, Materials and Waste

3.183 Waste will be clearly labelled and segregated on site. Where on-site segregation is not possible due to space limitations, arrangements will be put in place to segregate waste off-site.

3.184 Measures will be put in place to ensure that wastes cannot blow away, including use of self-closing bins.

3.185 Should soils require disposal, the contractor will undertake Waste Acceptance Criteria (WAC) testing prior to disposal.

3.186 Housekeeping measures will be followed for the storage of materials to ensure that materials are not damaged (resulting in waste). Some materials may need to be protected from weather.

3.187 The burning of waste on site will be prohibited.

Monitoring

3.188 The materials and waste taken off-site will be measured and monitored. As a minimum the following waste management data will be provided for each construction phase:

- quantity of materials and waste removed from site by type (in cubic metres) and weight (in tonnes);
- fate of the materials and waste on- and off-site (e.g. percentage split of re-use, recycling, composting, energy recovery and landfill disposal);
- waste transfer notes; and,
- hazardous waste consignment notes.

Relevant Guidance

- National Waste Strategy (DEFRA, 2007)
- Waste - Duty of Care (DEFRA, 2003)
- See http://www.hse.gov.uk/asbestos/information.htm for HSE Guidance on Asbestos
- Control of Substances Hazardous to Health (COSHH) Regulations, see http://www.hse.gov.uk/coshh/ for further details

- Planning Policy Statement (PPS) 10: Planning for Sustainable Waste Management (ODPM, 2005)
- AggRegain website for information on specifying, purchasing or supplying recycled or secondary aggregates www.aggregain.org.uk
- Review of England's Waste Strategy A Consultation Document (DEFRA, February 2006)
- Statutory Instrument 314: The Site Waste Management Plans Regulations (HMSO, 2008)
- ICE Demolition Protocol (ICE, 2004)
- EA Pollution Prevention Guidance Notes, PPG26 (Storage and Handling of Drums & Intermediate Bulk Containers) and PPG02 (Above ground oil storage tanks)
- Site Waste Management Guidance (Waste & Resources Action Programme (WRAP)) http://www.wrap.org.uk/construction/construction_waste_minimisation_and_management/onsite/site_how_to.html

j) Community Relations

Enquiries from Local Communities and Media

3.189 All enquiries associated with the Proposed Development will be directed to NGP and a coordinated response agreed and implemented as advised by NGP.

Stakeholder Communications

3.190 NGP's communication team will liaise directly with the following key stakeholders to maintain effective communication links and to keep them updated on construction matters likely to affect them:

- local Authorities;
- local residents;

- schools, nursing homes and community facilities;
- appropriate statutory agencies such as the EA
- local businesses; and
- appropriate representative groups identified by Local Authorities.

3.191 Appropriate information will be communicated by NGP to key stakeholders on a regular basis. This will include:

- the principal stages of the Proposed Development with anticipated commencement and completion dates;
- the start date and duration of specific construction activities likely to affect stakeholders;
- details of contact names and telephone numbers e.g. for complaints and enquiries; and
- potential impacts to stakeholders and proposed mitigation measures.

3.192 Where requested, the Principal Contractor will provide all relevant information to NGP so that effective stakeholder communication can be maintained.

3.193 Direct communication with appropriate regulators on consent issues will be by the Principal Contractor.

3.194 Liaison and consultation will be held regularly with stakeholders throughout the construction phase.

Notice Boards

3.195 Under the direction of NGP multi-lingual notice boards will be maintained at appropriate locations around the site for the duration of the works. The notice boards will be accessible and clearly visible. A description of the works to be undertaken, key contractors involved in the works together with Project contact details will be posted on the notice board.

Monitoring

3.196 NGP will maintain a log to record all enquiries and complaints and actions undertaken.

Relevant Guidance

- Environmental Good Practice Site Guide C650, CIRIA, 2005
- Considerate Constructors Scheme website, www.considerateconstructorsscheme.org.uk
- The Civil Engineering Environmental Quality Assessment and Award scheme (CEEQUAL), www.ceequal.com

GLOSSARY AND ABBREVIATIONS

CIRIA – Construction Industry Research and Information Association

CITB ConstructionSkills – a registered charity which helps to provide a fully trained and skilled construction workforce

CM – Construction Methodology

CEMP – Construction Environmental Management Plan

COSHH – Control of Substances Hazardous to Health

CPSE – Committee for Plant Supply

CSCS – Construction Skills Certification Scheme

DEFRA – Department of Environment, Food and Rural Affairs

DMRB – Design Manual for Roads and Bridges

EIA – Environmental Impact Assessment

EMS – Environmental Management System

ES – Environmental Statement

EWC – European Waste Catalogue code

FSC – Forest Stewardship Council

HGV – Heavy Goods Vehicle

HSE – Health and Safety Executive

ICE – Institute of Civil Engineers

LPG – Liquefied Petroleum Gas

ODPM – Office for the Deputy Prime Minister

PEFC – Programme for Endorsement of Forest Certification

PPE - Personal Protection Equipment

PPV – Peak Particle Velocity

PROW – Public Rights of Way

SWMP – Site Waste Management Plan

TRL – Transport Research Laboratory

TPO – Tree Preservation Order

VDV – Vibration Dose Value

Appendix 7.1

Primary schools within 1 mile of Site

School Name	Capacity	Number on roll	Surplus	Surplus %
Featherstone Primary and Nursery School	630	567	63	10.0%
St Anselm Roman Catholic Primary School	209	191	18	8.6%
Clifton Primary School	315	311	4	1.3%
Norwood Green Infant and Nursery School	268	248	20	7.5%
Norwood Green Junior School	360	326	34	9.4%
Wolf Fields Primary School	420	287	133	31.7%
Havelock Primary School	420	365	55	13.1%
Three Bridges Primary School	360	270	90	25.0%
Guru Nanak Sikh Primary School	240	245	0	0.0%
Blair Peach Primary School	420	406	14	3.3%
Beaconsfield Primary and Nursery School	210	201	9	4.3%
Hambrough Primary School	416	432	0	0.0%
North Primary School	420	437	0	0.0%
Dr Triplett's CofE Primary School	420	413	7	1.7%
Minet Nursery and Infant School	360	326	34	9.4%
Botwell House Catholic Primary School	630	563	67	10.6%
Cranford Park Primary School	621	612	9	1.4%
Yeading Infant and Nursery School	352	353	0	0.0%
Yeading Junior School	471	476	0	0.0%
Dormers Wells Infant School	327	289	38	11.6%
Dormers Wells Junior School	412	390	22	5.3%
Total	**8281**	**7708**	**617**	**7.3%**

Source: Edubase Annual Schools Census

Secondary Schools within 2 miles of Site

School Name	School Capacity	Number on Roll	Surplus	Surplus %
Guru Nanak Sikh Voluntary Aided Secondary School	366	501	0	0.0%
Harlington Community School	1168	1293	0	0.0%
Barnhill Community High School	1416	1332	84	5.9%
Greenford High School	1603	1639	0	0.0%
Villiers High School	1200	1141	59	4.9%
Dormers Wells High School	900	886	14	1.6%
Featherstone High School	1200	1172	28	2.3%
The Cardinal Wiseman Roman Catholic School	1663	1809	0	0.0%
Heston Community School	1265	1264	1	0.1%
Lampton School	1438	1382	56	3.9%
Cranford Community College	1346	1416	0	0.0%
Rosedale College	849	661	188	22.1%
Total	**14414**	**14496**	**430**	**3.0%**

Source: Edubase Annual Schools Census

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National Grid Properties Limited

WEST SOUTHALL,
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Transport Assessment

October 2008

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FORWORD

Planning Submission

This Report is one of a series of documents that have been prepared on behalf of National Grid Property Limited (NGPL), to support an outline planning application with details of all proposed accesses submitted in full for the comprehensive redevelopment of 44.7 hectares of land known as the Southall Gas Works site ('the Application Site'). This Report should be read in conjunction with the drawings and other documents submitted as part of this application, as follows:

- Environmental Statement, including a Non-Technical Summary
- Design and Access Statement (including Landscape and Accessibility Strategy)
- Development Specification
- Planning Statement
- Framework Travel Plan
- Retail Assessment
- Sustainability Strategy
- Energy Strategy including Renewables
- Regeneration Strategy
- Housing Strategy
- Health Impact Assessment
- Remediation Strategy
- PADHI Report
- General Management Strategy
- Statement of Community Involvement

Local Planning Authority

The application is submitted to both the London Borough of Ealing (LBE) and the London Borough of Hillingdon (LBH) as the Application Site straddles the borough boundaries.

Application Proposals

The proposals are for a high quality residential-led mixed use development comprising the following:

> An outline application for the demolition of the following properties: 16-32 (even) The Crescent; 1-11 (odd) Randolph Road; 137-143 (odd), 249 and 283 Beaconsfield Road; 30 The Grange; the remediation of the land and the redevelopment of the site to deliver a mixed use development for up to: 320,000sqm of residential, up to 14,200sqm for non-food retail, up to 5,850sqm of food retail, up to 1,750sqm of Class A3-A5 uses, up to 9,650sqm of hotel, up to 3,000 sqm of conference and banqueting, up to 4,700sqm of leisure forming a cinema, up to 2,550sqm of health care facilities, up to 3,450sqm of education facilities, up to 3,500sqm of office/studio units, up to 390sqm of sports pavilion, up to 600sqm of energy centre, up to 24,450sqm of multi-storey car park and associated car and cycle parking, landscaping, public realm, open space and children's playspace; and
>
> Details are submitted for full approval (layout, scale, appearance and landscaping) of the following accesses:
>
> - Pump Lane Link Road – New access road from the Hayes bypass to the Application Site for vehicle, cycle and pedestrian access, including drainage and a flood relief pond.
> - Eastern Access – New access road from Southall centre to the site, including land currently occupied by properties on The Crescent.
> - Minet Country Park Footbridge – Central pedestrian and cycle access to the Minet Country Park, bridging over the Canal and Yeading Brook.
> - Springfield Road Footbridge – Northern pedestrian and cycle access to Minet County Park and Springfield Road.
> - Widening of South Road across the railway line - Widening of south road over the railway line for the creation of a bus lane.
> - Accesses (3no.) onto Beaconsfield Road.

The development shall be carried out in accordance with the Development Specification and the Parameter Plans appended to that document. An illustrative Masterplan (Drawing Ref. 0317_P1017Rev 00) has been devised to demonstrate how the application proposals could be delivered. Further details of the Application Site and proposed development are set out in the Design and Access Statement and Planning Statement accompanying the outline planning application.

Application Site

The Application Site lies to the north of the Wales and Great Western Mainline Railway (with commercial uses beyond), to the south east of the Grand Union Canal (with Minet Country Park beyond) and to the south of residential developments in Southall, extending off Beaconsfield Road. A Grade II Iisted water tower is now in residential use, located adjacent to the south eastern corner of the Application Site. A retained operational gas works compound is located approximately mid-way along the southern boundary of the site. This comprises one working gasholders that creates the principal landmark within the Application Site. Please refer to the Design and Access Statement for further details

EXECUTIVE SUMMARY

The proposals are to redevelop the former gasworks site in Southall, to create a residential led mixed-use scheme including retail, commercial, leisure, community and associated facilities. The proposals include a Sustainable Transport Strategy that creates a network of footways and cycleways within the site and linking to the external networks. A comprehensive public transport strategy has been developed and focuses on improving local bus services, introducing bus priority and linking to Southall rail station.

Existing Conditions

The site is bordered by the London – Cardiff mainline railway line along the southern boundary, the Grand Union Canal along the north-western boundary and private residential properties along the north-eastern boundary. Existing vehicular access is restricted due to the former operation where materials for the gasworks were brought in via the canal and piped out. None of these existing accesses are suitable for the large scale redevelopment of the site which is now planned.

In common with many parts of London congestion occurs in and around Southall town centre at certain times of the day. However, it is neither feasible nor desirable to accommodate unfettered increases in demand flows on the highway network, particularly during peak periods. The emphasis is now placed on promoting walking, cycling and the use of public transport as meaningful alternatives to the private car.

The proposals for the Site have been developed with the above principles in mind, through the creation of a network of footpaths and cycleways along with public transport services, which will not only serve the Site but also significantly benefit those living and working in the surrounding area.

Walking and Cycling Strategy

The proposals include a network of footpaths and cycleways through the site, along with cycle parking and crossings to encourage people to walk and cycle. These routes will not only benefit residents and visitors to the site, but also people within the communities on all sides who will now be able to travel through as opposed to around the site.

Good quality links are provided to all sides of the site. To the north, there will be a total of 8 pedestrian and cycle links connecting to the network of roads in the area. These links will provide access to local facilities on Uxbridge Road as well as local bus services.

To the east, strong links will be formed to South Road and to Southall Railway Station which is 250m to the east of the main body of the site. The proposals include a 4.5m wide shared footway/cycleway linking from the site to South Road. Significant improvements will be made to the area around The Crescent in order to provide a high quality pedestrian environment linking from Southall and the rail station into the site.

To the south, the existing vehicular link at Brent Road will be converted to a pedestrian/cycle link and improvements will be made to the pedestrian tunnel at the end of Dudley Road.

To the west, the proposals include a total of three connections including two new pedestrian / cycle bridges over the Grand Union Canal and Yeading Brook into Minnet Country Park.

Public Transport Strategy

A key benefit of the site is its proximity to Southall Railway Station which can be accessed by walking, cycling or bus. Southall Station is proposed to be improved under the Crossrail scheme, which will not only improve facilities at the station but also services on the line.

The bus strategy comprises three main components as follows:

- On site infrastructure
- Off site improvements
- Enhanced bus services.

Within the site, the primary vehicular routes will include bus lanes on one or both sides as appropriate in order to provide reduced bus journey times and enhanced reliability.

Bus priority will be provided at the Eastern Access and the widening of the South Road bridge, adjacent to the station, will significantly improve facilities for buses and journey times.

Bus stops will be located at key locations throughout the site, with no individual plot being more than 400m from a bus stop. Where possible, this distance will be reduced to 250m.

It is not appropriate to determine prescriptive bus services at this stage since these will evolve as the site is built out and as local bus services change in the years ahead. Extensive discussions have been held with London Transport and a strategy devised which creates a phased introduction of services through the site. The proposals are likely to include a mix of new bus services, but also diversion of existing services through the site, or extensions from their existing termination point.

Travel Plan

A Framework Travel Plan has been prepared and submitted with the planning application. This envisages a site wide Travel Plan which will establish the principles for the whole site and Individual Travel Plans for the various land uses.

A Transport Review Group will be established that will determine the appropriate transport initiatives as the site is developed. This will include Travel Plan measures, bus service improvements etc.

Parking Strategy

A balanced parking strategy has been developed for the site. For residential element, the overall parking ratio will be 0.7 spaces per dwelling. This will be a mixture of on-street and off-street provision.

A total of 960 spaces will be provided for other uses on site. This will provide for the retail and commercial elements (including the hotel and conference centre) of the scheme as well as assisting with provision of car parking for Southall town centre.

Access Proposals

Notwithstanding the constraints associated with the Site and existing accesses, the proposals include the creation of five vehicular accesses with primary connections to the A312 via Pump Lane (“the Western Accesses) and to South Road (“the Eastern Access”) along with three secondary connections to Beaconsfield Road in the north.

The Eastern Access scheme includes the creation of a new signalised junction on South road a short distance to the north of Southall Station along with the widening the South Road Bridge over the railway line to assist bus journey times. The junction of South Road and Merrick Road will be signalised and improvements made to the existing Park Avenue signalised junction.

The Western Access includes the creation of a new signalised junction on Pump Lane immediately to the east of the A312 plus the signalisation of the existing A312 / Pump Lane junction.

The vehicular connections to the north onto Beaconsfield Road will be designed to facilitate movement whilst discouraging inappropriate traffic. This will be achieved through affording priority to pedestrians and cyclists through the creation of shared surfaces along with Traffic Regulation Orders and traffic calming. The connection to Brent Road under the railway will be maintained for pedestrians and cyclists only.

Off Site Highway Works

Following detailed discussions with the transport authorities, a programme of offsite highway improvements has been developed which will assist in mitigating the effects of the additional traffic generated by the development. The key elements of this package are as follows:

- Improvements to the A312 (Hayes Bypass) / M4 Junction include a number of capacity enhancements improving conditions compared to the no-development scenario which will be a major benefit given the strategic importance of both the M4 and the A312.

- Improvement of the Bulls Bridge junction on the A312. These works comprise significant capacity enhancements to this junction which produce conditions which are better than in the no-development scenario.

- South Road Area: These works comprise introduction of the Eastern Access to the site along with widening of the South Road bridge adjacent to the station and signalisation of the junction of South Road and Merrick Road. There will also be improvements to the existing Park Avenue signalised junction. The aim of these improvements is to generally improve conditions along the South Road corridor but particularly enhance facilities for buses. However, it must be recognised that this is a congested route within a dense urban area, in common with other similar areas in London. It is neither possible nor appropriate to introduce improvements that would provide totally free flowing conditions, particularly during the peak periods. This is no longer government policy and therefore the emphasis is on providing for alternative transport modes which discourage use of the private car.

The above package of improvements is considered an appropriate balance between making a suitable provision for the private car but placing the emphasis on improving public transport, walking and cycling.

Effects of Development

The effects of the additional trips generated by the development have been assessed on all modes of transport in the vicinity of the site. Junctions to the west of the site, on the Hayes Bypass, generally show post development conditions which are better than the no-development scenario. To the east of the site, the density of development and volume of traffic are such that significant improvements to existing conditions are not feasible. It is considered that the measures that have been introduced are an appropriate balance and will enhance conditions for buses, particularly adjacent to Southall Station.

Conclusions

A balanced transport strategy has been developed in order to serve the major mixed use development on Southall Gasworks. The strategy puts an emphasis on creating good pedestrian and cycle links as well as a strong and evolving public transport strategy. The site will be well served by local bus services as well as rail services at Southall Station which will be enhanced by the introduction of Crossrail. The highway improvement works are considered appropriate within the context of a dense urban area. They maintain and enhance traffic conditions on the strategic highway network whilst improving bus conditions to the east of the site.

Savell Bird & Axon

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1 INTRODUCTION

1.1 Savell Bird and Axon (SBA) are retained by National Grid Properties Limited (NGP) to provide transportation and traffic advice associated with the redevelopment of the former gasworks site in Southall, Ealing.

1.2 The site is located immediately north of the London – Cardiff mainline railway line, to the west of Southall Station as shown on **Figures 1 and 2**. It is broadly triangular in shape and virtually land locked with the railway line to the south, the Grand Union Canal to the north-west and residential properties to the north. There are three existing, albeit constrained, vehicular access points into the site, via Brent Road to the south, the Straight to the east and on to Beaconsfield Road to the north.

1.3 The site is currently used predominantly for car storage and long stay airport parking (operated by Purple Parking) and the proposals include redeveloping the site for a residential led mixed-use scheme along with retail, leisure, community (education and health), hotel and a small element of employment land plus associated parking. The existing uses will be phased out with the development of the site. Further details are included in Section 4 and the Planning Statement prepared by RPS.

1.4 This document follows more than two and a half years of negotiations and discussions with highway officers from LB Ealing (LBE), LB Hillingdon (LBH), Transport for London (TfL) and the Highways Agency (HA). The discussions explored all aspects of the scheme, resulting in a good level of agreement and the promotion of substantial sustainable transport measures and off-site highway improvements to assist in mitigating the potential impact of the scheme.

1.5 It is anticipated that the site will be developed out over a 15 year period, from decontamination through to construction and fitting out of the units. The assessment of the likely potential impact on the local and wider transportation network has been undertaken taking into consideration existing travel patterns and constraints, making adjustments as necessary to reflect anticipated changes in policy and travel patterns.

1.6 It is important to note at the outset that it is unlikely to be possible to fully mitigate the potential traffic effects of the development based on unfettered demand flows, particularly within Southall town centre. The application seeks to provide the appropriate level of infrastructure to serve the site, which includes significant off-site highway infrastructure along with increased public transport.

1.7 The remainder of the report is as follows;

- Section 2 - describes the existing situation, both on site and within the immediate surrounding area, including prevailing traffic conditions, public transport provision and parking along with travel habits.
- Section 3 - summarises existing policy guidance
- Section 4 - outlines the proposals associated with the redevelopment of the site. It provides a brief summary of the various planning applications along with mitigation measures.
- Section 5 - sets out the methodology and assumptions adopted for assessing the potential impact of the scheme.
- Section 6 - quantifies the number of trips by each mode during the assessment periods for each of the proposed land uses.
- Section 7 - sets out the walking and cycling strategy.
- Section 8 - sets out the public transport strategy, looking at the interim years in addition to the final scenario.
- Section 9 - sets out the parking strategy for the site, taking into consideration demand associated with the existing Southall town centre.
- Section 10 - outlines the anticipated build programme, and quantifies development for each phase.

- Section 11 - summarises the potential impact on the highway network, and includes assessments for weekday commuter and Saturday peak hours.
- Section 12 - summarises and concludes

2 EXISTING SITUATION

2.1 This section of the report sets out the existing conditions on and around the site, looking at infrastructure, accessibility and prevailing conditions, along with travel patterns of existing residents.

The Application Site ("the Site")

2.2 The Site (see **Figure 3**) is broadly triangular in shape and covers an area of approximately 37 hectares. However, although it is previously developed land formerly used for the storage and distribution of gas, vehicular access is limited to the Straight (in the east), Brent Road (to the south) and on to Beaconsfield Road (to the north).

2.3 Apart from the vehicular access via Brent Road, the only other access from the south is a pedestrian underpass broadly in the middle of the site, which connects to Dudley Road.

2.4 There are currently three gas holders remaining on the site, with the majority of other associated infrastructure demolished some time ago. Vehicular access is taken from The Straight and Beaconsfield Road for maintenance purposes. The majority of the site is now used for off-site airport parking or the storage of cars, with vehicular access via Brent Road.

The Surrounding Area

2.5 The surrounding area is typical of outer London boroughs with a mixture of retail, residential, commercial and employment development, along with recreational and educational facilities. Although the site is entirely in Ealing, the Grand Union Canal (Paddington Branch) that runs along the western boundary of the site forms the Hillingdon / Ealing boundary. The area to the north of the Site is known as the Southall Broadway ward, with the area to the south of the railway line is known as Southall Green.

2.6 The Site is bounded by the London to Cardiff mainline railway line to the south, the Grand Union Canal (Paddington Branch) to the north-west and by predominantly residential properties to the north-east. Southall town centre lies to the north and east of the site, with Hayes town centre approximately 1,25km to the west.

2.7 The site lies immediately south of the Southall Broadway ward in Southall, which comprises predominantly residential properties along with several educational facilities. The area is typified by narrow one-way streets that run between The Broadway (A4020) in the north and Beaconsfield Road in the south. The majority of the streets are subject to Controlled Parking Zones and traffic calming measures to discourage rat-running. Only the roads in the far west of the estate are not subject to a CPZ.

2.8 There are several existing schools along Beaconsfield Road, including Blair Peach Primary School at the western end adjacent to the Grand Union Canal (Paddington Branch) and Beaconsfield Road Primary School.

2.9 Southall town centre retail is concentrated along The Broadway and South Road to the north of the railway line, with further pockets of retail south of the railway line on The Green and Featherstone Road. The majority of the retail caters for the specialist Asian market, with some discount supermarkets. However, there is little or no typical western high street retail.

2.10 The Minet Country Park lies immediately to the west of the site on the opposite side of the Paddington branch of the Grand Union Canal.

Public Transport Services

2.11 The existing Public Transport Accessibility Level of the site is poor. Although the London to Cardiff mainline railway line runs along the southern boundary of the site, the closest mainline railway station is Southall approximately 500m to the east (with Hayes mainline railway station being approximately 1,250m to the west) and there are no bus services running through the site. The closest bus services operate along South Road to the east and the A4020 to the north.

Rail Services

2.12 There are regular services from Southall plus Hayes and Harlington stations to London (and intermediate stations) to the east and Heathrow Airport (via Heathrow Connect), Reading, Slough, Swindon and further affield to the west.

2.13 Table 2.1 includes a summary of the services calling at Southall Station during typical weekday commuter peak periods. Southall Station is in Zone 5 and the journey time to London Paddington takes on average 15 minutes. Hayes Station, approximately 1,250m to the west of the Site, is in Zone 6 and the journey time to London Paddington during commuter peak periods typically 19 minutes.

Table 2.1: Summary of Rail Services at Southall Station

Period	Direction	
	Towards London (trains per hour)	From London (trains per hour)
Early	5	6
Morning Peak	7	7
Day	4	4
Evening Peak	4	6
Late	4	5

Bus Services

2.14 Southall town centre is well served by buses as illustrated by the spider diagram in **Appendix 2A**. However, the nature of the local highway network and in particular the location of road crossings over the railway line restricts the distribution. Existing services typically run in an east-west direction along the Uxbridge Road corridor, or in a north-south direction along South Road.

2.15 There are in total 11 routes that serve Southall town centre on a regular basis Monday through Sunday, connecting to destinations in Ealing, Uxbridge and Hounslow, along with Heathrow Airport. Six of the services (105, 120, 195, 435, E5 and H32) travel along South Road, whilst the 207 and 607 run along Uxbridge Road to the north.

2.16 Service 95 terminates in the High Street a short distance to the north of the site whilst Service 207 terminates east of the Ossie Garvin roundabout junction.

2.17 Service H50 between West Drayton and Hayes via Stockley Park terminates a short distance to the west of the site at Blyth Road in the vicinity of Hayes & Harlington Station.

2.18 Other services terminating in the vicinity include the E6 and the H28, both of which terminate at the Bulls Bridge Tesco to the south of the site.

2.19 Information held by Transport for London in the form of Bus Origin Destination Surveys (BODS) suggests that there is existing capacity on most of the routes in the vicinity of the site. The BODS data records all passenger movements at every bus stop along a route, and is supplemented by Key Point surveys in the interim years.

2.20 **Appendix 2B** includes a summary of the BODS data for the bus services that operate in Southall. The data suggests that, during the weekday morning peak, all of the services with the exception of the eastbound 607 operate under the planning capacity of the buses. During the evening peak, all of the services currently operate under the planning capacity.

2.21 There is no BODS data for the weekend although the general presumption is that the commuter demand during the weekday morning and evening peaks represents the highest flows during the week. Furthermore, in most cases, services typically operate on a similar frequency Monday through Saturday, with lower frequencies on Sunday and during the evenings.

Pedestrian and Cycling Facilities

2.22 There is a good network of cycle routes and footpaths in the vicinity of the site which provide connections to day to day existing facilities such as schools, shops and public transport opportunities.

Pedestrian Facilities

2.23 There are pedestrian footpaths adjacent to all of the roads in the vicinity of the site with crossings at appropriate locations.

2.24 South Road is the main north – south link over the railway line, with footpaths on both sides. Other north-south crossings over the railway line are available at the canal (along the towpath), or via the pedestrian underpass in the vicinity of the gas holders and via the footbridge east of Southall Station. However, although the existing facilities over the railway line are adequate, they are not ideal, with activity at the bus stops typically reducing capacity along South Road and personal safety an issue at the other crossings, particularly during the evening.

2.25 There are pedestrian crossing facilities at the South Road / Park Avenue / Beaconsfield Road junction which has a dedicated pedestrian all-red stage, along with a pelican crossing outside Southall Station.

2.26 However, there are no links across the canal from the site into the Minet Country Park, nor are there any public routes across the site.

Cycle Facilities

2.27 The London Cycle Network (see **Appendix 2C**) passes the application site along each of the northern, southern and western boundaries. The Straight is designated as a route for pedestrians and cyclists (with pedestrians having priority), and Beaconsfield Road is designated as route on a quiet road recommended by cyclists. Cycling is permitted on the canal towpath although again pedestrians have priority.

2.28 These routes connect to the wider London Cycle Network, providing access to destinations throughout London. Other roads in the vicinity included on the London Cycle Network include South Road over the railway, The Green, Lady Margaret Road and Broadway. However, although the roads are designated, traffic conditions are not considered conducive to promoting cycling.

The Highway Network

2.29 The local highway network is illustrated on **Figure 2** and includes strategic, distributor and local roads. The strategic highway network includes the M4, the A312 Hayes By-pass, the A4020 The Broadway and the A3005 South Road. Distributor roads include Park Avenue, The Green and Merrick Road. Lower order roads include Beaconsfield Road, West End Road, Trinity Road and The Crescent.

The M4

2.30 The M4 runs in a broadly east-west direction between London and Wales. It forms part of the motorway network and is the responsibility of the Highways Agency.

The A312 Hayes By-pass

2.31 The A312 Hayes By-pass runs in a broadly north-south direction approximately 500m to the west of the site and is the responsibility of TfL.. It is a dual carriageway road that connects the A40 in the north to the M4 (and beyond) in the south. It varies in width with two or three lanes in each direction, with a mixture of at-grade and grade separated junctions.

2.32 The road carries high volumes of traffic throughout the day, and key junctions include Bulls Bridge (Hayes Road) and the M4 J3. Long queues are known to form on the approaches to these junctions during peak times and over the weekend.

The Broadway (A4020)

2.33 The Broadway (A4020)) is a single carriageway road that runs in an east-west direction from Uxbridge in the west, through Southall town centre to the north of the site and on to Ealing Broadway and Shepherds Bush.

2.34 It varies in width along the corridor, with sections of one lane in each direction and others with three lanes in each direction. The section through Southall town centre typically has two lanes in each direction, with the inside lane forming a bus lane in certain sections. All key junctions are signalised, including that with South Road, with lower order intersections under priority control, some with limited access.

2.35 As with the A312, the corridor carries high volumes of traffic, including several bus services.

South Road

2.36 South Road runs in a north-south direction through Southall town centre between the A4020 and Merrick Road. It forms part of the A3005 that continues northbound as Lady Margaret Road and southbound as Merrick Road.

2.37 It is a single carriageway road with one lane in each direction, widening on the approach to junctions. The junctions with the A4020 / Lady Margaret Road and with Park Avenue / Beaconsfield Road are signalised. In addition, there are signalised pedestrian crossings opposite Southall Station and in the vicinity of Orchard Avenue.

2.38 The road suffers from periods of congestion throughout the day, primarily due to the ongoing activities adjacent to the road. However, a main cause for the congestion, particularly during the peak periods, is associated with the activity outside Southall Station and the fact that the signals are not linked. There is only one southbound lane over the railway bridge at Southall Station which, coupled with the bus stop immediately south of the station and the frequency of call at the pedestrian signal, results in very little capacity for southbound traffic. This affects the whole corridor, resulting in queuing and causing drivers to seek alternative inappropriate routes.

Beaconsfield Road

2.39 Beaconsfield Road runs in a east-west direction between Springfield Road in the west and South Road in the east along the northern boundary of the site. However, it is split in two by the Grand Union Canal (Paddington Branch) without any physical connection.

2.40 North of the site, it is a narrow single carriageway road with one lane in each direction and footpaths on both sides. The road is traffic calmed with parking permitted on one or both sides. Although flows are typically low throughout the day, relatively long queues form at the junction with South Road during the morning peak as drivers use the road to avoid travelling through the town centre and drop off children at the various schools.

Park Avenue

2.41 Park Avenue runs in a broadly north-east to south-west direction between the A4020 and South Road. It is a single carriageway road with one lane in each direction and is traffic calmed. As with Beaconsfield Road, it carries relatively low flows throughout the day although queues do form at the junction with South Road as drivers use the route as a short cut to avoid Southall town centre during peak periods.

Travel Habits and Car Ownership

2.42 The 2001 Census provides useful information on travel to work patterns throughout the UK. The census which includes data for the resident population, summarised in Table 2.4, suggests that the majority of people travel by car (51%), with 37% using public transport and 10.5% walking or cycling.

Table 2.2: Summary of 2001 Census Travel to Work – Southall

Walk	Cycle	P/T	Car Driver	Car Pax	Other
8.6%	1.9%	37.4%	45.2%	5.8%	1.1%

2.43 However, the census does not provide any data on mode of travel for other forms of development. In this regard, we have considered information in the TEMPRO database that includes predicted share by each mode of travel by journey purpose throughout the day. **Table 2.3** includes a summary of the estimated share to each mode for all journey purposes for the Ealing Borough for 2025, i.e. the assessment year. The database estimates (see **Appendix 2D**) the mode share taking into consideration existing travel patterns along with changes due to anticipated policy aimed at encouraging travel by sustainable modes.

Table 2.3: Summary of TEMPRO Estimated Mode Share (Ealing 2025)

	AM Peak (07h00 – 10h00)		PM Peak (16h00 – 19h00)		Average Saturday	
	Arrive	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**
Walk	13.2%	16.8%	16.0%	15.6%	24.1%	24.2%
Cycle	1.9%	2.8%	3.1%	2.8%	2.7%	2.7%
Bus	26.9%	10.8%	9.3%	14.6%	16.1%	16.2%
Rail	9.3%	9.7%	8.6%	8.5%	4.6%	4.5%
Car Driver	38.1%	48.5%	43.5%	38.4%	27.4%	27.3%
Car Passenger	10.5%	11.4%	19.4%	20.1%	25.1%	25.2%

2.44 Existing car ownership levels within Southall are typical of outer London boroughs at circa 1.0 vehicle per dwelling which is higher than the average in London of 0.87 vehicles per dwelling. The trend is for larger detached houses to have more than one vehicle with apartments typically having less than one car.

Traffic Conditions

2.45 Traffic conditions in Southall are influenced by the constrained nature of the local highway network and the nature of the existing specialist retail offer along with the low number of bridges over the railway line and the proximity of Heathrow Airport.

2.46 Although the A4020 and South Road through the town centre are relatively wide, the nature of the pedestrian and retail activity along the corridors are such that the highway capacity is reduced. This is compounded by the relative lack of off-street town centre car parking north of the railway line and the limited number of vehicular crossings over the railway line. Existing vehicular rail crossings exist along South Road in Southall town centre, which has limited capacity as described earlier, via the A312 (in Hillingdon) to the west and along the A4020 at Iron Bridge to the east.

2.47 Traffic survey information on the surrounding highway network has been collected on several occasions over the past few years. **Appendix 2E** includes a copy of the most recent count for each of the junctions with the peak flows summarised on **Flow Diagrams AM01, PM01 and SAT01** for each of the weekday morning, weekday evening and Saturday peak hours respectively.

Town Centre Parking

2.48 Parking in Southall town centre is generally in short supply. The Ealing Cabinet Note (15th September 2006) identifies a total of approximately 686 spaces for cars, with 513 public spaces including 215 located south of the railway line in the Featherstone and Norwood Road car parks, plus 252 in the Herbet Road multi-storey car park located off Broadway. In addition, there are 173 spaces in private car parks, including the Iceland / Quality Foods car park on South Road.

2.49 Overall, it is estimated that there are approximately 75,000sqm of retail floor space in Southall town centre, which translates to a ratio of 1 space per 107sqm.

Accident Statistics

2.50 Accident statistics have been obtained from TfL for the three year period up to the end of October 2007 for all of the roads in the immediate vicinity of the application site including Beaconsfield Road, Park Avenue, South Road and along the A312 corridor. Copies of the summaries along with the accident plots are included in **Appendix 2F**.

Beaconsfield Road Area

2.51 A total of 8 accidents (all of which involved pedestrians) were recorded in the area to the north of the application site during the three year period. Of these, 4 were recorded on Beaconsfield Road, 2 on Townsend Road and 1 each on Lewis Road and Woodlands Road.

2.52 Two of the accidents resulted in serious injuries and the remainder in slight injuries.

Park Avenue

2.53 A total of 3 accidents were recorded along Park Avenue during the three year period leading up to October 2007. Two of the accidents occurred in the vicinity of Green Drive, one of which involved a cyclists (resulting in a slight injury) and the other between two cars (also resulting in a slight injury). The other accident occurred in the vicinity of Villiers Road and resulted in a slight injury.

South Road (A3005) / Uxbridge Road (A4020)

2.54 A total of 21 accidents were recorded at the junction (including the approaches) during the three year period up to October 2007. Of these, 3 resulted in serious accidents and 18 in slight accidents. Pedestrians were involved in 4 of the accidents, with buses and cyclists involved in 2 accidents each.

South Road / Beaconsfield Road / Park Avenue

2.55 A total of 19 accidents were recorded at the junction (including the approaches) during the three year period up to October 2007. Of these, 2 resulted in serious accidents and 17 in slight accidents. As with the South Road / Uxbridge Road junction, pedestrians were involved in 4 of the accidents and buses and cyclists involved in 2 accidents each.

South Road / Merrick Road

2.56 There was only 1 accident recorded during the three year period up to the end of October 2007.

M4 / J3

2.57 A total of 48 accidents were recorded at the junction, of which 10 occurred on the slip roads, 14 at the roundabout and the remaining 24 on the M4 flyover.

2.58 Of the total 48 accidents, 8 resulted in serious injuries and the remainder where registered as slight accidents. No fatal accidents occurred at this junction during the three year period.

2.59 Shunt accidents were the most common (20 of the 48 accidents), of which 2 resulted in serious injuries and 18 in slight injuries. Light Goods Vehicles were involved in 9 of the 48 accidents, with Heavy Good's vehicles involved in 6 accidents.

North Hyde Road/A312 Parkway/Hayes Road (Bulls Bridge)

2.60 A total of 12 accidents occurred at this junction, of which 1 resulted in serious injury and the remaining 11 in slight injuries.

2.61 Ten of the 11 accidents were shunts, whilst the remaining accident involved a vehicle loosing control. Light Goods Vehicles (<3.5T) were involved in three of the accidents.

A312 at Pump Lane

2.62 A total of 10 accidents were recorded at this junction, with 7 on the northbound (western) and 3 on the southbound (eastern) carriageways, all of which resulted in slight injuries

Transport Initiatives

Crossrail

2.63 Crossrail is being jointly promoted by the Department for Transport (DfT) and TfL to increase rail capacity into and through London.

2.64 Currently, the majority of mainline rail services into London terminate at stations on the periphery which affects the number of available train paths and hence the capacity. The proposals include creating more routes under London on the east-west corridor which will free up station platforms thereby increasing the number of train paths and hence capacity.

2.65 The proposals also include increasing capacity at several stations along the corridor, through increasing platform lengths (to accept longer trains) and general station capacity. In this regard, the proposals for Southall Station include a new ticket hall to replace the existing facility and longer platforms.

Buses

2.66 TfL has an ongoing programme to improve bus facilities and capacity throughout London. The programme includes improving waiting facilities along with the capacity and reliability of bus services.

3 TRANSPORT POLICY

3.1 Relevant transport policy is set out in a raft of documents at national, regional and local levels. These include Planning Policy Guidance 13 (Transport), the London Plan and the Ealing Unitary Development Plan with the key messages are summarised below.

National Policy

Planning Policy Guidance Note 13 (PPG13) Transport

3.2 There is substantial policy support for the reuse of previously developed sites for high density mixed use development, especially in areas that are or will be accessible by a choice of means of transport. Development should encourage the use of travel by modes other than the private car and to reduce the length of journeys.

3.3 The key objectives of transport policy, as set out in PPG13 are summarised as follows, to:

- Reduce congestion and the dependency on car travel;
- Reduce levels of air pollution and noise from transport;
- Improve the accessibility and encourage the use of environmentally friendly modes of transport;
- Raise awareness of the effect of transport and travel decisions;
- Reduce the risk and perception of risk of danger from the use of all modes of transport; and
- Promote sustainable growth in terms of economic development and land use planning.

3.4 PPG13 further states that the pattern of development, its location, scale, density and mix of land uses can "…help to reduce the need to travel, reduce the length of journeys and make it safer and easier for people to access jobs, shopping, leisure facilities and services by public transport, walking and cycling."

3.5 PPG13 stresses that maximum use is made of the most accessible sites such as those in town centres or close to public transport interchanges.

3.6 PPG13 gives specific guidance on elements such as car parking, requiring standards to be set as maximum permissible levels and encouraging restraint.

Other Related Policy Documents

3.7 Planning Policy Statement 6 (PPS6) considers planning for town centres. This encourages development in existing centres and in areas that already are or will be accessible by a choice of means of transport.

Regional Planning Policy

The London Plan

3.8 The transport policies of the London Plan are similar to those of PPG13. Significant emphasis is placed on checking accessibility levels and ensuring that major development has adequate accessibility levels. The London Plan parking strategy 3C.23 states

"*The Mayor will seek to ensure that on-site car parking at new developments is the minimum necessary and that there is no over-provision that could undermine the use of more sustainable non-car modes. The only exception to this approach will be to ensure that developments are accessible for disabled people*".

3.9 London plan also notes that LPA Unitary Development Plans (UDP) and Transport Local Implementation Plans should:

- *"adopt on and off street parking policies that encourage access by sustainable means of transport, assist in limiting the use of car and contribute to minimising road traffic;*

- *adopt the maximum parking standards set out in the annex on parking standards (annex 4) were appropriate, taking account of local circumstances and allowing for reduced car parking provision in areas of good transport accessibility;*

- *reduce the amount of existing, private, non-residential parking, as opportunities arise;*

- *recognise the needs of disabled people and to provide adequate parking for them; and*

- *take account of the needs of business for delivery and servicing movements,*

- *provide adequate facilities for coaches that minimise impact on the road network capacity and off-road wherever possible."*

3.10 This approach seeks to regulate parking in order to minimise additional car travel.

Local Planning Policy

Ealing Borough Unitary Development Plan (UDP), 2004

3.11 The transport strategy within the UDP aims "…*to provide sustainable access from homes to jobs, shops and services, and from business to business, by integrating land-use and transport planning, restraining car traffic, promoting improved public transport and facilities for pedestrians and cyclists…"*

3.12 The following policies summarised below, are considered applicable to the Site.

- *Policy 9.1 seeks to maximise access on foot, by bicycle and public transport and the promotion of sustainable transport, including the implementation of a Travel Plan;*

- *Policy 9.5 requires developments to include footpaths that are safe, attractive, well lit and comfortable for all, particularly for those who have mobility difficulties;*

- *Policy 9.6 requires developers to have regard to the safety and ease of movement of cyclists, and to provide appropriate facilities to promote cycling as a mode of travel.*

- *Policy 9.8 encourages the introductions of city car clubs and low car housing, particularly in town centre locations and within 200m of stations.*

3.13 Parking standards are set out in Table 1 of Transport Appendix 1 as follows;

Residential Parking Standards

- Vehicular parking: a maximum of 1 space per dwelling of up to 5 habitable rooms, and a maximum of 2 spaces per dwelling with 6 or more habitable rooms.

- Disabled parking: Spaces should be provided for 10% of the units.

- Cycle parking: a minimum of 1 cycle parking space per residential unit

Retail Parking Standards

- Vehicular parking: no more than 1 space per 350sqm site area plus 1 space per 75sqm GFA (Zone 1)

- Disabled parking: a minimum of 1 space per 800sqm site area plus 1 space per 150sqm GFA

- Cycle parking: no less than 1 space per 450sqm A1 and 1 space per 75sqm A3

3.14 The accompanying text in Chapter 9 suggests that typically the number of disabled parking spaces is a proportion of the overall supply, not an addition, except in cases where the need for disabled spaces can be shown to be more than the overall supply. Effectively the standards suggest that at least 50% of the retail parking provision should be for disabled users. This is considered to be an unrealistic and inappropriate provision.

Supplementary Planning Guidance and Documents

3.15 SPG 20 (Sustainable Transport / Transport Assessments) adopted in 2004 includes guidance on when transport assessments should be produced and what they should cover.

3.16 SPG 21 (Sustainable Transport / Green Travel Plans) adopted in 2004 includes guidance for the preparation of Travel Plans.

3.17 SPD 3 (Low Car Housing in Controlled Parking Zones) was adopted in March 2006 and sets out policies related to scheme with lower than parking provision at lower than maximum standards.

3.18 SPD 7 (Car Clubs) adopted in March 2006 sets out the principles for the creation of car clubs in low car housing schemes.

Other Relevant Policies and Guidance

Hillingdon Borough Transport Policies

3.19 The Hillingdon UDP, adopted in 1998, was subject to review in 2006 with a revised document adopted in September 2007. Section 4 (Reducing Travel Demand) includes three types of policies aimed at reducing travel demand, stabilising the quantum of vehicular trips associated with new developments and dealing with existing day-to-day traffic problems. Car parking standards are set out Annex 1 with the revised policy referring to minimums and maximums for cycle and vehicles in line with national and regional policies.

3.20 Policy AM4 at paragraph 14.10 identifies a total of five road schemes including the proposed Western Access. Specifically, the text states that "*this Plan is required to safeguard land needed for new roads and for highway improvements outside the highway boundary. Safeguarded schemes have to have a reasonable chance of implementation within the next 10 years. The Local Planning Authority will not grant planning permission for development which would prejudice the implementation of safeguarded road proposals*". Road Scheme (i) on the list is the link to the former gas works site in Southall from the Hayes By-pass.

3.21 SPG5 (Transport Accessibility and Movement) reiterates national and regional policy related to sustainable travel, covering issues such as walking, cycling and travel plans.

Hounslow Borough Transport Policies

3.22 The Hounslow UDP was adopted in December 2003 with transport covered in Section 5. The key messages are in line with national and regional guidance insofar of minimising the need to travel through the integration land-use and transport planning.

4 DEVELOPMENT PROPOSALS & MITIGATION MEASURES

4.1 This section provides a brief description of the proposals from a transportation perspective. Further details are set out in the Planning Statement (prepared by RPS), Design and Access Statement (MAKE) and the Environmental Statement.

Proposals

Main Site

4.2 The planning application seeks outline consent to construct a residential led mixed-use scheme along with retail, commercial, community and leisure plus associated facilities. **Table 4.1** below includes a summary of the main elements of the scheme. Copies of the indicative Masterplan along with selected Parameter Plans are included in **Appendix 4A**.

Table 4.1: Summary of Development Proposals

Land Use		Quantum
Residential		Between 3,400 and 3,750 units
Retail	A1 Food	5,850sqm
	A1 Non-Food	14,200sqm
	A3, A4 & A5 Uses	1,750sqm
	Total	21,600sqm
Other Uses	Employment	3,500sqm
	Hotel	9,650sqm
	Conference	3,000sqm
	School & Nursery	3,450sqm
	Cinema	4,700sqm
	Health	2,550sqm
	Total	26,850sqm

4.3 Key to the successful redevelopment of the site is access and public transport. The proposals include two primary vehicular accesses, to the east on to South Road (the Eastern Access) and to the west via Pump Lane, along with secondary vehicular accesses on to Beaconsfield Road.

4.4 The Public Transport Strategy (Section 8) sets out the detailed strategy in more detail. However, in short, the proposals include creating a network of bus services that run through the site, by diverting and / or extending existing services along with new routes. It is anticipated that there could be up to 30 buses an hour in each direction through the site at peak times, with many services calling at Southall station which provides excellent links to Central London and the West.

Eastern Access

4.5 The planning application (see Drawing 52212/A/56 in **Appendix 4B** for details) seeks detailed consent to construct a new road connecting the site to South Road via the Crescent. The access falls entirely within LB Ealing.

4.6 The proposals include creating a new junction on South Road approximately 100m south of the junction with Park Avenue. South Road will be widened to two lanes each direction between Park Avenue, through the new junction and over the railway line to the junction with The Green.

4.7 The alignment of the new road requires the demolition of 13 existing residential properties north of The Crescent along with the small commercial property plus 8 dwellings on the eastern side of Randolph Road.

Western Access

4.8 The planning application (see Drawing 52212/A/54 in **Appendix 4C** for details) seeks detailed consent for a new access road to connect the site to the A312 Hayes Bypass via Pump Lane.

4.9 The new road passes over the Yeading Brook and Grand Union Canal (Paddington Branch) and connects to Pump Lane immediately east of the A312. It is a single carriageway road with one eastbound lane and two westbound lanes along with 2.0m wide footpaths on both sides.

Beaconsfield Road Accesses

4.10 The proposals include three vehicular connections to Beaconsfield Road in the north as shown on drawings 52212/A/49, 52212/A/50 and 52212/A/51 in **Appendix 4D**. The junctions and roads will be designed in a manner to facilitate access whilst discouraging in appropriate through traffic. In addition, there will be pedestrian access via the existing footpath adjacent to Blair Peach School and to Grange Road, Lewis Road, Hanson Gardens and Randolph Road.

Springfield Road Footbridge

4.11 The planning application (see **Appendix 4E** for details) seeks detailed consent for a new foot bridge over the Grand Union Canal and Yeading Brook to the south of Blair Peach School, connecting the site to the Brook Industrial Estate.

Minet Country Park Footbridge

4.12 The planning application (see **Appendix 4F** for details) seeks detailed consent for a new foot bridge over the Grand Union Canal and Yeading Brook, connecting the application site to the Minet Country Park.

Parking

4.13 The proposals include approximately 3,577 spaces for cars along with 4,000 spaces for cycles and 8 spaces for coaches.

<u>Residential Car Parking</u>

4.14 The proposals include a total of up to 3,750 dwellings, with some apartments having no parking up to a maximum of 2 spaces per dwelling for the larger units. Overall, it is anticipated that there will be on average 0.7 vehicular parking spaces per dwelling (i.e. up to 2,625 spaces), with a mixture of on-street and off-street parking, which will be dictated by design.

<u>Residential cycle Parking</u>

4.15 The proposals include providing parking for one cycle per dwelling in line with the minimum standards as set out in The London Plan and the Ealing UDP.

<u>Commercial and Retail Car Parking</u>

4.16 The proposals include a mixture of on and off street parking to facilitate the anticipated demand along with the latent demand within Southall town centre.

4.17 The majority of the spaces will be provided for in two multi-storey car parks, with 420 spaces provided in the Central Multi-storey car park above the supermarket and 350 spaces in the Eastern multi-storey car park. In addition, there will be circa 70 spaces adjacent to the Cinema along with approximately 30 spaces will be provided on-street.

<u>Town Centre Cycle Parking</u>

4.18 A total of 125 cycle stands are proposed to be located in key positions throughout the development to accommodate parking for up to 250 cycles. Of these, many spaces will be provided under cover.

Hotel Parking

4.19 The proposals include a total of 122 parking spaces for cars along with 10 spaces for cycles.

Mitigation Measures

Off-Site Highway Works

4.20 The redevelopment of the site has been discussed with all of the highway authorities over the past two years. These discussions have resulted in the promotion of significant highway improvements at key junctions, notably on the A312 corridor and along South Road.

M4 J3

4.21 The proposals include general widening on the northern, southern and western approaches along with the circulatory carriageway (see Drawing 52212/A/52 in **Appendix 4G**). It is envisaged that the works will be implemented through a S278 Agreement, with the timing subject to a condition.

4.22 Faber Maunsell provided initial comments on the design and safety of the proposed layout during the model audit process. The comments referred to road markings and lane widths along with forward visibility, cycle facilities and signal heads. However, whereas the majority of the issues have been dealt with or can be dealt with, increasing the lanes widths on the bends to meet design standards is not considered appropriate.

4.23 This represents a departure from standards which suggest lane widths in the region of 5m. There is no accident trend that suggests that the existing lanes, which do not conform to standard, cause a problem. Therefore, given the prevailing and anticipated flows along with the accident record and percentage of HGV movements through the junction, the proposed layout is considered appropriate.

Bulls Bridge (A312 / Hayes Road)

4.24 The proposals include creating additional capacity though converting the roundabout into a “Hamburger” junction, along with some widening on the northern approach (see Drawing 52212/A/53 in **Appendix 4H**).

4.25 As with the M4 J3 works, it is anticipated that the works will be implemented through a S278 Agreement. It is envisaged that the works will not be carried out at the same time as those for the M4 J3 junction to reduce delays.

A312 / Pump Lane

4.26 The proposals include creating a new signalised junction on the A312 at Pump Lane, with all movements permitted except right turn in from the south (see Drawing 52212/A/55 in **Appendix 4I**). The layout envisages three lanes on both the north and southbound, along with two left turn and two right turn lanes from Pump Lane plus a dedicated left turn lane from the north. The existing left turn northbound filter from Bilton Way will be closed to traffic.

South Road / Merrick Road

4.27 The proposals include widening the South Road between Park Avenue and Merrick Road, which includes the bridge over the mainline railway line (see **Appendix 4J**). Although these works will form part of the detailed planning application for the Eastern Access, they are likely to be carried out in a phased manner.

Travel Plan

4.28 A Framework Travel Plan has been submitted with the planning application. The Travel Plan envisages two levels, to include a Site Wide Travel Plan setting out the broad principles to be adopted, along with Individual Travel Plans for the various land-uses.

4.29 National Grid will appoint a Travel Plan Co-ordinator prior to the commencement of development to oversee the implementation of the Site Travel Plan. The Travel Plan Co-ordinator will be responsible for ensuring that, among other things, design measures to encourage sustainable travel are implemented and setting up a Travel Forum.

4.30 Occupiers of the various developments will be required to appoint a Travel Plan Supervisor prior to occupation to oversee the implementation of the Individual Travel Plans.

Transport Review Group

4.31 It is envisaged that a Transport Review Group (TRG) will be established following consent to oversee the implementation of the various highway and transportation measures through the redevelopment of the Site. The group will be responsible for recommending changes to bus services along with the introduction of traffic calming measures and junction improvements at the appropriate times.

4.32 The group will include representatives from Ealing Borough, Transport for London, Hillingdon Borough, the Highways Agency and National Grid. Although the planning process will seek to achieve a degree of certainty over various aspects, it will be important that there is a degree of flexibility, particularly in relation to public transport, and traffic management as issues and opportunities change with time.

5 METHODOLOGY AND ASSUMPTIONS

5.1 This section sets out the methodology and approach along with the assumptions used to estimate the potential impacts of the proposals on the wider transportation network. These have been discussed with all of the various highway authorities and a good degree of agreement was reached. This document sets out areas of agreement as well as where agreement was not reached.

Periods for Assessment

5.2 The proposals are for a residential and retail led mixed-use scheme as set out in Section 4. It is generally accepted that employment and education along with health facilities are busiest during the week, and generally closed over the weekend. On the other hand, retail peaks typically occur during the afternoon and over the weekend whilst residential attracts peak flows during the morning and evening during the week as well as over the weekend.

5.3 As such, assessments have been conducted during each of the weekday morning, weekday evening and Saturday midday peak periods. The assessments assume the highest hourly flows through the junction during a given period, with the morning peak period from 07h00 – 10h00, the evening peak from 16h00 – 19h00 and the Saturday peak 12h00 – 17h00. The highest hourly flows during the period have been adopted.

Trip Rates

5.4 The redevelopment of the site is anticipated to come forward over a 15 year period, from decontamination through to occupation of the final units.

5.5 The local highway network is constrained and opportunities to create significant additional capacity for unfettered traffic growth are limited. It is therefore envisaged that public transport, walking and cycling will be key to the success of the redevelopment of the site with travel by car, particularly as driver alone, will not be the main mode of travel. Hence the approach has been to estimate the quantum of person trips in the first instance and apportion trips by mode based on existing and predicted mode share data along with conditions on the transportation network.

5.6 The potential quantum of person trips has been estimated based on trip rate information included in the TRAVL and TRICS databases. The TRAVL database includes historic survey data specific to Greater London whilst the TRICS database includes survey data for the whole of the UK. The reason for using both datasets is to increase the available information, although where possible only data from Greater London has been used.

5.7 SPG20 suggests that 85^{th} percentile trip rates are used. However, in this report the quantum of person trips has been estimated using average trip rates, which is considered appropriate given the scale of the development. Although some plots within the development will attract higher trip rates during a certain time period, others will attract lower than average trip rates during the same period. Given the size of the development, it is highly unlikely that 85^{th} percentile trip rates will apply throughout the site. However, 85^{th} percentile trip rates have been adopted for the public transport assessment.

Internal and External Trips

5.8 The application site covers nearly 37ha with a wide range of land uses including residential, employment, retail and leisure. As such, there will be a considerable number of trips that have an origin and a destination within the site, particularly between residential and residential (social), education, leisure and retail. In addition, there will be linked trips with either an origin or a destination within the site, i.e. a resident visiting the supermarket whilst travelling to or from work.

Mode share

5.9 Mode share is influenced by various factors, including the ability to travel by that mode, availability of parking (at the destination), prevailing traffic conditions (i.e. congestions both on the local and wider highway network) and cost. Furthermore, travel by various modes will be different for internal and external trips. There is a higher probability that a person will undertake an internal trip by foot or bicycle than an external trip by these modes; other than to destinations in the immediate vicinity. Likewise, external trips by public transport will be higher than internal trips by public transport.

5.10 It is also important to note that although historic survey data may suggest a particular mode share pattern these are likely to change with time as people change mode or time of travel, or both.

5.11 As such, the mode share for each land use category has been estimated considering data from the 2001 Census along with information in the TRAVL, TRICS and TEMPRO databases, taking into account the proposed mix of uses, prevailing traffic conditions and the proposed level of parking.

Trip Distribution and Assignment

5.12 Due to the scale of the development and hence the anticipated quantum of internal trips, the approach has been to estimate the quantum of internal and external trips by mode, and then distribute the external trips taking into consideration observed travel patterns (particularly in relation to work trips from census data), along with the location of external destinations such as shopping centres, schools, etc.

5.13 Vehicular trips have been assigned to the network based on the most direct approach, although route choice will include several factors such as prevailing traffic conditions and the need to visit a specific destination such as a school, etc.

5.14 To simplify matters, it has been assumed that all of the internal trips are associated with the residential use, i.e. has either an origin or destination with a residential dwelling. However, there will of course be internal trips between other uses, and in particular linked trips between the various retail uses. This is therefore a conservative assumption.

Study Network

5.15 The study network (see **Appendix 5A**) has been discussed with the various highway authorities over the past two and a half years. These discussions have resulted in the following junctions being assessed;

- M4 J3 (***signalised roundabout***)
- A312 / Hayes Road (Bulls Bridge Roundabout) (***signalised roundabout***)
- A312 / Pump Lane (***left-IN, left-OUT***)
- A312 / Bilton Way (***left-IN, left-OUT***)
- Pump Lane / Bilton Way (***mini-roundabout***)
- A312 / A4020 Uxbridge Road (***signalised roundabout***)
- A4020 The Broadway / South Road (***signalised junction***)
- South Road / Beaconsfield Road / Park Avenue (***signalised junction***)
- South Road / Merrick Road / The Green (***roundabout***)

Capacity Assessments

5.16 The capacity assessments have been undertaken using industry standard modelling tools, with signalised junctions assessed using TRANSYT, priority junctions using PICADY and roundabouts using ARCADY.

5.17 All of the signalised models have been audited by Faber Maunsell prior to submission, with all technical input and output reviewed. The majority of the model input complies with the strict DTO guidelines, with the exception of the survey data which is older than 18 month, whilst journey speeds have been used in place of journey times. However, it has been agreed that the models are “fit for purpose” insofar that they provide a representative view of the likely potential impact of the proposals.

5.18 The following assessments, where appropriate, have been conducted for each of the weekday morning, weekday evening and Saturday peak hours;

- Observed Scenario
- Year 0 Base Scenario (2010)
- Year 5 Base Scenario (2015)

- Year 5 Development Scenario No Improvement (2015)
- Year 5 Development Scenario with Improvement (2015)
- Year 10 Base Scenario (2020)
- Year 10 Development Scenario No Improvement (2020)
- Year 10 Development Scenario with Improvement (2020)
- Year 15 Base Scenario (2025)
- Year 15 Development Scenario No Improvement (2025)
- Year 15 Development Scenario with Improvement (2025)

Growth

5.19 The highway network in the vicinity of the site suffers from periods of congestion, particularly during the commuter peak periods, with long queues forming on the approaches to most junctions. It is generally accepted that the highway network is therefore operating at capacity and there are limited opportunities to create additional capacity within existing highway boundaries.

5.20 Furthermore, central government and local policies discourage capacity enhancements just to cater for peak hour private car growth with the aim of encouraging people to use more sustainable modes of transport wherever possible.

5.21 In light of the above we do not consider that it is not necessary or realistic to apply growth for the purpose of assessments. However, following discussions with each of the highway authorities, it was agreed that growth will be applied at a rate of 0.8% per annum from the date of the survey.

5.22 It is also considered that the redevelopment of the application site represents the majority of theoretical growth that could materialise in the immediate vicinity. As such, there is strong merit, particularly in the case of Southall town centre that there is an element of double counting where growth is applied.

6 QUANTUM OF TRIPS

6.1 This section quantifies the trips by mode associated with the various individual land uses for each of the peak hours. The trip rates have been discussed with all of the various highways authorities (LB Ealing, TfL, LB Hillingdon and the HA) with general agreement that the trip rates are appropriate for assessing the potential impact of the scheme.

Residential Trips

Quantum of Residential Trips

6.2 The proposals include up to 3,750 dwellings most of which will be apartments. The potential quantum of person trips has been estimated based on average trip rates by selecting sites from both the TRAVL and TRICS databases (see **Appendix 6A**).

6.3 Although the majority of the dwellings will be apartments, the site selection criteria included houses (for sale and rent) without any weighting to increase the quantum of surveys. A total of 30 surveys have been considered for the weekday peak hours.

Table 6.1: Residential Person Trips

Period	Arrivals		Departures	
	Rate	Flow	Rate	Flow
AM Peak	0.25	938	0.79	2,963
PM Peak	0.51	1,913	0.33	1,238
Saturday Peak*	0.52	1,950	0.52	1,950

*based on AM Peak combined flow split 50% / 50%

6.4 There is no multi-modal data for the weekend in either the TRAVL or TRICS databases. However, vehicular surveys from the TRICS database (see **Appendix 6B**) suggest that two-way flows during the weekend peak hours are similar to the two-way weekday commuter peak flows, albeit that the split is broadly even at the weekend when compared to the weekday peaks where there is a strong directional bias. Therefore, it has been assumed that the two-way person trip rate for the weekend peak hour is the same as the two-way person trip rate for the weekday morning peak hour, albeit with an equal split of arrivals and departures.

Journey Purpose

6.5 Residential properties are typically considered to be generators of trips whereas other elements of the scheme are attractors. As such, there will be a variety of journey purposes with persons travelling to and from school, work and shops, along with personal trips.

6.6 The TEMPRO database includes useful information in this regard. **Table 6.2** includes the predicted journey purpose for each of the peak periods considered, although it should be noted that the data relates to peak periods (i.e. AM Peak 07h00 – 10h00; PM Peak 16h00 – 19h00) rather than peak hours. As expected, during the morning peak, the majority of trips are associated with work and education destinations. During the evening peak, there is a greater proportion of shopping and personal trips, with fewer education trips. At the weekend, the majority of trips are personal in nature, visiting friends, leisure trips, etc.

Table 6.2: Residential Journey Purpose from TEMPRO

	AM Peak		**PM Peak**		**Saturday***	
	Arrive	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**
Work	43.9%	52.2%	44.6%	37.1%	14.2%	14.1%
Shopping	7.3%	7.4%	17.8%	19.2%	31.4%	30.6%
Education	34.4%	25.3%	6.1%	8.1%	0.5%	0.5%
Other	14.4%	15.1%	31.5%	35.6%	53.9%	54.8%
Total	100%	100%	100%	100%	100%	100%

*average Saturday data

Mode Share

6.7 The 2001 Census data suggests that of the persons living in the Southall Broadway and Green wards, approximately 52% travel to work by car (driver and passenger), 37% use public transport, 8.5% walk, 2% cycle and the remainder travel by other modes.

6.8 However, the Census data does not include any information for other journey purposes and it therefore proposed to rely on information in the TEMPRO database.

6.9 The data from the TRAVL database suggests that during a typical day, on average 47% of all arrival trips are by walk or public transport, 35% as car driver and 17% as passenger.

6.10 TEMPRO also provides useful data on mode of travel by journey purpose and as such is considered the most appropriate methodology for estimating the mode share for the residential trips. The journey purposes have been considered as follows; employment trips, shopping trips, education trips and other trips.

6.11 **Table 6.3 and 6.4** set out the trips by mode by time of day and **Table 6.5** the total trips by mode.

Distribution of External Residential Trips

6.12 The distribution of the residential person trips will depend on the nature of the destination / origin, i.e. whether it is employment, retail or other use based. The TEMPRO database suggests for Ealing that 52% of residential departures during the morning peak period (07h00 – 10h00) are work trips, 25% education trips, 7.5% shopping and 5% recreational.

6.13 The corresponding figures for the evening peak period (16h00 – 19h00) are 45% of arrivals from work, 18% from shops, 5.5% from personal business and only 6% education based. A total of nearly 12% of the arrivals are classified as people returning from a friend’s house.

Table 6.3: Residential Mode Share by Journey Purpose & Time of Day

Mode	AM Peak		PM Peak		Weekend	
	Arrive	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**
Journey to Work*						
Walk	8.6%	8.6%	8.6%	8.6%	8.6%	8.6%
Cycle	1.9%	1.9%	1.9%	1.9%	1.9%	1.9%
Car Driver	45.2%	45.2%	45.2%	45.2%	45.2%	45.2%
Car Passenger	5.8%	5.8%	5.8%	5.8%	5.8%	5.8%
Public Transport	37.4%	37.4%	37.4%	37.4%	37.4%	37.4%
Other	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%
Education Trips**						
Walk	14.9%	28.1%	27.6%	13.9%	13.7%	13.8%
Cycle	0.7%	1.1%	1.1%	0.7%	0.8%	0.8%
Car Driver	19.6%	48.2%	55.4%	20.0%	35.6%	36.6%
Car Passenger	4.5%	4.9%	9.3%	9.3%	38.6%	38.0%
Public Transport	60.2%	17.7%	6.5%	56.2%	11.4%	10.8%
Shopping Trips**						
Walk	26.0%	27.0%	21.4%	20.9%	26.1%	25.9%
Cycle	4.5%	6.7%	3.5%	3.2%	2.4%	2.4%
Car Driver	37.7%	31.7%	32.0%	31.7%	24.5%	24.5%
Car Passenger	18.8%	23.5%	27.8%	25.8%	26.3%	26.1%
Public Transport	12.9%	11.1%	15.4%	18.4%	20.7%	21.1%
Other Trips**						
Walk	21.7%	24.2%	21.7%	21.4%	26.6%	26.8%
Cycle	4.4%	5.7%	4.0%	4.0%	2.9%	2.8%
Car Driver	34.9%	41.4%	32.9%	30.1%	24.6%	24.1%
Car Passenger	30.2%	21.3%	28.9%	31.0%	28.4%	28.5%
Public Transport	8.8%	7.5%	12.4%	13.6%	17.6%	17.9%

*based on Census Data which does not differentiate between time periods, etc
**based on TEMPRO data

Table 6.4: Residential Trips by Journey Purpose by Mode & Time of Day						
Mode	**AM Peak**		**PM Peak**		**Weekend**	
	Arrive	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**
Journey to Work*						
Walk	32	127	96	38	28	29
Cycle	7	28	21	8	7	7
Car Driver	167	667	497	201	123	125
Car Passenger	21	85	64	26	26	27
Public Transport**	139	552	410	166	92	86
Other	4	16	12	5	0	0
Education Trips						
Walk	49	210	32	14	1	1
Cycle	3	8	1	1	0	0
Car Driver	63	361	65	20	4	4
Car Passenger	14	36	11	9	4	4
Public Transport**	194	133	8	57	1	1
Shopping Trips						
Walk	29	75	116	87	174	170
Cycle	5	20	19	14	16	14
Car Driver	41	90	174	163	160	146
Car Passenger	21	68	151	108	175	171
Public Transport**	14	32	85	78	138	138
Other Trips						
Walk	29	109	43	55	261	270
Cycle	6	28	4	6	28	29
Car Driver	48	187	61	78	245	243
Car Passenger	41	96	27	45	283	288
Bus	12	33	14	77	125	181

*based on census data
**based on average trip rates; assessments associated with potential impact on public transport conducted using 85th percentile trip rates

Table 6.5: Residential Trips by Mode & Time of Day						
Mode	**AM Peak**		**PM Peak**		**Weekend**	
	Arrive	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**
Walk	139	523	288	195	469	471
Cycle	20	81	45	29	52	51
Car Driver	319	1306	797	442	535	532
Car Passenger	97	285	254	189	489	490
Public Transport	359	750	516	377	406	406
Other	4	16	12	6	0	0
Total	938	2961	1912	1238	1950	1950

Residential Employment trips: The external trips have been distributed based on employment distribution from the 2001 census data for adjacent wards. These suggest that circa 30% of persons worked in Ealing, over 26% in Hillingdon (including 16% in Heathrow villages) and nearly 14% in Hounslow. The remainder were employed in a wide range of postcode areas.

Residential Education trips: This element includes trips to primary as well as secondary schools along with colleges and universities. In this regard, the proposals assume primary school education is provided on site with secondary education provided elsewhere.

There are several senior schools and colleges in the vicinity of the site, with 5 schools in Southall, 4 schools in Hounslow and 3 in Hayes. In addition, there is the Brunel University in Hillingdon. The external trips have been distributed been each of these destinations.

Residential Retail trips: The majority of such trips, particularly primary trips are likely to be internal during peak periods. External trips have been distributed taking into account existing retail offers in the vicinity. These include facilities within Southall, both on South Road and The Broadway, along with destinations slightly further afield at Hayes, Hounslow, Ealing and Uxbridge town centres.

Other Residential trips: It is difficult to obtain accurate data for distribution of these trips, particularly recreational and personal business trips. Therefore it has been assumed that these trips will be distributed broadly equally by the four points of the compass.

Supermarket Trips

Quantum of Trips

6.14 The proposals include a 5,850sqm GFA supermarket plus associated infrastructure with a dedicated service yard.

6.15 The potential quantum of person trips has been estimated based on average trip rates by selecting sites from the TRAVL and TRICS database (**Appendix 6B**). The weekday trip rates have been estimated considering only sites of similar size with no petrol filling station and in the case of the TRAVL, sites with PTAL ratings between 2 and 4. This has resulted in a total of 17 surveys for the weekday peak hours.

6.16 There are a total of 4 multi-modal weekend surveys in the TRICS database in the food superstore category, considering all sites in England without petrol filling stations. There is no data for the weekend in TRAVL.

Table 6.6: Supermarket Person Trips

Period	Arrivals		Departures	
	Rate	Flow	Rate	Flow
AM Peak	4.65	272	2.93	171
PM Peak	11.21	656	11.34	663
Saturday Peak	13.01	764	12.05	705

Internal and External Trips

6.17 There are several competing supermarkets in the immediate vicinity, including large Tesco and Sainsbury's supermarkets adjacent to the A312. Stores slightly further affield include the West Ruislip Sainsbury's and the Ilseworth Osterley Tesco. As such, it is considered likely due to external factors that the majority of trips, particularly during the peak periods, will be local in nature, i.e. internal or within the immediate area. Furthermore, the proposals include up to 3,750 residential dwellings on the site. This compares to the adjacent wards as follows;

- Ealing Ward 023 – 2,468
- Ealing Ward 026 – 3,124
- Ealing Ward 029 – 3,609
- Ealing Ward 037 – 3,324
- Ealing Ward 038 – 2,068
- Application Site – 3,750
- Total Dwellings – 18,343

6.18 Setting aside weighting according to distance from the store, the dwellings on the site equate to 20% of the overall quantum of dwellings in the immediate vicinity. Furthermore, it is anticipated that many residents, particularly those north of the A4020 and south of the railway line will continue to use supermarkets external to the application site. It has therefore been assumed that 20% of the weekday peak hour trips are dedicated internal trips, rising to 25% at the weekend.

Table 6.7: Supermarket Internal / External Trips

Period	Internal*		External		Total	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
AM Peak	54	34	218	137	272	171
PM Peak	98	133	557	531	656	663
Saturday Peak	190	176	571	529	761	705

*Dedicated Internal Trips

Mode Share

6.19 The mode share split for the supermarket has been estimated considering information in the TRICS and TRAVL database, taking into consideration prevailing traffic conditions and the proximity to competing facilities. Information from the TRICS database suggests that between 80 – 85% of trips are by car, including 15 – 30% as passengers. The TRAVL database suggests that circa 66% arrive by car (with 48% as car driver), 25% walk and 8% use public transport. The typical pattern is for a higher proportion of car drivers during the morning peak, with a higher proportion of passengers during the evening and Saturday peak periods.

Table 6.8: Supermarket Trips by Mode

Mode	AM Peak		PM Peak		Weekend	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
Walk	45	37	143	112	162	110
Cycle	5	3	8	8	9	8
Car Driver	159	96	322	353	380	386
Car Passenger	39	21	130	144	175	172
Public Transport	23	15	50	44	34	26
Other	1	0	2	2	2	2
Total	271	172	655	663	761	704

Table 6.9: Supermarket Resultant Mode Share

Mode	AM Peak		PM Peak		Weekend	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
Walk	16.7%	21.7%	21.8%	16.9%	21.3%	15.6%
Cycle	1.7%	1.6%	1.3%	1.3%	1.2%	1.2%
Car Driver	58.9%	55.9%	49.0%	53.2%	49.9%	54.8%
Car Passenger	14.2%	12.1%	19.8%	21.6%	23.0%	24.7%
Car Total	73.1%	68.0%	68.8%	74.8%	72.9%	79.5%
Public Transport	8.4%	8.7%	7.7%	6.7%	4.4%	3.6%
Other	0.2%	0.4%	0.4%	0.4%	0.2%	0.2%

6.20 The resultant mode share varies from the assumed proportions which were applied to the dedicated trips, with linked trips adopting the mode share for the residential leg of the trip. For example, whereas it was assumed that 15% of dedicated shopping trips during the morning peak were by walk mode, 8.6% of the linked trips to the supermarket are assumed by walk mode based on the primary journey purpose being a work trip. Further details are set out in Appendix 6B.

Distribution of External Supermarket Trips

6.21 Trips to and from the supermarket will be influenced by the quality and location of competing facilities, including the availability of parking.

6.22 In this regard, there are several existing competing supermarkets within the surrounding boroughs, all of which have abundant free parking. These include the Tesco at Bullsbridge (4,200sqm with 430 spaces), Tesco at Yeading (4,000sqm with 640 spaces) and Sainsbury's at Lombardy Retail Park (3,500sqm with 900 shared spaces). These stores are likely to retain most of their existing customers due to their parking allocation and proximity to the primary highway network, although there will be some draw to the new store associated with customers living adjacent to the gas works site.

6.23 The distribution of the supermarket external person trips has been determined by looking at the catchment in relation to the existing supermarkets in the vicinity. There are a total of 144,475 persons living or employed in the areas adjacent to the application site. Of these, circa 32% are located south of the railway line, 41% north of Uxbridge Road, 16% west of the Hayes By-pass and circa 5% each east and west of South Road to the south of Uxbridge Road.

6.24 Based on these population figures and the locations of existing supermarkets, it has been assumed that 40% of the external person trips originate from south of the railway line, 10% from west of the A312 and 50% from north and north east of the site.

Non-Food Retail Trips

Quantum of Trips

6.25 The proposals include up to 14,200sqm of retail floor space primarily located in the north-eastern sector of the site, along with small 'corner' shops in appropriate locations in throughout the remainder of the site.

6.26 The potential quantum of person trips has been estimated based on average trip rates from the TRAVL and TRICS databases (**Appendix 6C**). However, due to the limited multi-modal data in the databases, the peak hour trip rates have been estimated considering all surveys in the Retail Park, Shopping Centre and Factory Outlet Centre categories within the UK. The result is 14 surveys for the weekday morning peak, 17 surveys for the weekday evening peak and 5 surveys for the weekend peak hour.

Table 6.10: Non-food Retail Person Trips

Period	Arrivals		Departures	
	Rate	Flow	Rate	Flow
AM Peak	1.07	150	0.58	81
PM Peak	3.12	437	4.42	619
Saturday Peak	5.05	707	4.83	676

Internal and External Trips

6.27 The quantum of internal person trips to the non-food retail element will depend on the style of shopping on offer, but again there are likely to be a considerable number of local visitors. Typically large scale warehouse or retail park developments attract trips from further afield with many by car, whilst High Street style shops attract more local trips and a higher proportion by more sustainable modes. As with the supermarket, it has been assumed that 20% of the trips during each of the peak hours are dedicated internal trips.

Table 6.11: Non-Food Retail Internal / External Trips						
Period	**Internal***		**External**		**Total**	
	Arrive	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**
AM Peak	30	16	122	66	152	82
PM Peak	89	126	354	502	443	628
Saturday Peak	143	137	573	548	717	686

*Dedicated Internal Trips

Mode Share

6.28 The mode share for the non-food retail element will depend on style of shopping. Typical high street shops will attract a higher proportion of walk trips when compared to larger warehouse style or retail park operations. Although the proposals do not identify specific operators, they are likely to be more akin to high street operators and therefore there will be a relatively high proportion of trips by non-car modes.

6.29 It has been assumed that 30% of the internal trips are by walk or cycle modes and 33% of the external trips are by public transport with the majority of the remainder travelling by car, either as driver or passenger. The non-food retail trips and resultant modal split are shown at **Tables 6.12 and 6.13** respectively.

Table 6.12: Non-Food Trips by Mode						
Mode	**AM Peak**		**PM Peak**		**Weekend**	
	Arrive	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**
Walk	17	11	58	81	76	73
Cycle	5	3	13	19	21	20
Car Driver	81	43	231	326	381	363
Car Passenger	13	7	33	47	58	55
Public Transport	34	18	97	137	164	157
Other	1	0	5	6	7	7
Total	151	82	437	616	707	675

Table 6.13: Non-Food Resultant Mode Share						
Mode	**AM Peak**		**PM Peak**		**Weekend**	
	Arrive	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**
Walk	11.4%	13.2%	13.2%	13.2%	10.8%	10.8%
Cycle	3.1%	3.1%	3.1%	3.1%	3.0%	3.0%
Car Driver	54.0%	52.8%	52.8%	52.8%	53.8%	53.8%
Car Passenger	8.3%	7.7%	7.7%	7.7%	8.2%	8.2%
Public Transport	22.2%	22.2%	22.2%	22.2%	23.2%	23.2%
Other	0.9%	1.0%	1.0%	1.0%	1.0%	1.0%

Distribution of External Non-Food Retail Trips

6.30 The distribution of the non-food retail person trips will depend on the style of shopping offer along with the quality and location of nearby facilities.

6.31 There is a considerable amount of retail facilities on offer within Southall and other surrounding wards and boroughs. This includes retail along South Road (north of Beaconsfield Road) and the unique Southall offer on The Broadway. Further afield, there is Hayes town centre (2km) and Uxbridge (8km) to the west and north-west respectively, Hounslow (5km) to the south and Ealing Broadway (6km) to the east. Each of these areas (along with others) will be in direct competition to that proposed on the former Southall Gasworks site. In addition, there are several retail parks in close proximity of the site, including Lombardy Retail Park to the north-west.

6.32 Based on the above and looking at the natural boundaries, it is envisaged that the majority of the trips will come from the area bounded by the M4 to the south, the A312 Hayes by-pass to the west, the B455 Ruislip Road to the north and the A4217 Greenford Road / Tentalow Lane to the east. Examination of the data suggests that 27% of the external trips could originate from south of the railway line, 22% north of the A4202 The Broadway, 18% north of Beaconsfield Road and 9% from Hayes.

A3, A4 and A5 Uses

Quantum of Trips

6.33 The proposals include up to 1,750sqm of A3, A4 and A5 uses. The potential quantum of person trips has been estimated based on average trip rates from the TRICS database considering all similar sites in the pubs, restaurants and pub / restaurant categories (**Appendix 6D**).

6.34 There is no multi-modal data for the weekend, and it has therefore been assumed that the quantum of trips is the same as for the weekday evening peak hour 85th percentile trip rates.

Table 6.14: A3, A4 & A5 Person Trips

Period	Arrivals		Departures	
	Rate	Flow	Rate	Flow
AM Peak	0.57	10	1.183	21
PM Peak	7.708	135	5.204	91
Saturday Peak	8.91	156	8.828	154

Table 6.15: A3, A4 & A5 Retail Internal / External Trips

Period	Internal		External		Total	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
AM Peak	2	5	7	16	10	21
PM Peak	27	18	108	73	135	91
Saturday Peak	39	39	117	116	156	154

Internal and External Trips

6.35 The majority of units are anticipated to be located adjacent to the canal and cater for the development and immediate surrounding. However, in order to present a robust assessment, it has been assumed that only 20% of the trips during the weekday peaks are internal, rising to 25% over the weekend with the remainder external or linked trips.

Mode Share

6.36 It is anticipated that the majority of the dedicated internal trips will be by walk mode, with few people driving and little use of public transport. There will be a higher proportion of trips by car and public transport associated with external trips. The mode share split for the external trips has been based on information in the TRICS database. Further details are included in Appendix 6D.

Table 6.16: A3, A4 & A5 Uses Trips by Mode

Mode	AM Peak		PM Peak		Weekend	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
Walk	2	6	29	20	37	36
Cycle	0	1	4	3	5	5
Car Driver	5	9	45	30	52	51
Car Passenger	1	4	19	13	22	21
Public Transport	0	1	37	24	40	39
Other	0	1	1	1	1	1
Total	8	22	135	81	157	153

Table 6.17: A3, A4 & A5 Uses Resultant Mode Share

Mode	AM Peak		PM Peak		Weekend	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
Walk	27.5%	27.5%	22.0%	22.0%	23.8%	23.8%
Cycle	4.5%	4.5%	2.8%	2.8%	3.3%	3.3%
Car Driver	42.3%	42.3%	33.4%	33.4%	33.0%	33.0%
Car Passenger	17.5%	17.5%	14.0%	14.0%	13.8%	13.8%
Public Transport	4.3%	4.3%	26.8%	26.8%	25.3%	25.3%
Other	4.0%	4.0%	1.0%	1.0%	1.0%	1.0%

Distribution of External A3, A4 & A5 Uses Trips

6.37 The distribution of the external vehicular trips is assumed to be the same as the external non-food retail trips with 27% originating south of the railway line, 28% from the west of the site (including circa 10% from Hayes), and 45% north and north-east of the site.

Employment Trips

Quantum of Trips

6.38 The proposals include a small quantum of class B1 uses (up to 3,500sqm) located in close proximity to Southall Station in the eastern sector of the site. The potential quantum of person trips has been estimated based on average trip rates from the TRAVL database (**Appendix 6E**), considering all sites except council offices.

Table 6.18: Employment Person Trips

Period	**Arrivals**		**Departures**	
	Rate	**Flow**	**Rate**	**Flow**
AM Peak	1.82	64	0.18	6
PM Peak	0.44	15	1.96	69
Saturday Peak	0	0	0	0

Table 6.19: Employment Internal / External Trips

Period	**Internal**		**External**		**Total**	
	Arrive	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**
AM Peak	3	0	61	6	64	6
PM Peak	1	3	15	65	15	69
Saturday Peak	-	-	-	-	-	-

Internal and External Trips

6.39 It has been assumed that at 5% of the employees live on site. Based on a density of 1 employee per 20sqm suggests a total of 175 employees (for 3,500sqm) with 8 living in West Southall.

Mode Share

6.40 The proposals include a small element of starter units and studio space. The 2001 census data suggests that of the persons working in the immediate area (i.e. the daytime population), 65% travel to work by car (or van), 16.5% by public transport, 12% walk and nearly 4.5% cycle. These percentages have been adopted albeit that it is envisaged that the units will not have any dedicated parking as is the case with many historic sites in Southall and Ealing.

Table 6.20: Employment Trips by Mode

Mode	AM Peak		PM Peak		Weekend	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
Walk	9	1	2	10	0	0
Cycle	3	0	1	3	0	0
Car Driver	41	4	1	3	0	0
Car Passenger	0	0	0	0	0	0
Public Transport	10	1	2	11	0	0
Other	1	0	0	1	0	0
Total	64	6	15	68	0	0

Distribution of External Employment Trips

6.41 The overall quantum of trips is low and therefore it has been assumed that employment trips are distributed equally in each direction.

Table 6.21: Employment Resultant Mode Share						
Mode	AM Peak		PM Peak		Weekend	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
Walk	13.9%	13.9%	13.9%	13.9%	13.9%	13.9%
Cycle	4.8%	4.8%	4.8%	4.8%	4.8%	4.8%
Car Driver	64.8%	64.8%	64.8%	64.8%	64.8%	64.8%
Car Passenger	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%
Public Transport	15.8%	15.8%	15.8%	15.8%	15.8%	15.8%
Other	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%

Cinema Trips

Quantum of Trips

6.42 The proposals include a 4,700sqm GFA cinema. The potential quantum of person trips during the weekday evening peak has been estimated based on average trips rates from the TRAVL database (**Appendix 6F**), considering all surveys conducted post 1998 which resulted in 3 surveys. The weekend person trips have been estimated using multi-modal data from the TRICS database, considering all sites within the UK which resulted in 2 surveys.

Table 6.22: Cinema Person Trips				
Period	Arrivals		Departures	
	Rate	Flow	Rate	Flow
AM Peak	0	0	0	0
PM Peak	7.61	358	7.62	358
Saturday Peak	9.678	455	7.724	363

Internal and External Trips

6.43 It is anticipated that the cinema will primarily cater for site along with the surrounding area including Hayes. There are competing facilities in Uxbridge to the west, Hounslow to the south and Ealing to the east.

6.44 It has therefore been assumed that 10% of the trips during the weekday evening peak are internal, increasing to 15% on Saturday, with the remaining 90% and 85% respectively external to the site. As with the case for the retail internal trips, this is considered robust given the quantum of dwellings on the application site in relation to the surrounding areas.

Table 6.23: Cinema Internal / External Trips

Period	Internal		External		Total	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
AM Peak	-	-	-	-	-	-
PM Peak	36	36	322	322	358	358
Saturday Peak	68	54	387	309	455	363

Mode Share

6.45 Patrons typically travel in pairs or larger groups with fewer single journeys. As with retail, the mode share to car will depend on the availability and cost of parking along with prevailing traffic conditions on the local highway network.

6.46 During the week, Cinema peak periods typically occur during the evening (i.e. post the commuter peak period), whilst at the weekend there are peaks during the afternoon and evening. The town centre multi-storey car park is located immediately to the west of the Cinema and hence outside of retail peaks there will be fewer disincentives to travel by car. However, during the peak periods under consideration Cinema patrons choosing to travel by car will need to compete with retail customers, the majority of whom would have arrived in town earlier. As such, parking for Cinema patrons is likely to be limited and the TRAVL mode share observations have been adopted.

Table 6.24: Cinema Trips by Mode

Mode	AM Peak		PM Peak		Weekend	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
Walk	0	0	28	28	42	33
Cycle	0	0	11	11	19	15
Car Driver	0	0	89	108	115	110
Car Passenger	0	0	132	133	161	129
Public Transport	0	0	97	74	116	71
Other	0	0	2	5	2	5
Total	0	0	358	358	455	363

Table 5.25: Cinema Resultant Mode Share

Mode	AM Peak		PM Peak		Weekend	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
Walk	-	-	7.8%	7.8%	9.2%	9.2%
Cycle	-	-	3.0%	3.0%	4.2%	4.2%
Car Driver	-	-	24.8%	30.2%	25.2%	30.3%
Car Passenger	-	-	37.0%	37.0%	35.5%	35.5%
Public Transport	-	-	27.0%	20.7%	25.5%	19.6%
Other	-	-	0.5%	1.4%	0.4%	1.3%

Distribution of External Cinema Trips

6.47 It has been assumed that cinema trips are distributed equally in each direction, with patrons arriving from Hayes, Southall Broadway, Southall Green and to the east.

Education Trips

Quantum of Trips

6.48 The proposals include primary schools and a nursery with a total GFA of circa 3,450sqm. The potential quantum of person trips has been estimated based on average trip rates from the TRAVL and TRICS databases (**Appendix 6G**), considering all surveys in the primary school category, which resulted in a total of 5 surveys.

Table 6.26: Education Person Trips

Period	Arrivals		Departures	
	Rate	Flow	Rate	Flow
AM Peak	21.73	750	4.01	138
PM Peak	0.30	10	0.98	34
Saturday Peak	0	0	0	0

Internal and External Trips

6.49 It is anticipated that the schools will primarily cater for the site along with the surrounding area. There are existing primary schools on Beaconsfield Road to the north catering for existing off-site demand and it is therefore envisaged that the majority of pupils will originate from site. As such, it has been assumed that 85% of the school trips are internal to the site with the remaining 15% external.

Table 6.27: Education Internal / External Trips

Period	Internal		External		Total	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
AM Peak	637	117	112	21	750	138
PM Peak	8	29	2	5	10	34
Saturday Peak	-	-	-	-	-	-

Mode Share

6.50 Information in the TRICS databases suggest that on average 52% of trips to primary schools are on foot, with 40% by car and 7.5% by public transport. Information from the TRAVL database suggests that 63% of trips by walk mode, 22% by car and 16% by public transport. The TRAVL mode share has been adopted.

Table 6.28: Education Trips by Mode

Mode	AM Peak		PM Peak		Weekend	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
Walk	469	86	5	15	0	0
Cycle	0	0	1	3	0	0
Car Driver	87	29	1	9	0	0
Car Passenger	76	1	3	6	0	0
Public Transport	117	22	0	0	0	0
Other	0	0	0	0	0	0
Total	749	138	10	34	0	0

Table 5.29: Education Resultant Mode Share

Mode	AM Peak		PM Peak		Weekend	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
Walk	62.6%	62.5%	46.3%	46.3%	-	-
Cycle	0.0%	0.0%	9.3%	9.3%	-	-
Car Driver	11.6%	21.2%	17.6%	26.1%	-	-
Car Passenger	10.2%	0.8%	26.2%	17.7%	-	-
Public Transport	15.6%	15.6%	0.8%	0.8%	-	-
Other	0.0%	0.0%	0.0%	0.0%	-	-

Distribution of External Education Trips

6.51 The proposals are for new primary schools and associated nurseries on site and hence external trips for the most are likely to be local in nature. As such, it has assumed that 20% of the external trips originate from the west, i.e. Hayes, with 40% each from north and south of the railway line.

6.52 As secondary and further education will be provided for off-site, trips associated with these elements are included in the residential trip estimates.

Hotel Trips

Quantum of Trips

6.53 The proposals include a 9,650sqm hotel with circa 160 bedrooms and associated infrastructure, including restaurant and conference facilities plus car parking. It is anticipated that the hotel (and facilities) will primarily serve the Southall market, particularly for weddings and associated functions.

6.54 The potential quantum of person trips to the hotel element has been estimated based on average trip rates per unit floor area from the TRAVL database (**Appendix 6H**), considering all sites surveyed since 1998. Trips associated with the conference centre are summarised in paragraphs 6.57 through 6.62 inclusive.

Table 6.30: Hotel Person Trips

Period	Arrivals		Departures	
	Rate	Flow	Rate	Flow
AM Peak	0.32	31	1.02	98
PM Peak	0.87	84	0.39	38
Saturday Peak	0.87	84	0.39	38

Internal and External Trips

6.55 As with retail, there are staff and customer trips. However, although most of the hotel guests are likely to come from further afield en-route to local weddings, Heathrow Airport or other local facilities, some staff may come from the site. Hence it has been assumed that 95% of trips are external to the development.

Table 6.31: Hotel Internal / External Trips

Period	Internal		External		Total	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
AM Peak	2	5	29	93	31	98
PM Peak	4	2	80	36	84	38
Saturday Peak	4	2	80	36	84	38

Mode Share

6.56 This will, to an extent, be determined by the car parking provision for the hotel. The proposals include circa 120 parking spaces for cars for the hotel and conference facility, and as such, it has been assumed that 95% of people arrive by car, with 85% as car driver, and 5% by public transport with nobody walking or cycling. 100% of internal trips are assumed to be by car.

Table 6.32: Hotel Trips by Mode

Mode	AM Peak		PM Peak		Weekend	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
Walk	0	0	0	0	0	0
Cycle	0	0	0	0	0	0
Car Driver	25	84	72	32	72	32
Car Passenger	3	9	8	4	8	4
Public Transport	1	5	4	2	4	2
Other	0	0	0	0	0	0
Total	31	99	84	38	84	38

Table 6.33: Hotel Resultant Mode Share						
Mode	AM Peak		PM Peak		Weekend	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
Walk	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cycle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Car Driver	85.8%	85.8%	85.8%	85.8%	85.8%	85.8%
Car Passenger	9.5%	9.5%	9.5%	9.5%	9.5%	9.5%
Public Transport	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%
Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Distribution of External Hotel Trips

6.57 It has been assumed that 70% of vehicular trips will come from the M4 to the south, 20% from the A40 to the north and the remaining 10% from the local area. The 10% local trips will include trips made by staff, along with deliveries and certain business trips.

Conference and Banquet

Quantum of Trips

6.58 The proposals include a 3,000sqm conference and banquet facility, primarily to cater for the local demand for weddings. It is envisaged that the facility could cater for up to a maximum of 1,500 persons at any one time. The potential trip attraction for this element has been based on a first principles approach considering similar sized facilities within Greater London.

6.59 Conferences typically start and end outside of the commuter peaks. Therefore it has been assumed that 300 delegates (20% of 1,500 delegates) arrive during the morning peak, with the same number leaving during the evening peak and nominal flows of 75 persons (5%) have been adopted for the opposite directions. For the weekend peak it has been assumed that 500 delegates (33%) arrive during the peak hour, with 150 departures (10%) during the same period.

Table 6.34: Conference Centre Person Trips				
Period	Arrivals		Departures	
	Rate	Flow	Rate	Flow
AM Peak	20%	300	5%	75
PM Peak	5%	75	20%	300
Saturday Peak	33%	500	10%	150

Internal and External Trips

6.60 Although there will be a large population on West Southall, it is anticipated that the majority of delegates and guests are likely to originate from the surrounding residential areas and further afield. As such, it has been assumed that only 5% of the trips made by delegates are internal to the site during the weekday peaks, rising to 10% at the weekend

Table 6.35: Conference Centre Internal / External Trips						
Period	Internal		External		Total	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
AM Peak	3	1	297	74	300	75
PM Peak	4	15	71	285	75	300
Saturday Peak	50	15	450	135	500	150

Mode Share

6.61 The facilities will not have a dedicated car park like many of the competing facilities close to Heathrow. However, guests and conference members will be able to use spaces within the Hotel car park (which has a total of 122 spaces) and the town centre multi-storey car parks.

6.62 It is therefore anticipated that parking will generally be in short supply for the conference facilities with the majority of town centre spaces used by retail customers and hence the majority of guests will travel as passengers or by public transport. To this end, it has been assumed that 55% of delegates travel by public transport or coach, 15% drive, 25% as passenger with 5% using alternative modes. All internal trips are assumed to be by car.

Table 6.36: Conference Centre Trips by Mode

Mode	AM Peak		PM Peak		Weekend	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
Walk	0	0	0	0	50	15
Cycle	0	0	0	0	0	0
Car Driver	48	12	14	58	90	23
Car Passenger	74	19	18	71	113	35
Public Transport	163	41	39	157	248	77
Other	15	4	4	14	0	0
Total	300	75	75	300	500	150

Table 6.37: Conference Centre Resultant Mode Share

Mode	AM Peak		PM Peak		Weekend	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
Walk	0.0%	0.0%	0.0%	0.0%	10.0%	10.0%
Cycle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Car Driver	15.9%	15.9%	19.3%	19.3%	18.0%	18.0%
Car Passenger	24.8%	24.8%	23.8%	23.8%	22.5%	22.5%
Public Transport	54.5%	54.5%	52.3%	52.3%	49.5%	49.5%
Other	5.0%	5.0%	5.0%	4.8%	0.0%	0.0%

Distribution of External Conference Centre Trips

6.63 It has been assumed that all of the delegates arriving by car use the A312 Hayes Bypass to access the site. Here it is anticipated that there will be a broadly equal north – south split. Of those arriving by public transport, it is anticipated that the majority will come through Southall Station.

Health Centre

Quantum of Trips

6.64 The proposals include a 2,550sqm facility, primarily to cater for the local demand. The quantum of person trips has been estimated based on trip rate information from both the TRAVL (5 sites) and TRICS (6 sites) databases (see **Appendix 6I**).

Table 6.38: Health Centre Person Trips

Period	Arrivals		Departures	
	Rate	Flow	Rate	Flow
AM Peak	4.70	120	2.20	56
PM Peak	2.97	76	4.21	107
Saturday Peak	0	0	0	0

Internal and External Trips

6.65 The facility is primarily to serve the new population although there are likely to be some visitors and staff from further afield. There are existing surgeries in Southall to serve the existing community. As such, it has been assumed that 66% of the trips to the surgery will come from the site, either in the form of residents or employees travelling to or from work.

Table 6.39: Health Centre Internal / External Trips

Period	Internal		External		Total	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
AM Peak	79	37	41	19	120	56
PM Peak	50	71	26	37	76	107
Saturday Peak	-	-	-	-	-	-

Mode Share

6.66 Patients visiting a surgery typically travel alone or accompanied by someone else who does not need to see the doctor. Depending on the nature of the visit, those travelling shorter distances (say less than 400m) will in the most cases walk whereas those coming from further will either travel by car or public transport. However, in order to present a robust assessment, it has been assumed that 90% of the visitors come by car with 70% as car driver.

Table 6.40: Health Centre Trips by Mode

Mode	AM Peak		PM Peak		Weekend	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
Walk	4	2	2	4	0	0
Cycle	4	2	2	4	0	0
Car Driver	74	34	53	76	0	0
Car Passenger	34	16	15	21	0	0
Public Transport	4	2	3	4	0	0
Other	0	0	0	0	0	0
Total	120	56	76	108	0	0

Table 6.41: Health Centre Resultant Mode Share

Mode	AM Peak		PM Peak		Weekend	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
Walk	3.3%	3.3%	3.3%	3.3%	-	-
Cycle	3.3%	3.3%	3.3%	3.3%	-	-
Car Driver	61.4%	61.4%	70.0%	70.0%	-	-
Car Passenger	28.6%	28.6%	20.0%	20.0%	-	-
Public Transport	3.4%	3.4%	3.4%	3.4%	-	-
Other	0.0%	0.0%	0.0%	0.0%	-	-

Distribution of External Health Centre Trips

6.67 It has been assumed that 50% of the external trips will originate from south of the site with the remainder from the north.

Overall Trips

Total Person Trips

6.68 **Table 6.42** includes a summary of the quantum of person trips based on the average trip rates as set out in this section.

Table 6.42: Estimated Quantum of Person Trips

	AM Peak		PM Peak		SAT Peak	
	Arrive	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**
Residential	938	2,963	1,913	1,238	1,950	1,950
Employment	64	6	15	69	0	0
Education	750	138	10	34	0	0
Supermarket	272	171	656	663	761	704
Non-Food Retail	150	81	437	619	707	676
A3, A4 and A5 uses	10	21	135	91	156	154
Cinema	0	0	358	358	455	363
Health	120	56	76	107	0	0
Hotel	31	98	84	38	84	38
Conference / Banquet	300	75	75	300	500	150
Total	2,633	3,610	3,758	3,516	4,612	4,036

Internal, External and Linked Trips

6.69 The site is large and the proposals include a residential led mixed-use scheme with retail, leisure and community facilities (school, health & playing fields etc). As such, there will be many trips which have both an origin and destination within the site, i.e. dedicated internal trips, and others that either an origin or destination within the site i.e. linked trips.

6.70 **Table 6.43** sets out the assumed proportion of dedicated internal trips for each of the weekday morning, weekday evening and Saturday peak hour. The proportions take into account the scale of the various uses along with the residential journey purposes based on the TEMPRO data.

6.71 The overall quantum of internal trips equate to approximately 33% of all trips associated with the site in each of the peak periods. Although these percentages may appear high, the figures include linked trips. When these are stripped out, the proportion of internal trips reduces to circa 20% during the weekday evening and Saturday peak periods. The proportion of internal trips remains at circa 33% during the weekday morning peak as the majority of the internal trips are associated with the school.

Table 6.43: Proportion of Dedicated Internal Trips

	AM Peak		PM Peak		SAT Peak	
	Arrive	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**
Employment	5%	5%	5%	5%	-	-
Education	85%	85%	85%	85%	-	-
Supermarket	20%	20%	15%	20%	25%	25%
Non-Food Retail	20%	20%	20%	20%	20%	20%
A3, A4 and A5 uses	25%	25%	20%	20%	25%	25%
Cinema	-	-	10%	10%	15%	15%
Health	66%	66%	66%	66%	-	-
Hotel	5%	5%	5%	5%	5%	5%
Conference / Banquet	1%	1%	5%	5%	10%	10%
Total	23%	27%	22%	25%	31%	35%

*residential dedicated internal trips equivalent to total internal trips

Table 6.44: Summary of Internal and External Person Trips

	Internal		**External**		**Total**	
AM Peak	**Arrive**	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**
Supermarket	97	61	172	109	270	170
Non-food Retail	54	29	97	53	152	82
A3, A4 & A5 uses	2	5	7	16	10	21
Employment	3	0	48	5	50	5
Cinema	0	0	0	0	0	0
Hotel	1	5	28	90	30	94
Conference	3	1	297	50	300	50
Education	637	118	112	21	750	138
Health	79	37	41	19	120	56
Residential	256	878	681	2085	938	2963
	1134	1134	1485	2446	2618	3579
PM Peak						
Supermarket	209	237	443	421	650	658
Non-food Retail	160	226	284	401	443	628
A3, A4 & A5 uses	27	18	108	73	135	91
Employment	1	3	11	51	12	54
Cinema	36	36	322	322	358	358
Hotel	4	2	76	34	80	36
Conference	3	15	48	285	50	300
Education	9	29	2	5	10	34
Health	50	71	26	37	76	107
Residential	636	496	1277	741	1913	1238
	1132	1132	2595	2371	3727	3503
Saturday Peak						
Supermarket	174	253	481	445	754	699
Non-food Retail	229	219	487	466	717	686
A3, A4 & A5 uses	39	39	117	116	156	154
Employment	0	0	0	0	0	0
Cinema	68	54	387	309	455	363
Hotel	4	2	76	34	80	36
Conference	50	10	450	90	500	100
Education	0	0	0	0	0	0
Health	0	0	0	0	0	0
Residential	720	801	1230	1149	1950	1950
	1384	1378	3229	2610	4613	3988

6.72 In addition to the dedicated internal trips, there will be many external trips during the peak hours that include a secondary destination within the site, i.e. a linked trip. These will include visits to the supermarket en-route to and from work or other destinations. During the weekday morning and evening peak hours, it has been assumed that all of the linked trips are associated with residential work journeys, whilst at the weekend it has been assumed that the linked trips are associated with the residential "other trips", i.e. social trips which make up the bulk of the weekend trips.

6.73 **Table 6.44** summarises the quantum of internal and external trips for each of the weekday morning, weekday evening and Saturday peak hour. The table includes the dedicated trips along with the linked trips. Linked trips are included in the external trips total, with trips from home to work via the supermarket treated as follows;

- Residential – internal departure to supermarket
- Supermarket – internal arrival from home
- Supermarket – external departure to work

6.74 **Table 6.45 and 6.46** include summaries of the overall number of trips by modes plus the share to each mode for each of the weekday morning, weekday evening and Saturday peak periods. The figures include both internal and external trips.

Table 6.45: Summary of Overall Trips by Mode

Mode	AM Peak		PM Peak		Weekend	
	Arrive	Depart	Arrive	Depart	Arrive	Depart
Walk	684	666	557	467	837	740
Cycle	37	90	86	80	106	100
Car Driver	840	1,618	1,636	1,483	1,628	1,508
Car Passenger	338	361	612	628	1,026	907
Public Transport*	711	854	845	833	1,013	776
Other	32	22	26	35	12	15
Total**	2,633	3,611	3,764	3,525	4,623	4,046

*assessments based on 85th percentile trip rates
**differences to sum of individual scenarios due to rounding

Table 6.46: Summary of Overall Mode Share

Mode	AM Peak		PM Peak		Weekend	
	Arrive	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**
Walk	26.0%	14.4%	14.8%	13.2%	18.1%	18.3%
Cycle	1.4%	2.5%	2.3%	2.3%	2.3%	2.5%
Car Driver	31.9%	44.8%	43.5%	42.1%	35.2%	37.3%
Car Passenger	12.8%	10.0%	16.3%	17.8%	22.2%	22.4%
Public Transport	27.0%	23.7%	22.5%	23.6%	21.9%	19.2%
Other	0.8%	0.6%	0.7%	1.0%	0.3%	0.4%

7 WALKING AND CYCLING STRATEGY

7.1 As with public transport, walking and cycling are key to the success of the development. This section sets out the key elements of the proposals aimed at encouraging walking and cycling, both within the site and externally.

7.2 The proposals include creating a network of footpaths and footways throughout the Site, connecting the various land-uses with each other and to existing facilities adjacent to the Site.

7.3 The diagram in **Appendix 7A** illustrates the indicative network of footpaths and cycleways within the site, highlighting links to Beaconsfield Road in the north, South Road to the east, under the railway line in the south and to the Minet Country Park to the west.

7.4 Table 6.45 includes a summary of trips by all modes for the completed development. To this end, there are anticipated to be in the region of 1,350 two-way trips on foot during the morning peak hour, 1,024 two-way trips during the evening peak hour and 1,577 two-way trips during the Saturday peak hour. Overall there are anticipated to be in the order of 18,600 two-way trips on foot per day. Corresponding figures for cycling are 127 (AM Peak), 166 (PM Peak), 206 (SAT Peak) and 1,515 (Daily).

Links to the North

7.5 The proposals include a total of eight pedestrian and cycle links to the north, with three connections adjacent to the new vehicular links to Beaconsfield Road, plus connections to Grange Road, Hanson Gardens, Lewis Road, Randolph Road and in the vicinity of the Blair Peach School. The footways adjacent to the vehicular links will be a minimum of 2m wide, with shared pedestrian / cycle links 4.5m wide. These links will facilitate pedestrian and cycle movements between the Site and the Southall Broadway ward to the north. In particular, it will provide direct routes to existing bus services and retail on the A4020 corridor (approximately 525m from the northern boundary) for residents of the Site, and links to facilities on the Site for residents to the north.

Links to the East

7.6 Linkage between the Site and existing retail on South Road and to Southall Railway Station are considered particularly important to ensure that residents can utilise existing facilities in Southall and rail services from Southall Station which is located approximately 250m east of the Site. In addition, good pedestrian links will allow visitors to the existing retail and commercial facilities on South Road to utilise the car parking on the Site thus reducing existing parking stress in Southall town centre.

7.7 The proposals include a shared pedestrian footpath / cycleway along the northern side of the bus link that passes to the north of the Water Tower. The facility will be approximately 4.5m wide along the northern boundary of the Water Tower.

7.8 A pedestrian crossing is proposed over the access road a short distance to the east of the Water Tower, enabling pedestrians to use a more direct route to South Road along the southern side of the access road. In addition, pedestrian facilities will be incorporated into the new signalised junction on South Road (see DWG 52212/A/56 in Appendix 4B), which coupled with the anticipated relocation of the Southall Station ticket hall through the Crossrail project, will provide a convenient and direct route into the station.

7.9 The Crescent will be closed to vehicular traffic in front of the retail units immediately south of Beaconsfield Road. This, in conjunction with alterations at the South Road / Beaconsfield Road / Park Avenue signalised junction will improve conditions for pedestrians.

7.10 Overall the proposals associated with the Eastern Access will result in an environment conducive for walking, with significantly improved links to South Road when compared to the existing scenario. The eastern edge of the Site will be approximately 550m from the centre of the existing retail on South Road, and only 250m from Southall Station.

Links to the South

7.11 Although the London – Cardiff mainline railway line runs along the southern boundary of the Site, there are currently two links to the south, via the Brent Road underpass and the footpath tunnel at the end of Dudley Road.

7.12 The proposals include converting the existing vehicular link at Brent Road in to a dedicated pedestrian / cycle link, and improvements to the pedestrian tunnel at the end of Dudley Road. These will provide people south of the railway direct connections to the Site, which for many will be easier to walk / cycle than drive.

Links to the West

7.13 The proposals include a total of three non-vehicular connections to the west, with footways adjacent to the Pump Lane access and two pedestrian / cycle bridges over the Grand Union Canal and Yeading Brook into Minet Country Park.

7.14 These will provide residents of the Site with direct connections to Minet Country Park and industrial estates immediately to the north-west, along with creating considerably shorter and easier connections for existing residents of Southall Broadway and Southall Green.

7.15 Furthermore, the connection to Beaconsfield Road West (Springfield Road) in particular will allow employees on the industrial estates along with Guru Nanak students and Yeading Football Club members to walk or cycle to facilities on West Southall, Southall Broadway and Southall Green, or use bus services to connect to Southall Station and further affield.

Internal Facilities

7.16 The proposals include a network of footpaths and cycleways through the Site, along with cycle parking and crossings to encourage people to walk and cycle. These routes will not only benefit residents and visitors to the Site, they will benefit people on all sides who will now be able to travel through as opposed to around the Site.

Pedestrian Footways and Crossings

7.17 Pedestrian footways will be provided adjacent to all of the roads throughout the Site at a minimum width of 2m, with the footways along the High Street varying in width albeit typically at least 5m wide. In addition, pedestrian footpaths will be constructed between individual development plots to encourage walking as a meaningful mode of transport.

7.18 Pedestrian crossings will be provided at all junctions and on road links where appropriate.

7.19 Many of the highways in the residential areas adjacent to the Grand Union Canal will be constructed as Home Zones to give priority to pedestrians (and cyclists) whilst facilitating the movement of vehicles. In this regard, it is envisaged that whilst pedestrians will be able to walk all the way from south-west to north-east (and visa versa), vehicles will need to use Park Avenue.

7.20 The plan in **Appendix 7B** illustrates “as the crow flies” 1km distance from the centre of the new High Street which includes key destinations such as the health centre and cinema. The plan illustrates that there will be many people, including those on West Southall, living in acceptable walking distances from these destinations.

Cycleways and Cycle Parking

7.21 Cycleways will be provided either as shared facilities (with pedestrians or in bus lanes) or as dedicated facilities. Cycle parking will be provided in key locations throughout the Site in accordance with minimum standards as set out in local (Ealing) and regional (London) policy guidance.

7.22 The plan in **Appendix 7C** illustrates “as the crow flies” 2km distance from the centre of the new High Street which includes key destinations such as the health centre and cinema. These plans illustrate that there will be many people, including those on West Southall, living in acceptable cycling distance from these destinations.

7.23 Cycle parking will be provided for all uses in accordance with local policy guidance standards. Parking standards are set out in Table 1 of Transport Appendix 1 in the UDP as follows;

- Residential: A minimum of 1 space per residential unit
- A1 Retail: A minimum of 1 space per 450sqm
- A3 Retail: A Minimum of 1 space per 75sqm
- B1 Office: A minimum of 1 space per 140sqm
- C1 Hotel: A minimum of 1 space per 20 bedrooms
- D1 Non Residential: A minimum of 1 space per 300sqm
- D2 Leisure: A minimum of 1 space per 140sqm

7.24 **Table 7.1** summarises the minimum number of cycle stands to be included based on the standards set out above. The stands will be appropriately placed and under cover where ever possible with details to be finalised at the detailed design stage. However, it is envisaged that residential cycle parking will be provided predominantly off-street within basements or similar locations, whilst non-residential spaces will be provided in the immediate vicinity of the individual development site.

Table 7.1: Number of Cycle Stands

Land Use	GFA	Minimum No. of Cycle Spaces
Residential	3,750 units	3,750
A1 Retail, including supermarket	20,050sqm	45
A3, A4 & A4 Retail	1,750sqm	23
Office (B1)	3,500sqm	25
Hotel (C1)	9,650sqm*	8
School (D1)	3,450sqm	12
Health (D1)	2,550sqm	9
Cinema (D2)	4,700sqm	34
Conference Centre**	3,000sqm	10
Total		3,916

*estimated 160 bedrooms
**based on D1 use class, i.e. Non residential

7.25 The proposals include a total of up to 4,000 spaces for cycles, which is above the minimum requirement. The usage of the spaces will be monitored through the Travel Plan as the site is developed out and further spaces will be provided should demand exceed supply.

8 PUBLIC TRANSPORT STRATEGY

8.1 Key to the success of the redevelopment of the site is the delivery of a sustainable public transport package. To this end, the strategy has been developed following discussions with Transport for London (London Buses) officers with the aim of forming a package of measures to serve the Site.

8.2 This section sets out a strategy to ensure that the Site is appropriately served by public transport, considering the completed development along with interim years. However, as the Site is to be developed over a 15 year period, it is important to maintain flexibility to ensure that the strategy can adapt to changing circumstances.

8.3 Furthermore, as the existing mainline railway stations at Southall (to the east) and Hayes and Harlington (to the west) are relatively close, no changes are proposed to rail infrastructure or services. As such, it is envisaged that the public transport improvement strategy will be bus based.

On-Site Infrastructure

8.4 The proposals are to create a highway network with primary routes through the retail area (the "High Street") and along the northern side of the park ("Park Avenue"), with secondary routes serving the residential areas.

8.5 The primary route will include bus lanes on one or both sides as appropriate, to ensure that buses are given priority. This will include the provision of bus priority measures at the Eastern Access to ensure that buses are given priority over general traffic on the approach to the South Road junction.

8.6 Bus stops will be located at key locations throughout the Site, with no individual plot more than 400m (ideally 250m maximum) from a bus stop. The stops will be constructed to include shelters along with real time information to the appropriate standard. Indicative locations for bus stops are shown in **Appendix 8A**

8.7 In addition, a dedicated bus “station” with stands and driver facilities will be located in the eastern sector of the application site, to the south of the Eastern Multi-Storey Car Park as shown on the illustrative Masterplan. Although details will be finalised at a later stage through the detailed design process, it is envisaged that stands for 6 buses can be accommodated.

Options to Serve the Site by Bus

8.8 It is envisaged that the Site will be developed broadly from east to west, with early development taking access from Beaconsfield Road. The advantage of such a programme is that initial dwellings can use existing bus services running along South Road and Uxbridge Road along with rail services from Southall Station.

8.9 As noted above, the Site is anticipated to be developed out over a 15 year period. Discussions to date envisage that a Transport Advisory Group will be established to take decisions on matters such as how and when bus services will be introduced, etc. The paragraphs below provide an indication on the current views, considering five year intervals from when construction commences.

8.10 It should also be noted that within the development period Transport for London has a policy to improve all aspects of bus services, including improvements to capacity, frequency, reliability and infrastructure.

Year 5

8.11 Whilst the Eastern Access is being constructed, the proposals are to take vehicular access from Beaconsfield Road, with construction access from Pump Lane and retaining Brent Road as access for the Airport Parking. During this period, it is not deemed appropriate to bring buses into the site, with residents required to use existing services on the South Road and Uxbridge Road corridors. Although the dwellings will be on the outer limits of the desired minimum distance of 400m to a bus stop, the dwellings are within acceptable walking distance to existing stops and Southall Station, particularly for commuting purposes. It is also envisaged that many residents will walk to Southall Station.

8.12 Once the Eastern Access is completed at the end of Phase 1 Stage 1, it is envisaged that some of the services could be brought into the site, although the precise timing will depend on the quantum of occupied development at that time. Furthermore, it is envisaged that services directed into the site will not necessarily operate at the final frequency.

8.13 The phasing programme envisages occupation of circa 1,000 dwellings and 24,000sqm of retail, leisure and commercial floor space by the end of year 5, with vehicular links to Beaconsfield Road and South Road. Although the vehicular link to Pump Lane will be constructed, it is envisaged that the route will be limited to construction traffic along with the retained on-site Airport Parking.

Year 10

8.14 The phasing programme envisages the occupation of up to 2,850 dwellings and 30,000sqm of retail, leisure and commercial floor space along with the hotel, conference and majority of community facilities by the end of Year 10, with vehicular access from South Road (the Eastern Access), Pump Lane and Beaconsfield Road, with Brent Road closed to vehicular traffic.

8.15 Once the Pump Lane access is opened to general traffic, it will be possible to run services through to Hayes to the west. However, as with services to the east, it is envisaged that the initial services will operate on a less frequent basis.

Year 15

8.16 It is envisaged that the Site will be built out by Year 15. The options to serve the Site have been discussed with TfL London Buses and it has been agreed that it will be possible to serve the Site with an appropriate level of bus services. Options considered to date include extending Route No.95, diverting Route No.207, diverting Route No.453 and extending Route No.H50 along with the creation of new routes. However, any alteration to existing services will need to be consulted on in the first instance. Operating all of these services on a 10 minute frequency throughout the daytime will result in a total of 30 buses per hour in each direction. These options are illustrated in **Appendix 8B**. This will result in the PTAL for the Site increasing to 3 throughout, with some pockets of 4.

8.17 The diversions and extensions of the various services through the Site will result in increased journey lengths for some buses and as such it will be necessary to increase the number of buses on the routes to maintain existing frequencies. For example, there are currently 4 buses used on Route H50, whilst the extended service could require 7 buses to operate on a 10 minute frequency. Should Route No.95 be extended, then the number of buses could increase from 7 to 10. As such, the proposals will result in more capacity along the existing route due to the additional buses.

Capacity of Bus Routes

8.18 The capacity of the bus service has been assessed during the typical weekday commuter peak periods for the completed development using 85th percentile trip rates. As noted earlier, there is no demand data for existing services at the weekend, although it is generally accepted that demand during the weekday commuter peak periods is the highest. Table 8.1 includes a summary of the 85th percentile trip rates based on the survey information relied on in Section 6, details of which are included in **Appendix 8C**.

Table 8.1: 85th Percentile Trip Rates

	AM Peak		PM Peak		SAT Peak	
	Arrive	**Depart**	**Arrive**	**Depart**	**Arrive**	**Depart**
Residential (per dwelling)	0.47	1.29	0.78	0.45	0.88	0.88
Employment (per 100sqm)	2.69	0.27	0.66	2.67	0	0
Education (per 100sqm)	25.83	5.82	0.64	1.51	0	0
Supermarket (per 100sqm)	7.33	4.83	13.84	13.79	13.89	14.04
Non-Food Retail (per 100sqm)	1.92	1.24	4.73	7.78	4.83	8.00
A3, A4 and A5 uses (per 100sqm)	0.83	1.48	16.05	9.77	11.62	11.52
Cinema (per 100sqm)	0	0	7.61	7.62	9.68	10.37
Health (per 100sqm)	7.66	4.57	4.60	7.21	0	0
Hotel (per 100sqm)	0.43	1.61	1.10	0.52	1.10	0.52
Conference / Banquet (%)	33%	10%	10%	33%	50%	20%

Development Bus Peak Hour Trips

8.19 **Table 8.2** includes a summary of the estimated bus passengers for the weekday morning, weekday evening and Saturday peak periods for each of the assessment years. The passenger numbers are based on 85th percentile trip rates, with residential employment trips based on observed patterns from the 2001 Census, and the remainder assuming that 90% of the public transport trips are by bus with the exception of trips associated with the Conference Centre. Here it has been assumed that 50% of the trips are by bus, with the remainder by private coach and rail.

Table 8.2: Estimated Bus Passenger Numbers

Period	Arrivals	Departures	Two-way
Year 5			
Weekday AM Peak Hour	240	308	548
Weekday PM Peak Hour	464	540	944
Saturday Peak Hour	577	429	1,006
Year 10			
Weekday AM Peak Hour	470	721	1,191
Weekday PM Peak Hour	705	844	1,549
Saturday Peak Hour	938	756	1,694
Year 15 (Completed Development)			
Weekday AM Peak Hour	598	953	1,551
Weekday PM Peak Hour	838	985	1,813
Saturday Peak Hour	1,085	876	1,961

Based on 85th percentile trip rates

Distribution of Development Bus Trips

8.20 The potential impact on each route has been estimated taking into consideration existing travel patterns for travel to / from work along with the anticipated dispersion of other trips considering the locations of attractors, i.e. shopping centres, etc based on the assumptions and workings in Section 6. The purpose of the exercise is to quantify what level of service is appropriate to serve the site, without unduly impacting on existing levels of service external to the site, to assist in determining an appropriate level of contribution.

8.21 The approach adopted for estimating the distribution of trips was to consider the residential and retail elements individually and grouping the remainder together. The distribution of the residential employment trips has been based on information from the 2001 census. Based on this data, the most popular employment destinations by bus are Ealing (31%), Hillingdon (26,1%) and Hounslow (13.9%).

8.22 The distribution of bus retail trips has been based on the assumed distribution of the overall retail trips, with the demand to each area distributed equally on the bus services to the area.

8.23 It is anticipated that the majority of additional demand and growth in the Southall area / town centre will be associated with the redevelopment of the application Site. However, in order to provide a robust assessment, it has been assumed that there is an increase in demand equivalent to 3% per annum. **Appendix 8D** summaries the anticipated changes to existing bus services in Southall, assuming there is natural growth at a rate of 3% per annum through the development period in addition to flows associated with the redevelopment of the application site.

8.24 The assessment clearly indicates that there will need to be changes to existing services, either through increased frequencies or bus sizes to accommodate the natural increased demand should this materialise. In addition, further changes will also need to be made to some services to accommodate demand flows associated with the redevelopment of the application site. However, given the length of the build period along with the nature of the surrounding highway network and the fact that most of the increased demand will be associated with the application site, it is important to maintain a flexible approach in identifying services to be improved.

Bus Journey Times and Reliability

8.25 Although the provision of new infrastructure and services through the site is key, of equal importance is the effect on journey times and reliability along the route, particularly through Southall town centre.

8.26 Table 8.3 includes a summary of the impact of the development on bus journey times along South Road, from a point 200m north of the junction with Park Avenue to the junction with Merrick Road for southbound services, and from a point 200m south of the junction with Merrick Road through to Park Avenue for northbound services. The times are taken from the TRANSYT models which modelled buses separately.

Table 8.3: Summary of Average Bus Journey Times

	AM Peak		**PM Peak**	
	N/B	**S/B**	**N/B**	**S/B**
2006 Observed Scenario	158s	185s	187s	198s
2025 Base Scenario (existing layout)	277s	456s	203s	204s
2025 Base + Development	95s	91s	132s	108s

8.27 The results of the assessments suggest that existing average bus journey times both north and southbound are in the order of 3 to 4 minutes. Journey times are anticipated to become significantly longer and less reliable should growth materialise and capacity enhancements are not implemented. The section of highway over the railway line coupled with the frequency of stopping buses will have a significant impact on general traffic and bus journey times.

8.28 The results of the assessments show that bus journey times will be improved along the corridor with the implementation of the West Southall proposals and in particular the widening of the South Road railway bridge, signalising the junction with Merrick Road and affording priority to The Green. Although this will potentially reduce the capacity available for general traffic, it will improve bus journey times and reliability through the network

Rail Services

8.29 As with buses, the capacity of the rail services has been assessed during the typical weekday commuter peak periods for the completed development using 85th percentile trip rates.

Development Rail Peak Hour Trips

8.30 **Table 8.4** includes a summary of the estimated passengers for the weekday morning, weekday evening and Saturday peak periods for each of the assessment years. The passenger numbers are based on 85th percentile trip rates, with residential employment trips based on observed patterns from the 2001 Census, and the remainder assuming that 10% of the public transport trips are by rail.

Table 8.4: Estimated Rail Passenger Numbers

Period	Arrivals	Departures	Two-way
Year 5			
Weekday AM Peak Hour	33	55	88
Weekday PM Peak Hour	114	147	261
Saturday Peak Hour	274	241	515
Year 10			
Weekday AM Peak Hour	184	285	469
Weekday PM Peak Hour	205	214	419
Saturday Peak Hour	321	360	681
Year 15 (Completed Development)			
Weekday AM Peak Hour	223	355	578
Weekday PM Peak Hour	240	212	452
Saturday Peak Hour	340	408	748

Based on 85th percentile trip rates

8.31 There are currently on average 6 services per hour towards London during the morning peak and 4 services from London during the evening peak. Considering the completed development, assuming that 80% of the rail trips have an origin or destination in London plus 8 carriages per train suggests on average 6 additional passengers per carriage towards London during the morning peak and 6 additional passengers per carriage from London during the evening peak.

8.32 Given the small increase in passenger numbers per carriage, the demand will be able to be accommodated on existing services. Furthermore, capacity is envisaged to increase with longer and more frequent trains with the completion of improvements associated with Crossrail.

9 PARKING STRATEGY

9.1 This section sets out the vehicular parking strategy for West Southall.

9.2 It is recognised that existing car parking in and around Southall town centre is in short supply. Furthermore, it will be in the interest of retail tenants on the Site to ensure that parking spaces turn over on a regular basis, whilst residents will want to ensure that inappropriate parking does not occur. Hence the efficient management of the spaces will be key to the success of the parking strategy.

9.3 The proposals include dedicated parking for the residential and hotel uses along with off-street town centre parking plus a small quantum of on-street parking.

Residential Parking

9.4 The Masterplan includes a total of up to 3,750 dwellings across the site, the majority of which will be apartments along with some town houses. It is envisaged that the overall parking ratio will be in the region of 0.7 spaces per dwelling across the site (i.e. up to a maximum of 2,625 spaces), with some apartments having no parking, ranging up to a maximum of 2 spaces for larger units.

9.5 There will be a mixture of on-street and off-street parking with provision being made adjacent to dwellings or in communal areas as appropriate. Some of the off-street parking will be provided within the town centre car parks, whilst other spaces will be provided in courtyards or basements.

9.6 All of the parking will be controlled to ensure that inappropriate parking does not occur. It is envisaged that some residents will be allocated or required to purchase individual spaces, whilst others will be allocated or required to purchase permits to park in a particular area. A total of up to 375 spaces will be provided for special needs users. These spaces will be located in close proximity to residential accesses, and meet relevant design criteria for disabled users.

9.7 In addition, some spaces will be allocated for visitors, with time limits broadly in line with town centre parking, and up to 50 spaces will be set aside as car club spaces.

Town Centre Parking

9.8 The proposals include up to a total of 830 spaces for cars including approximately 30 on-street spaces, 730 spaces in two multi-storey car parks plus a small surface car park with 70 spaces adjacent to the cinema.

On-Street Provision

9.9 The proposals include approximately 30 on-street spaces for cars, with the final number determined through detailed design and limited due to design criteria, etc. These spaces will mainly be assigned as special needs parking.

9.10 Furthermore, it is envisaged that the management strategy will ensure that any general on-street parking will be very short stay, to encourage use of the off-street parking for longer stays.

Off-Street Parking

9.11 The proposals include two multi-storey car parks with a total of approximately 730 spaces along with a small surface car park with approximately 70 spaces adjacent to the Cinema.

<u>Eastern Multi-Storey Car Park</u>

9.12 The Eastern Multi-Storey Car Park is located to the east of the retained gas holder, acting as a noise buffer and afford visitors to the existing Southall town centre the opportunity to use the facility.

9.13 The car park, which has approximately 350 spaces for public use, will be managed to ensure that inappropriate long stay commuter parking is discouraged. However, it is envisaged that the detailed strategy will be discussed and finalised post planning through the Transport Review Group, with the final strategy taking into consideration the needs of the retailers and shoppers alike. In this regard, it is likely that although the car park will primarily be short stay, it will facilitate some intermediate stay parking.

9.14 It is typical in town centres across the country to dedicate the lower floors of a car park to short stay, i.e. up to say 2 – 3hrs maximum, and the upper floors to a longer stay of say 4 – 5hrs. These options would enable people to visit existing and future retail, along with a meal or visit to the cinema. However, it would not facilitate commuting for employment purposes.

Central Multi-storey Car Park

9.15 This car park which has approximately 380 spaces is ideally located to serve both the supermarket and the rest of the new high street retail.

9.16 As with the Eastern Multi-storey car park, it will be managed to discourage long stay parking. However, unlike the Eastern Multi-storey car park, it is envisaged that the car park will only facilitate short stay parking, with intermediate and long stay parking not permitted.

Disabled Parking

9.17 The proposals include the provision of approximately 50 spaces (included within the overall total of 830 spaces) for disabled people, with the majority of the spaces allocated on-street and the remainder included within the surface and multi-storey car parks.

9.18 Although this provision accords with DDA guidelines, it is well short of the minimum quantum based on the standards set out within the Ealing adopted UDP. Whereas the DDA guidelines recommend that circa 5% of the overall provision be allocated for disabled people, the standards within the Ealing UDP suggest that a minimum of circa 170 spaces should be allocated for disabled people for the retail element alone. Making an allowance on a similar ratio for the health and leisure facilities suggests that the UDP will be seeking a minimum of 200 spaces or circa 25% of the overall provision which is considered an over-provision that will not be an efficient use of space.

Parking Accumulation Study

9.19 A parking accumulation exercise has been undertaken to understand how the proposed quantum of commercial parking sits in relation to the assumed trip rates.

9.20 The exercise only considers parking demand associated with the retail, cinema and health elements of the scheme. Demand associated with the hotel, conference centre, residential and school elements are not considered as dedicated parking for these elements is provided elsewhere.

Table 9.1: Summary of Parking Accumulation

Weekday Accumulation						
Hour Ending	**Uses**				**Total**	**%**
	S/Market	**NFR**	**Cinema**	**Health**		
08h00	68	0	0	44	112	13%
09h00	120	61	0	177	358	43%
10h00	229	117	0	172	519	63%
11h00	279	188	0	175	641	77%
12h00	267	168	43	212	690	83%
13h00	312	238	62	192	804	97%
14h00	301	205	48	199	752	91%
15h00	266	227	46	162	701	84%
16h00	314	206	71	148	740	89%
17h00	281	225	89	87	682	82%
18h00	227	247	107	36	616	74%
19h00	251	180	166	12	609	73%
20h00	234	154	348	0	736	89%
Peak*	***312***	***247***	***348***	***212***	***804***	***97%***

*individual peaks for land uses plus overall peak for car parks.

9.21 The methodology adopted to ascertain the potential likely parking accumulation was as follows;

- The total daily number of daily person trips was estimated using trip rate information from both the TRICS and TRAVL databases as per the peak hour assessments.
- The quantum of daily vehicular movements was estimated using mode share data from the TRICS and TRAVL databases.
- The temporal distribution of vehicular trips throughout the day was based on survey information in the TRICS database, with only Greater London sites selected for the supermarket distribution and all UK sites for the other three, i.e. Non-food Retail, Cinema and Health.

Table 9.2: Summary of Parking Accumulation

Weekend Accumulation						
Hour Ending	**Uses**				**Total**	**%**
	S/Market	**NFR**	**Cinema**	**Health**		
08h00	95	0	0	0	95	11%
09h00	192	94	0	0	287	35%
10h00	265	219	15	0	483	58%
11h00	295	322	40	0	632	76%
12h00	316	393	81	0	750	90%
13h00	297	398	100	0	776	93%
14h00	278	344	116	0	722	87%
15h00	254	332	118	0	702	85%
16h00	285	359	123	0	761	92%
17h00	285	428	153	0	837	101%
18h00	245	323	225	0	721	87%
19h00	200	125	331	0	620	75%
20h00	208	111	328	0	650	78%
Peak	316	428	331	0	837	101%

9.22 A copy of the parking accumulation study is included in **Appendix 9A**, the results of which suggest that the peak occupancy will be in the region of 800 spaces (97%) during the week, increasing to nearly 840 spaces (101%) occupied at the weekend. The development weekday evening and Saturday peak hour departures assume that the entire car park capacity exits within a one hour period, which is considered very robust.

Hotel and Conference Car Park

9.23 The proposals include a Hotel with a GFA of approximately 9,650sqm along with a 3,000sqm Conference facility plus a dedicated car park with 122 spaces. It is envisaged that the hotel will have in the region of 160 bedrooms along with associated catering facilities.

9.24 LBE parking standards suggest a maximum of 1 space per 3 bedrooms, whilst the London Plan suggests no parking where the hotel is located within a town centre through to a maximum of 1 space per bedroom for locations on arterial routes. There are no standards for Conference facilities.

9.25 The car park will include a total of approximately 120 spaces to cater for the hotel and conference centre. This is considered appropriate given the size of the hotel and conference facility. The Conference Centre will be able to accommodate up to 1,500 persons, which given the quantum of town centre parking on site suggests that a very high proportion of delegates will have to travel by modes other than as car driver.

9.26 It is envisaged that the parking strategy will be linked to using the facilities, and not permit short stay parking for the town centre. For example, parking will be charged by the day with no refund for shorter stay.

Coach Parking

9.27 Parking for approximately 8 coaches is proposed immediately south of the Eastern Multi-storey Car Park. It is envisaged that these spaces will cater for existing demand associated with Southall town centre along with anticipated demand linked to the Hotel and Conference Centre.

10 CONSTRUCTION AND PHASING

10.1 The site is anticipated to be developed over a 15 year period from decontamination and demolition of existing infrastructure through to completion and occupation of the final dwellings.

Programme

10.2 A copy of the indicative phasing programme is included in **Appendix 10A**. The programme illustrates a total of 13 phases, broadly working from East to West, with construction access taken from Pump Lane and Airport Parking phased out over time. **Table 10.1** summarises the anticipated build programme based on the likely quantum of development with 3,493 dwellings. However, capacity assessments for each of the agreed interim years have been based on a pro-rata scenario assuming the upper limit of 3,750 dwellings.

<table>
<tr><th colspan="4">Table 10.1: Summary of Phasing Programme for Main Site</th></tr>
<tr><th colspan="2" rowspan="2">Phase</th><th colspan="2">Completed Development</th></tr>
<tr><th>Indicative Masterplan</th><th>Assessment</th></tr>
<tr><td rowspan="4">2010 – 2014</td><td>1</td><td>192 Dwellings; NFR (2,731sqm); Office (1,039sqm)</td><td rowspan="4">1,000 Dwellings + Supermarket (5,850sqm) Cinema (4,700sqm) + NFR (8,250sqm) + A3, A4 & A5 (1,750sqm) + Office (3,500sqm)</td></tr>
<tr><td>2</td><td>82 Dwellings; Cinema (4,651sqm); NFR (1,719sqm)</td></tr>
<tr><td>3</td><td>370 Dwellings; A3, A4 & A5 (1,720sqm)</td></tr>
<tr><td>4</td><td>283 Dwellings; Studio (2,358sqm); S/market (5,822sqm); NFR (3,549sqm)</td></tr>
<tr><td rowspan="5">2015 – 2019</td><td>5</td><td>180 Dwellings; NFR (5,277sqm); School (413sqm)</td><td rowspan="5">1,850 Dwellings + Hotel (9,650sqm) + Conference (3,000sqm) + School (3,050sqm) + Heath (2,550sqm) + NFR (5,750sqm)</td></tr>
<tr><td>6</td><td>395 Dwellings; Hotel (9,608sqm); Conference (2,979sqm)</td></tr>
<tr><td>7</td><td>390 Dwellings; School (2,588sqm); Health (2,511sqm)</td></tr>
<tr><td>8</td><td>303 Dwellings; NFR (208sqm)</td></tr>
<tr><td>9</td><td>430 Dwellings</td></tr>
<tr><td rowspan="4">2020 - 2025</td><td>10</td><td>297 Dwellings; School (401sqm)</td><td rowspan="4">900 Dwellings + School (450sqm) + NFR (200sqm)</td></tr>
<tr><td>11</td><td>200 Dwellings</td></tr>
<tr><td>12</td><td>249 Dwellings; NFR (183sqm)</td></tr>
<tr><td>13</td><td>122 Dwellings</td></tr>
</table>

Off-Site Highway Works

10.3 The summary in Table 10.1 provides an indicative programme for the on-site works. However, it does not indicate when the off-site highway works will be implemented.

10.4 In this regard, there are several issues that need to be taken into account when determining when off-site highway works are implemented and public transport measures are introduced. These include, in no particular order:

- Traffic Impact – although there is likely to be increased levels of congestion as the site is developed out prior to certain mitigation measures being introduced, it is important to maintain an appropriate level of service for all modes of transport.
- Cash-flow - it is important to recognise this an important aspect of the development, which not only affects the viability of the scheme as a whole, but also the deliverability of affordable housing and other S106 measures.
- Traffic Management – the proposals include works to several junctions along the A312 Hayes By-pass and along South Road to the east of the application site. There will be a need to maintain adequate capacity at key times during the week and hence it is considered appropriate not to carry out work on adjacent junctions simultaneously.

10.5 Taking into account all of the above, the proposals include completing the link to South Road as a first stage of the Eastern Access during Phase 1, along with links to Beaconsfield Road, with a haul road link to Pump Lane for construction vehicles.

10.6 During Phase 3, the Pump Lane / A312 junction will be signalised, albeit not opened to general traffic. The South Road bridge will also be widened during this phase, although this may depend on the successful acquisition of rail paths from Network Rail.

10.7 The improvements to the M4 J3 (see DWG 52212/A/52 Appendix 4G) and to the Bulls Bridge (DWG 52212//A/53 Appendix 4H) junctions will be conducted during

Phases 4 and 5 respectively. Once these are complete the Pump Lane junction will be opened to general traffic.

10.8 There will inevitably be delays to all traffic whilst the off-site highway improvements are being implemented. Whereas certain works will be able to be accommodated off-line, it will be necessary to close lanes for periods of the day and introduce narrow lanes potentially for weeks or months at a time. These actions will reduce the capacity of the junction in the short term thereby increasing delays and queue lengths. However, it will be possible to reduce the potential impact through working during nights and over the weekends when flows are lower and staggering works to adjacent junctions so as not to compound delays.

10.9 Construction of the Eastern Access and in particular widening of the bridge over the railway line will potentially cause significant delays dependent on the construction methodology. The bridge is one of the main crossing points and carries high volumes of traffic throughout the day. The proposals include extending the piers westwards and then creating a new deck. There are likely to be periods when the capacity of the existing bridge is reduced through lane closures and potentially complete road closures when larger sections are lowered in to place.

10.10 To this end, a balance will need to be struck between prevailing traffic conditions, residential amenity and the need to acquire rail possessions. Inevitably there will be periods of night time working when traffic flows are lower and more rail possessions available which could affect nearby residents dependent on the activity.

10.11 The construction of the Western Access and associated works at the A312 / Pump Lane junction are likely to result in less disruption, although there will be periods of narrow lanes and lane closures on the A312 whilst the necessary works are implemented.

Construction Traffic

10.12 The programme includes undertaking as much as possible of the remediation on-site, exporting only what is absolutely necessary to approved waste sites, and managing the movement of material.

10.13 As such, during all phases of the development flows during the construction period are anticipated to be considerably lower than the overall estimated flows for the fully developed site.

10.14 It has been assumed that construction traffic will be equivalent to approximately 10% of the completed development external traffic, and be broadly constant throughout, with the arrival and departure pattern reversed for the AM and PM Peak periods. Construction traffic during the Saturday peak is assumed at 7.5% of the total on the basis that the majority of construction activity will terminate during the afternoon. This is likely to represent a very robust assumption as construction activity is anticipated to be virtually zero during the Saturday afternoon peak period. **Table 10.2** includes a summary of the assumed construction traffic for each of the assessment years.

Table 10.2: Estimated Construction Traffic

	2025 External Flows		Construction Traffic	
	Arrivals	**Departures**	**Arrivals**	**Departures**
AM Peak	552	1,122	112	55
PM Peak	1,162	987	99	116
SAT Peak	1,105	1,011	83	76
Daily Flows	11,396	11,308	1,140	1,131

Use of Canal

10.15 The Grand Union Canal runs along the western boundary of the Site and represents an opportunity to potentially reduce construction traffic. Whilst the canal is used mainly for recreational purposes, it could accommodate the transfer of some bulk materials. However, the scope to use the canal to transport materials will depend on several factors including the type and source / destination of materials.

10.16 Unless the source or destination of the material is canal based, transporting material by water will require double handing which increases costs and risks associated with spillage. Although the canal runs along the boundary of the site, given the size of the site material will need to be transported to the waters edge and then transferred to the barge leading to further double handling. It will not be desirable to transport highly contaminated materials by canal due to the potential risk of contamination.

10.17 As such, the potential to use the canal for transporting material by water will need to assessed at a later date during construction when further details regarding material sources are known.

Construction Management Plan

10.18 It is envisaged that the requirement for a Construction Management Plan will be conditioned through the planning process.

10.19 The broad principles of the transport measures in the management plan for the Site will be as follows;

- Vehicular access for construction vehicles will primarily be from Pump Lane.

- There will be pedestrian and cycle links to Beaconsfield Road, South Road (via the Avenue) and to the south under the railway line for construction workers.

- The movement of HGV on and off the site will be restricted during commuter peak periods.

- Appropriate measures such as wheel washing and dust covers will be applied.

10.20 Construction Management Plans will be prepared for each of the junction improvement schemes by the relevant contractors where off-site highway works are proposed. The plans will be submitted for approval by the appropriate highway authority prior to starting works. The broad principles are as follows:

- HGV movements will be restricted during commuter peak hours.

- HGV routing agreements to be implemented to avoid sensitive and residential areas where possible.

- Appropriate measures such as wheel washing and dust covers will be applied.

- Lane closures will not be permitted during commuter peak periods unless absolutely necessary.

11 POTENTIAL IMPACT ON HIGHWAY NETWORK

11.1 This section summarises the potential impact of the application site on the local highway network for the various assessment years during each of the peak periods.

11.2 The local highway network in Southall along with the wider strategic highway network suffers from congestion during commuter and shopping peak periods, with the roads in the immediate vicinity experiencing congestion for long periods throughout the day. The discussions with the highway authorities have resulted in the promotion of significant off-site highway mitigation measures, as set out in Section 3.

11.3 This section summarises the results of the various capacity assessments conducted to support the planning application. The document considers each of the junctions individually, with the results for each of the scenarios that were set out in Section 4. All of the models for existing and proposed signalised junctions have been audited by Faber Maunsell on behalf of TfL and are considered fit for purpose and broadly in line with DTO modelling guidelines.

11.4 Saturation flows for all of the lanes have been calculated using the RRL67 formula or measured on site using the BUNDLE software package. Details of the calculations and measurements are included in **Appendix 11A.**

11.5 However, in all cases, link speeds have been adopted in place of the link travel times as recommended in TfL modelling guidance. Given the nature of the network and the prevailing traffic conditions, it has been accepted that the use of link speeds is acceptable to ascertain the potential impact of the redevelopment of the application site. Furthermore, all of the survey data is older than the 18 months as recommended in the modelling guidance. Again, it has been accepted that the prevailing traffic conditions on the local highway network are such that there are unlikely to have been any material changes in traffic patterns since the surveys were conducted and hence they are considered suitable for the purpose. It is recognised that the further surveys my need to be conducted at a later stage post planning during the detailed design process as and where appropriate.

Assessment Flows

11.6 The assessment flows are summarised on the various Flow Diagrams included in **Appendix 11B**. Flow Diagrams 1 through 36 summarise the weekday morning, weekday evening and Saturday peak hours for each of the observed, base and development scenarios as follows;

- Flow Diagram 01 – Weekday AM Peak (Observed)
- Flow Diagram 02 – Weekday PM Peak (Observed)
- Flow Diagram 03 – Saturday Peak (Observed)
- Flow Diagram 04 – Weekday AM Peak (2010 Base)
- Flow Diagram 05 – Weekday PM Peak (2010 Base)
- Flow Diagram 06 – Saturday Peak (2010 Base)
- Flow Diagram 07 – Weekday AM Peak (2015 Base)
- Flow Diagram 08 – Weekday PM Peak (2015 Base)
- Flow Diagram 09 – Saturday Peak (2015 Base)
- Flow Diagram 10 – Weekday AM Peak (2015 Development)
- Flow Diagram 11 – Weekday PM Peak (2015 Development)
- Flow Diagram 12 – Saturday Peak (2015 Development)
- Flow Diagram 13 – Weekday AM Peak (2015 Base + Development)
- Flow Diagram 14 – Weekday PM Peak (2015 Base + Development)
- Flow Diagram 15 – Saturday Peak (2015 Base + Development)
- Flow Diagram 16 – Weekday AM Peak (2020 Base)
- Flow Diagram 17 – Weekday PM Peak (2020 Base)
- Flow Diagram 18 – Saturday Peak (2020 Base)
- Flow Diagram 19 – Weekday AM Peak (2020 Development)
- Flow Diagram 20 – Weekday PM Peak (2020 Development)
- Flow Diagram 21 – Saturday Peak (2020 Development)
- Flow Diagram 22 – Weekday AM Peak (2020 Base + Development)
- Flow Diagram 23 – Weekday PM Peak (2020 Base + Development)
- Flow Diagram 24 – Saturday Peak (2020 Base + Development)
- Flow Diagram 25 – Weekday AM Peak (2025 Base)
- Flow Diagram 26 – Weekday PM Peak (2025 Base)
- Flow Diagram 27 – Saturday Peak (2025 Base)
- Flow Diagram 28 – Weekday AM Peak (2025 Development)
- Flow Diagram 29 – Weekday PM Peak (2025 Development)
- Flow Diagram 30 – Saturday Peak (2025 Development)
- Flow Diagram 31 – Weekday AM Peak (2025 Base + Development)
- Flow Diagram 32 – Weekday PM Peak (2025 Base + Development)
- Flow Diagram 33 – Saturday Peak (2025 Base + Development)
- Flow Diagram 34 – Weekday AM Peak (Observed + Development)
- Flow Diagram 35 – Weekday PM Peak (Observed + Development)
- Flow Diagram 36 – Saturday Peak (Observed + Development)

11.7 The peak hour for each junction is not necessarily the same and hence specific periods are not identified. For example, the morning peak hour relates to the highest peak hour flow for each junction broadly around 08h00 through 09h00, with the evening peak referenced around 17h00 through 18h00 and the Saturday peak anytime from around 12h00 through 16h00. This approach provides the most robust approach and assumes that the development peak co-insides with each of the identified peak hours.

11.8 As noted in Section 5, we are of the opinion that there will be little or no background traffic growth, particularly during peak periods and through Southall town centre. This approach is supported by policy and guidance at all levels. However, in order to reach agreement, growth has been applied at a rate of 0.8% per annum from the date of the survey through to the assessment year. **Appendix 11C** sets out the assumed growth from each of the various survey years.

M4 J3

11.9 The grade separated signalised junction is located south-west of the application site and is known to operate at capacity with long queues during peak periods. The proposals include creating additional capacity through widening on each of the northern, southern and western approaches, along with an additional circulatory carriageway as shown on DWG 52212/A/52.

11.10 The junction has been modelled using TRANSYT and the results of the various scenarios are summarised in **Tables 11.1 through 11.11**. The results of the observed scenarios (Table 11.1) illustrate that the junction operates at capacity with long queues, particularly on the A312 northern approach during the morning peak. The models do not assume that the junction is optimised.

11.11 The results of the future year scenarios, all of which have been optimised, illustrate that queue lengths and delays will increase through the junction assuming growth materialise. Queues are anticipated to increase significantly in the No Development No Improvement scenarios assuming growth materialises as applied with the majority of the approaches operating well above capacity.

11.12 The results of the assessments illustrate the proposed junction will typically operate within capacity on the majority of the approaches and achieve nil detriment. In some instances, queues are anticipated to increase (in terms of numbers of vehicles) for the With Development With Improvement Scenario when compared to existing. However, in most cases there is additional storage capacity through widened approaches and hence the actual queue lengths are anticipated to reduce. Copies of the full output are included in **Appendix 11D**.

Table 11.1: Observed Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
A312 North	2078	166%	230	2152	98%	37	1954	84%	21
M4 East	618	95%	22	577	86%	18	541	77%	16
A312 South	2033	91%	32	2025	98%	61	1759	85%	41
M4 West	2350	76%	46	2256	73%	43	1818	69%	31

Table 11.2: 2010 Base Scenario (No Improvement)

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
A312 North	2180	96%	60	2304	99%	70	2038	83%	41
M4 East	667	93%	23	613	94%	23	580	71%	14
A312 South	2128	94%	34	2063	92%	53	1847	87%	44
M4 West	2456	93%	70	2347	92%	63	1898	88%	42

Table 11.3: 2015 Base Scenario (No Improvement)									
	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North	2267	96%	61	2395	99%	70	2120	82%	38
M4 East	693	97%	27	638	98%	26	602	74%	16
A312 South	2212	116%	159	2146	91%	33	1921	93%	27
M4 West	2554	93%	70	2441	91%	66	1974	92%	47

Table 11.4: 2015 Base + Development (No Improvement)									
	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North	2398	128%	211	2456	124%	227	2170	185%	490
M4 East	705	97%	30	660	98%	28	618	83%	19
A312 South	2231	101%	79	2187	98%	69	1935	103%	89
M4 West	2566	99%	84	2463	99%	84	1989	98%	56

Table 11.5: 2015 Base + Development (With Improvement)									
	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North	2398	98%	54	2456	97%	47	2170	93%	48
M4 East	705	96%	24	660	89%	19	618	84%	17
A312 South	2231	99%	58	2187	94%	43	1935	93%	46
M4 West	2566	96%	52	2463	92%	48	1989	93%	42

Table 11.6: 2020 Base Scenario (No Improvement)									
	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North	2358	105%	91	2489	102%	95	2205	91%	45
M4 East	719	100%	31	662	93%	24	626	88%	20
A312 South	2301	109%	139	2233	112%	118	1997	114%	104
M4 West	2677	85%	58	2540	82%	52	2052	71%	35

Table 11.7: 2020 Base + Development (No Improvement)									
	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North	2677	148%	455	2676	139%	379	2342	100%	83
M4 East	751	97%	29	724	102%	32	669	85%	19
A312 South	2360	123%	268	2357	132%	228	2058	154%	225
M4 West	2708	98%	88	2623	110%	172	2129	98%	62

Table 11.8: 2020 Base + Development (With Improvement)									
	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North	2677	93%	50	2676	96%	47	2342	102%	67
M4 East	751	93%	24	724	106%	35	669	87%	18
A312 South	2360	97%	54	2357	97%	50	2058	91%	47
M4 West	2708	93%	55	2623	95%	49	2129	95%	47

Table 11.9: 2025 Base Scenario (No Improvement)									
	AM Peak			**PM Peak**			**Saturday Peak**		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
A312 North	2452	118%	173	2587	108%	170	2293	122%	186
M4 East	748	105%	38	689	99%	30	650	95%	36
A312 South	2394	114%	197	2322	121%	178	2078	93%	56
M4 West	2764	107%	157	2643	111%	182	2134	98%	92

Table 11.10: 2025 Base + Development (No Improvement)									
	AM Peak			**PM Peak**			**Saturday Peak**		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
A312 North	2876	161%	579	2804	134%	374	2458	111%	137
M4 East	786	99%	31	766	89%	27	700	88%	21
A312 South	2466	102%	90	2483	134%	249	2151	105%	99
M4 West	2822	110%	182	2741	111%	180	2219	106%	85

Table 11.11: 2025 Base + Development (With Improvement)									
	AM Peak			**PM Peak**			**Saturday Peak**		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
A312 North	2876	104%	77	2804	106%	80	2458	97%	56
M4 East	786	97%	29	766	11%	45	700	97%	25
A312 South	2466	101%	71	2483	98%	52	2151	95%	52
M4 West	2822	95%	60	2741	104%	72	2219	99%	60

Bulls Bridge Junction (A312 / Hayes Road)

11.13 The signalised roundabout is located approximately 900m north of M4 J3 and currently operates at capacity with long queues on the northern and southern approaches during peak periods. The proposals (**DWG 52212/A/53**) include the creation of a "Hamburger" style junction with vehicles heading north – south directed through the centre of the roundabout. Other changes include widening on the northern and southern approaches along with the relocation of the pedestrian and cycle facilities across the North Hyde Road (western) approach.

11.14 As with M4 J3, the junction has been modelled using TRANSYT with the results summarised in **Tables 11.12 through 11.23** and copies of the full output included in **Appendix 11E**. Overall, the results illustrate that although there will still be long queues the proposals broadly mitigates the potential impact of the redevelopment of the Site.

11.15 Considering the results in more detail, it is clear that if flows through the junction increase in line with the assumed growth, then conditions at the junction will deteriorate with significantly longer queues and delays. The results of the assessments of the Base plus Development Scenarios for the improved junction generally show shorter queues and or degrees of saturation. However, the results of the scenarios assuming growth need to be viewed with some caution as models tend to become unstable when the degrees of saturation exceeds 100%.

11.16 The results of the Observed plus Development Scenario (see Table 11.23) suggest that the junction will typically operate better than existing, albeit close to or at capacity and with longer queues on the A312 northern approach during the morning peak hour, plus longer queues on the A312 southern approach during the evening and Saturday peak hours. However, whilst queues are predicted to be longer on the southern approach, the proposals include an additional approach lane. Furthermore, the assessments have been conducted assuming that flows associated with the existing airport parking operation continue to pass through the junction. Clearly, there is scope to remove many of the trips associated with the airport parking when the operation ceases thereby reducing turning movements at the junction.

Table 11.12: Observed Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
A312 North	2533	104%	73	2562	103%	73	2268	91%	37
Hayes Road	1319	85%	17	1602	82%	27	1602	91%	27
A312 South	2265	94%	44	2733	101%	77	2024	74%	25
North Hyde Road	881	101%	31	1016	137%	158	954	136%	146

Table 11.13: 2010 Base Scenario (No Improvement)

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
A312 North	2753	146%	395	2751	9103%	84	2400	131%	249
Hayes Road	1480	99%	28	1841	101%	60	1735	85%	32
A312 South	2485	159%	480	2943	260%	979	2173	107%	98
North Hyde Road	1024	142%	168	1271	185%	310	1052	134%	147

Table 11.14: Year 5 (2015) Base Scenario (No Improvement)

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
A312 North	2862	171%	559	2861	138%	392	2554	124%	224
Hayes Road	1538	97%	28	1903	92%	44	1844	98%	35
A312 South	2582	164%	532	3061	189%	765	2310	172%	477
North Hyde Road	1061	143%	172	1315	190%	330	1117	158%	236

Table 11.15: Year 5 (2015) Base + Development (No Improvement)

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
A312 North	2996	144%	430	2930	201%	742	2604	194%	609
Hayes Road	1539	92%	31	1903	89%	41	1845	82%	22
A312 South	2626	193%	673	3149	280%	1095	2361	173%	533
North Hyde Road	1064	145%	191	1319	191%	335	1117	159%	230

Table 11.16: Year 5 (2015) Base + Development (With Improvement)

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
A312 North	2996	139%	353	2930	122%	271	2604	134%	260
Hayes Road	1539	72%	26	1903	58%	28	1845	56%	29
A312 South	2626	117%	171	3149	128%	367	2361	141%	239
North Hyde Road	1064	91%	20	1319	162%	278	1117	92%	22

Table 11.17: Year 10 (2020) Base Scenario (No Improvement)

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
A312 North	2975	137%	375	2976	129%	420	2655	162%	481
Hayes Road	1594	95%	36	1975	95%	50	1915	93%	38
A312 South	2684	179%	618	3184	189%	804	2400	224%	718
North Hyde Road	1101	157%	223	1360	207%	390	1160	164%	249

Table 11.18: Year 10 (2020) Base + Development (No Improvement)									
	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North	3306	149%	555	3173	164%	629	2793	220%	743
Hayes Road	1595	90%	31	1975	92%	36	1915	83%	27
A312 South	2825	198%	740	3458	192%	896	2589	150%	457
North Hyde Road	1106	155%	216	1370	204%	380	1162	165%	256

Table 11.19: Year 10 (2020) Base + Development (With Improvement)									
	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North	3306	131%	409	3173	151%	445	2793	139%	358
Hayes Road	1595	66%	24	1975	73%	34	1915	64%	30
A312 South	2825	124%	268	3458	208%	942	2589	161%	418
North Hyde Road	1106	140%	181	1370	124%	144	1162	93%	23

Table 11.20: Year 15 (2025) Base Scenario (No Improvement)									
	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North	3093	155%	540	3094	191%	618	2760	200%	645
Hayes Road	1657	93%	26	2050	93%	40	1990	81%	20
A312 South	2789	170%	603	3311	176%	675	2494	158%	466
North Hyde Road	1142	163%	245	1408	214%	411	1203	162%	245

Table 11.21: Year 15 (2025) Base + Development (No Improvement)

	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North	3535	210%	914	3326	191%	800	2927	216%	743
Hayes Road	1657	94%	27	2050	93%	38	1990	96%	32
A312 South	2958	229%	883	3655	245%	1160	2711	151%	488
North Hyde Road	1119	160%	232	1422	210%	400	1206	127%	126

Table 11.22: Year 15 (2025) Base + Development (With Improvement)

	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North	3535	151%	624	3326	144%	567	2927	144%	411
Hayes Road	1657	64%	29	2050	59%	31	1990	78%	35
A312 South	2958	134%	403	3655	190%	838	2711	157%	482
North Hyde Road	1119	93%	22	1422	178%	347	1206	87%	18

Table 11.23: Observed + Development Scenario (With Improvement)

	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North	2667	106%	135	2631	92%	52	2318	92%	44
Hayes Road	1319	67%	18	1603	47%	22	1602	96%	31
A312 South	2309	93%	46	2821	105%	90	2065	96%	48
North Hyde Road	913	73%	13	1059	104%	45	955	92%	20

A312 / Pump Lane

11.17 This new junction will be created on the A312 to provide a more direct route out of the site. The junction will facilitate all movements with the exception of right turn in from the south, where the left turn in to Bilton Way will be retained. However, the left merge out of Bilton Way is proposed to be closed, with traffic diverted under the A312 and through the new junction. This will represent a significant safety enhancement over the existing situation.

11.18 The junction has been modelled using TRANSYT and copies of the output are included in **Appendix 11F**. The results, summarised below, suggest that the new junction will operate satisfactorily albeit with some queuing on the approaches during peak periods.

Table 11.24: Year 5 (2015) Base + Development

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
A312 North	2636	71%	33	2751	61%	26	2895	63%	27
Pump Lane	773	53%	18	768	82%	36	727	60%	18
A312 South	2238	64%	21	3183	86%	36	2712	73%	25

Table 11.25: Year 10 (2020) Base + Development

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
A312 North	2778	74%	35	2937	63%	27	3074	66%	29
Pump Lane	1061	74%	26	978	91%	48	859	73%	26
A312 South	2328	70%	26	3310	89%	39	2802	76%	27

Table 11.26: Year 15 (2025) Base + Development									
	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North	2901	77%	38	3083	66%	29	3214	69%	31
Pump Lane	1247	84%	46	1054	89%	48	967	83%	40
A312 South	2421	73%	28	3411	93%	46	2936	95%	52

Table 11.27: Year 15 Observed + Development (i.e. No Growth)									
	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North	2,385	70%	34	2,584	55%	22	2,672	58%	23
Pump Lane	1,151	71%	38	942	77%	40	858	75%	32
A312 South	2,005	71%	28	2823	54%	15	2446	66%	21

Pump Lane / Site Access

11.19 The new junction will be created on Pump Lane to include two lanes on each approach along with pedestrian facilities as appropriate (see DWG 52212/A/54 Appendix 4C). The junction has been modelled using TRANSYT and the results of the assessments (included at **Appendix 11F**) suggest that the junction will operate satisfactorily during each of the peak periods.

11.20 The layout includes a bus lane on the eastern approach that terminates a short distance to the east of the junction. Advance stop lines and further bus priority measures are not proposed as buses are unlikely to turn right at the junction to use the A312. It is envisaged that all public bus services will continue ahead on to Hayes.

Table 11.28: Year 5 (2015) Base + Development									
	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
Pump Lane North	172	35%	3	277	24%	4	326	30%	4
Site Access Right	197	34%	3	121	62%	4	99	35%	2
Site Access Ahead	21	6%	1	61	17%	1	64	34%	2
Pump Lane West	625	13%	1	790	24%	1	744	18%	2

Table 11.29: Year 10 (2020) Base + Development									
	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
Pump Lane North	217	44%	4	365	32%	5	403	36%	5
Site Access Right	483	68%	8	305	66%	6	237	58%	5
Site Access Ahead	43	9%	1	69	17%	1	91	34%	2
Pump Lane West	751	24%	3	1019	51%	6	929	39%	4

Table 11.30: Year 15 (2025) Base + Development									
	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
Pump Lane North	239	45%	4	406	51%	6	438	43%	5
Site Access Right	645	72%	10	358	57%	6	288	54%	5
Site Access Ahead	57	7%	1	73	10%	1	98	20%	1
Pump Lane West	809	39%	3	1124	42%	6	1001	39%	5

South Road / A4020 Uxbridge Road

11.21 The signalised junction has two lanes on each of the north, south and western approaches and one lane on the eastern approach. The junction currently operates close to or at capacity during the peak periods, with long queues on all of the approaches.

11.22 However, there is little or no scope to significantly increase capacity through physical measures with built development close to the highway on all sides, although improved signal timings along with the introduction of adaptive control mechanisms and linking to adjacent signals to co-ordinate the junctions will assist. Furthermore, the majority of the roads and junctions that feed the junction are capacity constrained and therefore growth and unfettered growth is unlikely to materialise.

11.23 As such, the junction has been modelled using TRANSYT assuming growth as agreed along with considering the scenario without growth. The results which are summarised in **Tables 11.31 through 10.39** illustrate that queues will increase on the approaches to the junction assuming growth and demand flows materialise. Copies of the full output included in **Appendix 11G**.

11.24 The results of the Observed plus Development Scenario (see Table 11.38) illustrate that the junction will operate at capacity during the peak periods with relatively long queues on all of the approaches as per existing. The results can be compared to the 2025 base scenario results (see Table 11.36) where long queues are anticipated should growth be applied.

11.25 Furthermore, development flows are likely to displace non-essential trips with journeys transferring to other modes or time of day, whilst there are capacity constraints at many key junctions in the vicinity. As such, the flows are unlikely to materialise in the longer term as drivers and people adjust there travel habits to minimise inconvenience.

Table 11.31: Observed Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
Lady Margaret Road	397	89%	14	401	90%	14	488	110%	40
A4020 East	554	97%	23	474	85%	14	520	94%	19
South Road	504	100%	24	469	93%	17	505	100%	24
A4020 West	660	94%	22	662	93%	22	556	75%	14

Table 11.32: 2010 Base Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
Lady Margaret Road	422	93%	16	418	94%	16	502	111%	47
A4020 East	582	102%	31	498	90%	16	537	97%	22
South Road	532	104%	31	488	96%	20	519	103%	29
A4020 West	692	98%	27	695	98%	24	574	78%	15

Table 11.33: Year 5 (2015) Base Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
Lady Margaret Road	436	96%	18	432	97%	19	519	117%	55
A4020 East	605	106%	40	517	93%	18	559	101%	28
South Road	550	107%	39	505	100%	24	538	106%	36
A4020 West	221	103%	35	724	102%	34	598	81%	16

Table 11.34: Year 5 (2015) Base + Development

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
Lady Margaret Road	471	104%	29	504	113%	48	608	137%	101
A4020 East	608	107%	42	522	94%	19	562	101%	29
South Road	598	107%	38	611	121%	73	653	129%	95
A4020 West	729	103%	35	740	102%	35	626	81%	17

Table 11.35: Year 10 (2020) Base Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
Lady Margaret Road	446	100%	22	446	100%	23	537	121%	64
A4020 East	630	111%	52	539	97%	22	581	105%	36
South Road	569	111%	48	523	103%	30	556	110%	44
A4020 West	750	107%	45	752	106%	43	622	84%	17

Table 11.36: Year 10 (2020) Base + Development

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
Lady Margaret Road	502	113%	47	555	113%	48	664	118%	127
A4020 East	639	115%	63	566	102%	30	593	104%	35
South Road	682	135%	111	683	135%	111	733	130%	96
A4020 West	761	110%	52	777	106%	44	666	82%	17

Table 11.37: Year 15 (2025) Base Scenario									
	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
Lady Margaret Road	467	103%	21	462	104%	29	557	153%	139
A4020 East	655	115%	64	560	101%	28	606	112%	54
South Road	590	115%	58	542	107%	38	576	147%	146
A4020 West	780	111%	55	783	111%	54	647	87%	19

Table 11.38: Year 15 (2025) Base + Development									
	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
Lady Margaret Road	514	111%	53	574	129%	83	678	151%	135
A4020 East	667	120%	78	595	107%	42	620	109%	47
South Road	726	165%	195	698	138%	120	746	130%	97
A4020 West	791	114%	65	806	111%	55	690	85%	19

Table 11.39: Observed + Development									
	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
Lady Margaret Road	386	100%	22	447	115%	52	543	137%	102
A4020 East	566	99%	26	510	92%	18	534	96%	21
South Road	574	126%	87	554	124%	81	604	133%	107
A4020 West	670	94%	23	685	93%	22	599	75%	15

Eastern Access / South Road

11.26 The existing South Road "corridor" from Park Avenue through to Merrick Road includes two signalised junctions (with Park Avenue / Beaconsfield Road and the pedestrian crossing outside the station) and the roundabout junction at Merrick Road.

11.27 The existing network operates at capacity during peak periods with long queues, particularly on South Road and Park Avenue during the morning peak, and on The Green during the evening peak. The capacity of the network is significantly reduced primarily due to activity associated with the station and the bus stops along with the pedestrian signal, which result in queues that severely restrict the exit capacity for the South Road (southbound), Park Avenue and Beaconsfield Road approaches. In addition, the approaches to the area are constrained, particularly on The Green to the south and South Road to the north.

11.28 The proposals include creating a new junction a short distance to the south of the junction with Park Avenue to provide access for the Site (the "Eastern Access"), along with widening South Road from the junction with Park Avenue through to Merrick Road to provide two lanes in each direction (see Section 4). The existing pedestrian signal outside Southall Station will be removed with facilities provided at the Eastern Access.

11.29 The new junction will include two lanes on each of the northern and southern South Road approaches along with one lane and a flare on the western approach from the Site. A pedestrian crossing is included across the southern arm to replace the facility lost outside the station.

11.30 As with the South Road / A4020 junction, the majority of the roads and junctions that feed the corridor are capacity constrained and therefore unfettered peak period growth is unlikely to materialise. Nevertheless, a theoretical exercise has been conducted with the network modelled (using TRANSYT) assuming growth at 0.8% per annum as agreed. In addition, assessments have been conducted assuming zero growth along the corridor during peak hours which is considered more realistic given the nature of the highway network. The results which are summarised in **Tables 11.40 through 11.48** with full output in **Appendix 11H**.

11.31 The results for Merrick Road and The Green in each of the Base Scenario assessments suggest that there are no queues on the approaches. However, the roundabout typically operates satisfactorily in its own right, with the congestion and queuing as a result of exit blocking caused by constraints elsewhere on the highway network.

11.32 The results of the assessments assuming growth suggest that the corridor will continue to operate at capacity during peak periods and that levels of congestion and queue lengths will increase significantly, particularly in the Base Scenarios, i.e. assuming the existing highway layout.

11.33 The various Base plus Development Scenarios have been modelled in a manner to minimise queuing on the internal links and The Green, resulting in longer queues on Merrick Road and Park Avenue. The results illustrate that all of the approaches other than Merrick Road and Park Avenue operate within capacity in the Year 5 (2015) assessment year, and that with continued growth in addition to development flows the some other links reach capacity in the Year 10 (2020) and Year 15 (2025) assessment scenarios.

11.34 The results of the assessments assuming zero growth (see Table 11.47) also suggest that the corridor will operate close to or at capacity during the peak periods, albeit with shorter queues on the approaches. Again, the signal timings are assumed to prioritise traffic on The Green and reduce internal queues resulting in the Merrick Avenue and Park Avenue approaches operating above capacity. However, it is anticipated that the flow increases will not materialise primarily due to constraints elsewhere on the highway network, with development flows displacing through traffic. In addition, pass-by trips have not been considered whilst some drivers will change their time of travel.

Table 11.40: Observed Scenario

	AM Peak			PM Peak			Saturday Peak		
South Rd / Park Ave	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	479	56%	11	450	50%	10	483	53%	10
Park Avenue	401	82%	12	308	72%	9	328	77%	10
South Road (S)	903	94%	28	1066	100%	43	910	85%	23
Beaconsfield Road	293	63%	8	224	74%	7	252	81%	8
	AM Peak			**PM Peak**			**Saturday Peak**		
Pedestrian Crossing	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	963	85%	12	807	71%	6	805	71%	6
South Road (S)	903	74%	10	1066	88%	15	910	74%	9
	AM Peak			**PM Peak**			**Saturday Peak**		
South Rd / Merrick	**Flow**	**RFC**	**Q**	**Flow**	**RFC**	**Q**	**Flow**	**RFC**	**Q**
South Road (N)	905	76%	14	741	68%	9	727	67%	9
Merrick Road	558	29%	0	546	34%	0	464	29%	0
The Green	448	34%	0	556	54%	1	513	48%	0

Table 11.41: 2010 Base Scenario (Existing Layout)

	AM Peak			PM Peak			Saturday Peak		
South Rd / Park	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	517	61%	12	450	54%	11	497	55%	11
Park Avenue	431	89%	14	308	74%	10	339	80%	10
South Road (S)	944	98%	35	1115	98%	37	937	75%	23
Beaconsfield Road	307	73%	9	234	85%	8	260	86%	9
	AM Peak			**PM Peak**			**Saturday Peak**		
Pedestrian Crossing	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	1007	103%	41	843	86%	14	829	85%	13
South Road (S)	944	90%	15	1115	107%	57	937	89%	14
	AM Peak			**PM Peak**			**Saturday Peak**		
South Rd / Merrick	**Flow**	**RFC**	**Q**	**Flow**	**RFC**	**Q**	**Flow**	**RFC**	**Q**
South Road (N)	949	77%	14	772	71%	12	742	69%	12
Merrick Road	577	30%	0	596	38%	0	472	31%	0
The Green	479	36%	0	562	54%	1	513	49%	0

Table 11.42: 2015 Base Scenario (Existing Layout)									
	AM Peak			PM Peak			Saturday Peak		
South Rd / Park	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	535	63%	12	501	55%	11	506	56%	11
Park Avenue	447	92%	16	351	83%	11	352	83%	11
South Road (S)	980	101%	43	1151	97%	36	967	90%	26
Beaconsfield Road	319	80%	10	245	92%	10	270	93%	11
	AM Peak			**PM Peak**			**Saturday Peak**		
Pedestrian Crossing	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	1045	107%	59	867	89%	17	852	87%	17
South Road (S)	980	93%	17	1151	111%	79	967	92%	17
	AM Peak			**PM Peak**			**Saturday Peak**		
South Rd / Merrick	**Flow**	**RFC**	**Q**	**Flow**	**RFC**	**Q**	**Flow**	**RFC**	**Q**
South Road (N)	977	77%	14	809	69%	12	793	68%	12
Merrick Road	600	31%	0	619	32%	0	498	26%	0
The Green	499	37%	0	585	43%	0	552	41%	0

Table 11.43: 2020 Base Scenario (Existing Layout)									
	AM Peak			PM Peak			Saturday Peak		
South Rd / Park	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	554	65%	13	518	57%	11	524	58%	11
Park Avenue	465	96%	19	366	86%	12	366	86%	12
South Road (S)	1016	104%	51	1196	97%	37	1003	93%	30
Beaconsfield Road	333	89%	12	255	101%	13	282	102%	14
	AM Peak			**PM Peak**			**Saturday Peak**		
Pedestrian Crossing	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	1086	111%	80	900	92%	19	884	90%	18
South Road (S)	1016	95%	19	1196	116%	103	1003	96%	20
	AM Peak			**PM Peak**			**Saturday Peak**		
South Rd / Merrick	**Flow**	**RFC**	**Q**	**Flow**	**RFC**	**Q**	**Flow**	**RFC**	**Q**
South Road (N)	1,004	77%	14	833	71%	13	817	70%	12
Merrick Road	625	32%	0	644	33%	0	519	27%	0
The Green	518	38%	0	610	44%	0	573	42%	0

Table 11.44: 2025 Base Scenario (Existing Layout)

	AM Peak			PM Peak			Saturday Peak		
South Rd / Park	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	574	68%	14	537	59%	12	543	60%	12
Park Avenue	484	99%	23	381	90%	14	382	90%	14
South Road (S)	1056	107%	62	1240	100%	42	1041	97%	37
Beaconsfield Road	346	100%	15	264	111%	18	293	151%	19
	AM Peak			**PM Peak**			**Saturday Peak**		
Pedestrian Crossing	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	1128	116%	102	934	94%	21	917	92%	19
South Road (S)	1056	98%	25	1240	126%	159	1041	100%	28
	AM Peak			**PM Peak**			**Saturday Peak**		
South Rd / Merrick	**Flow**	**RFC**	**Q**	**Flow**	**RFC**	**Q**	**Flow**	**RFC**	**Q**
South Road (N)	1,032	77%	14	854	73%	13	835	72%	13
Merrick Road	550	33%	0	671	35%	0	540	28%	0
The Green	541	40%	0	632	87%	3	597	44%	0

Table 11.45: Year 5 (2015) Base + Development (Proposed Layout)									
	AM Peak			**PM Peak**			**Saturday Peak**		
South Rd / Park	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	649	46%	9	649	61%	12	649	83%	10
Park Avenue	440	211%	136	392	183%	103	400	183%	102
South Road (S)	1049	73%	13	1352	111%	40	1157	98%	27
Beaconsfield Road	319	82%	10	245	68%	7	270	69%	7
	AM Peak			**PM Peak**			**Saturday Peak**		
South Rd / Site Acc.	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Rd Ahead (N)	1013	52%	9	926	59%	8	878	50%	8
South Rd Right (N)	67	12%	1	130	43%	4	165	43%	4
South Rd (S)	1040	76%	12	1355	89%	11	1177	81%	8
Site Access	150	38%	2	150	71%	4	349	100%	14
	AM Peak			**PM Peak**			**Saturday Peak**		
South Rd / Merrick	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	1083	36%	9	1090	53%	15	1062	47%	6
Merrick Road	637	161%	113	693	201%	183	590	165%	120
The Green	588	49%	8	781	80%	18	736	64%	12

Table 11.46: Year 10 (2020) Base + Development (Proposed Layout)									
	AM Peak			**PM Peak**			**Saturday Peak**		
South Rd / Park Ave	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	711	56%	11	711	63%	13	711	54%	10
Park Avenue	575	162%	111	439	117%	46	440	201%	124
South Road (S)	1175	102%	25	1485	135%	74	1290	107%	37
Beaconsfield Road	333	164%	9	255	71%	7	282	72%	8
	AM Peak			**PM Peak**			**Saturday Peak**		
South Rd / Site Acc.	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Rd Ahead (N)	1140	60%	8	927	59%	12	883	48%	8
South Rd Right (N)	108	21%	3	239	61%	6	262	55%	6
South Rd (S)	1122	80%	15	1469	91%	28	1288	84%	8
Site Access	285	58%	6	462	71%	5	515	111%	27
	AM Peak			**PM Peak**			**Saturday Peak**		
South Rd / Merrick	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	1256	47%	11	1160	49%	9	1175	49%	13
Merrick Road	686	174%	135	757	220%	212	649	183%	151
The Green	629	56%	9	836	70%	14	794	74%	15

Table 11.47: Year 15 (2025) Base + Development (Proposed Layout)

	AM Peak			PM Peak			Saturday Peak		
South Rd / Park Ave	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	640	51%	10	711	57%	11	711	57%	11
Park Avenue	506	231%	161	455	208%	132	451	206%	130
South Road (S)	1250	99%	26	1525	112%	43	1318	112%	42
Beaconsfield Road	346	89%	12	264	74%	8	293	74%	9
	AM Peak			**PM Peak**			**Saturday Peak**		
South Rd / Site Acc.	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Rd Ahead (N)	1128	57%	7	934	51%	9	898	49%	8
South Rd Right (N)	101	20%	2	248	69%	7	256	65%	7
South Rd (S)	1151	81%	14	1513	54%	22	1311	88%	13
Site Access	341	75%	5	438	69%	4	482	93%	10
	AM Peak			**PM Peak**			**Saturday Peak**		
South Rd / Merrick	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	1264	45%	11	1151	42%	14	1133	45%	13
Merrick Road	707	179%	144	783	227%	225	662	186%	155
The Green	645	58%	10	859	75%	13	811	76%	17

Table 11.48: Observed + Development (Proposed Layout)

	AM Peak			PM Peak			Saturday Peak		
South Rd / Park Ave	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	652	45%	8	652	62%	12	730	55%	11
Park Avenue	514	201%	125	455	179%	98	451	181%	101
South Road (S)	1250	75%	16	1525	102%	28	1318	87%	22
Beaconsfield Road	346	76%	9	264	62%	6	293	64%	7
	AM Peak			**PM Peak**			**Saturday Peak**		
South Rd / Site Acc.	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Rd Ahead (N)	1135	50%	8	875	54%	6	917	46%	7
South Rd Right (N)	101	18%	3	248	61%	7	256	59%	7
South Rd (S)	1051	74%	11	1413	85%	15	1211	81%	10
Site Access	441	75%	9	538	69%	4	582	93%	11
	AM Peak			**PM Peak**			**Saturday Peak**		
South Rd / Merrick	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
South Road (N)	1271	39%	10	1092	49%	13	1152	45%	5
Merrick Road	737	155%	103	783	198%	174	662	166%	122
The Green	545	48%	7	759	70%	14	711	62%	11

Pump Lane / Bilton Way

11.35 The mini-roundabout junction is located a short distance to the west of the A312. The junction has four arms, with Pump Lane forming the eastern and western approaches, Bilton Way the northern approach and a private access the southern access.

11.36 The junction currently operates within capacity, with any queues that do form dissipating relatively quickly. The western arm of Pump Lane connects to Hayes town centre, with the eastern arm connecting to the A312 southbound carriageway and Bilton Way providing access to the industrial estate along with the northbound carriageway of the A312.

11.37 No changes are proposed to the junction with the redevelopment of the Site. However, the proposals do include the closure of the northbound on-slip to the A312, with traffic diverting under the A312 and turning right at a new signalised junction. The junction has been modelled using ARCADY for Observed Scenario along with each of the Base and Base + Development Scenarios during 2015, 2020 and 2025.

11.38 The results, summarised in **Tables 11.49 through 11.55** suggest that the junction currently operates within capacity and that queues are anticipated to increase should growth and the development flows materialise. However, it is envisaged that any queues that do form will dissipate relatively quickly.

Table 11.49: Observed Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	**RFC**	**Q**	**Flow**	**RFC**	**Q**	**Flow**	**RFC**	**Q**
Pump Lane (W)	493	0.612	2	616	0.762	4	562	0.698	3
Bilton Way	308	0.266	1	386	0.333	1	312	0.269	1
Pump Lane (E)	136	0.144	1	118	0.131	1	419	0.266	1

Table 11.50: Year 5 (2015) Base Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	RFC	Q	Flow	RFC	Q	Flow	RFC	Q
Pump Lane (W)	542	0.674	2	678	0.840	5	618	0.769	4
Bilton Way	339	0.298	1	425	0.373	1	344	0.302	1
Pump Lane (E)	149	0.160	1	130	0.147	1	274	0.298	1

Table 11.51: Year 5 (2015) Development Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	RFC	Q	Flow	RFC	Q	Flow	RFC	Q
Pump Lane (W)	570	0.718	3	724	0.897	8	685	0.870	6
Bilton Way	425	0.379	1	550	0.577	2	320	0.291	1
Pump Lane (E)	195	0.209	1	193	0.219	1	375	0.408	1

Table 11.52: Year 10 (2020) Base Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	RFC	Q	Flow	RFC	Q	Flow	RFC	Q
Pump Lane (W)	656	0.703	3	706	0.875	7	643	0.801	4
Bilton Way	353	0.313	1	442	0.391	1	357	0.315	1
Pump Lane (E)	156	0.169	1	135	0.154	1	285	0.312	1

Table 11.53: Year 10 (2020) Development Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	RFC	Q	Flow	RFC	Q	Flow	RFC	Q
Pump Lane (W)	602	0.761	4	771	0.956	13	748	0.948	12
Bilton Way	518	0.468	1	756	0.812	5	551	0.514	1
Pump Lane (E)	234	0.253	1	213	0.243	1	417	0.457	1

Table 11.54: Year 15 (2025) Base Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	RFC	Q	Flow	RFC	Q	Flow	RFC	Q
Pump Lane (W)	588	0.733	3	735	0.912	9	669	0.834	5
Bilton Way	367	0.328	1	460	0.410	1	372	0.331	1
Pump Lane (E)	163	0.177	1	140	0.162	1	297	0.328	1

Table 11.55: Year 15 (2025) Development Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	RFC	Q	Flow	RFC	Q	Flow	RFC	Q
Pump Lane (W)	618	0.770	4	799	0.991	19	772	0.963	14
Bilton Way	542	0.542	2	818	0.889	7	592	0.652	2
Pump Lane (E)	220	0.240	1	211	0.243	1	395	0.436	1

The Green

11.39 The Green is a single carriageway road running from Merrick Road through to the King Street / Dudley Road junction. It varies in width with typically has one lane in each direction, along with on-street parking, loading bays and bus stops. It is a major bus corridor, with a total of 6 services operating along the route.

11.40 Apart from being a major bus corridor, the road also attracts a significant volume of vehicular traffic albeit that it is not designated as a strategic route in London. Merrick Road, the A3005, is located a short distance to the east and carries considerably less traffic.

11.41 The redevelopment of the former gasworks site will attract vehicular trips from south of the railway line, the majority of which would choose to use South Road and the Eastern Access as the most direct route. Such demand flows would add to existing traffic congestion in the vicinity resulting in increased queues and delays.

11.42 It is recognised that there is an existing traffic problem within Southall and it is unlikely that the West Southall (or any other development site) will be able to solve the problems given existing constraints on the wider highway network. Furthermore, it is no longer policy to cater for demand flows and as such physical highway improvements are not proposed south of the railway line. However, public transport and in particular bus services are considered key to the success of the development, many of which operate along The Green to the south of the railway line.

11.43 Therefore, the proposals are to set the signal timings in a manner to give priority to The Green and ensure that buses are not unnecessarily delayed. The results of the assessments illustrate that the improved junctions along South Road in the vicinity of Southall Station will operate satisfactorily, albeit with long queues on The Merrick Road approach.

Beaconsfield Road / Site Access Junctions

11.44 A total of three vehicular links to Beaconsfield Road are proposed as illustrated on the Masterplan; broadly opposite Ranelagh Road, Trinity Road and West End Road. It is envisaged that all three junctions will operate under priority control with Access 1 (opposite Ranelagh Road) and Access 3 (opposite West End Road) being one-way southbound, i.e. in to the application site, and Access 2 (opposite Trinity Road) one-way northbound.

11.45 The junctions have been modelled using PICADY and the results for the Year 15 completed development which are summarised in **Tables 11.56 through 11.58** suggest that the junctions will operate within capacity during each of the peak periods. The assessments assume that all of the flows enter through one of the two access points, which is robust in that it effectively doubles the potential flows using the access points. All of the traffic egresses via the middle access.

Table 11.56 Year 15 (2025) Base + Development (Access 1)

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
Site Access	-	-	-	-	-	-	-	-	-
Right turn into site	56	0.103	1	94	0.197	1	148	0.297	1

Table 11.57: Year 15 (2025) Base + Development (Access 2)

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
Trinity Road	50	0.104	1	50	0.103	1	93	0.185	1
Site Access	71	0.164	1	122	0.316	1	143	0.378	1

Table 11.58: Year 15 (2025) Base + Development (Access 3)

	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
Site Access	-	-	-	-	-	-	-	-	-
Right turn into site	56	0.103	1	94	0.197	1	148	0.297	1

Ossie Garvin Roundabout (A312 / A4020)

11.46 The grade separated junction which is located north-west of the Site has four lanes on each of the eastern, western and southern approaches, with three lanes on the northern approach and four circulatory carriageways. North south traffic on the A312 passes under the junction. The junction operates under UTC control and is known to typically operate well within capacity with short queues. Traffic associated with the redevelopment of the Site is anticipated to travel to and from the A4020 western approach and the A312 southern approach en-route to and from the Western Access.

11.47 The junction has been modelled for the observed (2006), Base (2025) and Development (2025) scenarios for each of the weekday morning and evening plus Saturday peak periods. The results of the assessments illustrate that the junction will continue to operate within capacity albeit with marginally longer queues and higher degrees of saturation.

Table 11.59: Observed Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North Slip	730	50%	9	527	38%	8	949	72%	15
A4020 East App.	1165	83%	32	1282	102%	37	1264	106%	42
A312 South Slip	603	57%	8	1007	100%	27	833	79%	16
A4020 West App.	1070	70%	18	1210	75%	20	1279	92%	25

Table 11.60: 2010 Base Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
A312 North Slip	764	56%	12	553	62%	9	979	80%	17
A4020 East App.	1221	61%	16	1345	61%	19	1305	73%	19
A312 South Slip	629	63%	12	1052	68%	16	860	69%	15
A4020 West App.	1122	73%	19	1269	69%	20	1321	67%	18

Table 11.61: Year 5 (2015) Base Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
A312 North Slip	793	59%	12	575	72%	12	1020	83%	18
A4020 East App.	1271	68%	21	1400	63%	19	1358	71%	19
A312 South Slip	655	59%	12	1095	76%	18	895	72%	15
A4020 West App.	1169	76%	19	1321	72%	22	1375	69%	20

Table 11.62: Year 5 (2015) Base + Development Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
A312 North Slip	793	59%	12	575	72%	12	1020	83%	18
A4020 East App.	1271	73%	21	1400	73%	19	1358	75%	22
A312 South Slip	674	59%	12	1114	72%	17	917	72%	15
A4020 West App.	1179	76%	19	1337	72%	21	1404	69%	20

Table 11.63: Year 10 (2020) Base Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North Slip	789	66%	12	595	75%	12	1061	86%	20
A4020 East App.	1324	66%	21	1456	63%	19	1412	74%	22
A312 South Slip	682	69%	12	1139	79%	19	931	75%	16
A4020 West App.	1215	69%	19	1375	70%	22	1430	72%	19

Table 11.64: Year 10 (2020) Base + Development Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North Slip	789	66%	12	595	75%	12	1061	86%	20
A4020 East App.	1324	76%	22	1456	63%	19	1442	78%	22
A312 South Slip	710	63%	12	1170	76%	19	971	78%	17
A4020 West App.	1233	69%	19	1403	70%	22	1486	72%	21

Table 11.65: Year 15 (2025) Base Scenario

	AM Peak			PM Peak			Saturday Peak		
	Flow	DOS	Q	Flow	DOS	Q	Flow	DOS	Q
A312 North Slip	821	69%	14	620	78%	12	1104	90%	22
A4020 East App.	1377	84%	26	1515	68%	21	1471	81%	23
A312 South Slip	709	64%	12	1186	76%	19	969	78%	18
A4020 West App.	1266	72%	21	1430	73%	23	1488	75%	21

Table 11.66: Year 15 (2025) Base + Development Scenario									
	AM Peak			**PM Peak**			**Saturday Peak**		
	Flow	**DOS**	**Q**	**Flow**	**DOS**	**Q**	**Flow**	**DOS**	**Q**
A312 North Slip	821	69%	14	620	78%	12	1104	90%	22
A4020 East App.	1377	85%	26	1515	68%	21	1471	81%	24
A312 South Slip	756	69%	14	1220	80%	20	1019	82%	20
A4020 West App.	1289	72%	21	1464	73%	23	1559	75%	21

Brent Road

11.48 The redevelopment will see a reduction in Airport Parking during the initial years, with the total removal of the facility by the end of Year 5 / 6 to enable the remediation of the western portion of the Site to be carried out.

11.49 Automatic Traffic Count surveys undertaken in September 2006 indicated that average two-way flows were circa 190 during weekday morning peak hour, 225 during the weekday evening peak hour and 130 during a Saturday afternoon. Average weekday daily two-way flows are in the order of 2,590. All of the flows use Brent Road to access Western Road and the wider highway network, with the majority approaching or departing from the west.

11.50 Based on traffic survey information associated with the planning application for the UCS site, existing two-way traffic flows are on Brent Road are in the order of 570 during weekday morning peak hour and 450 during the weekday evening peak hour. Based on these peak hour flows daily flows are estimated to be in the region of 7,000 flows.

11.51 As such, flows on Brent Road will reduce significantly when compared to existing levels providing a benefit to local residents. Furthermore, there will be a corresponding reduction in flows along Western Road and at the Bulls Bridge junction, albeit that no reductions have been assumed for assessment purposes.

Impact on Hayes Town Centre

11.52 The Western Site access connects to Pump Lane via a new signalised junction immediately to the east of the A312 Hayes By-pass. Concerns have been raised by LB Hillingdon associated with the potential impact on Hayes town centre and Coldharbour Lane.

11.53 We are of the opinion that the proposals will not have any adverse affect on traffic flows in Hayes town centre. To this end, currently roads in and around Hayes town centre suffer from congestion for long periods of the day, with queues forming on the approaches to many junctions. In addition, north-south routes across the mainline railway line are limited with through traffic restricted in the town centre and a bus gate on Crown Close.

11.54 These existing conditions coupled with the proposed improvements at the Bulls Bridge roundabout and M4 J3 will result in little or no gain for development traffic through using existing potential rat runs through Hayes town centre. Conversely, the new route could result in benefits for existing Hayes residents through the highway improvements along with the alternative connections to Southall by all modes of transport. Residents from Hayes will have the opportunity to use the facilities on the application site which include retail and leisure uses, without the need to use the strategic highway network.

Commentary

11.55 The highway network in the vicinity of the Site is typical of many town centres in Greater London and suffers from periods of congestion during peak hours. The existing problems in and around Southall are exacerbated by a lack of parking and enforcement which result in unnecessary circulatory trips and inappropriate parking.

11.56 The redevelopment of the former gasworks site will result in additional demand flows on the wider highway network. Discussions and negotiations over the past two and a half years has resulted in the promotion of significant mitigation measures to include a network of bus services running through the Site and large scale highway improvements. These include improvements along the A312 corridor to the west along with widening of the South Road bridge over the London – Cardiff mainline railway. The results of the 2025 design year capacity assessments based on the adopted distribution and trip rates suggests that whereas the proposed mitigation measures along the A312 broadly achieve nil detriment, queues are likely to increase along the South Road corridor.

11.57 However, it should be recognised that in a densely developed part of west London such as Southall, it is not possible or desirable to cater for unfettered traffic demand on the local highway network, particularly during peak hours.

11.58 The two primary transport objectives should be to provide good quality public transport so that people are encouraged to leave their cars at home and make appropriate provision for buses. The proposals have been developed with the above in mind. In particular the on-site layout includes significant bus priority measures, whilst the bridge widening at Southall Station along with signal settings at the Merrick Road junction are primarily to assist bus movements.

11.59 Furthermore, it is envisaged that a Transport Fund will be created and administered by the Transport Review Group. There will be a Toolkit of measures that the Transport Review Group can decide to spend the funds on e.g. bus subsidy; travel plan measures; etc. Therefore if additional bus infrastructure measures in the South Road area are deemed beneficial then these could be implemented.

11.60 It is considered that this strategy gives certainty of the implementation of essential works to be funded by the developer yet retains flexibility if alternative or additional works come forward that are beneficial.

12 SUMMARY AND CONCLUSION

12.1 Savell Bird and Axon is retained by National Grid Properties Limited to provide traffic and transport advice associated with the redevelopment of the former gasworks site in Southall.

12.2 The proposals include a residential led mixed-use scheme with up to 3,750 dwellings, a supermarket and a high street along with employment, a hotel and conference plus community facilities and the removal of the off-site Airport Parking. Overall, the quantum of development represents a significant reduction in the density when compared to the 2005 planning application, which included a higher quantum of residential units and a significantly larger employment component on a smaller site area.

12.3 The proposals have been discussed extensively with all of the various highway authorities over the past two and a half years, with the aim of reaching agreement on as many matters as possible prior to submission of the planning application. Over the course of the period, a series of Working Papers covering aspects such as trip rates, trip distribution and mode share, through to assessment periods and parking were produced.

12.4 These discussions resulted in the promotion of significant off-site highway improvements along with a sustainable transport strategy based on walking, cycling and public transport. The key elements of the Sustainable Transport Strategy are as follows;

- On site facilities will mean that many day to day activities can be done without the need to leave the site, e.g. food shopping, education and leisure.
- The Site is close to Southall Station which has good links to destinations such as London, Heathrow Airport, Reading and intermediate stations. The facilities and services will be enhanced through the implementation of Crossrail.
- New pedestrian and cycle links across and through the Site will significantly enhance conditions for existing residents adjacent to the Site.

- There will be good links to Southall Station and town centre through the creation of footpaths, cycleways and bus routes.
- There will be a comprehensive bus network through the site, to include bus lanes on key links along with priority measures as appropriate. It is envisaged that there will be up to 30 buses an hour in each direction running through the Site with individual plots typically no more than 400m from bus stops.
- All parking on Site will be managed to discourage long stay commuter parking.
- There will be a Site wide Travel Plan along with Specific Travel Plans for individual elements of the scheme. The Travel Plans will be reviewed on a regular basis throughout the development of the Site to ensure that measures keep up with the latest trends.

12.5 In terms of traffic, capacity assessments of all of the key junctions in the vicinity of the site have been undertaken which has resulted in significant access and off-site highway improvements being promoted as follows;

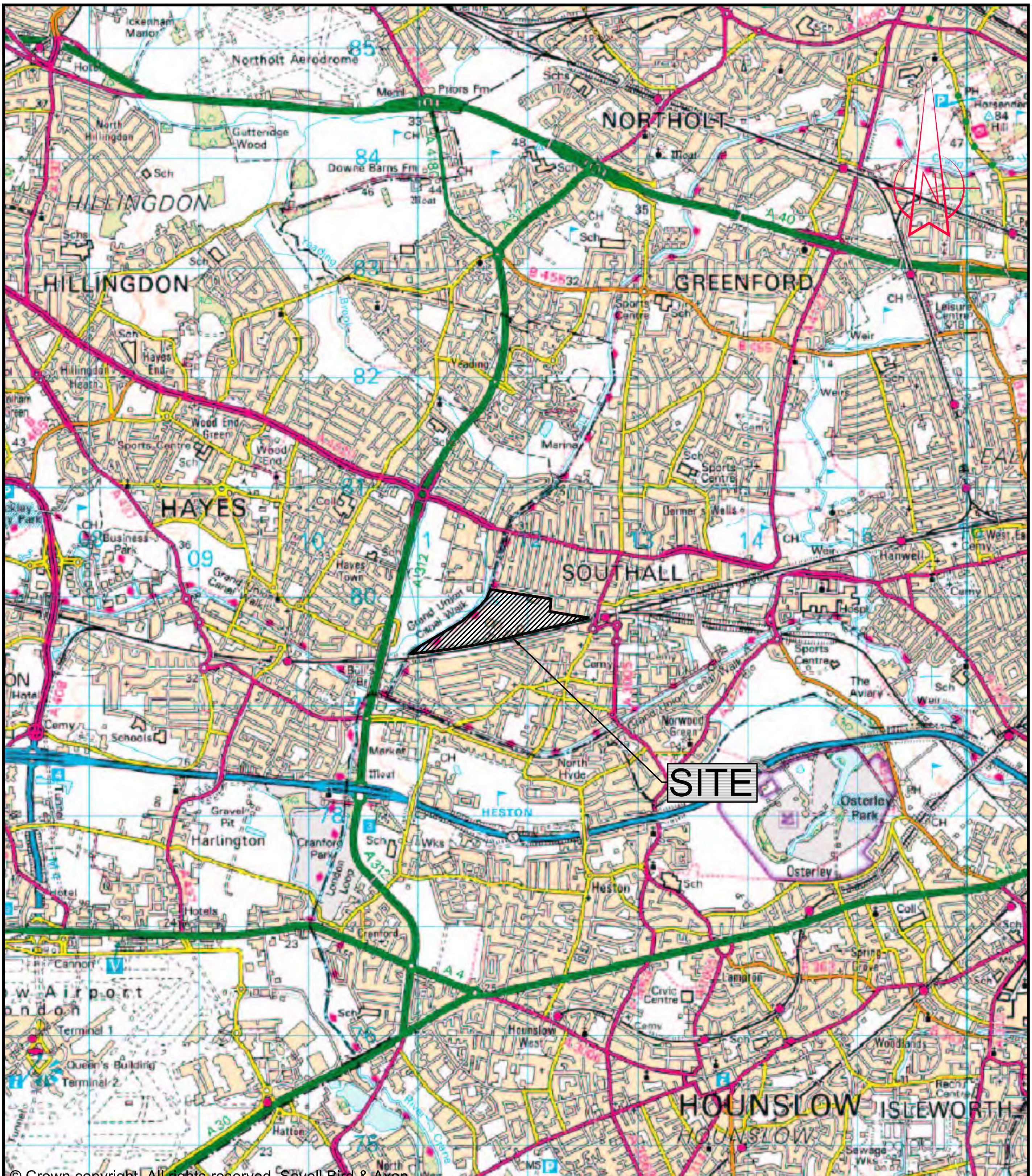
- works to the M4 J3 to include additional flare lanes on the northern, southern and western approaches along with internal widening,
- creating a “Hamburger” style junction at the Bulls Bridge roundabout with north – south traffic passing through the centre of the junction,
- signalisation of the A312 / Pump Lane junction, and
- widening of the South Road Bridge.

12.6 However, it is important to recognise that whereas it has been possible to broadly achieve nil detriment at some of the junctions, even allowing for growth through to 2025 and demand flows, it is not possible to fully mitigate the impact on South Road and in Southall town centre. However, it is generally accepted that in dense urban areas it is no longer appropriate to provide for unfettered demand.

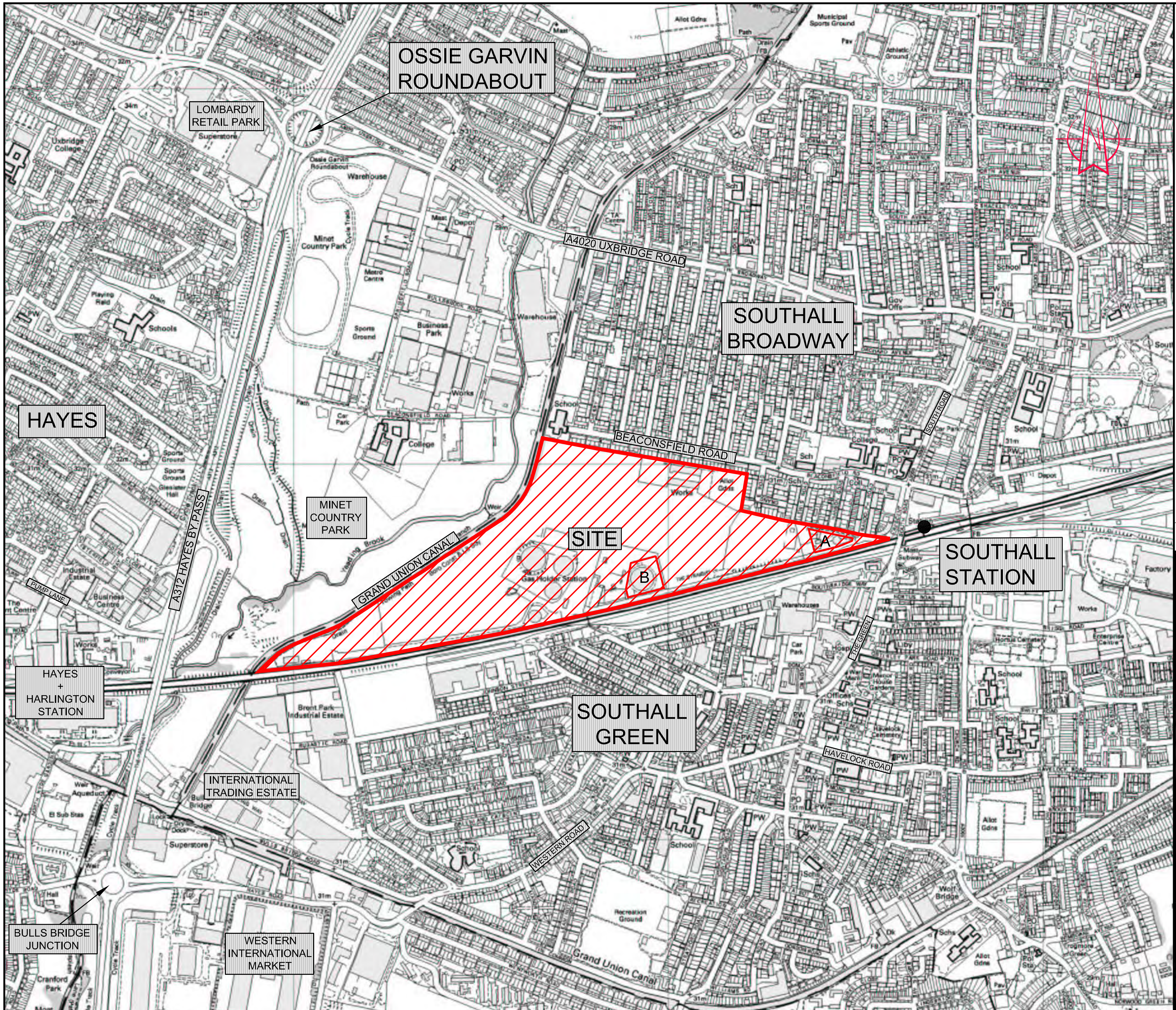
12.7 Notwithstanding this, the proposals include managing traffic through signal timings to reduce delay for buses with corresponding increases in delay for general traffic on opposing approaches.

12.8 In addition, the proposal to close the vehicular link to Brent Road under the railway line will reduce traffic volumes on Brent Road resulting in a major benefit for local residents.

12.9 Overall, the redevelopment of the Site for the proposed uses is acceptable in transportation terms. The Site is previously developed land in an urban environment with excellent public transport opportunities which will be improved. Therefore, although there may be additional delay to vehicles on the surrounding highway network and in particular through Southall town centre should traffic growth materialise in addition to development demand flows, there are significant benefits for walking and cycling in particular through the redevelopment of the Site.



West Southall					National Grid	
Site Location					Savell Bird & Axon A White Young Green Company Ariel House 74a Charlotte Street London W1T 4QJ t: 020 7580 8844 f: 020 7580 8818 e: sba@sbax.co.uk	
DRAWN: M.W.	DATE: 30.07.08.	CHECKED: A.M.	DATE: 30.07.08.	SCALES: 1:50,000 at A4	DRAWING NUMBER: Figure 1	REVISION: -



Notes:
1. This is not a construction drawing and is intended for illustrative purposes only.
2. White lining is indicative only.

REV.	DETAILS	DRAWN	CHECKED	DATE

CLIENT: National Grid

PROJECT: West Southall

DRAWING TITLE: Local Area

SCALES: 1:10,000 at A3

DRAWN:	CHECKED:	DATE:
M.B.W.	A.M.	04.08.08

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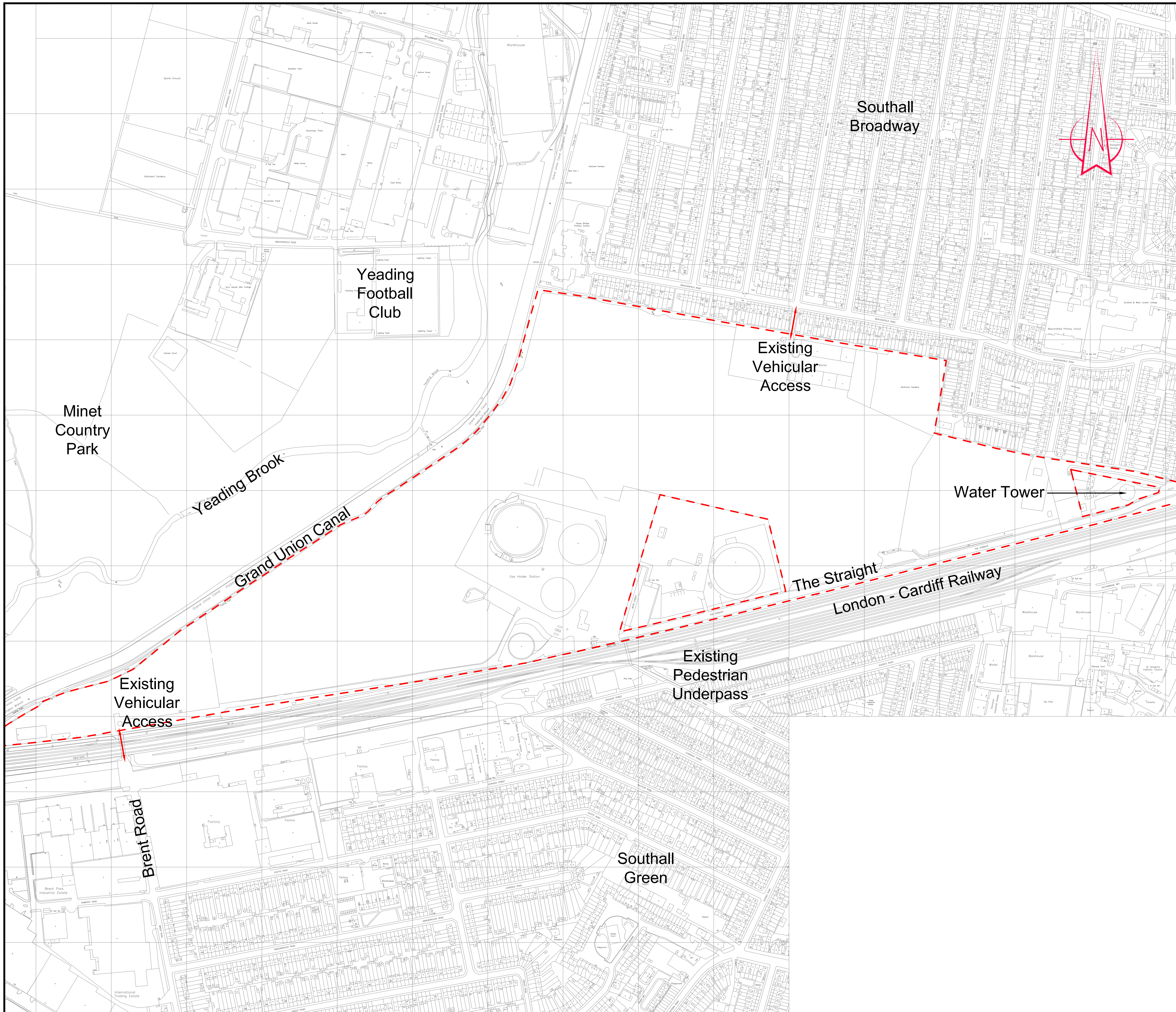
DRAWING NUMBER: Figure 2

REVISION: ·



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REV.	DETAILS	DRAWN	CHECKED	DATE
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CLIENT:
National Grid

PROJECT:
West Southall

DRAWING TITLE:
Location Plan

SCALES:
1:5000 at A3

DRAWN: M.W. CHECKED: A.M. DATE: 30.07.08.

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DRAWING NUMBER: Figure 3
REVISION: .

Appendix 9.1

Noise and Vibration Units, Standards and Guidance

Noise Units

1.1 Noise is defined as unwanted sound. The range of audible sound is from 0 dB to 140 dB. The frequency response of the ear is usually taken to be about 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dB(A) weighting. This is an internationally accepted standard for noise measurements.

1.2 For variable noise sources such as traffic, a difference of 3 dB(A) is just distinguishable. In addition, a doubling of a noise source would increase the overall noise by 3 dB(A). For example, if one item of machinery results in noise levels of 30 dB(A) at 10 m, then two identical items of machinery adjacent to one another would result in noise levels of 33 dB(A) at 10 m. The 'loudness' of a noise is a purely subjective parameter but it is generally accepted that an increase/decrease of 10 dB(A) corresponds to a doubling/halving in perceived loudness.

1.3 External noise levels are rarely steady but rise and fall according to activities within an area. In an attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

- L_{Amax} noise level: This is the maximum noise level recorded over the measurement period.
- L_{Aeq} noise level: This is the 'equivalent continuous A-weighted sound pressure level, in decibels' and is defined in BS 7445 [1] as the 'value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, T, has the same mean square sound pressure as a sound under consideration whose level varies with time'. It is a unit commonly used to describe community response plus, construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.
- L_{A10} noise level: This is the noise level that is exceeded for 10% of the measurement period and gives an indication of the noisier levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.
- L_{A90} noise level: This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during quieter periods. It is often

referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

Vibration Units

1.4 Groundborne vibration from construction sources, such as piling, can be a source of concern for occupants of buildings in the vicinity. The concern can be that the building may suffer some form of cosmetic or structural damage or that ground settlement may arise that could subsequently lead to damage. Research associated with BS 7385 [2 and 3], concerned with vibration-induced building damage found that although a large number of case histories were assembled, very few cases of vibration-induced damage were found. However, structural vibration in buildings can be detected by the occupants and can affect them in many ways: their quality of life can be reduced, as also can their working efficiency, although, there is little evidence that whole-body vibration directly affects cognitive processes. It should be noted that there is a major difference between the sensitivity of people feeling vibration and the onset of levels of vibration that damage a structure.

- Vibration Dose Value (VDV): The effect of building vibration on people inside buildings is assessed by determining their vibration dose. Present knowledge indicates that this is best evaluated with the VDV, as promoted through BS 6472 [4]. VDV defines a relationship that yields a consistent assessment of intermittent, occasional and impulsive vibration, as well as continuous input, and correlates well with subjective response. The way in which people perceive building vibration depends upon various factors, including the vibration frequency and direction. The VDV is given by the fourth root of the integral of the fourth power of the acceleration after it has been frequency weighted.

- Peak Particle Velocity (PPV): Peak particle velocity is defined as 'the maximum instantaneous velocity of a particle at a point during a given time interval', and has been found to be the best single descriptor for correlating with case history data on the occurrence of vibration-induced damage.

National Planning Guidance

Planning Policy Guidance Note 24: Planning and Noise

1.5 National planning guidance is contained within Planning Policy Guidance Note 24: Planning and Noise (PPG 24) [5]. PPG 24 offers guidance to local authorities on the assessment of noise and its potential impact on noise sensitive dwellings. In addition, the document defines four Noise Exposure Categories (NEC), which range from A to D and indicate to what extent noise should be considered in the granting of planning permission for new residential developments. PPG 24 also defines noise levels for each category, for a variety of noise sources. Table 1 below reproduces the summary in PPG 24 relating to the recommended NEC for new dwellings near to existing noise sources. Where a site falls exactly on the boundary between two categories, it is generally at the discretion of the local authority to determine the appropriate NEC. Nevertheless a worst-case assessment should place the site in the higher of the two categories.

Table 1: Summary of PPG 24 Noise Exposure Categories for New Dwellings

Noise Levels and Advice Corresponding to The Noise Exposure Categories for New Dwellings $L_{Aeq,T}$ dB				
Noise Source	**Noise Exposure Category (NEC)**			
	A	**B**	**C**	**D**
Road Noise **07:00 - 23:00** **23:00 - 07:00**	 <55 <45	 55 - 63 45 - 57	 63 - 72 57 - 66	 >72 >66
Rail Noise **07:00 - 23:00** **23:00 - 07:00**	 <55 <45	 55 - 66 45 - 59	 66 - 74 59 - 66	 >74 >66
Mixed Noise **07:00 - 23:00** **23:00 - 07:00**	 <55 <45	 55 - 63 45 - 57	 63 - 72 57 - 66	 >72 >66
Advice	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.	Noise should be taken into account when determining planning applications and, where appropriate, conditions should be imposed to ensure a commensurate level against noise.	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.	Planning permission should normally be refused.

1.6 The levels reported in the above table refer to free-field noise levels, measured on an open site, at least 3.5 m away from any reflecting façades, excluding the ground, at a height of 1.2m to 1.5 m above the ground. PPG 24 also recommends that the daytime period is 07:00 to 23:00 hours and the night-time period is 23:00 to 07:00 hours.

1.7 A further stipulation of PPG 24 in relation to night-time noise levels is that where individual noise events regularly exceed 82 dB L_{Amax} (S time weighting) several times in any hour, the site should be treated as being in NEC C, regardless of the LAeq,8h (except where the $L_{Aeq,8h}$ already puts the site in NEC D).

1.8 Where internal levels are considered, PPG 24 recommends that further guidance on suitable internal noise levels can be found in BS 8233 [6].

1.9 Where industrial noise is considered, PPG 24 recommends that further guidance can be found in BS 4142 [7]. Nevertheless, research undertaken on behalf of the former Department of the Environment [8] states that:

'The NEC system is not primarily intended for dealing with industrial noise. Where a site is affected by noise from an industrial or commercial source, an assessment according with BS 4142 should first be carried out. If the conclusion according to paragraph 8.2 of BS 4142 is that complaints are likely, the proposed development should be placed in NEC D. If the conclusion is that the noise is of marginal significance, the proposed development should be placed in NEC C. In all other cases, the daytime LAeq (07:00 to 23:00 hours) and night-time L_{Aeq} (23:00 to 07:00 hours) values of the industrial noise (after adding a character correction as described in paragraph 7.2 of BS 4142) should be calculated and combined by logarithmic addition with the noise from transportation sources and allocated a NEC using the criteria for mixed sources, unless one of the transportation noise sources is dominant in which case the development should be assessed against the NEC criteria for that source. A noise source is dominate if its noise level, before combination with the noise of other sources, is not less than 2 dB below the combined noise level of all sources.'

1.10 PPG 24 provides the following guidance on noise change:

'Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to a halving or doubling the loudness of a sound.'

1.11 PPG 24 is currently under review and a revised document is due to be released shortly.

British Standards

BS 8233:1999 ': Sound Insulation and Noise Reduction for Buildings - Code of Practice'

1.12 BS 8233 defines a range of internal noise levels from intrusive, external sources below which good or reasonable conditions are achieved in living rooms and bedrooms. A summary of the levels recommended in BS 8233 for rooms used for resting and sleeping is provided in Table 2.

1.13 The noise levels defined within BS 8233 are based on guidance published by the World Health Organisation.

Table 2: Indoor Ambient Noise Levels as Recommended in BS 8233

Criterion	Typical Situation	Designed Range dB $L_{Aeq,t}$	
		Good	Reasonable
Reasonable resting conditions	Living Rooms	30	40
Reasonable sleeping conditions	Bedrooms	30	35

British Standard 4142:1997

1.14 Sections 19 and 20 of Annex 3 of PPG 24 cite the use of BS 4142 to assess noise from industrial and commercial developments. The Standard provides a method for rating industrial noise affecting mixed residential and industrial areas and has been extensively used by local authorities and consultants to rate noise from fixed installations, such as plant noise. Paragraph 19 of PPG 24 states the following:

‘The likelihood of complaints about noise from industrial development can be assessed, where the Standard is appropriate, using guidance in BS 4142: 1990. Tonal or impulsive characteristics of the noise are taken into account by the 'rating level' defined in BS 4142. This 'rating level' should be used when stipulating the level of noise than can be permitted. The likelihood of complaints is indicated by the difference between the noise from the new development (expressed in terms of the rating level) and the existing background noise. The Standard states that: 'A difference of around 10 dB or higher indicates that complaints are likely. A difference of around 5 dB is of marginal significance.' Since background noise levels vary throughout the a 24 hour period it has been necessary to assess the acceptability of noise levels for separate periods (e.g. day and night) chosen to suit the hours of operation of the project. Similar considerations apply to developments that would emit significant noise at the weekend as well as during the week. In addition, general guidance on acceptable noise levels within buildings can be found in BS 8233: 1987, and guidance on the control of noise from surface mineral workings can be found in MPG 11.’

1.15 The Standard advocates the use of L_{Aeq}, a level that is directly measurable. The L_{Aeq} is either measured or calculated at a receptor location and this is termed the ‘Specific Noise Level’. The Specific Noise Level may then be corrected for the character of the noise, if appropriate, and it is then termed the ‘Rating Level’. A correction of +5 dB is made if the noise contains any discrete tones e.g. hums or whistles, any impulsive characteristics such as crashes, bangs or thumps or if the noise is irregular enough in character to attract attention.

1.16 When used to rate the likelihood of complaints, the Rating Level is determined and the L_{A90} background noise level is subtracted from it. Where positive differences occur, the greater the difference between the two levels, the greater the likelihood of complaints. Where negative differences occur, the greater the difference between the two levels, the lesser the likelihood of complaints. A difference of around +10 dB or higher indicates that complaints are likely; a difference of around +5 dB is of marginal significance; and a difference of -10 dB is a positive indication that complaints are unlikely. These descriptions are summarised in Table 3 below:

Table 3: BS 4142 Significance Criteria

BS 4142 Assessment Level dB(A) (Rating Level relative to Background Level)	**BS 4142 Semantic** (as described in BS 4142)
< - 10	*'If the rating level is more than 10 dB below the measured background level then this is a positive indication that complaints are unlikely'*
- 10 to + 5	No BS 4142 description, but the more negative the difference, the less the likelihood of complaints.
+ 5	*'A difference of around +5 dB is of marginal significance'*
+ 5 to + 10	No BS 4142 description, but the more positive the difference, the greater the likelihood of complaints.
> + 10	*'A difference of around 10 dB or more indicates that complaints are likely'*

1.17 BS 4142 states that measurement positions should be outside buildings in free-field conditions, where the microphone is at least 3.5 m from any reflecting surfaces other than the ground and at a preferred height of between 1.2 m and 1.5 m above ground level. However, where it is necessary to make measurements above ground floor level, the measurement position, height and distance from reflecting surfaces should be reported, ideally measurements should be made at a position 1 m from the façade of the relevant floor.

1.18 When assessing the noise from night-time operations, the period of 23:00 to 07:00 hours, as recommended in PPG 24, should be adopted. Whilst BS 4142 may be used to assess the likelihood of night-time noise complaints, it is generally accepted that other appropriate criteria should be adopted for assessing sleep disturbance during night-time periods, such as BS 8233 or Guidelines for Community Noise [9].

1.19 In situations where the LA90 background noise level is 'low' (less than 30 dB(A)) and the Rating Level is low (less than 35 dB(A)), the Standard states that the rating method of BS 4142 is not applicable. In these circumstances, for the night-time period (i.e. it is rare for this situation to occur during the day), it is usually more appropriate to assess the noise impact by considering sleep disturbance criteria and other aspects such as noise change. It should be noted that this is not a BS 4142 or British Standards Institute (BSi) recommendation, as there is no advice given as to an acceptable approach in these circumstances, but it is accepted practice for situations of this type.

1.20 BS 4142 requires a 'representative background noise level' to be adopted for the assessment. There is no Government or BSi guidance that states what is considered to constitute 'representative' and the night-time period is particularly difficult as it can be subject to a wide variation in noise level between the shoulder night periods.

British Standards 5228

1.21 BS 5228: Noise and vibration control on construction and open sites Parts, 1, 2 and 4 [10, 11 and 12] provide guidance, information and procedures on the control of noise from construction sites, including piling. This Standard, in its various parts, has been adopted under s. 71 of the Control of Pollution Act (Code of Practice for minimising noise) [13].

1.22 There are no set standards for the definition of the significance of construction noise effects. BS 5228 does not promote specific limits for construction noise and vibration, with the exception of vibration from piling. The assessment of whether changes in noise levels due to construction constitute significant effects will be dependent on the absolute levels of ambient and construction noise, as well as the magnitude, duration, time of occurrence and frequency of the noise change. BS 5228 does, however, provide guidance on controlling, predicting and measuring noise and vibration.

1.23 Part 1, provides a code of practice for basic information and procedures for noise and vibration control and recommendations for basic methods of noise and vibration control relating to construction and open sites where work activities/operations generate significant noise and/or vibration levels. It includes sections on: legislative background; community relations; training; occupational noise effects; neighbourhood nuisance; project supervision; and control of noise and vibration. However, annexes include: a list of EC and UK legislation; noise sources, remedies and their effectiveness (mitigation options); a guide to sound level data on site equipment and site activities; calculation procedures estimating noise from sites and noise monitoring.

1.24 Part 2, provides a guide to noise and vibration control legislation for construction and demolition including road construction and maintenance, provides further detail on the legislation applicable to construction and related aspects.

1.25 Part 4, provides a code of practice for noise and vibration control applicable to piling operations, provides specific advice and information on legislation, source terms, prediction, monitoring etc of noise and vibration from piling operations. Also included is guidance on human response to vibration and the response of structures. Table 4 summarises the vibration limits, promoted by BS 5228 part 4, that are said to be conservative thresholds for minor or cosmetic (i.e. non-structural) damage. The vibration levels refer to the maximum PPV in any one single direction. The guidance is applicable to piling vibration sources and is based upon the assumption that the range of frequencies excited by piling operations in the soil conditions typical in the United Kingdom is between 10 and 50 Hz.

Table 4: Threshold Values for the Evaluation of Building Damage to Piling Vibration

Building Classification	**PPV mm/s**	
	Intermittent	**Continuous**
Residential - in generally good repair	10	5
Residential - preliminary survey reveals significant defects	5	2.5
Industrial/commercial - light and flexible structure	20	10
Industrial/commercial - heavy and stiff structure	30	15

British Standards 7385

1.26 Construction and industrial plant and machinery can generate groundborne vibration that is perceptible to occupants of nearby buildings. The primary cause of community concern generally relates to building damage, although concerns are often expressed at levels of vibration significantly lower than that likely to cause damage.

1.27 BS 7385: Parts 1 and 2 provide guidance on the measurement of vibration in buildings and the assessment of the potential of cosmetic or structural damage. Guidance on vibration from piling activities is contained within BS 5228 Part 4. Guidance relating to the human response to vibration in buildings is contained within BS 6472.

1.28 BS 7385 Part 1, a guide for measurement of vibrations and evaluation of their effects on buildings, provides advice on measurement, measurement instrumentation, location and fixing of transducers and data evaluation. Annexes also provide advice on classifying buildings with regard to their likely sensitivity; estimating peak stress from peak particle velocity; random data; a bibliography is also provided.

1.29 Part 2, a guide to damage levels from groundborne vibration, provides guidance on the levels of vibration above which building structures could be damaged. It identifies the factors that influence the vibration response of buildings and describes the basic procedure for carrying out measurements. It also states that there is a major difference between the sensitivity of people feeling vibration and the onset of levels of vibration that damage structures and that levels of vibration at which adverse comment from people is likely are below levels of vibration which damage buildings, except at lower frequencies.

1.30 Table 5 provides the vibration limits contained within BS 7385 Part 2 above which cosmetic damage could occur. Minor damage is possible at vibration magnitudes that are greater than twice those given in Table 5 and major damage to a structure may occur at values greater than four times the tabulated values.

1.31 BS 7385 provides the following guidance with reference to other structures:

- important buildings that are difficult to repair [for example listed buildings] may require special consideration on a case-by-case basis. A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive.
- structures below ground level [for example underground water pumping stations or water and gas pipelines] are known to sustain higher levels of vibration and are very resistant to damage unless in very poor condition.

Table 5: Threshold Vibration Values for the Evaluation of Cosmetic Building Damage (BS 7385 Part 2)

Building Classification	Frequency Range of Vibration (Hz)	PPV mm/s	
		Transient Vibration	Continuous Vibration
Unreinforced or light framed structures Residential or light commercial type buildings	4 Hz to 15 Hz	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	7.5 mm/s at 4 Hz increasing to 10 mm/s at 15 Hz
	15 Hz and above	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above	10 mm/s at 15 Hz increasing to 25 mm/s at 40 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	4 Hz and above	50	25

British Standards 6472:1992

1.32 The human body is an excellent detector of vibration, which can become perceptible at levels which are substantially lower than those required to cause building damage. The way in which people perceive building vibration depends upon various factors, including the vibration duration, frequency and direction relative to the orientation of the receptor (e.g. person standing or lying down). The human body is most sensitive to vibration in the spinal direction.

1.33 The effect of structureborne vibration affecting people inside buildings is assessed by determining their vibration dose. VDV defines a relationship that yields a consistent assessment of intermittent, occasional and impulsive vibration, as well as continuous input, and correlates well with subjective response. The VDV is given by the fourth root of the time integral of the fourth power of the acceleration after it has been frequency weighted. BS 6472 provides separate weighting curves related to human response for vibration in the spinal (head to foot) and the front-to-back / side-to-side directions.

1.34 It should be noted that the Standard is currently being revised. One of the main proposed amendments is a change to the weighting curve in the spinal axis from W_g to W_b, which would assume a greater sensitivity in this orientation than currently adopted.

1.35 The VDV is evaluated at the point of entry to the subject. If direct measurement is not possible, for example, on a building that has not yet been built, then BS 6472 states that an appropriate transfer function must be applied. The VDVs above which it is considered there will be a low probability of adverse comment are drawn from BS 6472 and are provided in Table 6. BS 6472 suggests that adverse comment would be possible at values twice those given in Table 26.1 and that adverse comment would be probable at four times the tabulated values. However, BS 6472 states:

'Within residential areas people exhibit wide variations of vibration tolerance. Specific values are dependant upon social and cultural factors, psychological attitudes and expected degree of intrusion.'

Table 6: Threshold Values for the Evaluation of Disturbance due to Vibration – Low Probability of Adverse Comment

Place	Daytime 16 Hour VDV ($m/s^{1.75}$)	Night-Time 8 Hour VDV ($m/s^{1.75}$)
Residential	0.2 - 0.4	0.13
Office	0.4	0.4 1
Workshops	0.8	0.8 1

1These VDV thresholds would not apply unless night-time work was a regular activity at the site.

Guidelines for Community Noise

1.36 The World Heath Organisation (WHO) published guidance on the desirable levels of environmental noise in 2000. In GCN, the authors consider that the sleep disturbance criteria should be taken as an internal noise level of 30 dB $L_{Aeq,8hr}$ or an external level of 45 dB $L_{Aeq,8hr}$, measured at 1 m from the façade. It is also suggested that internal LAmax levels of 45 dB and external LAmax levels of 60 dB, should be limited where possible.

1.37 For daytime levels, it is considered that:

'To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB L_{Aeq} on balconies, terraces, and outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB L_{Aeq}. Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development.'

1.38 In a review of health effects based noise assessment methods undertaken for the DETR by Porter et al in 1998 [14], just before the issue of GCN, it is noted that:

'Perhaps the main weakness of both WHO-inspired documents is that they fail to consider the practicality of actually being able to achieve any of the stated guideline values.'

1.39 The report goes on to state that:

'around 56% of the population in England and Wales are exposed to daytime noise levels exceeding 55 dB L_{Aeq} and that around 65% are exposed to night-time noise levels exceeding 45 dB L_{Aeq} (as measured outside the house in each case). The value of 45 dB L_{Aeq} night-time outdoors is equivalent to the 1995 WHO guideline value of 30 dB L_{Aeq} night-time indoors allowing 15 dB attenuation from outdoors to indoors for a partially open window (for free air ventilation to the bedroom). The percentages exposed above the WHO guideline values could not be significantly reduced without drastic action to virtually eliminate road traffic noise and other forms of transportation noise (including public transport) from the vicinity of houses. The social and economic consequences of such action would be likely to be far greater than any environmental advantages of reducing the proportion of the population annoyed by noise. In addition, there is no evidence that anything other than a small minority of the population exposed at such noise levels find them to be particularly onerous in the context of their daily lives.'

1.40 Based on the most recent national survey of noise exposure carried out in England and Wales in 2000/2001, the percentage of the population exposed to day and night-time noise levels exceeding the WHO guidelines are 54% and 67%, respectively. The studies indicate that:

'the percentage of the UK population exposed to daytime levels of 55 dB $L_{Aeq,16hr}$ or greater, have decreased since 1990, whilst the percentage of the UK population exposed to night-time levels of 45 dB $L_{Aeq,8hr}$ or greater, have increased since 1990, although this change is not considered statistically significant' [15].

National Noise and Vibration Guidance

Calculation of Road Traffic Noise

1.41 The Department of Transport document, Calculation of Road Traffic Noise (CRTN) [16], describes the procedures for calculating noise from road traffic. These procedures are necessary to enable entitlement under The Noise Insulation Regulations [17] to be determined but they also provide guidance appropriate to the calculation of traffic noise for more general applications e.g. environmental appraisal of road schemes, highway design and land use planning. The document can also be used to generate scaling factors for expected increases in road traffic and expected levels of attenuation from barriers.

Calculation of Railway Noise

1.42 The Department of Transport document Calculation of Railway Noise (CRN) [18] is primarily concerned with procedures for calculating noise from moving railway vehicles as defined in the Noise Insulation (Railway and Other Guided Transport Systems) Regulations [19]. These procedures are necessary to enable entitlement under the Regulations to be determined but they also provide guidance on the calculation of railway noise for more general applications e.g. the assessment of the noise impact of railways, the design and location of new tracks and land use planning in the vicinity of existing or planned railways. The document can also be used to generate scaling factors for expected increases in use.

Building Bulletin 93 – Acoustic Design of Schools

1.43 The Department of Education and Employment has produced Building Bulletin 93, Acoustic Design of Schools, A Design Guide (BB93) [20]. The aim of the Bulletin is to provide guidance on the acoustic design for schools and is supported by the Building Regulations. It provides a comprehensive guide for architects, building control bodies, building services engineers and others involved in the design of new school buildings. The objective is to provide suitable internal ambient noise levels for clear communication between students and teachers, between students themselves and for quiet study.

1.44 The document states that all spaces within a school building should meet the performance standards defined within the document for ambient noise, reverberation time and airborne and sound insulation for each of the areas defined. Table 1.1 of the document contains recommended performance standards for indoor rooms, measured as the maximum internal ambient noise level, $L_{Aeq,30mins}$.

NHS Estates Noise and Vibration Criterion

1.45 NHS Estates Health Technical Memorandum 2045 [21] details acoustic design considerations for health care buildings. The document sets out internal noise level criteria for intrusive noise sources such as traffic, aircraft and plant on neighbouring buildings. Noise from construction sites is not specifically mentioned, as an intrusive source, however, it is stated in the document that construction noise should be considered and that best practice should be emphasised.

1.46 The criteria for intrusive noise are provided in terms of noise rating (NR) levels. The NR values and the approximate equivalent levels, in terms of L_{Aeq} are presented in Table 7. These values have been calculated using the relationship highlighted in BS 8233, which indicates that an A-weighted noise level can be estimated by adding 6 dB to the NR value.

1.47 Noise rating (NR) is a method for assigning a single number rating to a noise spectrum. It can be used to specify the maximum acceptable level in each octave band of a frequency spectrum, or to assess the acceptability of a noise spectrum for a particular application. The method was originally proposed for use in assessing environmental noise, but it is now used in the UK mainly for describing noise from mechanical ventilation systems in buildings.

Table 7: NHS Estates – Intrusive Noise Criteria

Location	Recommended NR Level for intrusive noise (dB)	Approximate Recommended Intrusive Internal Noise Level (L_{Aeq} dB)
Lecture theatre	35	41
Operating theatre, single bed ward	35	41
Private office, meeting and consultation room	35	41
Multi-bed ward, waiting room	40	46
General office	40	46
Staff room, recreation room, cafeteria	45	51
Corridor, laboratory	50	56
Washroom, toilet, kitchen	50	56

1.48 The NR values provided above are in terms of equivalent continuous sound pressure levels for worst-case situations, that is, the periods during which intrusive noise is likely to be at it's highest. The report notes that these guidelines are consistent with the recommendations in PPG 24 and GCN.

1.49 These levels are intended to be targets for the design of new NHS buildings. The list is not exhaustive; where an area is not listed, the most similar location should be selected. In some circumstances the noise levels in some areas of the hospital may already exceed the noise levels in Table 7, for example, due to traffic noise from the surrounding road network.

1.50 The vibration criteria stated in the NHS Estates Health Technical Memorandum are taken from BS 6472 and are reproduced in Table 8 below.

Table 8: NHS Estates – Intrusive vibration criteria

Location	Low Probability of Adverse Comment z axis VDV $ms^{-1.75}$	Low Probability of Adverse Comment x/y axis VDV $ms^{-1.75}$
Operating theatre, precision laboratories	0.1	0.07
Wards, residential – day	0.2 to 0.4	0.14 to 0.28
Wards, residential – night	0.13	0.09
General laboratories, offices	0.4	0.28
Workshops	0.8	0.56

Regional Guidance

The Mayor's London Plan

1.51 The Mayor's London Plan [22], published in February 2004, outlines a number of polices in response to environmental issues. Specifically policy 4A.14 relates to noise reduction and how this should be achieved. It is the Mayor's intention that the use of quieter technologies, implementation of transport policies and highway management will tackle the major noise sources, with local noise issues to be addressed through sensitive design, management and operation.

1.52 Policy 4A.14 states that: 'The Mayor will and the boroughs should reduce noise by:

- minimising the existing and potential adverse impacts of noise on, form, within, or in the vicinity of, development proposals.
- separating new noise sensitive development from major noise sources whether practicable.
- supporting new technologies and improved practices to reduce noise at source, especially in road, rail and air transport.
- reducing the impact of traffic noise through highway management and transport policies.
- containing noise from late night entertainment and other 24-hour activities, and where appropriate promoting well-managed designated locations.'

1.53 In addition, 'The Mayor will work with strategic partners to ensure that the transport, spatial and design policies of this plan support the objectives, policies and proposals set out in the London Ambient Noise Strategy.'

1.54 The policies of the London Plan are intended to support the objectives, policies and proposals of the Mayor's Ambient Noise Strategy.

The Mayor's London Ambient Noise Strategy

1.55 In March 2004, The Greater London Authority published the Mayor's London Ambient Noise Strategy [23]. The strategy is part of an EU drive towards more active management of ambient environmental noise. The strategy primarily relates to the noise impact of transportation sources, however, reference is also made to a number of issues, mainly construction, urban planning and design.

1.56 The aim of the Mayor's ambient noise strategy is 'to minimise the adverse impacts of noise on people living and working in, visiting London using the best available practices and technology within a sustainable development framework.'

1.57 The Mayor's Ambient Noise Strategy focuses on improved management of transport systems, town planning and building design. To address these issues, 97 different policy statements have been proposed. A number of these policies are aimed at Government, whilst others are aimed at organisations such as Transport for London (TfL) and the strategic Rail Authority (SRA). The policies range from practical approaches required to minimise noise, to proposals for future research and development into transportation noise mitigation and applying appropriate controls as part of the planning system. Early priorities include lower road noise surfaces and improved design of new residential accommodation.

Local Guidance

Ealing's Unitary Development Plan (UDP)

1.58 Policy 4.11 of the London Borough of Ealing's (LBE) UDP [24] concerns noise and vibration and states:

'<u>Noise and Vibration</u>

1. *Development generating noise or vibration will not be permitted where it would cause noise or vibration above acceptable levels, particularly where it would harm existing or proposed noise sensitive development, unless this can be satisfactorily attenuated.*

2. *Noise - sensitive development will not be permitted where its users would suffer noise above acceptable levels, unless this can be acceptably attenuated.*

For new developments such as housing, care is to be taken to ensure that the noise levels within the development area fall within a set category before development takes place. These categories are defined within Government Guidance (PPG24), and are described in more detail in the relevant Supplementary Planning Guidance.

(i) Category A requires no consideration.

(ii) Categories B and C require consideration for adequate protection.

(iii) Category D indicates that planning permission should not be given.

In residential areas, action will be taken to try and reduce noise where land adjoining has unacceptable noise exposure categories. Where housing is to be located near a significant source of noise, terraces or blocks of flats should be designed with habitable rooms, balconies and gardens facing away from that source. |The blocks should screen any further dwellings.

Noise - sensitive development including housing, hospitals and schools (e.g. exposure to aircraft noise) should be carefully considered in order to protect them from proposals for noise generating development, as well as not permitting such noise sensitive development in areas already experiencing high noise levels.

The Council will require development which either causes or is affected by excessive noise and vibration to be screened by landscaping, tree and shrub planting, banks, barrier fencing or landscaped walls, and for there to be an adequate distance between source and sensitive development. It should be provided with suitable sound and vibration attenuation, as most appropriate in improving the area or development.

Development that causes an unacceptable degree of disturbance (i.e. Category D) will be resisted. Where sound attenuation measures are unlikely to exclude existing or expected environmental noise, or reduce it to an acceptable level, planning permission will be refused for new residential development.'

Supplementary Planning Guidance (SPG) 10

1.59 LBE's UDP refers to SPG10 [25], which contains guidance for developers with regards to noise and vibration. SPG10 states:

'When considering proposals that will either generate noise or vibration and/or developments that are sensitive, developers and planners are required to consider the detailed criteria and measurements contained within this guidance. The information relates to Policy 4.11: Noise and Vibration contained within Chapter 4: Urban Design, in the Adopted 2004 Plan for the Environment.

When considering new developments care is to be taken to ensure that the potential or existing noise/vibration levels in the area are acceptable. As appropriate, attenuation against noise and vibration may be required. Such attenuation can be achieved in a number of ways through land use, the design of the building and the use of rooms. However where appropriate standards cannot be achieved, planning permission will normally be refused.'

1.60 When considering new development proposed near existing dwellings and other noise/vibration sensitive developments/areas, SPG10 refers to BS 4142, where applicable, for example proposed industrial developments. For commercial developments outside the remit of BS 4142, for example, night clubs, public houses, places of worship and restaurants, SPG10 refers to the Institute of Acoustic Good Practice Guide on the Control of Noise from Pubs and Clubs [26] and provides specific noise criteria.

1.61 When considering new dwelling and other noise sensitive developments, for example, schools and hospitals, proposed near to existing noise and/or vibration sources, SPG10 refers to PPG 24. SPG10 recommends that, where noise mitigation is required, the following criteria should be met:

Table 9: SPG10 Noise Criteria

Receptor	Noise Criteria (Maximum Permissible Noise Levels)
Residential & Hotel	
Private and Communal Gardens	50 dB $L_{Aeq,1\text{-}hour}$ (07:00 to 23:00 hours)
Bedrooms	30 dB $L_{Aeq,1\text{-}hour}$ (23:00 to 07:00 hours) 45 dB $L_{Amax,1\text{-}hour}$ (fast) (23:00 to 07:00 hours)
Living Rooms and Dining Rooms	35 dB $L_{Aeq,1\text{-}hour}$ (07:00 to 23:00 hours)
Kitchens, Bathrooms and Utility Rooms	45 dB $L_{Aeq,1\text{-}hour}$ (07:00 to 23:00 hours)
Educational	
Workshops and practical areas	50 dB $L_{Aeq,1\text{-}hour}$ (07:00 to 23:00 hours)
Libraries	45 dB $L_{Aeq,1\text{-}hour}$ (07:00 to 23:00 hours)
Classrooms	35 dB $L_{Aeq,1\text{-}hour}$ (07:00 to 23:00 hours)
Music and drama spaces	30 dB $L_{Aeq,1\text{-}hour}$ (07:00 to 23:00 hours)
Health	
Operating theatres / reception areas	35 dB $L_{Aeq,1\text{-}hour}$ (07:00 to 23:00 hours)
Physiotherapy, X-ray utility and store rooms	45 dB $L_{Aeq,1\text{-}hour}$ (07:00 to 23:00 hours)
Office / Conference Centre	
Private office / conference room	40 dB $L_{Aeq,1\text{-}hour}$ (07:00 to 23:00 hours)
Large Office	45 dB $L_{Aeq,1\text{-}hour}$ (07:00 to 23:00 hours)

1.62 SPG10 states that the criteria are taken from GCN, BS 8233 and Sound Control for Homes 93 [27]. However, the criteria differ from the guidance contained within these documents in the following respects:

- SPG10 considers that kitchens, bathrooms and utility rooms are noise sensitive, which GCN and BS 8233 do not (we are not aware of any other local, regional, national or international guidance that does consider kitchens, bathrooms and utility rooms to be noise sensitive); and
- SPG10 provides criteria in terms of 'worst-case' 1-hour assessment periods within the daytime (07.00 to 23.00 hours) and night-time (23.00 to 07.00 hours), whilst GCN suggests noise limits in terms of a 16-hour daytime (07.00 to 23.00 hours) period and an 8-hour night-time (23.00 to 07.00 hours) period and BS 8233 does not suggest specific assessment periods.

1.63 SPG10 provides the following guidance with regards to noise mitigation that is provided by closed windows:

'In the case of habitable rooms the following would be appropriate:

NEC Category B:

- *An acoustic secondary glazed window capable of providing a staggered opening indirect air path, or with a closed secondary glazed window and a trickle ventilator along with a controllable sound insulated air brick provided in each habitable room on any exposed elevation.*

NEC Category C:

- *A closed secondary glazed window.*
- *Including a sound attenuating mechanical ventilator, with an external cowl or grill supplying fresh air to the ventilator and comprising a variable speed air supply unit, located in an external façade, and having at least two specified.'*

1.64 SPG10 suggests the following criteria with regards to vibration within buildings:

Table 10: SPG10 Vibration Criteria

Highest vibration dose value (m/s$^{1.75}$) measured on the foundations in any of the three orthogonal directions not to exceed the following values.				
Type of Building	Hospitals, Theatres, Labs, etc	Residential	Offices	Workshops
Day 16 hr G/F	0.085	0.17	0.34	0.64
Day 16 hr F/F & above	0.04	0.08	0.16	0.32
Night 8 hr G/F	0.076	0.11	0.30	0.60
Night 8 hr F/F & above	0.037	0.05	0.15	0.30
Note: The values given relate to an undeveloped site and allow for an amplification factors of 1.2 at ground level in proposed building and 2.5 at first floor level and above. For measurements within buildings, the permitted values may be derived by applying these multiplying factors.				

1.65 The vibration criteria are derived from the guidance contained within BS 6472 but with multiplying factors applied that are said to correspond to the transfer functions between an vibration measured on an undeveloped site and vibration within buildings. The implication is that the multiplication factors take into account mass loading of the building on the ground, which reduces vibration levels compared with those on an undeveloped site and varies according to the size (mass) of the building; floor resonance, which amplifies vibration levels but only in the vertical direction; and transmission up a building, whereby vibration reduces with increasing number of floors above the ground. These effects are described in 'Measurement and Assessment of Groundborne Noise & Vibration' [28]. However, no justification is provided for the multiplication factors used in SPG10, which do not take into account that the transfer function between vibration on an undeveloped site and vibration within a building will be different in the vertical and horizontal directions and assume that vibration will increase with increasing number of floors above the ground, which is contrary the information in the available guidance.

References

1. British Standards Institution. British Standard 7445: Description and Measurement of Environmental Noise. Part 1: Guide to Environmental Quantities and Procedures. 2003.

2. British Standards Institution. British Standard 7385: Evaluation and Measurement for Vibration in Buildings. Part 1: Guide for Measurement of Vibration and Evaluation of their Effects on Buildings. 1990.

3. British Standards Institution. British Standard 7385: Evaluation and measurement for vibration in buildings. Part 2: Guide for Damage Levels from Groundborne Vibration. 1993.

4. British Standards Institution. British Standard 6472: Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz). 1992.

5. Department of the Environment. Planning Policy Guidance: Planning and Noise (PPG 24). HMSO. 1994.

6. British Standards Institution. British Standard 8233: Sound Insulation and Noise Reduction for Buildings - Code of Practice. 1999.

7. British Standards Institution. British Standard 4142: Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas. 1997.

8. Rupert Taylor. Department of the Environment. *http://www.ruperttaylor.com/ioappg24.htm*. The Stationery Office. 2005.

9. World Health Organisation. Guidelines for Community Noise. 2000.

10. British Standards Institution. British Standard 5228: Noise and Vibration Control on Construction and Open Sites. Part 1: Code of Practice for Basic Information and Procedure for Noise Control. 1997.

11. British Standards Institution. British Standard 5228: Noise and Vibration Control on Construction and Open Sites. Part 2: Guide to Noise Control Legislation for Construction & Demolition, including Road Construction and Maintenance. 1997.

12. British Standards Institution. British Standard 5228: Noise and Vibration Control on Construction and Open Sites. Part 4: Code of Practice for Noise Control applicable to Piling Operations. 1992.

13. The Stationery Office Limited. Control of Pollution Act, Chapter 40, Part III. 1974.

14. Porter, N. D., Flindell, I. H. and Berry, B. F. Health Effect Based Noise Assessment Methods: A Review and Feasibility Study. NPL Report CMAM 16. National Physical Laboratory. September 1998.

15. Skinner, C. J and Grimwood, C. J. The UK National Noise Incidence Study 2000/2001. Noise Forum Conference. Building Research Establishment. May 2002.

16. Department of Transport. Calculation of Road Traffic Noise. HMSO. 1988.

17. Statutory Instrument No. 1763. The Noise Insulation Regulations 1975. Statutory Instrument No. 2000. The Noise Insulation (Amendment) Regulations 1988. HMSO. 1975 Amended 1988.

18. Department of Transport. Calculation of Railway Noise. HMSO. 1995.

19. Building and Buildings, Statutory Instrument 428. The Noise Insulation (Railways and Other Guided Transport Systems) Regulations. HMSO. 1996.

20. Department for Education and Skills. Building Bulletin 93. Acoustic Design of Schools: A Design Guide. The Stationery Office. 1993 as amended.

21. NHS Estates. Health Technical Memorandum 2045. Acoustics: Design Considerations. UK Health Departments. HMSO. 1996.

22. Mayor of London. The London Plan: Spatial Development Strategy for Greater London. www.london.gov.uk. Greater London Authority. February 2004.

23. Mayor of London. Sounder City: The Mayor's Ambient Noise Strategy. www.london.gov.uk. Greater London Authority. March 2004.

24. The London Borough of Ealing. Ealing's unitary development plan. Adopted October 2004.

25. The London Borough of Ealing. Supplementary Planning Guidance 10 – Noise and Vibration. October 2004.

26. Institute of Acoustics. Good Practice Guide on the Control of Noise from Pubs and Clubs. March 2003.

27. BRE / CIRIA. Sound Control for Homes. 1993.

28. Association of Noise Consultants. Measurement and Assessment of Groundborne Noise & Vibration. 2001.

Appendix 9.2 - Model Input

Rail

Westbound Main Line

Type	Freight	HST	180	2 x 180	2 x 332	221	LH	2 car DMU	3 car DMU	2x2 car DMU	2&3 car DMU	2x3 car DMU	3x3 car DMU	DMU (E)
Description of Train:	Class 60 loco and 15 wagons	10 vehicles, formed 2 x Class 43 power car & 8 x Mk3 trailers.	5 vehicle Class 180 DMU	2 x 5 vehicle Class 180 DMUs	4 car Class 332 EMU and 5 car Class 332 EMU	4 vehicle Class 221 DMU	Class 57 loco and 10 vehicles	2 vehicle Class 165/166 DMU	3 vehicle Class 165/166 DMU	2 x 2 vehicle Class 165/166 DMU	2 vehicle Class 165/166 DMU & 3 vehicle Class 165/166 DMU	2 x 3 vehicle Class 165/166 DMU	3 x 3 vehicle Class 165/166 DMU	2 car Class 158 DMU
Line Speed (km/h)	121	201	201	201	201	201	121	201	201	201	201	201	201	201
Model Speed (km/h)	51	85	85	85	85	85	51	85	85	85	85	85	85	85
Daytime (06:00 to 00:00 hours)	1	66	15	3	71	2	0	1	43	0	4	4	0	0
Night-time (00:00 to 06:00 hours)	0	1	0	0	4	0	1	0	0	0	0	0	0	1

Westbound Relief Line

Type	Freight	HST	2 x 332	3 car DMU	2x3 car DMU	221	DMU (E)	2x341	2x341	2x341
Description of Train:	Class 60 loco and 15 wagons	10 vehicles, formed 2 x Class 43 power car & 8 x Mk3 trailers.	4 car Class 332 EMU and 5 car Class 332 EMU	3 vehicle Class 165/166 DMU	2 x 3 vehicle Class 165/166 DMU	4 vehicle Class 221 DMU	2 car Class 158 DMU	2 x 5 vehicle Class 341 EMU (Crossrail trains)	2 x 5 vehicle Class 341 EMU (Crossrail trains)	2 x 5 vehicle Class 341 EMU (Crossrail trains)
Line Speed (km/h)	97	121	121	121	121	121	121	121	121	121
Model Speed (km/h)	41	51	51	51	51	51	51	51	51	51
Daytime (06:00 to 00:00 hours)	18	0	0	24	12	1	0	10	61	72
Night-time (00:00 to 06:00 hours)	9	1	1	4	0	1	0	0	4	5

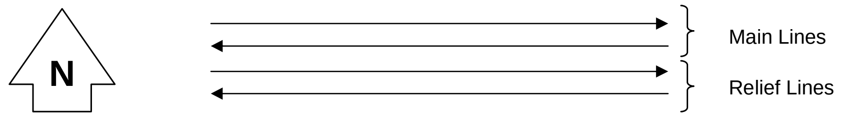
Eastbound Main Line

Type	Freight	HST	180	2 x 180	2 x 332	221	LH	2 car DMU	3 car DMU	2x2 car DMU	2&3 car DMU	2x3 car DMU	3x3 car DMU	DMU (E)
Description of Train:	Class 60 loco and 15 wagons	10 vehicles, formed 2 x Class 43 power car & 8 x Mk3 trailers.	5 vehicle Class 180 DMU	2 x 5 vehicle Class 180 DMUs	4 car Class 332 EMU and 5 car Class 332 EMU	4 vehicle Class 221 DMU	Class 57 loco and 10 vehicles	2 vehicle Class 165/166 DMU	3 vehicle Class 165/166 DMU	2 x 2 vehicle Class 165/166 DMU	2 vehicle Class 165/166 DMU & 3 vehicle Class 165/166 DMU	2 x 3 vehicle Class 165/166 DMU	3 x 3 vehicle Class 165/166 DMU	2 car Class 158 DMU
Line Speed (km/h)	121	201	201	201	201	201	121	201	201	201	201	201	201	201
Model Speed (km/h)	51	85	85	85	85	85	51	85	85	85	85	85	85	85
Daytime (06:00 to 00:00 hours)	0	68	15	2	72	1	0	0	41	0	6	2	1	0
Night-time (00:00 to 06:00 hours)	0	0	0	1	4	0	1	0	2	0	0	0	0	0

Eastbound Relief Line

Type	Freight	HST	2 x 332	3 car DMU	2x3 car DMU	221	DMU (E)	2x341	2x341
Description of Train:	Class 60 loco and 15 wagons	10 vehicles, formed 2 x Class 43 power car & 8 x Mk3 trailers.	4 car Class 332 EMU and 5 car Class 332 EMU	3 vehicle Class 165/166 DMU	2 x 3 vehicle Class 165/166 DMU	4 vehicle Class 221 DMU	2 car Class 158 DMU	2 x 5 vehicle Class 341 EMU (Crossrail trains)	2 x 5 vehicle Class 341 EMU (Crossrail trains)
Line Speed (km/h)	97	121	121	121	121	121	121	121	121
Model Speed (km/h)	41	51	51	51	51	51	51	51	51
Daytime (06:00 to 00:00 hours)	19	0	0	24	12	2	0	10	129
Night-time (00:00 to 06:00 hours)	16	0	0	3	0	0	1	0	8

Lines are as follows:



Road

Daytime Noise Assessment (07:00 to 23:00 hours)

Link	Link ID	Total 2-way flow (16-hour)	%HGVs	Mean Number of Cars per Hour	Mean Number of HGVs per Hour	Mean Speed (mph)	Mean Speed (km/h)
The Parkway (south of New Pump Lane)	3	64100	9.4	3630	377	25	40
The Parkway (north of New Pump Lane)	2	60753	9.4	3440	357	25	40
The Broadway	18	20479	3.6	1234	46	20	32
South Road (north of Beaconsfield Road)	10	11436	5.4	676	39	15	24
South Road (south of Beaconsfield Road)	12	21544	5.4	1274	73	15	24
Beaconsfield Road	24	6908	1.4	426	6	15	24

Night-time Noise Assessment (23:00 to 07:00 hours)

Link	Link ID	Total 2-way flow (8 hour)	%HGVs	Mean Number of Cars per Hour	Mean Number of HGVs per Hour	Mean Speed (mph)	Mean Speed (km/h)
The Parkway (south of New Pump Lane)	3	12553	9.4	1422	147	25	40
The Parkway (north of New Pump Lane)	2	11898	9.4	1347	140	25	40
The Broadway	18	4011	3.6	483	18	20	32
South Road (north of Beaconsfield Road)	10	2239	5.4	265	15	15	24
South Road (south of Beaconsfield Road)	12	4219	5.4	499	28	15	24
Beaconsfield Road	24	1353	1.4	167	2	15	24

Appendix 9.3 - Road Traffic Noise Assessment

Construction Road Traffic Noise Assessment

Link ID	Link Description	Baseline Flows (Total 2-way 18h flow) 2009/2010*	Baseline %HGVs 2009/2010*	Mean Speed (km/h)**	Baseline Number of HGVs per 18h day (2-way flow)	Number of Additional HGVs attending site*** per 18h day	With Construction Traffic Flows (Total 2-way 18h flow) 2009/2010	With Construction Traffic %HGVs 2009/2010	Noise Change (dB)
1	A312 north of A4020	63989	9.38	40	6003	100000	263989	78.03	6
2	A312 between A4020 and Pump Lane	68347	9.38	40	6412	100000	268347	76.92	6
3	A312 between Pump Lane and Hayes Road	72112	9.38	40	6765	100000	272112	75.99	6
4	A312 between Hayes Road and M4	63494	9.38	40	5957	100000	263494	78.16	6
5	A312 south of M4	60293	9.38	40	5657	100000	260293	79.01	6
10	South Road north of Beaconsfield Road	12865	5.42	24	697	20000	52865	76.98	6
11	South Road between Beaconsfield Road and eastern access road	23934	5.42	24	1297	40000	103934	78.22	6
12	South Road between site access road and Merrick Road	24237	5.42	24	1314	40000	104237	78.01	6
13	Merrick Road	13829	5.42	24	750	20000	53829	75.70	6
16	Uxbridge Road west of A312	36331	3.59	32	1303	50000	136331	74.31	6
17	Uxbridge Road between A312 and Springfield Road	29462	3.59	32	1057	40000	109462	74.05	6
18	The Broadway	23039	3.59	32	826	30000	83039	73.25	6
24	Beaconsfield Road	7400	1.36	24	101	10000	27400	73.36	6

* Assuming no increase from surveyed traffic data

** Assuming no change in mean speeds with/without construction traffic.

*** Each HGV contributes 2 movements: 1 arrival + 1 departure.

Appendix 9.3 - Road Traffic Noise Assessment

Operational Road Traffic Noise Assessment

Link ID	Link Description	Without Development Flows (Total 2-way 24h flow) 2025	With Development Flows (Total 2-way 24h flow) 2025	% Change in Flow	Noise Change* (dB)	Significant?**
1	A312 north of A4020	79770	81635	2	0	No
2	A312 between A4020 and Pump Lane	85202	83132	-2	0	No
3	A312 between Pump Lane and Hayes Road	89896	94372	5	0	No
4	A312 between Hayes Road and M4	79152	83428	5	0	No
5	A312 south of M4	75162	76983	2	0	No
6	Brookside Road	10658	10905	2	0	No
7	Springfield Road	4076	4076	0	0	No
8	Southall Lane	18441	18441	0	0	No
9	Lady Margaret Road	12400	14904	20	1	No
10	South Road north of Beaconsfield Road	16038	19620	22	1	No
11	South Road between Beaconsfield Road and eastern access road	29836	34870	17	1	No
12	South Road between site access road and Merrick Road	30214	35529	18	1	No
13	Merrick Road	17239	19993	16	1	No
14	Green Road	3570	3696	4	0	No
15	Park Avenue between Green Drive and High Street	3870	4868	26	1	No
16	Uxbridge Road west of A312	45291	45939	1	0	No
17	Uxbridge Road between A312 and Springfield Road	36727	36731	0	0	No
18	The Broadway	28721	29261	2	0	No
19	High Street between South Road and Green Drive	25975	26336	1	0	No
20	High Street between Green Drive and Park Avenue	27082	27947	3	0	No
21	High Street west of Park Avenue	28644	29436	3	0	No
22	Bilton Way	9268	8208	-11	-1	No
23	Pump Lane between A312 and Pump Lane access road	8907	16975	91	3	Yes
24	Beaconsfield Road	9688	9688	0	0	No
25	Park Avenue between South Road and Green Drive	11533	12882	12	0	No
26	Pump Lane west of Bilton Way	16167	17766	10	0	No
27	Pump Lane between Bilton Way and Pump Lane access road	9225	16355	77	2	No
30	North Hyde Road	33518	33648	0	0	No
31	Hayes Road	44184	44192	0	0	No
32	Western Avenue	29270	30546	4	0	No

* Assuming no change in %HGVs or mean speeds and the %change in 18-hour total flow is the same as the %change in 24-hour total flow.

** Change in $L_{A10,18h}$ > 3 dB

Appendix 10.1

Calculation of Annualisation Factor

The period mean of the six months of diffusion monitoring have been annualised in accordance with the method set out in local air quality management guidance[(10.16)] to provide an annual mean concentration in 2004 at each monitoring location.

Table 10.2.1 provides the basis for the calculation of the annualisation factor.

Table 10.2.1: Annualisation of Period Mean NO_2 Concentrations

Urban Background Continuous Monitoring Location	**Ealing Town Hall**	**Harlington**	**Cranford**	**Average Ratio**
Annual Mean in $\mu g.m^{-3}$	41.4	38.0	35.7	
Period Mean in $\mu g.m^{-3}$	37.5	34.6	30.6	
Ratio (Annual Mean/Period Mean)	1.10	1.10	1.17	1.12

Appendix 10.2

Future Predictions of NO_x and NO_2

Urban concentrations of NO_x have steadily declined since the 1990s. NO_2 concentrations have also declined but at a lower rate than NO concentrations. Consequently, the ratio between NO_2 and NO_x concentrations monitored has increased over recent years. The Air Quality Expert Group (AQEG) was commissioned by Defra to undertake a study of the trends in NO_2 in the UK. A draft report for consultation was issued in August 2006. The report identified three possible causes for the increasing ratio:

- an increase in primary NO_2 emissions associated with increasing numbers of diesel cars;
- an increase in primary NO_2 emissions associated with the fitting of pollution control devices such as catalytic particle traps; and
- an increase in hemispheric background ozone concentrations allowing increased oxidation of NO to NO_2.

The increased ratio between NO_2 and NO_x has only been identified at some road and kerb side sites outside London. This suggests that the cause may not be directly attributed to an increased number of diesel cars. Similarly, the increase in ozone concentrations necessary to explain the increased ratio has not been observed. Consequently, increases in background ozone concentrations have not been considered further as a likely cause. Measurements of NO_x and NO_2 concentrations from light duty diesel vehicles with oxidation catalysts and heavy duty vehicles fitted with catalytically regenerative particle traps suggest that an increase in primary NO_2 emissions associated with the fitting of pollution control devices is likely to best explain the increasing ratio.

The AQEG concluded that year adjustment factors set out in local air quality management guidance(10.16) and current emission factors may underestimate future NO_2 concentrations. A relationship, based on the results of monitoring undertaken between 2003 and 2006, has now been issued and local authorities are advised that this is likely to be an improved approach when compared with the relationship set out in LAQM.TG03. The improved relationship applicable to the Proposed Development site defines the road contribution of NO_2 as:

$$(-0.0413 \times \ln(\text{Total } NO_x)) + 0.5225) \times \text{Road Contribution of } NO_x \qquad (1)$$

Model Verification

Overview

The method used within this assessment is consistent with the verification process set out in local air quality management guidance[10.16]. The process requires a comparison of the monitored NO_x road contribution with the modelled NO_x road contribution. The guidance recommends the use of continuously monitored NO_x concentrations. The use of diffusion tube monitoring results is only recommended in instances where the tubes are collocated and the results for five locations are available.

Following the comparison of monitored and modelled concentrations, an adjustment factor may be determined based on the relationship between the monitored and modelled NO_x road contributions and applied to predicted concentrations.

Roadside Monitoring in the London Borough of Ealing

Continuous Monitoring

NO_x concentrations within the borough are continuously monitored at the roadside location known as 'Ealing 2 - Acton Town Hall'. Annual mean NO_x/NO_2 concentrations monitored at Ealing 2 for year 2005 is provided in Table 10.4.1. The data show that monitored concentrations at this location are above the annual mean AQS objective for NO_2 of 40 µg.m^{-3}.

Table 10.4.1: Annual Mean NO_x / NO_2 Continuous Monitoring Results Acton Town Hall (µg.m^{-3})

Pollutant	2005
NO_x	138.3
NO_2	58.5

Emission Sources at Ealing 2

The main source of emissions at the Ealing 2 monitor are vehicles on High Street (A402), Winchester Street (B490), Salisbury Street, Acton Lane, Churchfield Road and Market Place. The Ealing 2 continuous monitor is not adjacent to any of the roads identified within the traffic impact assessment. However, estimated traffic flow characteristics in 2005 are presented in the London Atmospheric Emissions Inventory. The estimated traffic flow data in 2005 used in the model verification are provided in Table 10.4.2.

Table 10.4.2: Estimated 2005 Traffic Flow Data Used in Model Verification

Road Name	Light Duty Vehicles (per hour)	Heavy Duty Vehicles (per hour)	Speed ($km.hr^{-1}$)
High Street (A402)	704	49	20
Winchester Street (B490)	149	11	5
Salisbury Street	93	4	15
Acton Lane	279	18	5
Churchfield Road	454	23	5
Market Place	372	24	5

Approach to Model Verification

Annual mean NO_x concentrations in 2005 have been predicted at the location of Ealing 2 monitor using the method set out in the Methodology and Assessment Criteria for the Operational Phase. The annual mean NO_x road contribution modelled using Heathrow meteorological data for 2005 has been compared with the monitored NO_x road contribution in 2005.

Ealing 1 was determined as the most suitable urban background continuous monitor for use within the verification. A summary of the monitored concentrations in 2005 is presented in Table 10.4.3.

Table 10.4.3: Urban Background Pollutant Concentrations used in Model Verification

Site Name	Ordnance Survey Grid Coordinates		Annual Mean Concentrations 2005 ($\mu g.m^{-3}$)	
	X	Y	NO_x	NO_2
Ealing 1: Ealing Town Hall	522629	176836	73	39.3

Results of the Model Verification

Table 10.4.4 sets out the results of the model verification undertaken at Ealing 2. The results suggest that the maximum annual mean NO_x road contributions modelled should be increased by a factor of 2.6.

Table 10.4.4: Adjustment of Modelled Annual Mean NO_2 Based on TH2 Monitored Annual Mean

Step 1: Calculate monitored roadside contribution for NO_x and NO_2 in µg.m^{-3}				
Total Monitored NO_x	**-**	Background NO_x	**=**	Road Contribution Monitored NO_x
138.3	-	73.0	=	65.3
Total Modelled NO_x	**-**	Background NO_x	**=**	Road Contribution Modelled NO_x
98.3	-	73.0	=	25.3
Step 2: Determine adjustment factor for modelled roadside contribution				
Road Contribution Monitored NO_x	/	Road Contribution Modelled NO_x	=	Adjustment Factor
65.3	**/**	25.3	**=**	2.6
Step 3: Calculate final NO_2 Concentration in µg.m^{-3} using Equation (1)				
Road Contribution of NO_2 = ((-0.0413 x ln (Total NO_x)) + 0.5225) x Road Contribution of NO_x				
Road Contribution of NO_2 = (-0.0413 x (ln (138.3)) + 0.5225) x 65.8 = 21.0				
Road Contribution Modelled NO_2	+	Background NO_2	**=**	Total Modelled NO_2
21.0	+	39.3	**=**	60.3

Comparing the estimated annual mean NO_2 concentration with the monitored annual mean NO_2 concentration at Ealing 2 of 58.5 µg.m^{-3} in 2005, the results show that Equation (1), marginally overestimates the monitored concentrations.

For the purposes of this assessment, modelled annual mean NO_x concentrations have been corrected by a factor of 2.6. Annual mean NO_2 concentrations have then been determined using the relationship defined by Equation (1).

Diffusion Tube Monitoring

The nearest roadside diffusion tube to the Proposed Development site is located at 4 Merrick Road. Annual mean NO_2 concentrations monitored between 2005 and 2007 are provided in Table 10.5.5. The year adjustment factors set out in LAQM.TG03[10.16] have been used to provide an estimate of annual mean NO_2 concentrations in 2009.

Table 10.5.5: Annual Mean NO_2 Concentration – Monitored at Merrick Road ($\mu g.m^{-3}$)

	2005 (2009)	2006 (2009)	2007 (2009)
4 Merrick Road	44.5 (38.8)	53.6 (48.2)	52.4 (48.6)

Estimated concentrations in 2009 provided in brackets

Estimated concentrations in 2009 range from 38.8 to 48.6 $\mu g.m^{-3}$. The diffusion tube is outside the road network modelled by the traffic consultants and may not be used for model verification purposes. However, the monitored concentrations may be considered to give confidence in the modelled results.

The range of monitored annual mean NO_2 concentrations is consistent with the range of predicted annual mean NO_2 concentrations of 30.4 to 48.5 $\mu g.m^{-3}$ suggesting that the model results are consistent with the results of monitoring.

Appendix 10.4

Modelled Rail Emissions

Detailed assessment of rail emissions is generally scoped out by technical guidance for local authorities and, therefore, well established methods for dispersion modelling do not currently exist.

The most extensive study identified was undertaken by AEAT(10.19) in 2005. The AEAT study considered the contribution of rail diesel exhaust emissions in 27 European countries including the UK. The results of the study confirmed that the largest source of emissions associated with rail operations was in shunting yards and locations where locomotives are idling. The report confirmed that monitoring of air quality effects associated with rail emissions is sparse and, therefore, the study relied upon the results of dispersion modelling. The results of the dispersion modelling showed that "*busy line sections gave rise to insignificant NO_2 and PM_{10} concentrations, very busy shunting yards gave rise to low level NO_2 and PM_{10} concentrations and more relevant contributions (but still below the limit values) are possible at large terminal stations where there is a high amount of diesel activity.*"

For the purposes of this assessment, emissions from the railway in the West Southall have been modelled as an additional line source within the ADMS-Roads model. A comparison of predicted concentrations and the results of the AEAT study for a 'busy line section' are presented in Table 10.5.1.

Table 10.5.1 Comparison With AEAT Modelling Study

	AEAT Study	West Southall Assessment
Maximum number of trains per day	'Busy line section' = 181	GWML movements on Southall rail section = 430
Predicted annual mean NO_2 contribution in $\mu g.m^{-3}$	Receptor 20m from busy line section = 0.3 $\mu g.m^{-3}$ Receptor 20m from line section with 430 movements = 0.3 * 430 / 181 $\mu g.m^{-3}$ = 0.71 $\mu g.m^{-3}$	Representative grid receptor 20m from Southall rail section = 8.9 $\mu g.m^{-3}$
Predicted annual mean PM_{10} contribution in $\mu g.m^{-3}$	Receptor 20m from railway line = 0.02 *430/181 = 0.05 $\mu g.m^{-3}$	Representative grid receptor 20m from Southall rail section = 1.7 $\mu g.m^{-3}$
Scaling factor for NO_2 contribution	0.71/8.9 = 0.0798	
Scaling factor for PM_{10} contribution	0.05/1.7 = 0.029	

A similar calculation has been undertaken for the 'with development' rail movements, including forecast Crossrail trains. These scaling factors have been applied to the predicted contributions to ensure consistency with monitored contributions reflected in guidance.

APPENDIX 11.1 METHODOLOGY AND SIGNIFICANCE CRITERIA

The Assessment Process

The assessment of significance of the potential effects on townscape and visual issues is based on professional experience and judgement in accordance with best practice guidelines (Landscape Institute (LI)/Institute of Environmental Management and Assessment Guidelines (IEMA), paragraph 2.12)[(11.1)]. A detailed description of the methodology and criteria adopted for the Environmental Impact Assessment is set out below. The assessment identifies and draws on aspects of the resource (character, importance, and sensitivity) and the change brought about by the scheme (magnitude or scale, nature and duration of the change). Similarly the visual assessment identifies the visual receptors (number of viewers, nature of activity, importance of view and sensitivity to change) and the change in visual amenity brought about by the scheme (using the same criteria as for townscape change i.e. magnitude, scale, nature and duration).

Extent of Study Area

The geographical extent of the townscape and visual assessment has been considered at two levels:

- Wider Level – The site does not fall within any of the View Protection policies identified in the London Plan[(11.2)] (Policies 4B.15, 4B.16 or 4B.17), or subsequent Supplementary Planning Guidance set out in the London View Management Framework[(11.3)]. However, some views would be gained from beyond the local area, particularly toward taller elements of the proposals.

- Local level – The townscape character and visual receptors are assessed in detail for the area within the planning application boundaries and zones that abut them.

Baseline Description and Characterisation

The term ‘Baseline’ is used to describe the prevailing conditions on and in the vicinity of the site at the commencement of development works. This may be the equivalent of ‘existing conditions’ that are recorded during surveys and studies conducted to inform the development design and EIA. Often however, development will not begin for several years, during which time the existing conditions may have been changed or otherwise affected by outside forces (such as planned changes in Central or Local Government policy, by the implementation of extant planning consents, or by preparatory works such as remediation of contaminated land).

For the purposes of this assessment, 2007 is taken as the ‘existing’ year, and 2009 as the Baseline Year. Design Year is deemed to be the date at which development is completed, and the site fully occupied (taken as 2024 for this project).

The townscape assessment has taken into account methodologies developed for the characterisation of landscape by the Landscape Institute/IEMA and the Countryside Agency Guidance for Landscape Character Assessment(11.4).

Evaluation

The evaluation stage applies judgements about the importance of the physical landscape and townscape resources and views, and their sensitivity to change arising from implementation of the proposed development. It takes into account the professional opinion of the assessors, local designations and the opinion of consultees.

Importance/Value

The assessment of importance has involved:

- Evaluation of the individual features, character areas and views to determine their value;
- Assignment of greater importance to listed buildings and their setting; and
- Identification of those buildings, structures and features which make a positive or negative contribution to the townscape.

Importance has been categorised as; None, Very Low, Low, Moderate, High and Very High.

Sensitivity to Change

Sensitivity to change is described by the LI/IEMA Guidelines (paragraph 7.16) as *“The degree to which a particular landscape type or area can accommodate change arising from a particular development, without detrimental effects on its character”.*

Sensitivity will vary in accordance with the type and character of changes that are proposed. Factors considered in the assessment of townscape sensitivity, based upon the LI/IEMA Guidelines p.87 are

- Existing land use;
- Pattern and scope of the existing and proposed townscape;
- The quality of the proposed development.

The sensitivity of character areas to the proposed changes are assessed as:

- High – unlikely to be capable of accommodating change without major adverse effect;
- Moderate – may be capable of accommodating the proposed changes, but with some adverse effect;
- Low – the proposed development would be capable of accommodating change with little adverse effect.

These values are based on the robustness of the existing character areas and their ability to accommodate the proposed changes.

Nature of the Effects

The effects of the development are assessed in terms of their magnitude or scale, nature and duration.

Magnitude/Scale

No standard methodology exists for the quantification of scale or magnitude. However, The LI/IEMA Guidelines state (paragraph 7.19) magnitude *"is generally based on the scale or degree of change to the landscape resources, the nature of the effect and its duration including whether it is permanent or temporary"*.

Professional judgement and experience has been used by the assessors to describe magnitude/scale of effects in terms of:

- Large;
- Medium;

- Small;
- Negligible.

Effects can, in accordance with Schedule 4 Part 1(4) of the EIA Regulations be indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative.

It is inevitable that the character and appearance of an area would experience changes as a result of development. Perception of the change to character is not automatically deemed to be an adverse effect of the development. Positive and varied land uses would replace temporary uses with high quality built form, public realm and improved vehicular and pedestrian accessibility.

A change to appearance is assessed by comparing the baseline and proposed views; the loss of established views and effect on the setting of Listed buildings may be considered an adverse effect. However, the creation of new views may be a positive effect, particularly where they are to newly established landmarks.

Public views into parts of the site from local roads and footpaths and other transport routes (i.e. railways, canals etc) are assessed.

Views of the site from private properties around the site boundary and from taller buildings in the area are also addressed.

Duration

The duration of effects has been considered in terms of whether they are permanent, temporary of reversible. Temporary and reversible effects may in turn be described as short term, medium term of long term and generally relate to the duration of construction works and operations. For this assessment these are described as:

- Short-term – less than 12 months;
- Medium term – 1 to 5 years;
- Long-term – more than 5 years.

Assessment of Significance

For the purposes of the assessment, the significance of townscape and visual effects is based on two aspects:

- The receptor – its character, importance or value, and its sensitivity to change;
- The effects – arising from the implementation of the proposed development in terms of magnitude/scale, nature and duration of effect.

The term ‘receptor’ is used to mean an element or assemblage of elements that would be directly or indirectly affected by the proposed development (paragraph 6.12, LI/IEMA Guidelines).

Examples of receptors include people using the site or the surrounding area (i.e. occupiers, workers, residents, visitors, commuters etc and heritage buildings).

As an example, an effect of major significance may be the result of a small change to a resource of high value or a large change to a resource of lower value.

Level of Significance

The following levels of significance are used in this assessment.

- Substantial effects of the development of greater than local scale;
- Moderate effects of the development that may be judged to be important at a local scale (i.e. in the local planning context);
- Minor effects that are of low importance in the decision making process.

These levels of significance apply to both adverse and beneficial effects. A further category of ‘negligible’ is used to describe effects, which are of such low importance that they are not material to decision making.

For the beneficial effects, greater significance has been attributed to those aspects of the proposal that meet the townscape and visual objectives set out in Unitary or Local Plans, or Supplementary Planning Guidance related to the site. For example, this may include, amongst other topics:

- Mix of Uses;
- Open Space; or
- Urban Design and Sustainability.

Consultations

Views of the local planning authorities and other statutory bodies (as appropriate) have been sought with respect to features and resources (including views) that are deemed particularly sensitive to change and the potential effects of proposed development. Greater weight is given to acknowledged features and resources that are subject to specific planning policies, as set out in Unitary Development Plans or Local Plans etc.

Where the proposed development site may influence more than one local planning authority area, then each LPA has been consulted with regard to policy and potentially sensitive receptors, as set out above.

References:

11.1 IEMA and LI (2002) Guidelines for Landscape and Visual Impact Assessment (GLVIA), Institute of Environmental Management and Assessment and The Landscape Institute.

11.2 GLA (2004) The London Plan – Spatial Development Strategy for Greater London, Greater London Authority.

11.3 GLA (2007) London View Management Framework – The London Plan Supplementary Planning Guidance.

11.4 CA and SNH (2002) Landscape Character Assessment Guidance for England and Scotland, Countryside Agency and Scottish natural Heritage.

APPENDIX 11.2 COMPARATIVE VIEW PREPARATION

Introduction

The Mayor of London's Supplementary Planning Guidance (SPG) London View Management Framework has been developed as a tool for the protection and enhancement of the most important views towards London's historic landmarks designated in the London Plan. In Appendix C of the SPG, 'Accurate Visual Representation' is described as a technique which "shows the location of a proposed development as accurately *as possible; it may also illustrate the degree to which the development will be visible, its detailed form or the proposed use of materials*".

The proposed West Southall development does not fall within or affect any of the designated views described within the London Plan. Whilst the views to, from and within the West Southall site are not as sensitive as those that are the subject of the London View Management Framework, techniques similar to those of AVR may be useful in preparing illustrations of the extent to which the West Southall proposal will be seen from potentially sensitive viewpoints identified by the Local Planning Authorities that can be compared to existing views. Appendix C of the SPG identifies four levels of AVR that fulfils different purposes in terms of rendering styles. These are:

- Level 0 – Location and size of proposal
- Level 1 – Location, size and degree of visibility of proposal
- Level 2 – As Level 1 plus description of architectural form
- Level 3 – As Level 2 plus use of materials

The nature of the West Southall proposals and planning application define the most suitable level of visual representation in terms of purpose, and is also influenced by the level of information about the appearance of the proposed development that is available at the time of preparation of the visual representation. The height and massing of the proposed scheme is described in a series of Parameter Plans, which will control the quantum and form of the development as it is implemented over the envisaged construction period. It is therefore inappropriate to speculate about the description of architectural form or material that will be used for individual buildings, and therefore an AVR of Level 1 has been adopted for the purposes of the ES to illustrate the '*location, size and degree of visibility of (the) proposal*'.

The broad methodology has been prepared by RPS Group plc with reference to Appendix C of the SPG. The Viewpoint co-ordinates have been identified and original photography has been undertaken by RPS. Generation of the graphic representations has been prepared by the West Southall project architects Make, together with the bridge architects Hakes Associates and Marks Barfield Architects.

Selection of Viewpoints

The West Southall development is likely to have a visual influence to varying degrees upon viewpoints that lie within the London Boroughs of Ealing, Hillingdon and Hounslow. Each of these planning authorities was contacted to identify any views that are of particular interest. Reference was also made to the townscape and visual assessment that was presented in the previous Environmental Statement prepared for the Site.

No locally designated views are identified within the Hillingdon UDP or the Hounslow UDP. Two locally designated views within the vicinity of the Site are identified in Table 10.8 of the Ealing UDP, however, only one of these is toward the site and would be influenced by the proposed development namely "*25 Southall Railway Bridge, west toward the former Water Tower on The Straight*".

Other viewpoints have been identified as they fulfil one or more of the following criteria:

- Falls within broad areas identified by the local planning authorities;
- From areas/locations deemed to be sensitive to visual change (i.e. recreational land uses/ the Blue Ribbon network);
- Publicly accessible vantage points;
- Representative of similar views that occur; and
- Views would encompass particular features of the development (i.e. proposed bridges).

The Comparative View photographs were taken on 10th October 2007 and 28th January 2008.

Table 11a – Viewpoint Location and Description

View Ref	Description	OS Co-ordinates[1]		Camera lens[2] centerline level (m AOD)	Comments
		Easting	Northing		
A	Junction of The Straight/The Crescent looking east toward South Road	TQ512509	179803	31.56	
B	South Road Railway bridge looking Northwest toward the Water Tower and retained gas holder	TQ512593	179758	40.5	
C	South Road railway bridge looking north toward The Crescent (joint viewpoint with B)	TQ512593	179758	40.5	
D	Trinity Road looking south toward retained gas holder	TQ512014	180063	31.5	
E	Grand Union Canal (GUC) towpath near Blair Peach School looking south toward proposed pedestrian bridge	TQ511677	180130	31.48	
F	GUC towpath looking north toward proposed pedestrian bridge	TQ511581	179878	31.52	
G	GUC towpath looking south toward proposed Minet Bridge (joint viewpoint with F)	TQ511581	179878	31.52	
H	GUC towpath looking north toward proposed Minet Bridge	TQ511258	179670	31.49	

View Ref	Description	OS Co-ordinates[1]		Camera lens[2] centerline level (m AOD)	Comments
		Easting	Northing		
I South	GUC towpath looking south toward existing railway bridge/proposed Pump Lane Link Bridge	TQ511132	179577	31.47	
I North	GUC towpath looking north toward existing railway bridge/proposed Pump Lane Link Bridge	TQ510905	179445	31.49	
J	Corner of Yeading Town training pitch looking southeast toward proposed Minet Bridge	TQ511332	179901	27.5	
K	Minet Country Park picnic area (adjacent to play area) looking west east toward West Southall site	TQ511071	180115	34.9	
L	Hayes Bypass rail bridge looking east toward West Southall site/along proposed Pump Lane Link alignment.	TQ510680	179547	40.64	
Note 1	Co-ordinates and altitude measured using a Garmin eTrax Geographical Positioning System (GPS) receiver, calibrated to the British Ordnance Survey (OS) Grid. On-screen reading tolerance stated as +/- 6m. Two onsite spot-checks were conducted as a control – First on-site check measurement taken at South Road/Southall Station OS Bench Mark (37.98m AOD); actual on-site tolerance measured as -0.98m AOD (eTrax reading = 37m AOD). Second on-site check measurement taken at location of OS spot height on GUC towpath near Blair Peach School (29.9m AOD); actual on-site tolerance measured as +0.1m AOD (eTrax reading = 30m AOD).				
Note 2	All photographs taken using a Nikon D200 Digital SLR camera fitted with an 18-70mm zoom lens set at c.35mm. Horizontal picture angle (angle of view) with Nikon DX format = 76^{o} (18mm focal length) to 22^{o} 50' (at 70mm focal length) approximate picture angle at 35mm focal length therefore = approximately 50^{o}. Selected camera and lens combination is equivalent to a 52mm lens being used on a 35mm SLR camera.				

Visual Impact Assessment **Comparative View Data Sheet**		
Project name: West Southall		**Date:** 10-10-2007
Project ref: JWR.1222		**Time:** 11.59am
Viewpoint number: A		**Surveyor**: AJS
Camera Type: Nikon D200		
Lens: Nikkor 18-70mm	**Focal Length:** 35mm	**Angle of View:**
Coordinates: OS Sheet TQ	**Ground level:** 30m	**CL lens:** GL+ 1.56m
E: 512509	**N:** 179803	**AOD:** 31.56m
No. Images in Sequence:	1	**Format (L/P):** Landscape

Description of view:

From traffic island near the Water Tower, looking east toward The Crescent and South Road Bridge.

Comments:

Note vista along The Straight could not be taken as security gates obscure much of the view.

Map/photo of camera position:

Visual Impact Assessment Comparative View Data Sheet		
Project name: West Southall		**Date:** 10-10-2007
Project ref: JWR.1222		**Time:** 12:15pm
Viewpoint number: B		**Surveyor**: AJS
Camera Type: Nikon D200		
Lens: Nikkor 18-70mm	**Focal Length:** 35mm	**Angle of View:**
Coordinates: OS Sheet TQ	**Ground level:** 39m	**CL lens:** GL+ 1.5m
E: 512593	**N:** 179758	**AOD:** 40.5m
No. Images in Sequence:	5	**Format (L/P):** Portrait

Description of view:

From South Road railway bridge looking northwest toward the Water Tower and The Straight, also includes West Southall Site – corresponds to London Borough of Ealing locally designated view number 25.

Comments:

Vertical format (portrait) selected to include Water Tower/gasholder and to accommodate level difference between viewpoint position (on railway bridge) and lower level of rail tracks/the Site.

Note: Datum checked with OBM (37.98m AOD) near Station Entrance on north eastern side of rail bridge.

Map/photo of camera position:

Visual Impact Assessment **Comparative View Data Sheet**		
Project name: West Southall		**Date:** 10-10-2007
Project ref: JWR.1222		**Time:** 12:20pm
Viewpoint number: C		**Surveyor**: AJS
Camera Type: Nikon D200		
Lens: Nikkor 18-70mm	**Focal Length:** 35mm	**Angle of View:**
Coordinates: OS Sheet TQ	**Ground level:** 39m	**CL lens:** GL+ 1.5m
E: 512593	**N:** 179758	**AOD:** 40.5m
No. Images in Sequence:		**Format (L/P):** P

Description of view:

From South Road rail bridge looking north towards The Crescent. Viewpoint same as position B, but different direction of view.

Comments:

Vertical format (portrait) selected to accommodate level difference between viewpoint position (on railway bridge) and lower level of rail tracks/The Crescent.

Map/photo of camera position:


Visual Impact Assessment **Comparative View Data Sheet**		
Project name: West Southall		**Date:** 10-10-2007
Project ref: JWR.1222		**Time:** 11:40am
Viewpoint number: D		**Surveyor**: AJS
Camera Type: Nikon D200		
Lens: Nikkor 18-70mm	**Focal Length:** 35mm	**Angle of View:**
Coordinates: OS Sheet TQ	**Ground level:** 30m	**CL lens:** GL+ 1.5m
E: 512014	**N:** 180063	**AOD:** 31.5m
No. Images in Sequence:	3	**Format (L/P):** Portrait

Description of view:

Trinity Road looking south toward the Site and the retained gasholder, along the entrance to Southall Self-Storage compound.

Comments:

Vertical (portrait) selected to incorporate full height of buildings on Beaconsfield Road that frame the view.

Map/photo of camera position:

Visual Impact Assessment **Comparative View Data Sheet**		
Project name: West Southall		**Date:** 10-10-2007
Project ref: JWR.1222		**Time:** 13:15
Viewpoint number: E		**Surveyor**: AJS
Camera Type: Nikon D200		
Lens: Nikkor 18-70mm	**Focal Length:** 35mm	**Angle of View:**
Coordinates: OS Sheet TQ	**Ground level:** 30m	**CL lens:** GL+ 1.48m
E: 511677	**N:** 180430	**AOD:** 31.48m
No. Images in Sequence:		**Format (L/P):** Portrait

Description of view:

Grand Union Canal towpath by Blair Peach School, looking south along the canal toward the proposed pedestrian bridge.

Comments:

Viewpoint position broadly coincides with OS spot level of 29.9m used as check (i.e. + 0.1m variation).

Vertical format to accommodate anticipated height (in part) of proposed canal side development within the Site.

Map/photo of camera position:

Visual Impact Assessment Comparative View Data Sheet		
Project name: West Southall		**Date:** 10-10-2007
Project ref: JWR.1222		**Time:** 13:27
Viewpoint number: F		**Surveyor**: AJS
Camera Type: Nikon D200		
Lens: Nikkor 18-70mm	**Focal Length:** 35mm	**Angle of View:**
Coordinates: OS Sheet TQ	**Ground level:** 30m	**CL lens:** GL+ 1.52m
E: 511581	**N:** 179878	**AOD:** 31.52m
No. Images in Sequence:		**Format (L/P):** Portrait

Description of view:

Grand Union canal towpath looking north toward proposed pedestrian bridge.

Comments:

Vertical format to accommodate anticipated height (in part) of proposed canal side development within the Site.

Map/photo of camera position:

Visual Impact Assessment **Comparative View Data Sheet**		
Project name: West Southall		**Date:** 10-10-2007
Project ref: JWR.1222		**Time:** 13:30
Viewpoint number: G		**Surveyor**: AJS
Camera Type: Nikon D200		
Lens: Nikkor 18-70mm	**Focal Length:** 35mm	**Angle of View:**
Coordinates: OS Sheet TQ	**Ground level:** 30m	**CL lens:** GL+ 1.52m
E: 511581	**N:** 179878	**AOD:** 31.52m
No. Images in Sequence:		**Format (L/P):** Portrait

Description of view:

Grand Union Canal towpath looking south toward position of proposed Minet Bridge. Same viewpoint position/coordinates as View F, but looking in opposite direction.

Comments:

Vertical format to accommodate anticipated height (in part) of proposed canal side development within the Site.

Map/photo of camera position:

Visual Impact Assessment Comparative View Data Sheet		
Project name: West Southall		**Date:** 28-01-2008
Project ref: JWR.1222		**Time:** 13:43
Viewpoint number: H		**Surveyor**: AJS
Camera Type: Nikon D200		
Lens: Nikkor 18-70mm	**Focal Length:** 38mm	**Angle of View:**
Coordinates: OS Sheet TQ	**Ground level:** 30m	**CL lens:** GL+ 1.49m
E: 511258	**N:** 179670	**AOD:** 31.49m
No. Images in Sequence:		**Format (L/P):** Portrait

Description of view:

Grand Union Canal towpath looking north toward proposed Minet Bridge.

Comments:

Vertical format to accommodate anticipated height (in part) of proposed canal side development within the Site.

Map/photo of camera position:

Visual Impact Assessment Comparative View Data Sheet		
Project name: West Southall		**Date:**
Project ref: JWR.1222		**Time:**
Viewpoint number: I - South		**Surveyor**: AJS
Camera Type: Nikon D200		
Lens: Nikkor 18-70mm	**Focal Length:** 35mm	**Angle of View:**
Coordinates: OS Sheet TQ	**Ground level:** m	**CL lens:** GL+ 1.47m
E: 511132	**N:** 179577	**AOD:** 31.47m
No. Images in Sequence:		**Format (L/P):** Portrait

Description of view:

Grand Union canal towpath looking south toward existing railway bridge/position of proposed Pump Lane Link Road bridge.

Comments:

Vertical format to accommodate anticipated height (in part) of proposed canal side development within the Site.

Map/photo of camera position:

(Image not available)

Visual Impact Assessment **Comparative View Data Sheet**		
Project name: West Southall		**Date:** 28-01-2008
Project ref: JWR.1222		**Time:**
Viewpoint number: I - North		**Surveyor**: AJS
Camera Type: Nikon D200		
Lens: Nikkor 18-70mm	**Focal Length:** 35mm	**Angle of View:**
Coordinates: OS Sheet TQ	**Ground level:** m	**CL lens:** GL+ 1.49m
E: 510905	**N:** 179445	**AOD:** 31.49m
No. Images in Sequence:		**Format (L/P):** Portrait

Description of view:

Grand Union canal towpath looking north (from beneath existing railway bridge) toward existing railway bridge/position of proposed Pump Lane Link Road bridge.

Comments:

Vertical format to accommodate anticipated height (in part) of proposed canal side development within the Site.

Map/photo of camera position:

Visual Impact Assessment Comparative View Data Sheet		
Project name: West Southall		**Date:** 10-10-2007
Project ref: JWR.1222		**Time:** 14:51
Viewpoint number: J		**Surveyor**: AJS
Camera Type: Nikon D200		
Lens: Nikkor 18-70mm	**Focal Length:** 35mm	**Angle of View:**
Coordinates: OS Sheet TQ	**Ground level:** 26m	**CL lens:** GL+ 1.5m
E: 511332	**N:** 179901	**AOD:** 27.5m
No. Images in Sequence:		**Format (L/P):**

Description of view:

Corner of Yeading FC training pitch/boundary of Sikh college looking southeast toward retained gasholder/along western approach to proposed Minet Bridge.

Comments:

Vertical format to accommodate anticipated height (in part) of proposed canal side development within the Site.

Map/photo of camera position:

Visual Impact Assessment **Comparative View Data Sheet**		
Project name: West Southall		**Date:** 10-10-2007
Project ref: JWR.1222		**Time:** 14:29
Viewpoint number: K		**Surveyor**: AJS
Camera Type: Nikon D200		
Lens: Nikkor 18-70mm	**Focal Length:** 34mm	**Angle of View:**
Coordinates: OS Sheet TQ	**Ground level:** 33m	**CL lens:** GL+ 1.49m
E: 511071	**N:** 180115	**AOD:** 34.49m
No. Images in Sequence:		**Format (L/P):** Portrait

Description of view:

Minet Country Park picnic areas to east of equipped play area, looking east toward Guru Nanak Sikh College, with West Southall site forming the backdrop.

Comments:

Vertical format to accommodate anticipated height (in part) of proposed canal side development within the Site.

Map/photo of camera position:

Visual Impact Assessment **Comparative View Data Sheet**		
Project name: West Southall		**Date:** 10-10-2007
Project ref: JWR.1222		**Time:** 15:22
Viewpoint number: L		**Surveyor**: AJS
Camera Type: Nikon D200		
Lens: Nikkor 18-70mm	**Focal Length:** 35mm	**Angle of View:**
Coordinates: OS Sheet TQ	**Ground level:** 39m	**CL lens:** GL+ 1.64m
E: 510680	**N:** 179547	**AOD:** 40.64m
No. Images in Sequence:		**Format (L/P):** Portrait

Description of view:

Hayes bypass rail bridge, broadly above centre line of Pump Lane, looking east along approximate route of proposed Pump Lane Link Road toward the Site, across Minet Country Park.

Comments:

Vertical format to accommodate anticipated level difference between Hayes Bypass bridge elevation and lower level of Pump Lane/proposed Link Road, and Minet Country Park.

Map/photo of camera position:

APPENDIX 11.3 BASELINE CHARACTER AREA DESCRIPTIONS

CHARACTER AREA 1 – Minet Country Park and Yeading Brook Corridor

Figures – see Figure 11.3.1

Boundaries
- Northern boundary defined by the southern edge of Beaconsfield Road (west of Yeading Brook), and in part also by Uxbridge Road.
- Eastern boundary defined by the Grand Union Canal towpath
- Southern boundary defined by the West Coast Main Line railway
- Western boundary defined by the A312 Hayes Bypass

Designations
- Green Belt (in part)
- Minet Country Park (in part)
- GUC part of London Plan 'Blue Ribbon' network
- Towpath/London Trail/part Conservation Area

Historic Use
- Part of area used for tipping of spoil

Land Use (Baseline)
- Informal recreation
- Children's equipped play area
- Car parking to Minet Country Park
- Informal cycle paths/tracks linking to Pump Lane and Abbotswood Way
- Various football pitches Grass and artificial pitches), club houses/stand and facilities buildings
- School/college and sports pitches/recreational space
- Grand Union Canal and towpath (water based uses and angling)

Landscape Features
- Yeading Brook
- Grand Union Canal
- Guru Nanak Sikh College
- Football stand and lighting
- High level chain link fencing (artificial football pitches)
- Trees, hedgerows, and scrubby vegetation
- Artificial land form/ground modelling

Public Access
- Open pedestrian and cycle access within Minet Country Park (from north and west only)
- Public path under Hayes Bypass links to Avondale Drive area to west of bypass
- Vehicular access to car park, school and Yeading FC ground
- Public access along towpath (eastern bank of canal only)

Buildings
- School/college

- Yeading Town FC facilities building and spectator stand
- New artificial football pitch complex
- Small-scale Minet Country Park resources building

Spaces/Townscape

Enclosure

- Weak enclosure on all sides related to scale of character area
- Internal hedgerows and scrub sub-divide southern part of character area

Scale

- Large scale due to general openness of character area

Grain

- Generally coarse, loose north-south grain created by watercourses and boundary with Hayes bypass to the west.

Landmarks

- High level football pitch lighting (YTFC and new sports complex)

Links/Movement

- Pedestrian access from Springfield Road/Beaconsfield Road (west) junction with Minet Country Park and Avondale Drive
- Internal circulation within park and links to west
- Links to south prevented by railway
- Yeading Brook and Grand Union Canal form barrier preventing links to east
- North-south along eastern bank of GUC but no linkage to Minet Country Park.

Views

- Eastward to NationalGrid Gas gasholder
- Internal views controlled by hedgerows, scrub and artificially undulating land form
- North to commercial/retail park
- South toward railway
- West to Hayes bypass and urban form of Hayes (including tower blocks off Avondale Drive)

Baseline Character and Sense of Place

Minet Country Park occupies land between the Hayes bypass flood channel and Yeading Brook, extending generally from Yeading Brook in the vicinity of the railway in the south, north towards Uxbridge Road. The Yeading Brook and land to the east, including the Grand Union Canal, sports pitches surrounding the Guru Nanak Sikh College and Yeading FC fall outside of, but are in keeping with the character of the Minet Country Park.

This character area provides large scale open space that is in sharp contrast with small scale urban residential estates and large scale urban business and commercial parks that prevail around its edges.
Meandering Yeading Brook bisects the area, and the geometric form of the Grand Union Canal (Paddington Branch) further east adds to the riparian character if the Brook.

Opportunities for Change

Major opportunity is to create a link between the Grand Union Canal towpath with Minet Country Park, thus opening up routes to north, south and east via West Southall Site.
Would also provide recreational and ecological link to wider London area via London Plan's 'Blue Ribbon' network along canal to north and south of t he study area.

Location of vehicular access routes toward northern and southern extent of character area would maintain a sense of openness within Green Belt, Minet Country Park and Yeading Brook corridor.

CHARACTER AREA 2 – Large Scale Urban Area

Figures – see Figure 11.3.2

Boundaries

Three pockets of land falling within this character area description:

- Business/Commercial Park off Springfield Road/Beaconsfield Road (Hayes)
  - Northern boundary defined by Uxbridge Road, eastern boundary defined by the Grand Union Canal towpath, southern and western boundaries defined by Minet Country Park
- Bull's Bridge Industrial Area
  - Northern boundary formed by railway, western boundary by Hayes bypass, eastern boundary by residential areas (Character Area 3)
- Featherstone Road Industrial Area
  - Northern boundary defined by railway, western boundary formed by Featherstone Road, residential areas (Character Area 3), eastern boundary formed by The Green.

Designations

- None

Historic Use

- Open land/agriculture

Land Use (Baseline)

- Commercial, retail and light industrial business park comprising large-scale buildings, car parking and storage

Landscape Features

- No remarkable landscape features

Public Access

- Public access (vehicular, pedestrian and cycle) along business park roads, and to retail units

Buildings

- Miscellaneous light industrial and retail units

Spaces/Townscape

Enclosure

- Enclosure created by built form/building lines and property boundaries

Scale

- Medium to large-scale created by access road and large-scale buildings

Grain

- Large coarse-grain on rectilinear pattern created by roads and built form

Landmarks

- No distinctive land marks

Links/Movement

- Off Springfield Road
  - North-south vehicular pedestrian and cycle link created by Springfield Road linking to Uxbridge Road
  - East-west movement restricted to routes within the business park along Beaconsfield Road (west) and internal access roads

- Minet Country Park/Hayes bypass and Yeading Brook/GUC restrict wider movement to the west and east respectively
- Bull's Bridge
  - Principally north-south along Brent Road, linking to Western Road, leading to Hayes bypass
- Featherstone Road
  - Principally eastwards via Featherstone Road/Western Road or directed onto The Green

Views

- Channelled along principal routes and glimpsed views between buildings
- Glimpsed views of retained NationalGrid Gas gasholder, and tower blocks off Avondale Drive, west of the Hayes bypass

Baseline Character and Sense of Place

These areas generally display an industrial 20th Century character defined by large-scale buildings laid out within rectilinear patterns. This functional character is reinforced by associated uses such as open storage, generally wide access roads and heavy goods vehicle movements. The mixed quality of building design and construction and an apparently indifferent maintenance regime further distract from the character.

These areas do not display a distinguishable sense of place.

Opportunities for Change

The industrial estate off Springfield Road is a large cul-de-sac, where customer, employee and goods access and egress is largely restricted to the Uxbridge Road/Springfield Road junction.

Opportunity for change is therefore to create an east-west access to West Southall site (via Pedestrian Bridge) to provide pedestrian and cycle linkage for potential employees and customers, thus improving accessibility.

Industrial areas to the southeast and southwest are severed from the West Southall Site by the Paddington-Bristol railway line. Access is restricted to Brent Road underpass to the southwest, and South Road Railway Bridge to the southeast. In effect the railway and dense development to the south constrain opportunities for change.

CHARACTER AREA 3 – Small Scale Urban

Figures – see Figure 11.3.3

Boundaries

Two areas fall within this character area description in proximity to the site:

- Beaconsfield Road
  - Northern extent undefined beyond Uxbridge Road
  - Eastern boundary loosely defined by the South Road, but character area extends east beyond this
  - Southern boundary defined by the West Southall Site
  - Western boundary defined by the Grand Union Canal towpath
- Dudley Road
  - Railway forms northern boundary
  - Eastern and western boundaries formed by Character Area 3
  - Character Area extends southward

Designations

- Former Water Tower Grade II Listed
- Curved façade of The Crescent subject to LB Ealing notation "building/façade of local value"
- Individual buildings within the area also Listed or noted as being of some local historic interest. None of these other building adjoins the proposed planning application sites
- No Tree Preservation Orders occur adjacent to the proposed planning application sites
- Eastern part of the Grand Union Canal (within Ealing) designated as Conservation Area

Historic Use

- Residential

Land Use (Baseline)

- Predominantly residential, of mixed age and style including Victorian/Edwardian terraces, Inter-War and Post-War detached and semi-detached
- Associated urban uses include schools, places of worship, small and medium scale retail and commercial, open space and recreation

Landscape Features

- Serried ranks of c.1900 red brick terraces or post-war terraces and semi-detached
- Regular, rectilinear road patterns
- Mature street trees

Public Access

- Public access (vehicular and pedestrian) along roads that subdivide the area
- Short public footpaths via alleyways approximately mid way along north-south streets to the north of Beaconsfield Road.

Buildings

- Regular pattern of two-storey red brick (some stuccoed) housing

- Occasional larger scale building such as schools or other community uses (Blair Peach School off Beaconsfield Road)

Spaces/Townscape

Enclosure

- Enclosure created by built form/building lines and property boundaries
- Strong sense of linear enclosure experienced along streets

Scale

- Predominantly small, suburban scale

Grain

- Beaconsfield Road area, regular rectilinear grain oriented north-south, truncated by West Southall Site
- Dudley Road area, regular grain varying orientation truncated by railway to north

Landmarks

- Grade II Listed former Water Tower locally distinctive near South Road/Southall Railway Bridge
- Glimpsed views gained to retained NationalGrid Gas gasholder in neighbouring character area

Links/Movement

- Movement restricted from Beaconsfield Road by Grand Union Canal to the west and West Southall Site/Paddington-Bristol railway to the south. Linkages from area therefore orientated toward the busy commercial thoroughfares of Uxbridge Road to the north, and South Road to the east
- Movement from Dudley Road area restricted by railway to north. Pedestrian link to The Straight/White Street permitted beneath poor-quality Spencer Street Underpass.

Views

- Channelled along roads and between buildings
- Glimpse views of gas holder, and to tower blocks west of Hayes bypass (Avondale Drive)
- View from South Road bridge towards Grade II Listed former Water Tower noted in Ealing UDP as 'Local View in Southall'

Baseline Character and Sense of Place

Areas dominated by ranks of terraced housing that display a strong late 19th/early 20th Century character, reinforced by occasional land mark buildings of a contemporary date.

A strong sense of place is emphasised by the unity of grain, building lines and orientation, scale, materials and articulation. Occasional established street and garden trees add to their maturity.

Opportunities for Change

Notable opportunity to create new linkages between the West Southall Site through to existing road network within this character area to the north (for example multiple connections to Beaconsfield Road and The Crescent/South Road).

Proposed accesses to the west of the West Southall Site (Pump Lane Link Road and the pedestrian bridges) would increase choice and permeability.

Opportunity to also improve pedestrian and cycle routes via improved access through West Southall Site to Grand Union Canal towpath and proposed bridges linking towpath to Minet Country Park.

The railway and dense development to the south of it constrains opportunities for creation of new links to the south.

CHARACTER AREA 4 – West Southall Site

Figures – see Figure 11.3.4

Boundaries
- Northern extent defined by housing along southern edge of Beaconsfield Road
- Eastern boundary defined by housing off Beaconsfield Road and derelict cricket pitch
- Southern boundary defined by the Paddington-Bristol railway
- Western boundary defined by Grand Union Canal towpath

Designations
- Not designated for landscape, heritage or ecological interest
- London Plan identifies West Southall Site as an 'Opportunity Area'

Historic Use
- Brickearth and gravel excavations
- Brentford Gas Company founded Gas Works in 1866
- Norwood Chemical Works built adjacent to the Gas Works (by 1897)
- Railway sidings and open storage
- Localised canal basins

Land Use (Baseline)
- Temporary use for long-stay car parking/storage in connection with Heathrow Airport

Landscape Features
- Mature trees and shrubs of mixed quality and condition, generally along perimeter of character area
- No other distinguishing features

Public Access
- No public access to any part of the West Southall Site

Buildings
- Workshop structures to north eastern corner, contemporary with gas works operation
- Temporary single-storey structures (offices, welfare facilities etc.) associated with Heathrow car parking in vicinity of operational NationalGrid Gas compound.

Spaces/Townscape

Enclosure
- Enclosure created by security barriers around site comprising various materials – enclosure is weak due to barrier height compared to scale of open site.

Scale
- Large scale open space

Grain
- No discernible grain due to open vacant nature of area, some temporary, poorly defined circulation routes within area

Landmarks

- Groups of Lombardy poplar trees form landmarks within the character area due to their distinctive fastigiate form, but are in poor condition
- Gas holder in adjacent character are forms the dominant landmark

Links/Movement

- Links limited to access south-western corner (from Brent Road) and movement east-west along The Straight which runs along the southern boundary of the character area.

Views

- Corrugated steel barriers along western and northern boundaries prevent views in those directions
- Southward views dominated by massive structure of the retained gas holder
- Eastward views obscured by remnant walling to West Southall Site and tree canopies in the vicinity of the Derelict Cricket Pitch character area

Baseline Character and Sense of Place

An area of derelict and underused land from which virtually all above-ground remnants of former land uses have been removed. Lacks any sense of place or distinctive character, form or grain. Enclosure for much of the boundary length by tall sheet metal fences or masonry walls segregates and divorces the character area from neighbouring features and character areas.

The area does not display a coherent or distinguishable sense of place.

Opportunities for Change

Significant opportunities to reclaim derelict land and restore active use in accordance with Supplementary Planning Guidance. Scope to establish a new coherent and structured urban form and grain, through high quality townscape and public realm. Opportunity to open-up site to public access and create linkages across and through the character area extended grain from established townscape to the north. New views would be created to, from and within the area to the proposed landmark buildings, structures and open spaces.

Opening up of canal side presents major opportunity to enhance amenity of West Southall Site and the Grand Union Canal, through the establishment of high quality townscape and linear public realm.

CHARACTER AREA 5 – NationalGrid Gas Compound

Figures – see Figure 11.3.5

Boundaries

- Northern, eastern and western extent loosely defined by the West Southall Site
- Southern boundary defined by The Straight/White Street and the Paddington to Bristol Railway

Designations

- Not designated for landscape, heritage or ecological interest

Historic Use

- Brentford Gas Company founded Gas Works in 1866 (gas works is extant use)

Land Use (Baseline)

- Gas works (gas holder and ancillary equipment)

Landscape Features

- One remaining gas holder (approximately 91m high)

Public Access

- No public access

Buildings

- Gas holder plus low-rise ancillary buildings and pipelines

Spaces/Townscape

Enclosure

- Weak enclosure created by chain-link fencing

Scale

- Large scale

Grain

- No distinctive grain

Landmarks

- Retained gas holder

Links/Movement

- Links limited to access point off of The Straight/White Street

Views

- No public access or views from this character area

Baseline Character and Sense of Place

Industrial character established by large-scale gasholder and bulky pipe work systems (ground level and overhead), valves and control equipment. Sense of place established by the gasholder, which creates a distinctive landmark set within a utilitarian industrial compound.

Opportunities for Change

Not applicable as outside of West Southall Site and subject to Health and Safety restrictions. However, boundaries between the West Southall Site and the extant gas compound can be reinforced and enhanced through appropriate edge treatments and/or structures.

CHARACTER AREA 6 – Derelict Cricket Pitch

Figures – see Figure 11.3.6

Boundaries

- Northern extent defined by housing off Beaconsfield Road
- Eastern boundary loosely defined by the former Water Tower
- Southern boundary defined by The Straight/Paddington-Bristol Railway
- Western boundary defined by the West Southall Site

Designations

- Not designated for landscape, heritage or ecological interest

Historic Use

- Brickearth extraction
- Welfare (sports) facility associated with former gas works (the West Southall SIte

Land Use (Baseline)

- Derelict lawns/grassed areas subject to scrub invasion. Tree planting around periphery.

Landscape Features

- Mature trees and hedgerows along all boundaries

Public Access

- No formal public access

Buildings

- No permanent buildings

Spaces/Townscape

Enclosure

- Enclosure created by tree and scrub/hedgerow planting around periphery of character area

Scale

- Medium scale

Grain

- No distinctive grain

Landmarks

- Mature trees along boundaries

Links/Movement

- Open access along western boundary from private access road. No formal movement between character area and roads to north/northwest (Grange Road and Randolph Gardens).

Views

- North toward residential edge of Southall
- East toward Grade II Listed former Water Tower
- South towards railway obscured by overgrown hedgerow/scrub
- West toward gas holder

Baseline Character and Sense of Place

The fringe of mature vegetation which encircles the derelict pitch creates a strong sense of enclosure forming an incidental and intimate private open space. The openness of the unmanaged space is subject to encroachment by scrub, and is marred by unlawful access leading to fly tipping etc.

Opportunities for Change

The location and spatial openness of this area at the eastern limit of the West Southall Site provides an opportunity to create the new development. The creation and enhancement of public realm would also be enabled so as to establish a distinctive sense of place and character for the redevelopment as a whole, and an enhanced setting to the Listed Water Tower

APPENDIX 11.4 TOWNSCAPE ASSESSMENT

Table A: Townscape Assessment: Minet Country Park and Yeading Brook Character Area
(For Visual Impact Assessment see Appendix 11.5)

Asset/Feature	**Phase**	**Receptor**	**Effect**		**Significance**	**Comments**
		Importance/ Value	**Magnitude/ Scale**	**Nature of Effect**		
MINET COUNTRY PARK AND YEADING BROOK CORRIDOR HERITAGE: Heritage Buildings and Structures – Loss or demolition of, or impact upon recognised historic features (i.e. canal).	Phase 1	High	Negligible	Permanent Adverse	Minor	Some lengths of the Site boundary wall removed to allow for the creation of Pump Lane Link Road. Towpath retained and enhanced.
	Phase 2		Small	Permanent Adverse	Moderate	Extended length of the Site boundary wall removed to allow for the creation of canal side promenade. Towpath retained and enhanced.
	Phase 3		Small	Permanent Adverse	Moderate	Remaining lengths of the Site boundary wall removed to allow for the creation of canal side promenade. Towpath retained and enhanced.
	Operation Yr 1		Negligible	Neutral	Negligible	No further effect/changes additional to Phase 3
	Operation Yr 15		Negligible	Neutral	Negligible	As per Year 1
Context and visual connections to heritage features	Phase 1	High	Negligible	Permanent Beneficial	Negligible	Little change during Phase 1 to existing views from Minet Country Park/Grand Union Canal towpath
	Phase 2		Medium		Substantial	New footbridges open up access to canal towpath from west. New development on northern part of West Southall Site would create backdrop and re-establish urban context to canal.
	Phase 3		Medium		Substantial	New development on southern part of West Southall Site would complete the new canal frontage, re-establishing urban context to canal.
	Operation Yr 1		Large		Substantial	New development on West Southall Site would create a new canal frontage, re-establishing urban context to canal.

Table A: Townscape Assessment: Minet Country Park and Yeading Brook Character Area

(For Visual Impact Assessment see Appendix 11.5)

Asset/Feature	**Phase**	**Receptor**	**Effect**		**Significance**	**Comments**
		Importance/ Value	**Magnitude/ Scale**	**Nature of Effect**		
	Operation Yr 15		Large	Permanent Beneficial	Substantial	As Year 1, but proposed landscape planting would be established.
OPEN SPACES: Loss of/impairment of open space	Phase 1	High	Medium	Permanent Adverse	Substantial	Pump Lane Link Road will permanently remove strip of land toward southern edge of Minet Country Park – potential impact limited by proposed road alignment and landscape planting.
	Phase 2		Small	Permanent Adverse	Moderate	Minet Footbridge and Pedestrian Bridge will permanently remove small areas of Minet Country Park - potential impact minimised by proposed landscape planting to embankments.
	Phase 3		Negligible	Neutral	Negligible	No further land-take/changes additional to Phases 1 and 2.
	Operation Yr 1		Medium	Permanent Adverse	Substantial	As per Phase 3.
	Operation Yr 15		Medium	Permanent Adverse	Substantial	As per Year 1
CHARACTER: Influence on townscape character	Phase 1	Moderate to Low	Medium	Temporary to Permanent Adverse	Moderate to Minor	Pump Lane Link Road construction will affect character of southern part of Minet Country Park.
	Phase 2		Medium	Temporary Adverse to Permanent beneficial	Moderate	Minet Footbridge and Pedestrian Bridge construction will positively affect character of Minet Country Park by creating new landmark structures.
	Phase 3		N/A	-	-	No additional change above Phases 1 and 2.

Table A: Townscape Assessment: Minet Country Park and Yeading Brook Character Area
(For Visual Impact Assessment see Appendix 11.5)

Asset/Feature	**Phase**	**Receptor**	**Effect**		**Significance**	**Comments**
		Importance/ Value	**Magnitude/ Scale**	**Nature of Effect**		
	Operation Yr 1		Medium	Permanent Beneficial	Minor	Landscape planting associated with Pump Lane Link Road embankments now well established (minimum 10 years growth). Footbridges established as landmark features. Planting to footbridge embankments minimum 5 years growth.
	Operation Yr 15		Medium	Permanent Beneficial	Minor	Embankment planting to 'new' footbridges well established (5 to 20 years growth)
TOWNSCAPE: Mass	All Phases and Operational Years	N/A	-	-	-	No new urban development proposed within this character area.
Height	Phase 1	Moderate	Small	Temporary Adverse	Moderate	No new buildings proposed in this character area. Lifting equipment/cranes required to erect Pump Lane Link Road bridge will have short-term impact upon character area. New bridge of restricted height compared to context (i.e. Hayes Bypass viaduct).
	Phase 2		Small	Temporary Adverse to Permanent Beneficial	Moderate to Minor	Lifting equipment/cranes required to erect footbridges will have short-term impact upon character area. New bridges of restricted height, but this adds to presence and interest within context of Country park and along Canal as new landscape features.
	Phase 3		N/A	-	-	No change
	Operation Yr 1		Small	Permanent Beneficial	Minor	Height of Minet Footbridge and Pedestrian Bridge would add positive, new landmarks within Minet Country Park and vertical interest
	Operation Yr 15		Small	Permanent Beneficial	Minor	As per Year 1.

Table A: Townscape Assessment: Minet Country Park and Yeading Brook Character Area
(For Visual Impact Assessment see Appendix 11.5)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
Density	All Phases and Operational Years	N/A	-	-	-	No new urban development proposed within this character area.
Grain	Phase 1	Low	Small	Permanent Neutral	Minor to Negligible	Pump Lane Link Road closely follows established east-west grain (railway line/Uxbridge Road).
	Phase 2	Low	Negligible	Permanent Neutral	Minor to Negligible	Minet Footbridge and Pedestrian Bridge extend truncated east-west grain into Minet Country Park
	Phase 3	N/A	-	-	-	No additional changes to Phases 1 or 2
	Operation Yr 1	Low	Small	Permanent Neutral	Minor to Negligible	New access routes follow or extend east-west grain into Minet Country Park.
	Operation Yr 15	Low	Small	Permanent Neutral	Minor to Negligible	As per Year 1.
Edges	Phase 1	Moderate	Medium	Permanent Neutral	Moderate	Pump Lane Link Road forms new southern edge to Minet Country Park, with landscaped embankments.
	Phase 2	High	Large	Permanent Beneficial	Substantial	Temporary construction impacts arising due to ongoing development. New development at West Southall north of Minet Footbridge will create new high quality edge to Minet Country Park/Grand Union Canal towpath.
	Phase 3	High	Large	Permanent Beneficial	Substantial	Temporary construction impacts arising due to ongoing development. New development at West Southall south of Minet Footbridge will create new high quality edge to Minet Country Park/Grand Union Canal towpath.
	Operation Yr 1	High	Large	Permanent Beneficial	Substantial	Development completed along eastern edge of Minet Country Park/Grand Union Canal, providing cohesive, high quality, well-defined edge.

Table A: Townscape Assessment: Minet Country Park and Yeading Brook Character Area
(For Visual Impact Assessment see Appendix 11.5)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
	Operation Yr 15	High	Large	Permanent Beneficial	Substantial	As per Year 1
Spaces	All Phases and Years of Operation	N/A	-	-	-	See Open Spaces comments above.
Connectivity and Links	Phase 1	Moderate	Medium	Permanent Beneficial	Moderate	Temporary construction works during Phase 1 do not affect connectivity or links within or to this character area. Pump Lane Link Road will create connectivity between West Southall Site and Hayes Bypass for drivers, pedestrians and cyclists. Indirect links also created between Minet Country Park and Grand Union Canal.
	Phase 2	Moderate	Small	Permanent Beneficial	Moderate	Temporary construction works during Phase 2 do not affect connectivity or links within or to this character area. Minet Footbridge and Pedestrian Bridge will create direct connectivity between Minet Country Park, the Grand Union Canal, West Southall Site and land to the north and east.
	Phase 3	N/A	-	-	-	No additional changes; temporary construction works during Phase 3 do not affect connectivity or links within or to this character area.
	Operation Yr 1	Moderate	Medium	Permanent Beneficial	Moderate	Three access routes well established, improving connectivity between land to the east and west of the Grand Union Canal.
	Operation Yr 15	Moderate	Medium	Permanent Beneficial	Moderate	As per Year 1

Table A: Townscape Assessment: Minet Country Park and Yeading Brook Character Area
(For Visual Impact Assessment see Appendix 11.5)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
Mix of Uses	All Phases and Operational Years	N/A	-	-	-	No new urban development proposed in this character area.
Public Access	All Phases and Operational Years	N/A	-	-	-	No change in extent or range of public access available within this character area, but improved connectivity likely to increase volume (see above).
Landmarks	Phase 1	Low	Small	Permanent Beneficial	Minor	No existing landmarks affected. New landmarks created by Pump Lane Link Road Bridge.
	Phase 2	Low	Medium	Permanent Beneficial	Moderate	No existing landmarks affected within this character area during Phase 2. Height and distinctive design of Minet Footbridge and Pedestrian Bridge would add positive, new landmarks within Minet Country Park. See also 'height' description above.
	Phase 3	N/A	-	-	-	No existing landmarks affected and/or no new landmarks created within this character area during Phase 3.
	Operation Yr 1	Low	Medium	Permanent Beneficial	Moderate	New bridges create distinctive landmarks and points of orientation/interest within Minet Country Park and along Grand Union Canal.
	Operation Yr 15	Low	Medium	Permanent Beneficial	Moderate	As per Year 1
Vistas	Phase 1	High	Medium	Temporary Adverse to Permanent Beneficial	Substantial	Temporary adverse impacts upon southward views from Minet Country Park during construction of Pump Lane Link Road. Permanent enhancement by creation of elevated views from new bridge/road across Minet Country Park.

Table A: Townscape Assessment: Minet Country Park and Yeading Brook Character Area
(For Visual Impact Assessment see Appendix 11.5)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
	Phase 2	High	Medium to Small	Temporary Adverse to Permanent Beneficial	Substantial to Moderate	Temporary adverse impacts upon views from Minet Country Park towards landmark of retained gasholder (cranes etc), and views also affected by access route construction. Minet Footbridge and Pedestrian Bridge afford new, elevated vistas across Minet Country Park and Yeading Brook/Grand Union Canal corridor/football pitches.
	Phase 3	Moderate	Small	Temporary Adverse	Moderate	Temporary adverse impacts upon views from Minet Country Park towards landmark of retained gasholder (cranes etc).
	Operation Yr 1	High	Medium to Small	Permanent Beneficial	Substantial to Moderate	Pump Lane Link Road will in turn create new vistas from road and pedestrian/cycle paths (as will new Minet Footbridge and Pedestrian Footbridge) across Minet Country Park and Yeading Brook/Grand Union Canal corridor. Existing landmark of retained gasholder viewed from Minet Country Park within context of West Southall development.
	Operation Yr 15	High	Medium to Small	Permanent Beneficial	Substantial to Moderate	As per Year 1, but views further softened by maturing tree planting.
Trees and Vegetation	Phase 1	High	Large	Temporary Adverse to Permanent Neutral	Substantial	Removal of swathe of trees and scrub along southern edge of Minet Country Park during construction of Pump Lane Link Road.
	Phase 2	High	Small	Temporary Adverse to Permanent Neutral	Moderate	Removal of localised area of trees and scrub during construction of Minet Footbridge and Pedestrian Bridge.

Table A: Townscape Assessment: Minet Country Park and Yeading Brook Character Area
(For Visual Impact Assessment see Appendix 11.5)

Asset/Feature	**Phase**	**Receptor**	**Effect**		**Significance**	**Comments**
		Importance/ Value	**Magnitude/ Scale**	**Nature of Effect**		
	Phase 3	N/A	-	-	-	No change
	Operation Yr 1	High	Small to Negligible	Permanent Neutral	Minor to Negligible	Area of trees scrub permanently lost due to alignment of access routes, but largely offset by additional planting to verges/embankments and interface between Minet Country Park and access routes (minimum of 5 years growth at Year 1).
	Operation Yr 15	High	Negligible	Permanent Neutral	Negligible	As per Year 1, but mature tree growth (approximately 15 to 20 years)

Table B: Townscape Assessment: Large Scale Urban Area Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
LARGE SCALE URBAN AREA HERITAGE: Heritage Buildings and Structures – Loss or demolition of, or impact upon recognised historic features.	All Phases and Operational Years	N/A	-	-	-	Impacts on this character area are very limited as no heritage features affected, and no new urban development proposed within it – Pedestrian Footbridge ties into eastern end of Springfield Road.
Context and visual connections to heritage features	All Phases and Operational Years	N/A	-	-	-	No heritage features within this character area would be affected.
OPEN SPACES: Loss of/impairment of open space	All Phases and Operational Years	N/A	-	-	-	No open spaces within this character area would be affected.
CHARACTER: Influence on townscape character	All Phases and Operational Years	N/A	-	-	-	No new urban development proposed within this area. Very localised change arising from Pedestrian Footbridge linking to Springfield Road – unlikely to affect townscape character.
TOWNSCAPE: Mass	All Phases and Operational Years	N/A	-	-	-	No new urban development proposed within this character area
Height	All Phases and Operational Years	N/A	-	-	-	Pedestrian Bridge would tie into existing ground levels – therefore no effect upon height.
Density	All Phases and Operational Years	N/A	-	-	-	No new urban development proposed within this character area
Grain	Phase 1	N/A	-	-	-	No change
	Phase 2	Low	Small	Permanent Beneficial	Minor	Localised impacts on eastern end of Springfield Road during Pedestrian Bridge construction.
	Phase 3	N/A				No change

Table B: Townscape Assessment: Large Scale Urban Area Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
	Operational Yr 1	Low	Small	Permanent Beneficial	Minor	Pedestrian Footbridge extends urban grain of Large Scale Urban Area southeastward.
	Operational Yr 15	Low	Small	Permanent Beneficial	Minor	As per Year 1
Edges	Phase 1	N/A	-	-	-	No change
	Phase 2	Low	Small	Temporary Adverse	Minor	Localised temporary impacts on southern edge of character area during Pedestrian Bridge construction.
	Phase 3	N/A	-	-	-	No change
	Operational Yr 1	Low	Small	Permanent Beneficial	Minor	Landscape treatment of Beaconsfield Road (west) enhances edge, at least 5 years old.
	Operational Yr 15	Low	Small	Permanent Beneficial	Minor	Landscape treatment (c. 20 years old) along Beaconsfield Road (west) enhances access route, defining new edge/gateway.
Spaces	All Phases and Operational Years	N/A	-	-	-	No change
Connectivity and Links	Phase 1	N/A	-	-	-	No change
	Phase 2	N/A	-	-	-	No change
	Phase 3	N/A	-	-	-	No change
	Operational Yr 1	Moderate	Medium	Permanent Beneficial	Minor to Moderate	Pedestrian and cycle link between West Southall Site and Uxbridge Road created via the Large Scale Character Area. Improved connections will be of benefit to workers and customers of the commercial/business estates and occupants/users of West Southall Site.
	Operation Yr 15	Moderate	Medium	Permanent Beneficial	Minor to Moderate	As per Operational Year 1.
Mix of Uses	All Phases and Operational Years	N/A	-	-	-	No change – no new urban development proposed

Table B: Townscape Assessment: Large Scale Urban Area Character Area

(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
Public Access	All Phases and Operational Years	N/A	-	-	-	No change to public access within Large Scale Urban Area, but improved connectivity between this character area and adjacent areas (see Connectivity and Links above).
Landmarks	All Phases and Operational Years	N/A	-	-	-	No change within character area (Pedestrian Bridge assessed as part of Minet Country park and Yeading Brook Character Area).
Vistas	All Phases and Operational Years	N/A	-	-	-	No change of vistas within character area
Trees and Vegetation	Phase 1	N/A	-	-	-	No change
	Phase 2	N/A	-	-	-	No change
	Phase 3	N/A	-	-	-	No change
	Operation Yr 1	Moderate	Negligible	Permanent Beneficial	Negligible	No existing trees within character area would be affected. Limited opportunity for new tree planting associated with Pedestrian Bridge; new planting would be minimum of 5 years old at Year 1.
	Operation Yr 15	Moderate	Negligible	Permanent Beneficial	Negligible	As per Year 1, but planting semi-mature at c.20 years old.

Table C: Townscape Assessment: Small Scale Urban Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor Importance/ Value	Effect Magnitude/ Scale	Nature of Effect	Significance	Comments
SMALL SCALE URBAN AREA HERITAGE: Heritage Buildings and Structures – Loss or demolition of, or impact upon recognised historic features (i.e. former Water Tower).	Phase 1	High to Moderate	Medium	Permanent Adverse to Temporary Adverse	Substantial to Moderate	Demolition of The Crescent, identified as a building or façade of group value, would have substantial but localised impact. Temporary construction impacts upon Grade II former Water Tower.
	Phase 2		Negligible	Temporary Neutral	Negligible	No change
	Phase 3		Negligible	Temporary Neutral	Negligible	No change
	Operation Yr 1		Medium	Permanent Beneficial	Moderate	Physical prominence of Grade II Listed former Water Tower enhanced by key location at eastern gateway to site, and from new high quality landscape. Tower becomes embedded within the new development, with improved connectivity.
	Operation Yr 15		Medium	Permanent Beneficial	Moderate	As per Year 1.
Context and visual connections to heritage features	Phase 1	High to Moderate	Medium	Permanent Adverse to Temporary Adverse	Substantial to Moderate	Demolition of The Crescent, identified as a building or façade of group value, would have substantial but Local visual impact. Temporary construction impacts upon views to/from Grade II former Water Tower.
	Phase 2		Small	Temporary Adverse	Moderate	Indirect temporary construction impacts upon views from/to Listed former Water Tower during development of pocket of land to the west (school/health /cinema complex).
	Phase 3		Negligible	Temporary Neutral	Negligible	No change

Table C: Townscape Assessment: Small Scale Urban Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	**Phase**	**Receptor**	**Effect**		**Significance**	**Comments**
		Importance/ Value	**Magnitude/ Scale**	**Nature of Effect**		
	Operation Yr 1		Medium	Permanent Beneficial	Moderate	Visual prominence of Grade II Listed former Water Tower enhanced by key location at eastern gateway to site, and from new high quality landscape. Tower becomes embedded within the new development, with improved visual connectivity.
	Operation Yr 15		Medium	Permanent Beneficial	Moderate	As per Year 1.
OPEN SPACES: Loss of/impairment of open space	Phase 1	Moderate	Small	Permanent Adverse	Moderate	Loss of small play area to accommodate improved South Road junction (note increased play provision will be delivered as part of West Southall Site development – See Table D)
	Phase 2		N/A	-	-	No change
	Phase 3		N/A	-	-	No change
	Operation Yr 1		Small	Permanent Beneficial	Minor to Moderate	Establishment of high quality public realm around South Road junction and the former Water Tower.
	Operation Yr 15		Small	Permanent Beneficial	Minor to Moderate	As per year 1.

Table C: Townscape Assessment: Small Scale Urban Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
CHARACTER: Influence on townscape character	Phase 1	High to Moderate	Medium	Temporary to Permanent Adverse to Permanent Beneficial	Substantial to Moderate	Demolition of The Crescent/Randolph Road properties creates new open area adjacent to South Road, providing opportunity for enhancement of townscape character in proximity to the Water Tower. Demolition of isolated properties along Beaconsfield Road to create connections into West Southall site would have localised effects, but would not compromise the overall integrity or character of Beaconsfield Road. Temporary construction impacts upon townscape features.
	Phase 2		Negligible	Temporary Neutral	Negligible	No change
	Phase 3		Negligible	Temporary Neutral	Negligible	No change
	Operation Yr 1		Medium	Permanent Beneficial	Moderate	Landmark value of former Water Tower enhanced by newly expanded space and high quality landscape. Tower becomes embedded within the new development, with improved connectivity. Small-scale residential character extended westward into West Southall Site. Replacement of high quality townscape and public realm through use of coherent design and materials.
	Operation Yr 15		Medium	Permanent Beneficial	Moderate	As per Year 1.
TOWNSCAPE: Mass	All Phases and Operational Years	N/A	-	-	-	No change
Height	All Phases and Operational Years	N/A	-	-	-	No change

Table C: Townscape Assessment: Small Scale Urban Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
Density	All Phases and Operational Years	N/A	-	-	-	No change
Grain	Phase 1	Low	Small	Permanent Beneficial	Minor	Demolition of isolated properties along Beaconsfield Road to create connections into West Southall site would extend grain of Small Scale Urban Area southward during Phase 1.
	Phase 2	N/A	-	-	-	No change
	Phase 3	N/A	-	-	-	No change
	Operation Yr 1	Low	Small	Permanent Beneficial	Minor	As per Phase 1
	Operation Yr 15	Low	Small	Permanent Beneficial	Minor	As per Year 1
Edges	Phase 1	Low	Small	Permanent Beneficial	Minor	Demolition of isolated properties along Beaconsfield Road to create connections into West Southall site would soften edge of Small Scale Urban Area. Enhancement of area around former Water Tower improves edge locally with South Road and railway.
	Phase 2	N/A	-	-	-	No change
	Phase 3	N/A	-	-	-	No change
	Operation Yr 1	Low	Small	Permanent Beneficial	Minor	As per Phase 1
	Operation Yr 15	Low	Small	Permanent Beneficial	Minor	As per Year 1
Spaces	Phase 1	Low	Small	Permanent Beneficial	Minor	Creation of incidental public realm and open space in vicinity of the former Water Tower/South Road. See Open Spaces above for assessment of loss of play area/open space off South Road.
	Phase 2	N/A	-	-	-	No change
	Phase 3	N/A	-	-	-	No change
	Operation Yr 1	Low	Small	Permanent Beneficial	Minor	As per Phase 1
	Operation Yr 15	Low	Small	Permanent Beneficial	Minor	As per Year 1

Table C: Townscape Assessment: Small Scale Urban Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
Connectivity and Links	Phase 1	High	Small	Permanent Beneficial	Moderate	Creation of new links between Beaconsfield Road (and wider Southall area) and West Southall development.
	Phase 2	N/A	-	-	-	No change
	Phase 3	N/A	-	-	-	No change
	Operation Yr 1	High	Small	Permanent Beneficial	Moderate	Creation of new connections between Beaconsfield Road and West Southall site would also improve connectivity between Small Scale Urban Area, West Southall Site, and subsequently Grand Union Canal towpath and Minet Country Park as Site developed.
	Operation Yr 15	High	Small	Permanent Beneficial	Moderate	As per Year 1
Mix of Uses	All Phases and Operational Years	N/A	-	-	-	No change
Public Access	Phase 1	Moderate	Small	Permanent Beneficial	Moderate	Public access gained to northern part of West Southall site through new Beaconsfield Road linkages and routes adjacent to Water Tower.
	Phase 2	N/A	-	-	-	No change
	Phase 3	N/A	-	-	-	No change
	Operation Yr 1	Moderate	Small	Permanent Beneficial	Moderate	As per Phase 1, but public access enabled to much of West Southall Site.
	Operation Yr 15	Moderate	Small	Permanent Beneficial	Moderate	As per Year 1
Landmarks	Phase 1	Moderate	Medium	Permanent Beneficial	Moderate	New public realm adjacent to South Road junction has potential to establish a new local landmark that complements the established Water Tower landmark.
	Phase 2	N/A	-	-	-	No change
	Phase 3	N/A	-	-	-	No change
	Operation Yr 1	Moderate	Medium	Permanent Beneficial	Moderate	As per Phase1
	Operation Yr 15	Moderate	Medium	Permanent Beneficial	Moderate	As per Year 1

Table C: Townscape Assessment: Small Scale Urban Character Area

(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
Vistas	Phase 1	Moderate	Small	Temporary Adverse	Moderate	New vistas created into West Southall Site from Beaconsfield Road, but temporary adverse affects as views toward construction activity. Temporary impact on Water Tower vista during demolition and access/public realm works.
	Phase 2	Moderate	Negligible to Small	Temporary Adverse	Minor	Indirect views towards cranes/construction activity as part of Phase 2.
	Phase 3	Moderate	Negligible to Small	Temporary Adverse	Minor	Indirect views across railway towards cranes/construction activity as part of Phase 3 from residential areas in vicinity of Spencer Street.
	Operation Yr 1	Moderate	Small	Permanent Beneficial	Moderate	New vistas created into West Southall Site from Beaconsfield Road. Enhanced Water Tower vista.
	Operation Yr 15	Moderate	Small	Permanent Beneficial	Moderate	As per Year 1
Trees and Vegetation	Phase 1	Moderate	Medium	Permanent Adverse	Moderate	Loss of trees associated with creation of new South Road junction (removal of park/play area). Also tree/scrub loss to north of former Water Tower and that associated with property demolitions along Beaconsfield Road. Will be offset by new planting (see Year 1 below).
	Phase 2	N/A	-	-	-	No change
	Phase 3	N/A	-	-	-	No change
	Operation Yr 1	Moderate	Medium	Permanent Beneficial	Moderate	New tree planting proposed as part of South Road junction, plus additional tree planting associated with public realm improvements at least 5 years old.

Table C: Townscape Assessment: Small Scale Urban Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
	Operation Yr 15	Moderate	Medium	Permanent Beneficial	Moderate	As per Year 1, but planting c.20 years old.

Table D: Townscape Assessment: West Southall Site Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
WEST SOUTHALL SITE HERITAGE: Heritage Buildings and Structures – Loss or demolition of, or impact upon recognised historic features (i.e. associated with canal).	Phase 1	High	Medium	Permanent Beneficial	Moderate	No loss of recognised heritage features. Removal of eastern boundary enables physical connectivity with former Water Tower to be established (via Old Cricket Pitch character area).
	Phase 2	High	Medium to Small	Permanent Neutral	Moderate	Walling along northwest edge of site removed; some lengths possibly associated with Grand Union Canal. Physical connectivity with heritage feature formed by Canal established and interface enhanced.
	Phase 3	High	Medium to Small	Permanent Neutral	Moderate	Walling along southwest edge of site removed; some lengths possibly associated with Grand Union Canal. Physical connectivity with canal established and interface enhanced.
	Operation Yr 1	High	Medium	Permanent Neutral	Moderate	Loss of miscellaneous boundary walls possibly associated with Grand Union Canal offset by increased connectivity with GUC and former Water Tower.
	Operation Yr 15	High	Medium	Permanent Neutral	Moderate	As per Year 1
Context and visual connections to heritage features	Phase 1	High	Medium	Permanent Beneficial	Substantial	Removal of existing boundary fences/walls along eastern edge of West Southall Site and establishment of new avenue aligned with former Water Tower.
	Phase 2	High	Medium	Permanent Beneficial	Substantial	Removal of existing boundary fences/walls along northwest frontage of West Southall Site opens up views to the Grand Union Canal.

Table D: Townscape Assessment: West Southall Site Character Area

(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
	Phase 3	High	Medium	Permanent Beneficial	Substantial	Removal of existing boundary fences/walls along southwest frontage of West Southall Site opens up views to the Grand Union Canal.
	Operation Yr 1	High	Large	Permanent Beneficial	Substantial	Positive impact arising from removal of miscellaneous boundary treatments improving relationship with heritage features.
	Operation Yr 15	High	Large	Permanent Beneficial	Substantial	As per Year 1.
OPEN SPACES: Loss of/impairment of open space	All Phases and Operational Years	None	Negligible	Permanent Neutral	Negligible	No public or private open space within existing West Southall Site. See 'Spaces' below for assessment of open space created as part of Development.
CHARACTER: Influence on townscape character	Phase 1	Very Low	Large	Permanent Beneficial	Substantial	Poor/degraded baseline townscape character. New high quality, and coherent townscape character will be established by West Southall scheme, on eastern part of Site.
	Phase 2	Very Low	Large	Permanent Beneficial	Substantial	As per Phase 1, but in central/northwest part of Site.
	Phase 3	Very Low	Large	Permanent Beneficial	Substantial	As per Phase 1, but to western/southwest part of Site.
	Operation Yr 1	Very Low	Large	Permanent Beneficial	Substantial	High quality townscape character established across whole of West Southall Site. Tree planting will further enhance appearance and character as it matures (see Trees and Vegetation below).
	Operation Yr 15	Very Low	Large	Permanent Beneficial	Substantial	As per Year 1, but will improve further as tree planting matures (minimum 20 years growth at Year 15).

Table D: Townscape Assessment: West Southall Site Character Area

(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
TOWNSCAPE: Mass	Phase 1	Low	Large	Permanent Neutral	Moderate	No existing development/massing on baseline site. Phase 1 of West Southall development establishes new townscape and urban mass on eastern part of site.
	Phase 2	Low	Large	Permanent Neutral	Moderate	No existing development/massing on baseline site. Phase 2 of West Southall development establishes new townscape and urban mass on central and northern part of site.
	Phase 3	Low	Large	Permanent Neutral	Moderate	No existing development/massing on baseline site. Phase 3 of West Southall development establishes new townscape and urban mass on south/western part of site.
	Operation Yr 1	Low	Large	Permanent Neutral	Moderate	West Southall development establishes new coherent, townscape and urban mass.
	Operation Yr 15	Low	Large	Permanent Neutral	Moderate	As per Year 1
Height	Phase 1	High	Large	Permanent Neutral	Substantial	Maximum storey heights generally limited adjacent to former Water Tower and existing low-rise housing. Phase 1 maximum storey heights vary from 10.5m above site datum (3 storeys) close to Beaconsfield Road to 36.5m above site datum (10 storeys) close to the gasholder and 46m (12 storeys) toward the eastern end of the proposed main street.

Table D: Townscape Assessment: West Southall Site Character Area

(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
	Phase 2	High	Large	Permanent Neutral	Substantial	Maximum storey heights controlled adjacent to existing low-rise housing and along Canal frontage. Phase 2 varies from 10.5m above site datum (3 storeys) to 57m above site datum (17 storeys) adjacent to the proposed urban square.
	Phase 3	High	Large	Permanent Neutral	Substantial	Maximum storey heights controlled adjacent to railway (to south of new park). Phase 3 varies from 13.5m above site datum (4 storeys) to 36.5m above site datum (10 storeys) adjacent to Canal and main road.
	Operation Yr 1	High	Large	Permanent Neutral	Substantial	Varied storey heights to add articulation and emphasise key nodal points/create new landmarks and points of orientation.
	Operation Yr 15	High	Large	Permanent Neutral	Substantial	As per Year 1
Density	Phase 1	Moderate	Large	Permanent Neutral	Substantial	Density in keeping with urban context of Outer London.
	Phase 2	Moderate	Large	Permanent Neutral	Substantial	As per Phase 1
	Phase 3	Moderate	Large	Permanent Neutral	Substantial	As per Phase 1
	Operation Yr 1	Moderate	Large	Permanent Neutral	Substantial	As per Phase 1
	Operation Yr 15	Moderate	Large	Permanent Neutral	Substantial	As per Year 1
Grain	Phase 1	Moderate	Large	Permanent Beneficial	Moderate	Baseline open site has no recognisable grain. Rectilinear grain of existing Beaconsfield Road area development extended into northernmost par of West Southall site. However, emphasis given to east-west grain due to shape, orientation and characteristics of West Southall Site as a whole.
	Phase 2	Moderate	Large	Permanent Beneficial	Moderate	As per Phase 1, but new less regular grain established at heart of Site.

Table D: Townscape Assessment: West Southall Site Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
	Phase 3	Moderate	Large	Permanent Beneficial	Moderate	Mixed rectilinear/curvilinear grain established in southwest portion of Site.
	Operation Yr 1	Moderate	Medium	Permanent Beneficial	Moderate	Mixed rectilinear and curvilinear grain will contribute to creating a distinctive townscape character for West Southall.
	Operation Yr 15	Moderate	Medium	Permanent Beneficial	Moderate	As per Year 1.
Edges	Phase 1	High	Medium	Permanent Beneficial	Substantial	Residential properties along Beaconsfield Road edge sensitive to changes in use, massing and form. Proposed development respects sensitivity by restricting height and massing etc. Creation of links through to Beaconsfield Road also assists in melding edges together.
	Phase 2	High	Large	Permanent Beneficial	Substantial	Canal frontage forms sensitive edge to Site. Proposed buildings set back and public and private realm established to soften effect of massing of buildings and to enhance and integrate open space.
	Phase 3	High	Large	Permanent Beneficial	Substantial	As per Phase 2 for Canal frontage. Edge treatment along railway frontage to south sets buildings back to create public and private realm to enhance corridor and reduce potential effect and
	Operation Yr 1	High	Large	Permanent Beneficial	Substantial	Existing and proposed buildings create and define open space and route edges. Canal and Beaconsfield Road edges of particular sensitivity, but this is offset by restriction of maximum building heights, building set back and creation of canal side promenade/towpath enhancement.
	Operation Yr 15	High	Large	Permanent Beneficial	Substantial	As per Year 1.

Table D: Townscape Assessment: West Southall Site Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor Importance/ Value	Effect Magnitude/ Scale	Nature of Effect	Significance	Comments
Spaces	Phase 1	High	Medium	Permanent Beneficial	Substantial	New formal open space/local play areas, and incidental urban spaces/public realm created during Phase 1.
	Phase 2	High	Large	Permanent Beneficial	Substantial	Major open space and neighbourhood play areas, plus incidental public realm created during Phase 2, particularly along Canal frontage.
	Phase 3	High	Medium	Permanent Beneficial	Substantial	New informal open space, local and neighbourhood play areas, and incidental public realm created during Phase 3, particularly along Canal frontage.
	Operation Yr 1	High	Large	Permanent Beneficial	Substantial	Major open spaces and public realm (urban spaces and thoroughfares) provide setting for new built development and establish high quality townscape throughout character area.
	Operation Yr 15	High	Large	Permanent Beneficial	Substantial	As per Year 1
Connectivity and Links	Phase 1	High	Large	Permanent Beneficial	Substantial	New vehicular and non-vehicular connections established between West Southall and Beaconsfield Road. Pump Lane Link Road and eastern accesses constructed.
	Phase 2	Moderate	Medium	Permanent Beneficial	Moderate	Temporary disturbance to Grand Union Canal towpath during construction of Minet Footbridge and Pedestrian Bridge, and northeast area of the Site - offset by substantial improvements to long-term accessibility of Canal and direct links to Minet Country Park.

Table D: Townscape Assessment: West Southall Site Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
	Phase 3	Moderate	Small	Permanent Beneficial	Moderate	Temporary disturbance to Grand Union Canal towpath south of proposed Minet Footbridge during construction offset by substantial improvements to long-term accessibility of Canal and Minet Country Park to west.
	Operation Yr 1	High to Moderate	Large	Permanent Beneficial	Substantial	Opening up of privately owned, introverted area through creation of new linkages to north, east and west. Southern linkages prohibited by Paddington-Bristol railway. Provision of increased choice and variety of links into and through West Southall and wider area.
	Operation Yr 15	High to Moderate	Large	Permanent Beneficial	Substantial	As per Year 1.
Mix of Uses	Phase 1	Moderate	Medium	Permanent Beneficial	Moderate	Temporary existing use of site as airport car parking and storage transformed by diversification in mix of uses, introducing retail, residential, employment and public realm.
	Phase 2	Moderate	Medium	Permanent Beneficial	Moderate	As per Phase 1, but introduces school, health, and cinema and public realm.
	Phase 3	Moderate	Small	Permanent Beneficial	Moderate	No effect
	Operation Yr 1	Low	Medium	Permanent Beneficial	Moderate	Increased mix of uses arising from development (retail, residential, commercial and public realm).
	Operation Yr 15	Low	Medium	Permanent Beneficial	Moderate	Mix of uses within character area diversified further with addition of school/health/cinema developments.

Table D: Townscape Assessment: West Southall Site Character Area

(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
Public Access	Phase 1	Moderate	Large	Permanent Beneficial	Moderate	Land in private ownership/restricted access due to construction works. Public access established on completion of this Phase, including Pump Lane Link Road (see Connectivity and Links above).
	Phase 2	Moderate	Large	Permanent Beneficial	Moderate	Land in private ownership/restricted access due to construction works. Public access established on completion of this Phase, including Minet Footbridge and Pedestrian Footbridge (see Connectivity and Links above).
	Phase 3	Moderate	Large	Permanent Beneficial	Moderate	Land in private ownership/restricted access due to construction works.
	Operation Yr 1	Moderate	Large	Permanent Beneficial	Moderate	Site-wide opening up of privately owned, exclusive area and creation of public realm across West Southall area.
	Operation Yr 15	Moderate	Large	Permanent Beneficial	Moderate	As per Year 1.
Landmarks	Phase 1	Moderate to Low	Small	Permanent Beneficial	Moderate	Restriction of proposed storey heights maintains status of landmarks in adjacent character areas (retained gasholder to south and former Water Tower to east). New landmark features/buildings established as part of the Development (up to 46m above site datum, 12 storeys).

Table D: Townscape Assessment: West Southall Site Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
	Phase 2	Low	Medium	Permanent Beneficial	Moderate	Restriction of proposed storey heights maintains status of landmark to south in adjacent character areas (retained gasholder, approximately 91m high). New landmark features/buildings established as part of the Development (up to 57m above site datum, 17 storeys).
	Phase 3	Low	Small	Permanent Beneficial	Moderate	Restriction of proposed storey heights maintains status of landmark to south in adjacent character areas (retained gasholder, approximately 91m high). New landmark features/buildings established as part of the Development (up to 36.5m above site datum, 10 storeys).
	Operation Yr 1	Low	Small	Permanent Beneficial	Moderate	Restriction of impacts on influence of existing landmarks, and creation of new landmarks.
	Operation Yr 15	Low	Small	Permanent Beneficial	Moderate	As per Year 1
Vistas	Phase 1	High	Medium	Temporary Adverse to Permanent Beneficial	Moderate	Vistas along The Straight experience temporary impact during construction. New vistas created northward through to Beaconsfield Road, and within West Southall Site. New Pump Lane Link Road and bridge afford elevated views across Minet Country Park and the Yeading Brook/GUC corridor.

Table D: Townscape Assessment: West Southall Site Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
	Phase 2	High	Small	Temporary Adverse to Permanent Beneficial	Moderate	Temporary construction impacts to Grand Union Canal towpath due to ongoing development and construction of pedestrian bridges. New vistas created northward through to Beaconsfield Road and within West Southall Site. New bridges afford vistas to Minet Country Park and the Yeading Brook/GUC corridor.
	Phase 3	High	Small	Temporary Adverse to Permanent Beneficial	Moderate	Temporary construction impacts to Grand Union Canal towpath due to ongoing development. New vistas created within West Southall Site, and toward new park in particular. Multiple vistas between Minet Country Park and the Yeading Brook/GUC corridor and the Development.
	Operation Yr 1	High	Medium	Permanent Beneficial	Substantial	Vistas gained into, out of, and within West Southall Site along newly established public streets (see also trees and vegetation below).
	Operation Yr 15	High	Medium	Permanent Beneficial	Substantial	As per Year 1, but vistas enhanced by maturing vegetation (see below).
Trees and Vegetation	Phase 1	Moderate to Low	Large	Temporary Adverse	Moderate	Temporary loss of mature trees and scrub. Extensive new tree and shrub planting as part of comprehensive, co-ordinated landscape proposals.

Table D: Townscape Assessment: West Southall Site Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
	Phase 2	Moderate	Large	Long-term Beneficial	Moderate	No further effect on loss of existing vegetation, assuming all vegetation cleared within character area in Phase 1. Extensive new tree and shrub planting as part of comprehensive, co-ordinated landscape proposals – including new park.
	Phase 3	Moderate	Large	Long-term Beneficial	Moderate	No further effect on loss of existing vegetation, assuming all vegetation cleared within character area in Phase 1. Extensive new tree and shrub planting as part of comprehensive, co-ordinated landscape proposals.
	Operation Yr 1	Moderate	Small	Permanent Beneficial	Moderate	New tree and shrub planting established, at least 5 years old.
	Operation Yr 15	Moderate	Medium	Permanent Beneficial	Moderate	New tree and shrub planting well established and maturing, at least 20 years old.

Table E: Townscape Assessment: NationalGrid Gas Compound Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor Importance/ Value	Effect Magnitude/ Scale	Nature of Effect	Significance	Comments
NATIONALGRID GAS COMPOUND HERITAGE: Heritage Buildings and Structures – Loss or demolition of, or impact upon recognised historic features.	All Phases and Operational Years	N/A	-	-	-	No features of acknowledged heritage interest in this area. Retained landmark gasholder first appears on 1935 OS map.
Context and visual connections to heritage features	All Phases and Operational Years	N/A	-	-	-	As above
OPEN SPACES: Loss of/impairment of open space	All Phases and Operational Years	N/A	-	-	-	No public open space in this area.
CHARACTER: Influence on townscape character	All Phases and Operational Years	N/A	-	-	-	The gas compound has a negative effect on the character and quality of adjacent areas, but is an established feature and represents the original function of the West Southall Site.
TOWNSCAPE: Mass	All Phases and Operational Years	N/A	-	-	-	No change.
Height	All Phases and Operational Years	N/A	-	-	-	No new development within this area, but the gasholder continues to be the dominant tall structure at c.91m high (AGL) within the vicinity of West Southall, even with the new development in place.
Density	All Phases and Operational Years	N/A	-	-	-	No change.

Table E: Townscape Assessment: NationalGrid Gas Compound Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
Grain	All Phases and Operational Years	N/A	-	-	-	No change within this character area; but gas compound forms interruption within southern part of West Southall site that affects grain within that character area.
Edges	Phase 1	Low	Negligible	Permanent Neutral	Negligible	Gas compound forms edge to new mixed development to east and new park to west, but no change within this character area.
	Phase 2	Low	Negligible	Permanent Neutral	Negligible	Gas compound forms edge to new public open space to north and west, but no change within this character area.
	Phase 3	N/A	-	-	-	No change
	Operation Yr 1	Low	Negligible	Permanent Neutral	Negligible	See Phases 1 and 2
	Operation Yr 15	Low	Negligible	Permanent Neutral	Negligible	As per Year 1.
Spaces	All Phases and Operational Years	N/A	-	-	-	No change.
Connectivity and Links	All Phases and Operational Years	N/A	-	-	-	No change.
Mix of Uses	All Phases and Operational Years	N/A	-	-	-	No change.
Public Access	All Phases and Operational Years	N/A	-	-	-	No change.
Landmarks	All Phases and Operational Years	N/A	-	-	-	No change; landmark value of gasholder maintained.
Vistas	All Phases and Operational Years	N/A	-	-	-	No change.
Trees and Vegetation	All Phases and Operational Years	N/A	-	-	-	No change.

Table F: Townscape Assessment: Former Cricket Pitch Character Area

(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
FORMER CRICKET PITCH HERITAGE: Heritage Buildings and Structures – Loss or demolition of, or impact upon recognised historic features (i.e. associated with former Water Tower).	Phase 1	High	Medium	Temporary Adverse	Substantial	No features of recognised heritage value within this character area therefore no direct impacts from redevelopment. Indirect temporary impact upon curtilage of Listed former Water Tower from construction of adjacent residential and retail development in this character area.
	Phase 2	N/A	-	-	-	No change
	Phase 3	N/A	-	-	-	No change
	Operation Yr 1	High	Medium	Permanent Adverse	Substantial	Replacement of open land with new urban form to rear of former Water Tower.
	Operation Yr 15	High	Medium	Permanent Adverse	Substantial	Replacement of open land with new urban form to rear of former Water Tower.
Context and visual connections to heritage features	Phase 1	High	Medium	Temporary Adverse	Substantial	Direct temporary impacts upon westward views from Listed former Water Tower from development in this character area.
	Phase 2	High	Medium	Temporary Adverse	Substantial	Indirect temporary impact upon westward views from Listed former Water Tower during development of school/health centre/cinema), although this is separated by Phase 1 residential and retail development in this character area.
	Phase 3	N/A	-	-	-	No change
	Operation Yr 1	High	Medium	Permanent Adverse	Substantial to Moderate	Permanent impact upon views from Water Tower, but new development in keeping with urban context that surround former Water Tower to north, east and south.

Table F: Townscape Assessment: Former Cricket Pitch Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
	Operation Yr 15	High	Medium	Permanent Adverse	Substantial to Moderate	As per Year 1.
OPEN SPACES: Loss of/impairment of open space	Phase 1	Moderate	Large	Temporary Adverse	Moderate	Loss and clearance of private, neglected open space and trees (tree loss assessed below). Temporary adverse impacts during construction works.
	Phase 2	Moderate	Small	Temporary Adverse	Moderate	Development of remaining part of character area (school/health/cinema)
	Phase 3	N/A	-	-	-	No effect
	Operation Yr 1	Moderate	Large	Permanent Adverse	Moderate	Permanent replacement of neglected *private* open space with new high quality built form, although this adverse effect will be mitigated by provision new *public* space will be provided as part of the wider West Southall development (see Table D: Open Spaces above).
	Operation Yr 15	Moderate	Large	Permanent Adverse	Moderate	As per Year 1
CHARACTER: Influence on townscape character	Phase 1	Moderate	Large	Temporary Adverse	Moderate	Construction impacts will have temporary adverse impact on character.
	Phase 2	Moderate	Large	Temporary Adverse	Moderate	Localised construction impacts will have temporary impact on character of existing and new neighbouring developments.
	Phase 3	N/A	-	-	-	No effect
	Operation Yr 1	Moderate	Large	Permanent Beneficial	Moderate	Replacement of neglected private open space with high quality townscape.
	Operation Yr 15	Moderate	Large	Permanent Beneficial	Moderate	As per Year 1
TOWNSCAPE: Mass	Phase 1	Low	Large	Permanent Neutral	Moderate	No existing development/massing on baseline site. West Southall development establishes new townscape and urban mass, although sizeable area will not be developed until Phase 2 (see below).

Table F: Townscape Assessment: Former Cricket Pitch Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor Importance/ Value	Effect Magnitude/ Scale	Nature of Effect	Significance	Comments
	Phase 2	Low	Large	Permanent Neutral	Moderate	Development of school/health/cinema completes new urban form and massing within this character area.
	Phase 3	N/A	-	-	-	No effect
	Operation Yr 1	Low	Large	Permanent Neutral	Moderate	West Southall development establishes new coherent, townscape and urban mass.
	Operation Yr 15	Low	Large	Permanent Neutral	Moderate	As per Year 1
Height	Phase 1	Low	Medium	Permanent Neutral	Moderate	Maximum storey heights generally limited adjacent to former Water Tower and existing low-rise housing.
	Phase 2	Low	Medium	Permanent Neutral	Moderate	As per Phase 1
	Phase 3	N/A	-	-	-	No effect
	Operation Yr 1	Low	Medium	Permanent Neutral	Moderate	Storey heights range from 3m to 27m above site datum (c.3 to 8 storeys).
	Operation Yr 15	Low	Medium	Permanent Neutral	Moderate	As per Year 1
Density	Phase 1	Moderate	Large	Permanent Neutral	Substantial	Density in keeping with established townscape of Southall.
	Phase 2	Moderate	Large	Permanent Neutral	Substantial	As per Phase 1
	Phase 3	N/A	-	-	-	No effect
	Operation Yr 1	Moderate	Large	Permanent Neutral	Substantial	As per Phase 1
	Operation Yr 15	Moderate	Large	Permanent Neutral	Substantial	As per Year 1
Grain	Phase 1	Moderate	Medium	Permanent Beneficial	Moderate	Grain of existing development to north extended into West Southall site, but emphasis given to east-west grain due to shape, orientation and characteristics of site.
	Phase 2	N/A	-	-	-	New urban grain within this character area established during Phase 1; no further effect at Phase 2.
	Phase 3	N/A	-	-	-	No change
	Operation Yr 1	Moderate	Medium	Permanent Beneficial	Moderate	As per Phase 1

Table F: Townscape Assessment: Former Cricket Pitch Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
	Operation Yr 15	Moderate	Medium	Permanent Beneficial	Moderate	As per Year 1.
Edges	Phase 1	High to Low	Medium	Permanent Beneficial	Substantial to Moderate	Proposed buildings and associated land uses will create and define open spaces and route edges. The edge adjacent to the former Water Tower is of particular sensitivity. Potential impacts will be offset by restriction of the maximum building height to 13.5m to 24m (4 to 6 storeys).
	Phase 2	High to Low	Small	Permanent Beneficial	Moderate to Minor	As per Phase 1, but maximum building height 18m (5 storeys).
	Phase 3	N/A	-	-	-	No effect
	Operation Yr 1	High to Low	Medium to Small	Permanent Beneficial	Moderate	As per Phases 1 and 2
	Operation Yr 15	High to Low	Medium to Small	Permanent Beneficial	Moderate	As per Year 1
Spaces	All Phases and Operational Years	Moderate	Small	Permanent Beneficial	Moderate	See Open Spaces above. Permanent loss of *private* open space will be offset in the longer-term by creation of new *public* open spaces in West Southall development. Creation of open spaces within this character area comprises public realm to main routes.
Connectivity and Links	Phase 1	Low	Small to Medium	Temporary Adverse to Permanent Beneficial	Minor to Moderate	Temporary adverse impact upon The Straight during construction. Improved connectivity by extending access from Grange Road, Lewis Road and The Straight into West Southall development area.
	Phase 2	Low	Small	Temporary Adverse to Permanent Beneficial	Minor	Temporary adverse impact upon The Straight during construction. Improved connectivity with The Straight.
	Phase 3	N/A	-	-	-	No effect

Table F: Townscape Assessment: Former Cricket Pitch Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
	Operation Yr 1	Moderate	Medium	Permanent Beneficial	Moderate	Permanent benefits gained from creation of new connections into Beaconsfield Road, Grange Road and via The Crescent to South Road. Enhancement of The Straight.
	Operation Yr 15	Moderate	Medium	Permanent Beneficial	Moderate	As per Year 1
Mix of Uses	Phase 1	Low	Medium	Temporary Adverse to Permanent Beneficial	Moderate	Use of area during construction works limits diversification of mix of uses, but in turn introduces retail, residential, and public realm (see Operational Years 1 and 15).
	Phase 2	Low	Small	Temporary Adverse to Permanent Beneficial	Minor	As per Phase 1, but introduces school, health, and cinema and public realm.
	Phase 3	N/A	-	-	-	No effect
	Operation Yr 1	Low	Medium	Permanent Beneficial	Moderate	Increased mix of uses arising from development (retail, residential and public realm, diversified further with addition of school/health/cinema developments).
	Operation Yr 15	Low	Medium	Permanent Beneficial	Moderate	As per Year 1
Public Access	Phase 1	High	Negligible	Temporary Neutral	Negligible	Land in private ownership/restricted access due to construction works.
	Phase 2	High	Negligible	Temporary Neutral	Negligible	Development of school/health/cinema will be completed in Phase 2, but access to part of the character area will be temporarily restricted during construction works.
	Phase 3	N/A	-	-	-	No effect
	Operation Yr 1	High	Medium	Permanent Beneficial	Substantial	Public access would be gained along new West Southall thoroughfares to land previously in private ownership.
	Operation Yr 15	High	Medium	Permanent Beneficial	Substantial	As per Year 1.

Table F: Townscape Assessment: Former Cricket Pitch Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
Landmarks	All Phases and Operational Years	N/A	-	-	-	No effects – no landmarks occur within this character area. Restriction of proposed storey heights maintains status of landmarks in adjacent areas (retained gasholder to west and former Water Tower to east).
Vistas	Phase 1	High	Small	Temporary Adverse	Moderate	Vistas along The Straight experience temporary impact during construction. New vistas created northward through to Beaconsfield Road, and within West Southall Site.
	Phase 2	High	Small	Temporary Adverse	Moderate	Temporary construction impacts to The Straight due to school/health/cinema construction.
	Phase 3	N/A	-	-	-	No effect
	Operation Yr 1	High	Medium	Permanent Beneficial	Substantial	Vistas gained into, out of, and within West Southall Site along established public streets (see also trees and vegetation below).
	Operation Yr 15	High	Medium	Permanent Beneficial	Substantial	Vistas gained into, out of, and within West Southall Site along mature public streets (see also trees and vegetation below).
Trees and Vegetation	Phase 1	Moderate	Large	Temporary Adverse to Permanent Beneficial	Moderate	Temporary loss of mature trees and scrub. New planting will offset temporary loss.
	Phase 2	Moderate	Small	Permanent Beneficial	Moderate	No further effect on tree loss – assuming all vegetation cleared within character area in Phase 1. New planting will offset temporary loss.
	Phase 3	N/A	-	-	-	No effect.

Table F: Townscape Assessment: Former Cricket Pitch Character Area
(For Visual Impact Assessment see Appendix 11.6)

Asset/Feature	Phase	Receptor	Effect		Significance	Comments
		Importance/ Value	Magnitude/ Scale	Nature of Effect		
	Operation Yr 1	Moderate	Small	Permanent Beneficial	Moderate	New street tree planting established, at least 5 years old.
	Operation Yr 15	Moderate	Medium	Permanent Beneficial	Moderate	New street tree planting maturing, at least 20 years old.

APPENDIX 11.5 VISUAL IMPACT SCHEDULES

Table G: Visual Impact Schedule – Local Views

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
Residential Properties	Dudley Road, looking north (photo view 22)	Low	Phase 1: Views controlled by existing built form and street trees. Maximum proposed height buildings (up to 12 storeys) along main street and immediately to north of gasholder would be glimpsed just above foreground development and behind gasholder. Proposed buildings of 8 storeys or less would tend to be hidden by foreground development and obstructions due to distance from viewer and angle of view. Temporary, medium-term impacts will occur from tall construction plant such as cranes that will be visible above foreground development.	Close range, direct	Small to Negligible	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral (Operational)	Minor
			Phase 2: Much of the proposed Phase 2 development would be hidden by foreground development and vegetation, but where visible it would be seen behind the gasholder. The tallest proposed building (17 storeys) is approximately in line with this viewpoint and the gasholder, and therefore would be hidden by it (see also Viewpoints 23 and 24). Construction cranes would create temporary medium-term impacts as this Phase is developed.	Close range, Direct and oblique	Negligible	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral (Operational)	Negligible
			Phase 3: Phase 3 development largely hidden by intervening development and vegetation. The uppermost storeys of isolated 10 storey buildings (36.5m above Site datum) may be glimpsed. Construction cranes would create temporary medium-term impacts as this Phase is developed.	Close range, oblique	Negligible	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral (Operational)	Negligible
			Operation Year 1: Proposed tree planting within the Site unlikely to influence views from this vantage point.	Close range, Direct and oblique	Negligible	Permanent	Neutral	Negligible

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
			Operation Year 15: Trees along Dudley Road would continue to screen views of the development. Proposed planting within Site unlikely to have additional long-term effect on this view.	Close range, Direct and oblique	Negligible	Permanent	Neutral	Negligible
	Dudley Road/ Queens Road looking north (photo view 23)	Moderate	Phase 1: Views of the Site currently dominated by gasholder. Maximum height development immediately to north of gasholder (10 storeys, 36.5m ASD) and along main street (12 storeys, 46m) would at most be just visible above ridge of existing houses. Oblique private views of proposed development would be available from 1st floor windows of properties on Queen's Road.	Close range, oblique	Small	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral /Adverse (Operational)	Moderate
			Phase 2: Cranes during construction would create temporary, medium-term impacts as this Phase is developed. Direct private views of proposed development would be available from 1st floor windows of properties on Queen's Road towards Phase 2 development, although new development would be seen as a backdrop to gasholder and gas compound.	Close range, direct	Small	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral /Adverse (Operational)	Moderate
			Phase 3: Proposed development immediately north of the railway would be hidden by existing development when viewed from Dudley Road/Queens Road. Oblique private views of proposed development would be available from 1st floor windows of properties on Queen's Road. Cranes during construction would create temporary medium-term impacts as this phase is developed.	Close range, oblique	Small to Medium	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral (Operational)	Moderate
			Operation Year 1: Proposed planting would help to soften development immediately to north of railway, but taller structures would remain visible above the tree canopy.	Close range, direct and oblique.	Small to Medium	Permanent	Neutral	Moderate

Visual Receptor			Visual Effects of the Development					Significance
Description	Location	Importance/ Value/ Sensitivity	Description	Distance & angle of view	Magnitude / Scale	Duration	Nature of Effect	
			Operation Year 15: Trees along Dudley Road/Queens Road would continue to screen views of the development. Proposed planting within Site unlikely to have additional long-term effect on this view.	Close range, direct and oblique.	Small to Medium	Permanent	Neutral to Adverse	Moderate
	Balfour Road/ Johnstone Street looking north (photo view 25)	Moderate	Phase 1: Views of the Phase 1 development area from this viewpoint largely screened by existing housing and avenue tree planting on Balfour Road; only glimpsed views may be gained between buildings and would be a minor element within the view.	Close range, oblique	Small to Negligible	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral (Operational)	Moderate
			Phase 2: Existing development and tree cover continues to control views to the Site, as per Phase 1. Establishment of planting within proposed park (west of gas compound) will soften views toward much of Phase 2 area, although taller buildings along the main street (10 to 17 storeys, 36.5m to 57m ASD) would be visible.	Close range, oblique	Medium to Small	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral (Operational)	Moderate
			Phase 3: Existing development and tree cover continues to control views to the Site, as per Phase 1, but direct views are channelled along roadway. Proposed 4-storey (13.5m ASD) buildings would partly close-off views along Balfour Road and would mask sections of taller 8 and 10 storey buildings along proposed main road (west of the park). Taller buildings (8 to 10 storeys, 34.5 to 36.5m ASD) along the canal frontage would be obscured by new Phase 3 development adjacent to railway.	Close range, direct	Medium	Temporary (Medium Term) to Permanent	Adverse (Construction and Operational)	Moderate
			Operation Year 1: New development along railway edge and planting to park would continue to screen new structures of intermediate height (5 to 7 storeys).	Close range, direct and oblique	Medium to Small	Permanent	Neutral to Adverse	Moderate
			Operation Year 15: Growth of the proposed tree planting immediately to north of the railway would assist in partially screening housing blocks.	Close range, direct and oblique	Medium to Small	Permanent	Beneficial	Moderate

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
Residential Properties	Beaconsfield Road/ Grange Road, looking south (photo view 4)	Moderate	Phase 1: Grange Road would be extended southwards into the Site, forming one of the minor accesses to Beaconsfield Road. Short-term adverse visual impacts arising from the demolition of two properties and the removal of mature trees would be offset by the establishment of new development zones of 4 to 6-storeys (13.5m to 21m), drawing the eye into the development. Oblique views to the 12-storey structure toward the eastern end of the main street would be visible above existing housing, but would be seen in the context of and rising above the new low-rise development. Upper floors of buildings along the main street are likely to be visible, but these would not form a dominant element of the view. Cranes during construction would create temporary medium-term impacts as this phase is developed.	Close range, direct	Medium	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Moderate
			Phase 2: When viewed from this location, existing housing would obscure much of the Phase 2 area. A new vista would be created toward a pocket of Phase 2 development (school/health/cinema) glimpsed between and in the context of the new Phase 1 development as an extension of Grange Road. Cranes during construction would create temporary short -term impacts as this phase is developed.	Close range, oblique	Small	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral/ Beneficial (Operational)	Moderate
			Phase 3: Phase 3 development would not be visible form this vantage point.	N/A	N/A	N/A	N/A	N/A
			Operation Year 1: There would be little change over and above Phase 1 impacts, although tree planting along the main street would mature and frame views.	Close range, direct and oblique	Medium	Permanent	Beneficial	Moderate

Visual Receptor			Visual Effects of the Development					Significance
Description	Location	Importance/ Value/ Sensitivity	Description	Distance & angle of view	Magnitude / Scale	Duration	Nature of Effect	
			Operation Year 15: As per Year 1.	Close range, direct and oblique	Medium	Permanent	Beneficial	Moderate
	Beaconsfield Road/ Trinity Road, looking south (Illustrative Comparative View D)	Moderate	Phase 1: The existing entrance to the self-storage site would become one of the minor accesses into the West Southall Site. A narrow block of new residential development (3 to 4 storeys, 10.5 to 13.5m ASD) would back onto existing properties along Beaconsfield Road, screening buildings to the south that rise in height toward the gasholder when viewed from Beaconsfield Road and associated residential properties. The new access would link directly to a new urban square with a backdrop of the retained gasholder. Cranes and ground-level hoardings during construction would create temporary medium-term impacts as this phase is developed.	Close range, direct	Large to Medium	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Moderate
			Phase 2: A small pocket of Phase 2 development (11-storey hotel) flanks the western side of the new access and may be glimpsed from Beaconsfield Road along the new access. Existing and Phase 1 development would largely obscure the remainder of the Phase 2 area further to the west. Cranes and ground-level hoardings during construction would create temporary medium-term impacts as this phase is developed.	Close range direct and oblique	Large to Medium	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Moderate
			Phase 3: Development and construction activity (including cranes) in the Phase 3 area would not be visible from this viewpoint.	N/A	N/A	N/A	N/A	N/A
			Operation Year 1: There would be little change over and above Phase 1 impacts, although tree planting along the main street would mature and frame views.	Close range, direct and oblique	Large to Medium	Permanent	Beneficial	Moderate

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
			Operation Year 15: As per Year 1.	Close range, direct and oblique	Large to Medium	Permanent	Beneficial	Moderate
	Beaconsfield Road/ West End Road, looking south (photo view 3)	Moderate	Phase 1: Direct views would be gained from the properties on Beaconsfield Road of one of the proposed access roads into the development site. The demolition of a property to create the access would have a short-term negative impact upon the street scene, opening up views into the Site. New 4-storey buildings immediately to the south of Beaconsfield Road would be visible beyond, but these would in turn screen views to the taller buildings (up to12-storeys) along the main street. A new vista would be created, punctuated by the main street and truncated by a 5-storey retail and residential unit close to the railway. Cranes and ground-level hoardings during construction would create temporary medium-term impacts as this phase is developed.	Close range, direct	Large	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral (Operational)	Moderate
			Phase 2: Development and construction activity (including cranes) in the Phase 2 area would not be visible from this viewpoint.	N/A	N/A	N/A	N/A	N/A
			Phase 3: Development and construction activity (including cranes) in the Phase 3 area would not be visible from this viewpoint.	N/A	N/A	N/A	N/A	N/A
			Operation Year 1: There would be little change over and above Phase 1 impacts, although tree planting along the access route and main street would mature and frame views.	Close range, direct and oblique	Large	Permanent	Neutral to Beneficial	Moderate
			Operation Year 15: Street tree planting would be a feature of the new residential areas and this would soften the transition between the existing and proposed housing.	Close range, direct and oblique	Large	Permanent	Beneficial	Moderate

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
Residential Properties	Beaconsfield Road/ Ranelagh Road, looking south (photo view 1)	Moderate	Phase 1: Direct views would be gained from the Beaconsfield Road along the new access road into the development site. The demolition of a property to create the minor access would have a short-term impact upon the street scene, opening up views into the Site. New 3 and 4-storey buildings immediately to the south of existing houses would partly screen taller structures to the south. Cranes and ground-level hoardings during construction would create temporary medium-term impacts as this phase is developed.	Close range, direct	Large	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral (Operational)	Moderate
			Phase 2: Phase 2 development will be visible to the east (left) of the access varying from 4 to 17 storeys. A new vista would be created from Beaconsfield Road south toward the new park to the west of the gas compound. Cranes and ground-level hoardings during construction would create temporary medium-term impacts as this phase is developed.	Close range direct and oblique	Medium to Small	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Moderate
			Phase 3: It is unlikely that development and construction activity (including cranes) in the Phase 3 area would be visible from this viewpoint.	N/A	N/A	N/A	N/A	N/A
			Operation Year 1: There would be little change over and above Phase 1 and 2 impacts, although tree planting along the access route and main street would mature and frame views.	Close range, direct and oblique	Large to Small	Permanent	Neutral to Beneficial	Moderate
			Operation Year 15: Street tree planting would be a feature of the new residential areas and this would soften the transition between the existing and proposed development.	Close range, direct and oblique	Large to Small	Permanent	Beneficial	Moderate

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
	The Straight, looking east towards the Southall Railway Bridge (photo view 19)	Moderate To High	Phase 1: Demolition of The Crescent and 6 properties on Randolph Road, and establishment of new access road, landscape planting and level change from The Crescent to South Road would create substantial localised change in views from this viewpoint. New high quality townscape (paving, street furniture and new grassed areas) would enhance the view from The Straight and the Water Tower.	Close range, direct	Large, Localised	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral (Operational)	Substantial to Moderate
			Phase 2: Short-term, temporary disruption to views during Southall Road Bridge widening.	Close range, oblique	Small to Negligible	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral (Operational)	Moderate
			Phase 3: No change	N/A	N/A	N/A	N/A	N/A
			Operation Year 1: There would be little change over and above Phase 1 and 2 impacts, although tree planting along the access route and main street would mature and frame views.	Close range direct and oblique	Medium	Permanent	Neutral to Beneficial	Moderate
			Operation Year 15: Generally as per Year 1, although trees will continue to mature and increase in stature.	Close range, direct and oblique	Medium	Permanent	Beneficial	Moderate
Community Buildings	Guru Nanak Sikh College looking east (no photo view available)	Moderate to Low	Phase 1: Limited views toward Phase 1 development from college, but elevated views likely to be gained from upper floors on east-facing facades. Effect of new development tempered by backdrop of existing urban form of Southall. Views of Pump Lane Link Road and bridge hidden by river valley/Minet Country Park vegetation. Cranes would create temporary medium-term impacts as this phase is developed.	Close to Medium range, direct (east-facing windows only)	Medium to Small	Temporary (Medium Term) to Permanent	Neutral (Construction and Operational)	Moderate

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
			Phase 2: Progressive development more apparent than Phase 1, particularly along GUC frontage of up to 10-storeys, although impact lessened by separating buffer of sports pitches, Yeading Football Club complex and vegetation along the river corridor. Gasholder would continue to be visible Minet Bridge would form striking new feature, but effect would be reduced by foreground of sports pitches. Springfield Footbridge obscured by Yeading FC complex and river valley scrub. Cranes would continue to create temporary medium-term impacts as this phase is developed; ground level activity would not generally be visible at this distance.	Close range, direct (east-facing windows only)	Medium to Small	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral (Operational)	Moderate
			Phase 3: Similar effects as per Phase 2, but ground level construction activity obscured by river valley vegetation and undulating land form. Cranes would continue to create temporary medium-term impacts as this phase is developed; ground level activity would not generally be visible at this distance.	Close range, oblique (south-facing windows only)	Small	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral (Operational)	Moderate
			Operation Year 1: Development within the body of the Main Site would tend to be screened by the canal side development. Tree planting along the canal frontage would continue to soften the western development frontage. Temporary construction impacts would be removed.	Close to Medium range, direct and oblique	Medium to Small	Permanent	Neutral to Beneficial	Moderate
			Operation Year 15: No significant changes to Year 1 are anticipated.	Close to Medium range, direct and oblique	Medium to Small	Permanent	Neutral to Beneficial	Moderate

Visual Receptor			Visual Effects of the Development					Significance
Description	Location	Importance/ Value/ Sensitivity	Description	Distance & angle of view	Magnitude / Scale	Duration	Nature of Effect	
Highways	Southall Railway Bridge west to former Water Tower and Gasholder (Comparativ e View B) [Ealing Local View 25]	Moderate to High	Phase 1: Locally noted view retained. Medium-term adverse impacts arising from loss of some mature vegetation to the west of the Water Tower (trees within curtilage of Water Tower would remain); impact offset by the establishment of varied new skyline within the Site. Cranes and ground-level hoardings during construction would create temporary medium-term impacts as this phase is developed.	Close range, direct	Large to Medium	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral /Beneficial (Operational)	Substantial to Moderate
			Phase 2: Taller structures would be introduced as part of Phase 2 (up to 17 storeys) and would be visible behind but appear lower and subservient to the Water Tower when viewed from this location. The proposed school/health/cinema development would be visible to the left of the Water Tower. This would be softened by proposed tree planting along the southern boundary of the site as it matures. Cranes and ground-level hoardings during construction would create temporary medium-term impacts as this phase is developed.	Close range, direct	Medium	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral (Operational)	Moderate
			Phase 3: Development at the far western corner of the site would just be visible to the left of the gasholder, but would form a very minor element within the view. This would be softened by proposed tree planting along the southern boundary of the site as it matures. Cranes and ground-level hoardings during construction would create temporary medium-term impacts as this phase is developed. Whilst there would be a general progression of construction activity from east to west within the Site, cranes etc. will be visible from this elevated vantage point for the duration of the development (i.e. fifteen years).	Close to Medium range, direct	Small to Negligible	Temporary (Medium Term) to Permanent	Neutral (Construction) to Neutral (Operational)	Minor

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
			Operation Year 1: There would be little change over and above the phased impacts, although tree planting along the access route and main street would mature and soften views to the new buildings, thus 'anchoring' them within the site. A notable change would be the removal of construction features including cranes.	Close to Medium range, direct	Medium	Permanent	Beneficial	Moderate
			Operation Year 15: Generally as per Year 1, although trees will continue to mature and increase in stature.	Close to Medium range, direct	Medium	Permanent	Beneficial	Moderate
Highways	South Road Bridge looking northwest toward The Crescent (Illustrative Comparative View C)	Moderate to High	Phase 1: Demolition of The Crescent and 6 properties on Randolph Road, and establishment of new access road, landscape planting and level change from The Crescent to South Road would create substantial localised change in views from this viewpoint. New high quality townscape (paving, street furniture and new grassed areas) would enhance the view.	Close range, oblique	Large, Localised	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Substantial to Moderate
			Phase 2: Temporary disruption due to bridge widening works. No change arising from built development.	Close range, oblique	Small to Negligible	Temporary (Short Term)	Adverse (Construction) to Neutral (Operational)	Negligible
			Phase 3: No change	N/A	N/A	N/A	N/A	N/A
			Operation Year 1: No significant changes to Year 1 views are anticipated, although proposed urban tree planting would continue to mature, providing further softening of the townscape.	Close range, oblique	Medium	Permanent	Beneficial	Moderate

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
			Operation Year 15: As per Year 1	Close range, oblique	Medium	Permanent	Beneficial	Moderate
Highways	The Green, Southbridge Road looking northwest (photo view 20)	Low	Phase 1: Proposed buildings at or below 7-storeys (24m ASD) would generally be obscured by existing development to the south of the railway. The upper floors of 10 and 12-storey structures to the northeast of the gasholder would be visible to the right of the view. High-level cranes during construction would create temporary medium-term impacts as this phase is developed.	Close range, oblique	Small	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral (Operational)	Minor
			Phase 2: Much of the development proposed during Phase 2 is likely to be screened from this vantage point by the earlier Phase 1 construction. However, the uppermost floors of the proposed 17-storey hotel may be visible to the right of the gasholder. High-level cranes during construction would create temporary short to medium-term impacts as this phase is developed, although effect would diminish as the development proceeds westward.	Close range, oblique	Small to Negligible	Temporary (Medium Term) to Permanent	Adverse (Construction) to Neutral (Operational)	Negligible
			Phase 3: Proposed development within this area would be largely screened by existing development to the left (west) of the gasholder. There would be negligible change in the view.	N/A	N/A	N/A	N/A	N/A
			Operation Year 1: Impacts generally as per Phase 1, although the uppermost part of the Phase 2 hotel may be visible. All temporary construction impacts would cease.	Close to medium range, oblique	Small to Negligible	Permanent	Neutral	Negligible
			Operation Year 15: No significant changes to Year 1 are anticipated.	Close to medium range, oblique	Small to Negligible	Permanent	Neutral	Negligible

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
	South Road/ Beaconsfield Road looking west (photo view 9)	Low	Phase 1: Minor changes may be discernible from this viewpoint, but most of proposed development would be hidden by existing buildings along the southern edge of Beaconsfield Road.	Close range, oblique	Negligible	Temporary (Medium Term) to Permanent	Neutral (Construction and (Operational)	Negligible
			Phase 2: As per Phase 1	Close range, oblique	Negligible	Temporary (Medium Term) to Permanent	Neutral (Construction and (Operational)	Negligible
			Phase 3: As per Phase 1	Close range, oblique	Negligible	Temporary (Medium Term) to Permanent	Neutral (Construction and (Operational)	Negligible
			Operation Year 1: As per Phase 1	Close range, oblique	Negligible	Permanent	Neutral	Negligible
			Operation Year 15: As per Year 1	Close range, oblique	Negligible	Permanent	Neutral	Negligible
Railways	Paddington to Bristol Mainline Railway (no photo)	Moderate	Phase 1: New views would be opened up toward Minet Country Park by removal of vegetation for Pump Lane Link Road, although the duration of such views would depend upon train speed and would tend to be brief. Elevated open views across the eastern part of the Site would be controlled by new built form to east of gas compound, new views to east and high quality townscape, replacing views to car parking. Cranes and ground-level hoardings during construction would create temporary medium-term impacts as this phase is developed. Views from the railway would be tempered by the mode and speed of travel.	Close range direct	Large to Medium	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Moderate

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
			Phase 2: Slightly elevated open views across this area would be seen as a backdrop to the gasholder. Cranes and ground-level hoardings during construction would create temporary medium-term impacts as this phase is developed. Views from the railway would be tempered by the mode and speed of travel.	Close range, direct	Large to Medium	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Moderate
			Phase 3: Slightly elevated open views across Site would be controlled by new built form to west of gas compound, new views to east and high quality townscape, and replacing views to car parking. Cranes and ground-level hoardings during construction would create temporary medium-term impacts as this phase is developed. Views from the railway would be tempered by the mode and speed of travel.	Close range, direct	Large to Medium	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Moderate
			Operation Year 1: No further changes over and above Phase 3. Planting within Site would continue to mature, providing further softening of the townscape.	Close range, direct	Medium	Permanent	Beneficial	Moderate
			Operation Year 15: As per Year 1, but planting would continue to mature and soften views to Minet Country Park and within the development.	Close range, direct	Medium	Permanent	Beneficial	Moderate
Employment	Beaconsfield Road/ Springfield Road, looking east (no photo)	Very Low	Phase 1: Development during this phase is unlikely to be visible. High-level cranes during construction would create temporary medium-term impacts as this phase is developed; ground level construction features unlikely to be discernible at this distance.	Medium range, oblique	Small	Temporary (Medium Term) to Permanent	Neutral (Construction and Operational)	Negligible

Visual Receptor			Visual Effects of the Development					Significance
Description	Location	Importance/ Value/ Sensitivity	Description	Distance & angle of view	Magnitude / Scale	Duration	Nature of Effect	
			Phase 2: The upper levels of the proposed hotel (up to 17 storeys) would be discernible toward the centre-right of the view, to the left of the gasholder. Additional planting would blend the minor realignment of the road in the vicinity of Yeading Football Club. High-level cranes during construction would create temporary medium-term impacts as the northern part of this phase is developed.	Medium range, oblique	Small to Negligible	Temporary (Medium Term) to Permanent	Neutral (Construction) to Beneficial (Operational)	Negligible
			Phase 3: Medium to long-range views of this part of the development would be largely screened from view by virtue of topography and intervening development including the Sikh College.	Medium range, oblique	Negligible	Temporary (Medium Term) to Permanent	Neutral (Construction and Operational)	Negligible
			Operation Year 1: No additional effects anticipated over and above Phase 2 impacts. Proposed planting on approach to Pedestrian Bridge would be well established.	Medium range, oblique	Negligible	Permanent	Neutral	Negligible
			Operation Year 15: No significant changes over and above Year 1 are anticipated. However, growth of the proposed vegetation would continue to enhance the road re-alignment.	Medium range, oblique	Negligible	Permanent	Neutral	Negligible
	Brent Road, looking north to access beneath railway	Very Low	Phase 1: Changes in Phase 1 area not discernible from this vantage point.	N/A	N/A	N/A	N/A	N/A
			Phase 2: Changes in Phase 2 area not discernible form this vantage point.	N/A	N/A	N/A	N/A	N/A

Visual Receptor			Visual Effects of the Development					Significance
Description	Location	Importance/ Value/ Sensitivity	Description	Distance & angle of view	Magnitude / Scale	Duration	Nature of Effect	
	(photo view 26)		Phase 3: Upper levels of new development (5 to 8-storeys) immediately to the north of railway line visible. High-level cranes during construction would create temporary medium-term impacts as this phase is developed; ground level construction features would be screened by slightly elevated railway embankment.	Close range, direct and oblique	Large to Medium	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Minor
			Operation Year 1: No change anticipated over and above Phase 3.	Close to Medium range, direct and oblique	Medium	Permanent	Beneficial	Minor
			Operation Year 15: No significant changes to Year 1 views are anticipated.	Close to Medium range, direct and oblique	Medium	Permanent	Beneficial	Minor
Leisure and Public Rights of Way	Spencer Street play area, looking north (photo view 24)	Moderate to High	Phase 1: Oblique views toward the lower and intermediate height (6-storeys and below) elements of the Phase 1 development area would be largely obscured by the gasholder and existing intermittent vegetation along the southern edge of the railway. Glimpsed views may be gained of the upper floors of the tallest buildings to the northeast of the gasholder (10 and 12-storeys). Phase 1 development immediately to the south of Beaconsfield Road would be hidden by a combination of distance and foreground elements such as the railway embankment and bridge parapet (Spencer Street/White Street underpass). During construction cranes would create temporary medium-term impacts as development occurs immediately to the north of the railway; ground level construction features would be screened by the slightly elevated railway/embankment.	Close range, oblique	Medium	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Moderate

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
			Phase 2: Views of the upper floors of the maximum 10 to 12-storey development along the main street would be visible to the left of the gas holder guide frame to the centre left of the view (note the gasholder guide frame is scheduled to be removed by 2009 in advance of site development). In turn, these new buildings would tend to screen proposed Phase 2 buildings to the north. High-level cranes during construction would create temporary medium-term impacts as this phase is developed; ground level construction features would be screened by slightly elevated railway embankment. Proposed tree planting within the new park and along the north of the railway would have limited influence upon this view.	Close range, direct	Medium	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Moderate
			Phase 3: The upper floors and roofline of low-level development (4-storeys) immediately to the north of the railway would be visible, with the lower parts of the buildings being obscured by the railway and associated features. These buildings would lead the eye upward toward taller units proposed along the main street/canal frontage. High-level cranes during construction would create temporary medium-term impacts as this phase is developed; ground level construction features would be screened by slightly elevated railway embankment.	Close range, direct	Large	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Substantial
			Operation Year 1: Little change anticipated over and above Phase 3, although temporary construction impacts would be removed.	Close range, direct and oblique	Medium	Permanent	Beneficial	Moderate

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
			Operation Year 15: No significant changes to Year 1 views are anticipated, although tree canopies immediately to the north of the railway and within the southern part of the new park would be visible above the railway embankment.	Close range, direct and oblique	Medium	Permanent	Beneficial	Moderate
Leisure and Public Rights of Way	Minet Country Park (Illustrative Comparative Views J and K)	High	Phase 1: Development in this area would not be discernible from Minet Country Park due to the degree of separation and intervening land form/vegetation. High-level cranes during construction may be visible for the tallest elements of the Phase 1 development (12-storeys) but would not be a major element of the view, representing temporary medium-term impacts as this phase is developed. Ground level construction features would not be visible due to river corridor trees/scrub. Planting along the Pump Lane Link Road embankments would soften the impact of the proposed road.	Medium to close range, oblique	Small	Temporary (Medium Term)	Adverse (Construction) to Neutral (Operational)	Minor

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
			Phase 2: Development along the western frontage of the Site would be visible above the river corridor vegetation, particularly canal side buildings of up to 10-storeys. The light structural form of Minet Footbridge would be discernible from viewpoint K, and would in turn form the main focal point in View J on the approach to the bridge. Existing river corridor vegetation would largely hide Pedestrian Bridge. High-level cranes during construction would create temporary medium-term impacts as this phase is developed, particularly for the proposed hotel (17-storeys). Ground level construction features within the Site would be filtered by existing scrub but would be openly visible through gaps in vegetation created by bridge development. Temporary short-term impacts would occur during bridge construction. Proposed tree and shrub planting along bridge routes and canal frontage would 'anchor' the development and soften the interface between old and new. Pump Lane Link Road Planting maturing (minimum of 5-years old).	Close range, direct	Large	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Substantial

Visual Receptor			Visual Effects of the Development					Significance
Description	Location	Importance/ Value/ Sensitivity	Description	Distance & angle of view	Magnitude / Scale	Duration	Nature of Effect	
			Phase 3: Generally effects of the development would be similar to those of Phase 2, principally affecting the southern part of the Park. Views would continue to be controlled by the artificial topography of Minet Country Park and the intervening vegetation along the river but buildings along the canal side of 7 to 10-storeys would be visible above the riverside tree/scrub canopy. High-level cranes during construction would create temporary medium-term impacts as this phase is developed. Ground level construction features would not be visible. Pump Lane Link Road Planting maturing (minimum of 10-years old) and also pedestrian bridges (planting minimum 5-years old).	Close range, direct	Large to Medium	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Substantial
			Operation Year 1: Little change anticipated over and above Phases 2 and 3 development. Canal side development would largely screen views to development further east, and would be enhanced by frontage planting as it matures.	Medium to close range, direct to oblique	Medium	Permanent	Beneficial	Moderate
			Operation Year 15: No significant changes to Year 1 views are anticipated.	Medium to close range, direct to oblique	Medium	Permanent	Beneficial	Moderate
Leisure and Public Rights of Way	Pedestrian access beneath Hayes by-pass to Minet Country Park, looking east (no photo view)	Moderate to Low	Phase 1: Development in this area would not be discernible from this route due to the distance and intervening land form/vegetation. High-level cranes during construction may be visible for the tallest elements of the Phase 1 development (12-storeys) but would not be intrusive, representing temporary medium-term impacts as this phase is developed. Ground level construction features would not be visible.	Medium range, oblique	Negligible	Temporary (Medium Term)	Neutral (Construction and Operational)	Negligible

Visual Receptor			Visual Effects of the Development					Significance
Description	Location	Importance/ Value/ Sensitivity	Description	Distance & angle of view	Magnitude / Scale	Duration	Nature of Effect	
			Phase 2: Development along the western frontage of the Site may be glimpsed between the buildings of the Guru Nanak Sikh College, but would not form a significant element within the view. The light structural form of Minet Footbridge would be difficult to discern, but may be more apparent during darkness hours when illuminated. High-level cranes during construction would create temporary medium-term impacts as this phase is developed, particularly for the proposed hotel (17-storeys. Ground level construction features would not be visible.	Medium to close range, oblique	Small to Negligible	Temporary (Medium Term) to Permanent	Neutral (Construction and Operational)	Minor
			Phase 3: Generally the artificial topography of Minet Country Park and the intervening vegetation on the western edge of the Park would screen views to the development and Springfield Road Link Road, although taller elements (10-storeys) may be visible above the tree cover. High-level cranes during construction would create temporary medium-term impacts as this phase is developed, particularly for the proposed hotel (17-storeys. Ground level construction features would not be visible.	Close range, direct	Small to Negligible	Temporary (Medium Term) to Permanent	Neutral (Construction and Operational)	Minor
			Operation Year 1: Little change anticipated over and above Phase 3 development.	Medium to close range, direct to oblique	Negligible	Permanent	Neutral	Negligible
			Operation Year 15: No significant changes to Year 1 views are anticipated.	Medium to close range, direct to oblique	Negligible	Permanent	Neutral	Negligible

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
	Grand Union Canal towpath (and the canal), adjacent to the Blair Peach Primary School (Illustrative Comparative View E)	High	Phase 1: Proposed development would not be visible from this viewpoint.	N/A	N/A	N/A	N/A	N/A
			Phase 2: Close range views of the new waterfront edge of the development site. Buildings up to 10-storeys set back from the towpath edge and separated from it by new active canal zone with waterside tree planting. Temporary adverse impact from the loss of vegetation within the Main Site (to the left of the view), and a short length of vegetation to the right to create the Pedestrian Bridge in the far foreground. Minet Footbridge likely to be hidden by vegetation along the Canal. The enhanced and widened towpath would have high quality durable surfacing and materials.	Close range, direct	Large	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Substantial
			Phase 3: No direct views gained toward Phase 3 development, but upper floors of the 8 to 10-storey buildings would be visible in part above Yeading Brook corridor vegetation on the western side of the Canal.	Close range, oblique	Medium	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Substantial
			Operation Year 1: Planting adjacent to Canal would continue to mature and hide lower floors of buildings, in turn anchoring new development into Site. Impacts would remain similar to those arising from construction Phases 2 and 3.	Close range, direct and oblique	Large	Permanent	Beneficial	Substantial

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
			Operation Year 15: Growth of proposed tree planting to the Pedestrian Bridge would soften the embankment structures. Waterside planting along the towpath and within building courtyards would enhance the water frontage and soften the building edge.	Close range, direct and oblique	Large	Permanent	Beneficial	Substantial to Moderate
	Grand Union Canal towpath (and the canal), looking north and south (Illustrative Comparative Views F and G)	High	Phase 1: Assuming that vegetation and existing Site boundary walls/fencing are removed during Phase 1, views would be opened up into the Site, looking both north and south. Development in the northern part of the site, plus the main street up to eastern approach of Pump Lane Link Road would be visible in View F; the Pump Lane Link Road Bridge would be screened by river corridor vegetation in View G. During construction cranes would create temporary medium-term impacts as this phase is developed. Ground level construction features would be visible across a foreground of the Site, but would not form a major element.	Close range, oblique (View F only)	Large to Medium	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Substantial to Moderate
			Phase 2: Close range views of the new waterfront edge of the development site in both Views F and G. Pedestrian Bridge would form a new feature within View F. For View G, Minet Bridge would provide a foreground focal point as it spans the Canal and Yeading Brook. During construction cranes would create temporary medium-term impacts as this phase is developed. Ground level construction features would be in close proximity and openly visible in both directions.	Close range, direct	Large	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Substantial

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
			Phase 3: View F would not be affected by further development in Phase 3. Ten-storey buildings constructed as part of Phase 2, immediately to the north of Minet Bridge would partly screen southward views (View G) towards the Phase 3 development, but upper storeys of 8 to 10-storey buildings to the south of the bridge would be visible extending westward	Close range, direct (View F only)	Large	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Substantial
			Operation Year 1: View F would experience little change over and above Phase 2 impacts, although waterside planting would continue to mature. View G would experience little change over and above Phase 3 impacts, although waterside planting would again continue to mature and provide ground-level interest.	Close range, direct and oblique	Large to Medium	Permanent	Beneficial	Substantial to Moderate
			Operation Year 15: Waterside planting along the towpath and within building courtyards would enhance the water frontage and soften the building edge in both Views F and G.	Close range, direct and oblique	Large to Medium	Permanent	Beneficial	Substantial to Moderate
	Grand Union Canal towpath (and the canal), looking north east (Illustrative Comparative View H)	High	Phase 1: Phase 1: Assuming that vegetation and existing Site boundary walls/fencing are removed during Phase 1, views would be opened up into the Site, looking north towards the Phase 1 development adjacent to the Beaconsfield Road properties. Development in the northern part of the site, plus the main street up to eastern approach of Pump Lane Link Road would be visible to the right of the view. During construction cranes would create temporary medium-term impacts as this phase is developed. Ground level construction features would be visible across a foreground of the Site, but would not form a major element.	Close range, oblique	Large to Small	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Substantial to Moderate

Visual Receptor			Visual Effects of the Development					Significance
Description	Location	Importance/ Value/ Sensitivity	Description	Distance & angle of view	Magnitude / Scale	Duration	Nature of Effect	
			Phase 2: For View G, Minet Bridge would provide a foreground focal point as it spans the Canal and Yeading Brook. Close range views of the new waterfront edge of the development site would be gained beyond the new bridge. The Pedestrian Bridge would not be visible from this vantage point. During construction cranes would create temporary medium-term impacts as this phase is developed, and during the construction of Minet Bridge in particular (although this latter impact would be short-term). Ground level construction features would be in close proximity and openly visible.	Close range, direct	Large	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Substantial
			Phase 3: Ten-storey buildings constructed as part of Phase 2, immediately adjacent to this viewpoint would form the dominant element of the view and would create strong enclosure to the towpath at low level, although the building seeks to reduce potential impacts. In turn, these buildings would screen much of the Canal side development to the north of Minet Bridge and development within the core of the Site. Cranes would create an immediate and medium-term impact during construction.	Close range, direct	Large	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Substantial
			Operation Year 1: Little change would be experienced over and above Phase 2 impacts, although waterside/Site edge planting would continue to mature and provide ground-level interest.	Close range, direct and oblique	Large	Permanent	Beneficial	Substantial
			Operation Year 15: As per Year 1, although waterside planting would continue to mature and provide ground-level interest.	Close range, direct and oblique	Large	Permanent	Beneficial	Substantial

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value/ Sensitivity**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
	Grand Union Canal towpath (and the canal), looking southwest (Illustrative Comparative View I)	High	Phase 1: Proposed Pump Lane Link Road Bridge would create major change in this view, and would form the main focus; land cleared of vegetation to the west of the Canal would also be visible. Main street would be visible to the left of the view, within the Site due to early site clearance works in advance of development. Short to medium -term construction impacts during erection of bridge and construction of Link Road east and west of Canal only (i.e. not that associated with new development).	Close range, direct	Large	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Substantial
			Phase 2: No change to this View arising from Phase 2 development.	N/A	N/A	N/A	N/A	N/A
			Phase 3: New development along waterfront of 7 and 8-storeys would create strong enclosure and significant impact upon and immediately adjacent to this view. As a worst-case it has been assumed that new landscape and tree planting associated with the eastern end of the Link Road and Bridge would not proceed until Phase 3. Cranes would create an immediate and medium-term impact during construction.	Close range, direct	Large	Temporary (Medium Term) to Permanent	Adverse (Construction) to Beneficial (Operational)	Substantial
			Operation Year 1: View would be partially closed-off and framed by the Pump Lane Link Road bridge. New waterfront development would dominate the left of the view, softened slightly by waterside tree planting.	Close range, direct	Large	Permanent	Beneficial	Substantial
			Operation Year 15: No significant changes to Year 1 views are anticipated.	Close range, direct	Large	Permanent	Beneficial	Substantial

Table H: Visual Impact Schedule – Wider Views

Visual Receptor			Visual Effects of the Development					Significance
Description	Location	Importance/ Value	Description	Distance & angle of view	Magnitude / Scale	Duration	Nature of Effect	
Highways	The A4020 The Broadway Canal Bridge looking south (Photo view A)	Moderate	Phase 1:	Medium range, perpendicular	Small	Permanent	Adverse	Minor to Negligible
			Phase 2:					
			Phase 3:					
			Operation Year 1: Distant views would be gained of the uppermost floors of the Western Gateway towers although existing foreground development to the west of the canal (B&Q warehouse) would largely obscure these. Similarly the towers of the Eastern Gateway would be glimpsed above foreground/middle distance residential properties to the left of the view. Tall buildings around the Etoile would form the most noticeable new element within the view, together with Springfield Road Link Road bridge.					
			Operation Year 15: No significant changes to the Year 1 views are anticipated.		Small	Permanent	Adverse	Minor to Negligible
	Uxbridge Road/ Delamere Road, looking southeast (Photo	Low	Phase 1	Medium range, perpendicular	Negligible	Permanent	Neutral	Negligible
			Phase 2					
			Phase 3					

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
			Operation Year 1: Views of the site currently dominated by eastern gas holder. Maximum height development along Boulevard unlikely to be visible above ridge of existing foreground development (B&Q). However, towers around the Etoile would be visible towards the right of the view, within the context of existing foreground buildings.					
			Operation Year 15: No significant changes to the Year 1 views are anticipated.		Negligible	Permanent	Neutral	Negligible
	Pump Lane, looking east (Photo view C)	Low	Phase 1	Medium range, perpendicular	Moderate	Long-term	Adverse	Minor
			Phase 2					
			Phase 3					
			Operation Year 1: Existing views to the eastern gas holder would be obscured by new development at the Western Gateway. Development along the canal frontage would be obscured by retained vegetation within the Yeading Brook corridor. The new signal-controlled Pump Lane Link Road junction would transform the middle distance beyond the bypass.					
			Operation Year 15: Proposed landscape planting associated with the Link Road junction would soften and blend the new highway works into their setting over time, and would screen longer distance views toward the Main Site.		Small	Long-term	Neutral	Negligible
	The A312 parkway, looking east (Photo View D)	Moderate	Phase 1	Medium range, oblique	Moderate	Permanent	Adverse	Minor to Moderate
			Phase 2					
			Phase 3					

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
			Operation Year 1: Much of the new development on the Main Site and Pump Lane Link Road would be visible from this elevated viewpoint, above the canopy of trees and scrub within the Yeading Brook corridor. The tallest elements of the Western and Eastern gateways would rise to a little over half the height of the eastern gas holder which would continue to be the dominant element. Similarly the Etoile would rise above existing vegetation and would be visible to the left of the gas holder guide frame. The tallest buildings along the Boulevard (up to 10 storeys) would extend obliquely across the view behind the gas holders and would be generally equivalent to the height of the guide frame.					
			Operation Year 15: No significant changes to the Year 1 views toward the Main Site are anticipated. Proposed landscape planting would soften the 'raw' appearance of the Pump Lane Link Road as it matures.		Moderate	Permanent	Adverse	Minor
	Southall Lane – M4 motorway overbridge, looking north-northeast (Photo View F)	Low	Phase 1	Long range, perpendicular	Negligible	Permanent	Neutral	Negligible
			Phase 2					
			Phase 3					
			Operation Year 1: Some glimpsed views would be gained to taller elements of the proposed Main Site development from this elevated viewpoint. The Western Gateway towers would be discernible to the left of Southall Lane, above the roofline of the International Market, seen in the middle distance. The Etoile would be obscured by vegetation in the middle distance. The Eastern Gateway would be just visible above building rooflines to the left of the view.					

Visual Receptor			Visual Effects of the Development					Significance
Description	Location	Importance/ Value	Description	Distance & angle of view	Magnitude / Scale	Duration	Nature of Effect	
			Operation Year 15: No significant changes to the Year 1 views are anticipated.		Negligible	Permanent	Neutral	Negligible
	Osterley Lane – M4 motorway bridge looking northwest (Photo view G)	Low	Phase 1	Long range, perpendicular	Negligible to Small	Permanent	Neutral	Negligible
			Phase 2					
			Phase 3					
			Operation Year 1: Much of the proposed Main Site development would be obscured by existing vegetation from this slightly elevated viewpoint. The only apparent change would arise from the proposed towers of the Eastern Gateway that would rise slightly above that line.					
			Operation Year 15: No significant changes to the Year 1 views are anticipated, although tree growth may increase the degree of screening.		Negligible	Permanent	Neutral	Negligible
	Bull's Bridge Grand Union Canal Walk, looking north (Photo View E)	Moderate	Phase 1	Medium range, oblique	Small	Permanent	Adverse	Minor
			Phase 2					
			Phase 3					
			Operation Year 1: Medium-range views of the Main Site would be largely screened by the significant intervening industrial development. Glimpses may be gained to the proposed towers of the Western Gateway. Some loss of vegetation may be discernible beyond the railway embankment, permitting brief glimpses of traffic traversing the elevated Pump Lane Link Road.					

Visual Receptor			Visual Effects of the Development					Significance
Description	**Location**	**Importance/ Value**	**Description**	**Distance & angle of view**	**Magnitude / Scale**	**Duration**	**Nature of Effect**	
Rights of Way			Operation Year 15: No significant changes to the Year 1 views are anticipated.		Small	Permanent	Adverse	Minor
	Osterley Park to Norwood Green footpath looking northwest (Photo View H)	Moderate	Phase 1	Long range, oblique	Negligible	Permanent	Neutral	Negligible
			Phase 2					
			Phase 3					
			Operation Year 1: No significant elements of the proposed development would be gained from this ground level viewpoint, although the very upper level of the Eastern Gateway may by just perceptible.					
			Operation Year 15: No significant changes to the Year 1 views are anticipated.	Long range, oblique	Negligible	Permanent	Neutral	Negligible

White Young Green Environmental

GROUND CONDITIONS REPORT
(INCLUDING SUMMARY OF PREVIOUS
SITE INVESTIGATIONS)
OF THE SOUTHALL FORMER GASWORKS SITE
FOR
BG PROPERTY HOLDINGS LTD

Reference: REPORT/E0357/JC/OCT00/GCR/V3 (S)				
Issue		**Prepared by:**	**Verified by:**	
V1	**Nov 99**			
V2	**Apr 00**			
V3	**Aug 00**	**JON COOKE** **Geo-environmental Engineer**	**SIMON SMITH** **Senior Geo-environmental Engineer**	**DOUGLAS FORD** **Director**
File Ref: P:\EGE\TYPING\e0357\jaja0025v7r.rep.doc				

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FIGURES

DRAWINGS

APPENDICES

0.0 EXECUTIVE SUMMARY

Current Site Status	This generally level site being some 37 hectares is off Brent Road, Southall, Middlesex (NGR 511600 179800) and is located, at the intersection of three London Boroughs; Hillingdon, Ealing and Hayes. It is bounded to the north by the Grand Union Canal, to the south by the west coast rail line into Paddington and to the northeast by high density terraced residential properties. Southall Town Station is located 300m to the east, with Southall town centre beyond residences to the north. At present the site can be divided into four main areas, based on the present day usage. The first and by far the largest is the area occupied by vehicle operations being located to the west, centre north and northeast. Almost immediately in the centre of the site, but not within the site's boundary, is the operational Transco area comprising three holders one of which is waterless and static. In the far east of the site is an area of heavily overgrown land. Access between the northern Secure Storage compound and the above overgrown area is via a road passing through a number of small industrial units. Operations within this area include vehicle washing and refuelling (for Secure Storage), a carpenters workshop and vehicle maintenance etc. Visual inspection of the site indicates that the surface integrity is exceedingly variable, from gravel and cinder to well maintained and newly laid concrete or tarmac.
Geology Hydrogeology Hydrology	Made Ground at surface overlying alluvium / brickearth, overlying Taplow Gravel (Thames River gravel) which overlies the London Clay. Beneath the London Clay at depth is Cretaceous Chalk. The Taplow Gravel is identified as a Major Aquifer. Groundwater flow within the gravel is generally towards the northwest, although local variations are present across the site. Surface water courses adjacent to the site comprise the Grand Union Canal (level with the site) and Yeading Brook (approximately 2-3m below the level of the site) which are both located on the north western boundary.
Site History	The eastern area of the site was originally developed as brickfields during the early part of the 19^{th} century. Extensive open cast shallow quarrying activities were associated with the manufacture process. The central area of the site was developed as an oil works at approximately the same time. This was soon taken over and converted to a small gasworks. Associated chemical factories were constructed in the area of the brick fields during the early part of the 20^{th} Century. The gas works was further developed in response to demand with addition of large retort houses and the gas storage infrastructure, including the holders currently on site. During the time of the WW1 the western area of the site was utilised for manufacture of Tar and Benzole. During the interwar period site activity remained relatively constant, the canal was increasingly used for in port and export of raw materials and products. Following WW2 several changes in gas production techniques resulted in alterations and enhancements to plant infrastructure leading to the eventual decommissioning of the wider works and the utilisation of the site for storage and distribution purposes only.
Site Investigations (Previous)	The site has been subject to a series of 3^{rd} party ground conditions assessments dating back to 1989. Records of these are currently held by WYGE on behalf of LPH. These comprised elements of desk study and intrusive ground investigation aimed at characterising ground contamination conditions at the site. It was identified that some of the third party data may not be truly reflective of the site conditions not only due to time elapsed but also reflecting the advances made over the recent past in site investigation sampling techniques and laboratory analysis protocols. Further detailed works are proposed.
WYGE Site Investigations (Recent)	An extensive groundwater monitoring exercise (installation of 15no. boreholes and 5 months of monitoring) to assess any potential risks on the site has been undertaken. The strategy was developed in conjunction with the EA and the results identified limited current immediate significant risks, although major impact was noted in some areas and the need for detailed consideration of development issues was highlighted further.
Risk Assessment	The potential environmental risks of the site associated with ground contamination are assessed to be **MEDIUM** after testing of off site watercourses revealed no significant impact.
Proposed Remediation	Further soil and groundwater investigation should be undertaken to allow further development of the detailed design of the remediation strategy. This remediation strategy will be achieved through a programme of controlled contamination source removal or treatment and pathway disconnection. Maximum sustainability through controlled assessment and reuse of site derived materials will form a significant aspect of the strategy.
This sheet is intended as a summary of the assessment of the site in relation to ground contamination. It does not provide a definitive engineering analysis. Site remediation is recommended.	

1.0 INTRODUCTION

1.1 General

1.1.1 *Involved Parties*

This assessment has been prepared on behalf of BG Property Holdings Ltd (BGPH) by White Young Green Environmental (WYGE). It presents a summary of ground conditions based partly on data recovered from third party investigations, consultations with Statutory Authorities with additional information derived from recently completed investigations, undertaken by WYGE.

1.1.2 *Site Identification*

The site is identified as the Southall Former Gasworks (location plan: SK01)

1.1.3 *Instruction*

An instruction was received from Paul Mantell of BGPH, in response to a proposal submitted on the 19th March 1999. The proposal detailed the services necessary to produce a report collating and interpreting salient ground conditions information gathered from the site to date. This information was from reports prepared by various third parties as detailed below.

A topographical survey has been commissioned as part of this study and a copy is included in drawing E0357/01.

Previous reports provided by the client included the following:

- Percy Trentham; Site Investigation Number 587/89 – Factual data – **1989**.
- April **1994**, Environmental Liability Assessment, compiled by Symonds Travers Morgan (includes contamination data from the Percy Trentham report 587/89).
- Frank Graham Consulting Engineers, Southall Gasworks, Supplementary Investigation Report (Draft), October **1996**.
- Frank Graham Consulting Engineers, Summary Contamination Report, Southall Gasworks, February **1997**.
- Various associated drawings.

Based on the assessment of this third party information certain further ground investigation works were undertaken by WYGE in October 1999. These works specifically comprised the installation of groundwater monitoring wells to facilitate an extended period of groundwater monitoring. Soil samples collected during the borehole installation were also submitted for laboratory chemical testing. A summary of these works is presented within this report with details of the works and the results presented in the report titled Supplementary Groundwater Borehole Contamination Assessment (JUN 2000), referenced E0357\JC\JUN00\GCA\V2(S) dated June 2000.

Limitations

It is identified that the above documents do not represent all those produced for the site. However, although 'aged', they are deemed to be the most reliable and appropriate with relation to the accuracy of the information reported within them and therefore considered to be most representative of the conditions present beneath the site. They are not physically reproduced within this document but are held for reference by the author.

There is a need to recognise that some of the third party data may not be truly reflective of the site conditions not only due to time but also reflecting the advances made over the recent past in site investigation sampling techniques through to laboratory analysis. The strictest limitation that must be applied therefore, is in identifying the potential for misinterpretation of contaminant concentrations when comparing third party data to the recently collected data by WYGE.

1.1.4 *Proposed Use*

The site in the short term will continue as a car storage and preparation area whilst planning negotiations are progressed for a phased redevelopment firstly by residential uses to the north then by commercial / employment uses to the remaining western part of the site (proposed development zones are illustrated on figure SK02).

1.1.5 C*onditions*

This report is subject to the terms of the BGPH / WYGE agreement and certain accepted proposals and conditions as agreed within the brief with BGPH and is subject to practical limitations of that exercise. Specific report conditions are further detailed in Appendix A at the rear of this document.

1.2 Report Format

Through necessity this report transgresses from the formats detailed within the BGPH Guidance Document 2.5. However care has been taken to keep variations to a minimum. The report aims to summarise the conditions present beneath the site as identified by third party investigations and the recent WYGE investigations and their implications on the environment and general redevelopment proposals.

2.0 SITE STATUS

2.1 Site Location and Description

2.1.1 *Geographical Context*

The site is located off Brent Road, Southall, Middlesex and is located, being some 37 hectares, at the intersection of three London Boroughs; Hillingdon, Ealing and Hayes. It is bounded to the north by the Grand Union Canal, to the south by coast rail line into Paddington and to the northeast by high density terraced residential properties. Southall Town Station is located 300m to the east, with Southall town centre beyond residences to the north.

2.1.2 *Ordnance Survey Grid Reference*

The site is centred at approximately National Grid Reference TQ 115 797 (511600 179800). A location plan is appended (SK01).

2.1.3 *General District Area*

The site is located in an area having a high density of residential properties to the northeast and southeast. To the northwest is open recreational ground. To the northeast and east of the site is a housing estate comprising terraced and semi detached properties with gardens and beyond these Southall centre. To the southwest of the site is a multiple railway line with mixed industrial activities beyond this.

2.1.4 *Topographical Information*

The site covers an area of approximately 37 hectares and is generally level around a height of 30mAOD (above ordnance datum).

A topographic survey has been undertaken and a copy is included as drawing E0357/01.

2.1.5 *Site Description, Plant and Equipment*

The site has been visited on a number of occasions and the following represents a summary of observations.

(A) <u>Site Area</u>

At present the site can be divided into four main areas, based on the present day usage. The first and by far the largest is the area occupied by vehicle operations being located to the west, centre north and north east. This is primarily accessed via a restricted height road below the railway.

Almost immediately in the centre of the site, but not in the site’s boundary, is the operational Transco area comprising three holders one of which is waterless and static. The holders are separated by an access road formerly known as “White Road” and parking/reception area used by Secure Storage as part of their airport park and ride operation. A large pressure reduction station is located on the eastern side of the access road. This is operated by Transco.

In the far east of the site is an area of heavily overgrown and well vegetated land. This appears to have no use at present, although Secure Storage are known to have used it for temporarily parking vehicles during 'overflow' periods. This area is separated from the remainder of the site by a 3m high metal fence.

Access between the northern Secure Storage compound and the above overgrown area is via a road passing through a number of small industrial units. These are located on the northern boundary and appear to be housed in buildings possibly associated with the former gas production plant. Operations within this area include vehicle washing and refuelling (for Secure Storage), a carpenters workshop and vehicle maintenance etc.

Visual inspection of the site indicates that the surface integrity is exceedingly variable, from gravel and cinder to well maintained and newly laid concrete or tarmac. There appeared, at the time of one visit, to be on going attempts by Secure Storage to 'patch' those areas for which hardstanding is not present. This is being undertaken to provide a firm standing for their cars.

Moving from the far west over into the centre and centre north it is observed that the proportion of evident remnant surface level features relating to operational gas production infrastructure increases markedly. These include; holder bases, tank bases, railtracks and reinforced concrete columns. These decrease in intensity moving east, corresponding with the mapped historical layout of the site. The former locality of historical structures and activities are presented on drawing E0357/02 illustrating the historical development of the site.

Contamination is locally evident on the site surface, generally as localised patches of spent oxide in the area to the centre north of the holders, with tarry residue patches and ashes and cinders also apparent.

The site is surrounded generally by fencing some 2m high and topped with razor wire, enclosing the Secure Storage compounds. Fencing is less complete in areas outside of these compounds, in particular in the overgrown area to the east.

There are three infilled docks present beneath the car storage compounds. It is difficult to visually locate the docks due to the volume of cars present on the site but they do not appear obviously evident on inspection.

(B) <u>Grand Union Canal</u>

The Grand Union Canal outside the boundary appears visually (at the time of the site visit) of relatively good quality. Fishes and 'vegetation' look to be well developed and healthy. The old dock entrances can be visually identified through the presence of sheet piling (used in their decommissioning) as compared to the original brick lining of the canal. No significant water flow was apparent between the canal and infilled dock.

A brick retaining wall along the northern boundary separating the site from the adjacent tow path exhibits local staining with blue patches in a number of locations. It is possible that this is the result of leaching through the wall of contamination within the shallow made ground on the site.

(C) Yeading Brook

Three drainage points appear to discharge into Yeading Brook. A large relatively new concrete drain was evident just north of the eastern site boundary. Rusty brown discolouration has been noted historically in this area. A smaller drain discharges close to the large canal overflow 'weir'. This too has had discolouration and foaming noted in the past. The third drain connects to the canal overflow system. Drainage discharge points are illustrated on figure SK18.

2.1.6 *Site Boundary and Adjoining Uses*

The boundary is clearly evident around the site periphery as detailed above. To the northeast and southeast are high density residential properties, generally comprising houses with gardens. To the north is the Grand Union Canal, Yeading Brook and open land. To the south is the railway track beyond which are mixed residential properties and various industrial units.

2.1.7 *Services Information*

Up to date service information was collated prior to the recent WYGE ground investigation works. A summary of services and constraints is presented on drawing E0357/03.

2.2 **Geology, Hydrogeology and Hydrology**

2.2.1 *Geology*

Interpretation of previous investigations and the results of the recent WYGE investigation indicate the near surface geological succession to be:

Made Ground

Third party sources indicate made ground present across the majority of the site to a maximum depth of 3.5m. This comprises generally and dominantly of rubble, with bricks, rags, glass, paper and coke/coal residues. The indicative thickness of made ground is presented in the drawing number SK03.

Brickearth

Third party sources indicate the Brickearth comprises of firm orange/brown clayey silt, organic in parts. This is not present across the entire site with its absence expected to be the result of quarrying excavation for brick manufacture last centuary. The indicative thickness of Brickearth in presented is the drawing number SK04.

Taplow Gravels

Third party sources indicate that the gravel generally comprises of medium dense flint gravels and sand. The indicative thickness of Taplow Gravel is presented in the drawing number SK05 and varies from less than 3.0m to a maximum identified thickness of 6.9m.

London Clay

The London Clay is present across the site and comprises of a stiff dark brown silty clay with blue/grey mottling becoming a dark blue/grey clay with depth. Selenite crystals and concretions are also found in the less weathered parts of the formation. Local well records indicate that the clay is present to a thickness of some 50m. The indicative upper surface of the London Clay is presented in the drawing number SK06. WYGE identified silty sandy CLAY, London Clay, in all locations.

The London Clay is underlain by the Reading Beds below which is the Upper Chalk.

The result of the recent WYGE borehole investigation indicate generally similar ground conditions with summary of the results and discussion presented here in section 6.0. A schematic cross section through the site illustrates the approximate geological succession and is presented in figure SK20

2.2.2 *Hydrogeology*

The ground beneath the site is classified by the Environment Agency as a major aquifer (Groundwater Vulnerability Map, Sheet 39) suggesting that the underlying strata is a significant groundwater resource and is able to support large abstractions.

Groundwater flow within granular material comprising the made ground, brickearth / alluvium and gravel is a function of intergranular flow with the permeability controlled by the fine material, especially clays and silts, occupying the pore spaces between the larger sand and gravel particles.

Groundwater flow directions are likely to be influenced by the fact that the subsurface down to a significant depth within the Taplow gravels is not homogenous, the naturally occurring fabric significantly disturbed by both the removal of strata (gravel / brickearth) abstraction and the presence of subsurface obstructions. Furthermore the overall extent of the site and the variable presence of hardstanding will have a controlling effect on rainfall infiltration and hence groundwater recharge possibly sufficient to locally distort groundwater flow patterns. The presence of the infilled dock in the northeastern area of the site is likely to significantly effect groundwater flow.

Groundwater flow has local variations across the site but can generally be interpreted as towards the Yeading Brook in the western and central areas of the site with apparent disturbance to this general trend in the extreme eastern areas of the site. The gradient is very shallow and may locally and periodically alter. These observation hold that a significant potential exists for the recharging of the River Yeading from the Taplow Gravel aquifer.

A summary of the results and assessment undertaken by WYGE in relation to groundwater conditions is presented here in sections 6.0.

Review of the North Thames Gas (NTG) Scientific Services Report dated 1981

This document, held by Ealing Borough Council, was not held in BG's library. It is considered here for completeness but its results (as discussed below) are not included as they are potentially misleading. In the light of some confusing data interpretation presented within this report a review of the contents and findings of the report acknowledges that the report has been of some assistance in facilitating further our understanding of the groundwater conditions at the site 20 years ago.

It is unclear from the North Thames Gas report how groundwater monitoring wells were constructed to facilitate measurement of groundwater levels. For the purposes of groundwater flow direction interpretation it is essential that the made ground or natural horizons screened in the monitoring well are identified. The boreholes installed recently by WYGE were screened specifically to measure the water level within the gravel and as such make interpretations of the groundwater flow direction within the gravel.

Re-examination of the all available drilling and trial pit records for this area of site indicate that very limited inflows and seepages of groundwater have only ever been identified within the made ground in the northeastern area of the site. Further examination of Frank Graham and recent WYGE data identified some 'perched' groundwater within the made ground at two localities along the northern boundary of the site. At one locality there was only a trace of water identified, and in the other, approximately 10cm of water was identified. These volumes are considered to be relatively insignificant and are likely to relate to discrete, isolated 'pockets' of water. It is acknowledged that perched water to a greater depth could be retained within as yet unconfirmed underground structures in this area of the site, and that these will be identified during the course of further detailed investigation to follow planning. Any retained water will be dealt with in accordance with the remediation strategy for the site.

The NTG report contains an interpretation of groundwater flow directions, again bearing in mind we don't have any records detailing the specification or construction of these wells. An element of groundwater flow is interpreted by NTG as being to the north in the direction of residential properties to the north of the site.

The interpretation made in our recent groundwater monitoring report do not suggest any northerly groundwater flow directions in the gravels in this area of the site based on the findings of our recent works.

The interpretation made by NTG appears to be a function of a single high water level recorded in this area of the site (30.42m, BH1) in the context of their interpretation of the hydrogeological regime generally beneath the site. It is appears that NTG did not take into account the potential for underground structures to effect the hydraulic regime beneath the site. Specifically, the presence and effect of the infilled northern most dock that runs northwest to south east, has clearly not been accounted for.

The NTG interpretation illustrates three equipotential lines abutting the dock, disappearing and then continuing on, on the other side with no deflection. It is considered very unlikely based on the construction and decommissioning history (sheet piled or brickwork walls infilled with rubble) of the dock that no effect on groundwater flow would be generated.

It is our experience of groundwater flow in similar industrial settings that significant flow deflection and / or drainage into such structures as the dock may occur, resulting in severe disruption to the natural distribution of equipotential and flow lines in the ground.

The report is therefore not considered as representative herein although detailed SI will fully clarify and allow interpretation of perched made ground water influences.

2.2.3 *Landgas*

WYGE installed dual purpose land gas and groundwater standpipes in all boreholes.

Initial results indicated methane in none of 17 monitored positions. Subsequent monitoring indicated methane in 3 of 19 positions with concentrations ranging between 0.1 and 8.4% by vol. volume (maximum in BH101).

During the earlier monitoring exercise carbon dioxide was encountered in 14 of the 17 standpipes, with concentrations ranging between 0.2 and 9.1% by vol. (maximum concentrations were encountered in BH4A. The later monitoring visit indicated carbon dioxide in 16 of the 19 positions with concentrations ranging between 0.1 and 9.8% by vol.

2.2.4 *Hydrology*

Surface water courses adjacent to the site comprise the Grand Union Canal (level with the site) and Yeading Brook (approximately 2-3m below the level of the site) which are both located on the north western boundary.

The Yeading Brook bounds the site to the northwest, beyond the Grand Union Canal (which is understood to be clay lined), and this has the potential to be influenced by the site's groundwater conditions via groundwater flow within the gravel and via man made conduits such as sewers e.g. the White Street Sewer. The results of recent monitoring indicate very little evidence of significant contamination in the Brook or the canal as a result of the site, especially in the area context. The results of the recent WYGE monitoring are discussed here in section 6.0.

(A) Grand Union Canal

The Grand Union Canal flows in a north to south direction and forms the north western boundary of the site. Historical information suggests that the canal was constructed using brick walls locally repaired with sheet piles to form the banks with the base sealed from the underlying Taplow Gravels by a puddle clay liner. Three docks provided access from the canal into the gasworks. These are understood to have been infilled between 1966 and 1979 using demolition and hardcore material sealed with steel sheet piles at the canal wall. It is anticipated that the likely construction sequence for infilling would be to place the hardcore and then use this to provide a firm base from which the sheet piles could be installed. Soil samples recovered from the infilled docks (Frank Graham) indicate the presence of concentrations of metals not generally associated with gasworks residues. They assessed that these originated from slag material used in the infilling.

In 1991 Ealing Borough Council Served a notice in relation to soil and groundwater contamination identified along the canal tow path in the vicinity of the Blair Peach School, close to the intersection of the northern most dock with the canal. Concentrations of cyanide (in the form of 'blue billy' leaching through the wall and onto the tow path) and phenol, in water were identified. Action was taken by British Gas PLC (North Thames) to mitigate against further contamination of the towpath, which was apparently successful in the short term. Blue billing staining of the retaining wall on part of the northeast boundary adjacent to the towpath was evident in similar locality on recent site visits.

Observations from a site visit carried out in 1992 (KRA report) detailed that after a period of heavy rain a significant inflow of water from Dock number 2 was observed. ‘This liquid smelled strongly of phenol and it was considered that concentrations were above Dutch C values.’

The Canal is classed as a Poor (Class E) water course. Surface water samples recovered in 1996 (Frank Graham) and analysed for a suite of determinands including metals, TPH, BOD and COD did not record any elevated concentrations of contaminants likely to be associated with the site.

Sediment samples recovered at the same time did record elevated concentrations of several metals including cadmium, copper, chromium, lead, nickel and zinc. Additionally the sediment samples were recorded as having a high organic content.

(B) Yeading Brook

The Yeading Brook flows in a north to south direction and is located to the northwest of the Grand Union Canal. Third party information indicated that it is likely that alluvial deposits associated with the river will provide an attenuation layer minimising hydraulic continuity between the surface water and the groundwater in the gravels. The results of the recent WYGE ground investigation which indicate some hydraulic gradient in the direction of the River especially in the central and southern area of the site. At this stage, given the above, it is evaluated that the Yeading Brook remains one of the principal environmental receptors. Further evidence for this is the presence of a public surface water sewer (White Street Sewer) beneath the site. This used to drain residential/industrial areas to the south but is thought to have been decommissioned. However it is still present below the former gasworks and passes below the Grand Union Canal, via a siphon, discharging into Yeading Brook. A CCTV survey has been undertaken on this sewer revealing that it is in a poor state of repair and is probably collecting some water from the site.

The Yeading Brook is classed as a Fair (Class C) watercourse.

Surface water samples recovered in 1996 (Frank Graham) and analysed for a suite of determinands including metals, TPH, BOD and COD did not record any elevated concentrations of contaminants thought to have been associated with the site although BOD analysis did record slightly elevated readings. This was assigned to natural breakdown of organic matter.

2.2.5 *Surface Water Drainage*

It is considered that drainage on the site has been greatly affected by its redevelopment phases and demolition. At present surface water is observed to pond in some areas whilst infiltrating away through permeable deposits in others. It is believed that some land drains have been installed by Secure Storage although the locations of these are unknown.

Site drainage is believed to discharge primarily into the Canal.

3.0 HISTORY

Site Development

The history of the site is summarised on figure SK11 and presented on detail on the Historical development drawing, E0357/02.

The site of the gasworks was originally occupied by farmland and later developed into brickfields and an oil works before being purchased by the Brentford Gas Company in 1868. At this time their plant at Brentford could no longer cope with demand and the company purchased 17.5 acres of land at Southall, between the Great Western Railway and the Paddington Branch of the Grand Union Canal.

Over the next year a retort house with horizontal retorts, a 480,000cu ft gas holder and attendant buildings were constructed and gas was first produced on Christmas of 1869.

In 1881 a second retort house was built containing 22 horizontal retorts, followed four years later in 1885 by a sulphate of ammonia plant. In 1887 the first inclined retorts were introduced at Southall in an extension to Retort House no. 1 and by 1894 all the horizontal retorts had been replaced by the Coze inclined retorts. The following year no. 4 house was built containing 18 beds of inclined retorts.

By 1895 three new holders had been built. In 1878 no. 2 holder was built with a capacity of 1.13million cu. ft. In the same year as the sulphate of ammonia plant was constructed, a Hurd holder was built with a capacity of 2.1million cu. ft. Finally in 1892 holder No. 4 was erected, holding 3.95million cu. ft of gas.

In 1899 four carburretted water gas units, each capable of producing 750000cu.ft of gas a day were installed, followed in 1903 by a fifth inclined retort house, holding 200 retorts. Development was limited until 1914 when the works changed from inclined retorts and installed vertical ones. The only works improvements before this was the increase of the capacity of the CWG units to produce 1million cu.ft. of gas a day in 1909.

During WW1 chemical plants were constructed to produce oil gas tar, coal tar and crude benzole. These are tentatively identified as formerly located in the far western area of the site with approximate localities indicated on the detailed historical development drawing E0357/02. Additionally a benzole rectification plant was constructed. Infrastructure associated with the production and use of benzene and related products is tentatively identified on the detailed historical development of the site, drawing E0357/02. In 1916 the CWG capacity was increased after the addition of a fifth unit, and in 1920 two Blue Water Gas Sets were installed.

In 1922 there was another change in the retort system with a return to the use of horizontal retorts in retort house no. 2. From this point on vertical and inclined retorts were phased out until 1950 when all of them were removed.

In the early 1920's the layout of the site could be considered as follows:

- The central part contained the main works in retort houses, purifiers and holders.
- There was a storage area and railway sidings to the west.

- ♦ Employees housing to the east.
- ♦ The chemical works to the north, along with gravel pits and a brickworks.

In 1926 the Brentford Gas Company was taken over by the Gas Light and Coke Company. Between 1929 and 1931 the gas production was largely changed to horizontal retorts in order to implement heat conservation. Development also occurred at this time including the construction of the 7.5million cu ft waterless holder.

By 1935 the chemical works had closed and had been replaced by a newer, smaller works further east. The site of the old works became a chemical storage ground.

After WWII oil gassfication began. Construction commenced in 1948 and by 1951 the units were capable of producing 300 000cu. ft. of gas a day, but initially they were only used at times of peak demand. The site of the previously demolished retort house no. 1 was used in 1953-4 to house 12millioncu. ft. of CWG plant. In the same year tower purifiers were also installed.

From 1960 coal was superseded as a feedstock by liquid petroleum. Coal carbonization was actually ceased in 1962. As a consequence rationalisation of buildings occurred due to the change in feedstocks e.g. storage facilities. Whereas coal could be stockpiled, LPG had to be stored in tanks. The first of these, installed in 1960, had a capacity of 544000 gallons. In 1963 catalytic reforming plants having a total capacity of 60 million cu.ft per day were installed, two going into production in late 1963, the other two in early 1964. Later that year LPG capacity was increased to 216000 gallons.

Catalytic rich gas plant was installed in 1966 with a capacity of 30milion cu.ft./day and a new 1million gallon storage facility for LDS. Ten Boosters were also installed in between 1963 and 1966. They were used to utilise the high pressure gases produced

With the advent of natural gas the works closed in 1973 leaving gas distribution and storage as the main on site functions.

A composite summary plan detailing the main historical stages of development and associated infrastructure is reproduced in drawing SK12 with the detailed historical development of the site presented in the drawing E0357/02. This information is collated from a number of different sources which are referenced on the drawings. A key to specific historical land use is also referenced on the drawings. It is the intention that the a specific report relating to the history of the site will be produced as a standalone document to facilitate greater historical focus and assist in the further detailed site investigation works planned.

4.0 CONSULTATIONS

Consultations have been undertaken and are ongoing with the key statutory authorities including the Environment Agency (EA) and Pollution Control department (Environmental Health) of Ealing Borough Council (EBC). Alongside telephone discussions consultation meetings have been held to present in detail technical information, particularly the results of both historical investigation works and the more recent WYGE work detailing groundwater and surface water conditions at the site. Some meeting have embraced planning issues also.

Presentation was undertaken in the context of both BG's continuing employment use and following phased redevelopment objectives in relation to the site. Elements of the ongoing consultation with statutory authorities have been included within this report, further details of up to date correspondence are detailed below.

4.1 Philip Dinn, The Head of Pollution Control of Ealing Borough Council (EBC) tel. 020 8579 2424.

Two technical consultation meetings have taken place with EBC along with follow up technical correspondence. The meetings were held on the 19th April 2000 and the 20th June 2000 and were specifically geared towards support of planning applications for short term continued use and medium term change of use at the site. At the first meeting the Ground Contamination Assessment Summary Report (V2) was presented. This report contained a summary of previous site investigation and assessment work undertaken at the site by third parties. At the second meeting the results of the WYGE recent borehole investigation were presented in the report titled Supplementary Groundwater Borehole Contamination Assessment (V2), which included soil, groundwater and surface water analytical results.

From the second meeting an updating and enhancement exercise has led to this version three (V3) of the Ground Contamination Assessment Summary Report. In the light of ongoing research and consultation with respect to the site this also contains expanded history and consultation sections.

Over the course of the two meetings and the ongoing correspondence EBC have received clarification on certain issues related to ground contamination at the site which is summarised below:

- Contaminated Groundwater Evaluation and visible signs of surface soil contamination.

  Groundwater issues have been further evaluated in conjunction with the Environment Agency (EA), as a planning consultee and summarised herein.

  ‘Blue billy’ staining of some soils was an identified issue, but mainly one to do with perception rather than actual significant risk at this stage. WYGE explained that as with all contaminated land re-development an appropriate health and safety plan for groundworkers and public would be in place to break the pollutant linkage between hazard and receptor, thus mitigating risks.

- The importance that the site be assessed and considered as a whole.

  Due to the size of the site a phased program of site investigation has always been presented as most manageable and practical option. With site investigation works commencing in the eastern area of the site, coinciding with the potential first areas for remediation and subsequent development, and being progressed westwards in areas of approximately 6 acres each.

  This approach was agreed satisfactory by EBC and the EA. Although the whole site should be investigated prior to the commencement of remediation and subsequent development works, even if such was phased. The economic and physical practicality of that approach would be difficult to surmount, so, it was agreed that prior to the commencement of remediation works, investigation of the site and areas adjacent to the residential development area could be undertaken prior to remediation in this area. EBC agreed that this was acceptable.

- A Phenol contamination incident occurred in the Beaconsfield Road Sewer approximately 10 years ago:

  There is no direct evidence that this incident was connected with the former gasworks. The results of the recent WYGE groundwater monitoring do indicate phenols in the groundwater, but at some distance from the sewer. No repeat in incidents are recorded. However, the planned further site investigation will identify any major source for removal or treatment as part of the remedial works.

- A notice has been served with respect to local contamination of the Grand Union Canal and Towpath adjacent to the site in approximately 1991.

  Leaching of 'blue billy' at the site boundary through the brick wall adjacent to the canal towpath had resulted in discoloration of the wall and seepage of affected groundwater near the former, now infilled, dock structure (southern dock). Some remedial action was undertaken by Transco comprising the excavation and filling of a ditch with clay to mitigate further occurrence (agreed with authorities).

  There is no evidence from the recent monitoring results of ongoing significant contamination of the canal specifically from the former gasworks.

- EBC sought clarification on the proposed depth of remediation proposed.

  WYGE explained that the remediation would be reactive to encountered conditions both vertically and horizontally, and acknowledged that many structures present at the site, where they contained significant contamination, would be excavated to their constructed depth, in some cases 5m - 6m.

- Clarification on made ground water bodies, especially in the northeastern area of the site.

  This issue has been addressed in section 2.2.2 of this report.

4.2 Alistair Norton, The Environment Agency tel. 01707 632 300.

Mr Norton attended the second technical consultation meeting with EBC on the 20th June 2000. Mr. Norton raised some issues in relation to the contamination of the site which are summarised below:

- Sources of DNAPL and LNAPL in groundwater identified during the course of the remediation works should be removed.

  WYGE explained that this was in line with the current proposed remediation strategy and that appropriate techniques would be utilised.

- The EA expressed concern that the White Street Sewer (which is potentially a significant pathway off site to the brook) had been acting as a conduit (due to seepage) potentially discharging contaminated water to the brook, although recent monitoring results do not indicate this.

Surveys of the sewer will be analysed to establish its current status and negotiation in conjuction with Thames Water Utilities to establish the best course of mutually agreeable action to address the sewer.

4.3 Dr. Paul Beckworth, British Waterways (BW) tel. 01452 525 069

In recent a telephone conversations Dr. Beckworth made comments on the structure of the canal. He considered it most likely that the canal walls were founded on the gravel, rather than the London Clay, thus groundwater flow to the Yeading Brook is unlikely to be impeded by the canal structure.

A meeting was also undertaken on the 12th June 2000 with BG, WYGE and BW to explore technical information available focusing on the off site BW dredging and former tip area laying between the canal and the Yeading Brook to the northwest of the site.

Both parties have agreed continuing co-operation to address this area over which the new link road will pass.

5.0 GEOTECHNICAL ASSESSMENT

5.1 General

This assessment is included at the request of BGPD and comprises an assessment of the strength, permeability and durability of the ground in relation to proposed development of the site. Consideration is given especially to likely ground treatment and foundations necessary for proposed structures on the site with emphasis on the effect that construction and development might have on the ground and groundwater conditions. Assessment of the contamination condition of the ground and groundwater is presented in section 6.0.

Some of the data utilised in this discussion was not collected in the recent WYGE ground investigation and relates to earlier work undertaken at the site by others. Where appropriate relevant supplementary data collected during the recent WYGE ground investigation has been included in this assessment.

Until specific redevelopment building proposals are formulated (it is recognised that outline planning applications have been prepared) the following discussion only aims to provide outline guidance on likely geotechnical solutions for development.

Soils are identified as exhibiting contamination and it is likely therefore that remedial strategies utilised to promote site development will alter the ground profile to an extent. Some areas of the site may be capped with an engineered low permeability barrier, which will raise ground levels whilst soils in other areas of the site may be simply replaced or treated with ex situ techniques which can allow improvement of the geotechnical properties of the soils, if considered necessary.

The following comments are based on information on the ground conditions from geological sources, previous site investigation reports and observations made during the site visit.

- The site is generally flat with local variations in topography reflecting infilled areas and extensive subsurface structures.

- The ground profile at the site is characterised by the following approximate profile:

Approximate Thickness (m)	Lithology
1.0 - 2.8	Made ground
0.0 - 1.1	Alluvium and Brickearth
2.7 - 6.9	River Terrace Gravels
>15	London Clay
>150	Chalk

To determine the engineering properties of the strata encountered beneath the site the results of in-situ Standard Penetration Tests (SPT's) have been assessed. To further supplement the in-situ data, laboratory test data including the results of quick undrained triaxial tests, particle size distribution analysis (PSDs), consistency limit analysis, sulphate content and pH analysis have also been assessed. The results of the insitu and laboratory testing are presented in Appendix C.

5.2 Made Ground

The results of SPT tests undertaken in the Made Ground indicate densities in the range of very loose to dense. Made ground often comprises fill material which is deposited with variable control over its density, with areas of low density end tipped material juxtaposed with higher density rolled material. Underground structures are known to be present in the made ground. These may include buried concrete hardstanding, foundations, slabs, tanks and pipe work. Deep infill is likely to be present in some areas, for example, where the canal docks have been 'back filled with rubble' or where gasholder bases have been infilled with various materials (depths of 6m and possibly more to be expected).

Falling head tests undertaken in the made ground indicate permeability ranged from 1.8×10^{-4}m/s in the far western area of the site to 7.3×10^{-6}m/s in the central eastern area of the site.

5.3 Brickearth and Alluvium

The SPT test results obtained from the Alluvium and Brickearth deposits indicate densities in the range of loose to dense for the granular materials. Alluvium and Brickearth can typically comprise soft compressible 'cohesive' sediments inter bedded with denser granular deposits. The strength of these cohesive materials generally be described in the region of soft to firm. Alluvium may potentially have a high organic content.

5.4 River Terrace Gravel (Taplow Gravel)

The results of SPT tests undertaken in the River Terrace Gravel indicate densities in the range of medium dense to very dense. In general the density of the gravel increases with depth (see SPT vs. depth plot, Appendix D). High SPT 'N' values recorded at relatively shallow depths within the gravel are likely to be a result of large cobbles inhibiting the progress of the test. It is also possible that the results of the test are affected by man made obstacles in the ground e.g. old piled foundations.

Falling head tests undertaken in the made ground indicate that permeability in the Terrace Gravel deposits ranged from 7.5×10^{-5}m/s on the central northeastern boundary to 2.1×10^{-6}m/s in the western area.

5.5 London Clay

Undrained shear strength in the London Clay generally ranges from 70kN/m^2 to 200kN/m^2 and generally increases with depth (see undrained shear strength vs. depth plot, appendix D). An anomalous undrained shear strength of 236kN/m^2 was recorded at one locality. This possibly relates to a 'claystone' pocket or layer.

The permeability of the London Clay is in the region of approximately 10^{-9}m/s.

There have been no plasticity limit tests undertaken on the London Clay at this site. However, in general the London Clay is classified as a medium to high plasticity clay that can be severely effected by moisture content variations.

5.6 Sulphate and pH test results

Sulphate test results for the Made Ground, Brickearth and Alluvium and the London Clay initially indicate that groundwater conforms to sulphate class 2 while soluble extract from soil samples generally conforms to sulphate class 1, in accordance with BRE 363. It should be noted that sulphate testing protocols have changed since publication of the results under discussion and that sulphate levels at gasworks sites can locally be in a higher classification.

The average pH of groundwater samples was 6.5 and the average pH for soil samples was 6.7 at the time of investigation, indicating slightly acidic conditions.

Without further understanding of the ground conditions at the site, in particular the hydrogeological conditions a concrete classification can not be recommended at this stage. It is anticipated that the planned more detailed ground investigation work will provide data to facilitate recommendation of the future requirements for sulphate resistance classification of concrete at the site.

5.7 Spread foundations

The Made Ground, brickearth and alluvium across the site are not generally considered a suitable bearing stratum due to lateral variation in thickness, density and consistency which could lead to unpredictable foundation settlements. The River Terrace Gravel deposits are considered to be a potentially good bearing stratum for spread foundations because of their thickness and density across the site. A presumed bearing capacity for the gravel deposits could be in the region of 200kN/m^2. However, there are a number of potential problems with the utilisation of the gravel as a bearing stratum, namely the depth at which groundwater is encountered and the potential total thickness of the made ground, brickearth and alluvium above the gravel.

It is believed that groundwater at the site is generally encountered in the gravel deposits, however, in certain areas of the site, especially in the west, groundwater has been encountered in the made ground. This could potentially result in foundation construction difficulties. The maximum depth of made ground, brickearth and alluvium deposits at the site is believed to be approximately 3.0m, which again, could potentially result in foundation construction difficulties in certain areas of the site.

During trial pitting excavations side wall instabilities were recorded in the more granular deposits, especially water bearing gravel, encountered generally below 2.0mbgl. Should any small steep sided excavations be undertaken at the site for remedial works or future site developments works shoring of the sides of the excavation may be necessary. Should man entry into excavations greater than 1.2m depth be required, pit shoring must be employed. Given the poor material characteristics of the made ground and brickearth and alluvium deposits, it is considered likely that large excavations for foundation construction at the site will be potentially unstable. Depending on the depth of excavation the side walls of the excavation may have to be battered and benched or supported with temporary piled walls.

The construction of spread foundations bearing onto the River Terrace Gravel will require the excavation of potentially contaminated soil. Soil arisings would need to be assessed on site for their suitability for re-use on site or given a waste classification and disposed of at a licensed waste disposal facility. However, the generally residential transport infrastructure currently in place around the site and the cost of licensed disposal are both prohibitive factors for the removal of large volumes of contaminated soil from the site.

If development is undertaken on the more contaminated areas of the site it may be necessary to reduce the volume of contaminated soil arisings. This may be achieved by utilising some form of ground improvement or short piles bearing onto the Terrace Gravel Strata instead of using traditional spread foundations. It is also anticipated that material processing and reassessment will be taking place on site as part of the remediation programme, and as such it is likely that site derived backfill materials could be replaced with a degree of control over density allowing suitable founding stratum to be engineered in certain areas of the site.

5.8 Ground Treatment

Should it be decided that there are sufficient problems, related to depth, water and contamination condition of the soil, associated with bearing directly onto the gravel deposits, such that this method of foundation construction is deemed cost prohibitive, it may be possible to improve the bearing capacity and settlement characteristics of the made ground, brickearth and alluvium deposits in other ways. This could possibly be achieved through a combination of vibro-compaction and vibro-replacement, the latter of which utilises vibrated stone columns (VSC) or vibrated concrete columns (VCC) to strengthen the ground.

The use of ground treatment may be restricted to areas of the site where there are no ‘inert’ underground structures left insitu following remediation or areas where the integrity of the remediated soil and any engineered low permeability covering is left intact or improved.

Bearing in mind the contamination issues at the site, it is likely that the potential increase in vertical hydraulic conductivity as a result of the installation of VSCs should be avoided in certain areas of the site. If vibro-replacement techniques were utilised it is likely that the installation of VCCs would be recommended.

5.9 Deep foundations

Both the River Terrace Gravel and the London Clay are suitable founding strata for piled foundations. For lighter structural loads the gravel, because of its thickness, should be an appropriate founding strata. For heavier loads, significantly longer piles may be required to provide appropriate support and the London Clay should prove a suitable bearing stratum.

It is possible that some developments will require piled foundations to be installed through remediated soils and low permeability barriers. As such, it may be best practice for piles which are to be end bearing in the gravel to be cast insitu to mitigate against the effects of contaminant migration around the annulus of the pile. Continuous flight auger (CFA) piles may be the most appropriate. Driven piles may also be appropriate in certain areas of the site, dependant on ground conditions. It is considered that the process of driving will increase the density of granular soils within the made ground and Brickearth and Alluvium and promote consolidation in clay deposits, adjacent to the pile. This should reduce the risk of the pile installation forming a pathway for vertical migration of contaminants. The installation of driven piles will also result in very low volumes of contaminated soil arisings which would otherwise have to be disposed of at an off site licensed disposal facility.

Where the resolved likely load indicates that the London Clay is the most appropriate founding strata other methods of pile installation may have to be considered. The thickness and density of the gravel is likely to restrict driving piles to the London Clay so a non-displacement technique is likely to be most appropriate. Continuous flight auger (CFA) piles may be appropriate. Soil arisings would need to be assessed on site for their suitability for re-use on site or given a waste classification and disposed of at a licensed waste disposal facility.

The depth to which piles can be installed into the London Clay may be subject to restriction by the Environment agency with a view to protection of water resources beneath the London Clay. This has an implication for the design and distribution of piles.

5.10 Floor slabs

Ground bearing floor slabs could be adopted for parts of any proposed development subject to floor area and loading details. Where possible incompetent Made Ground should be treated or removed and replaced with a well-compacted granular sub-base material. It may be impossible to remove or treat Made Ground in certain areas of the site because of the presence of the low permeability capping layer. In areas of the site where there is no low permeability cap and incompetent ground conditions are encountered or particularly heavy floor slabs are proposed it may be necessary to incorporate some ground improvement measures or the adoption of a suspended floor.

5.11 Groundwater

Perched groundwater has been occasionally encountered in the made ground. Generally groundwater was encountered in the gravel strata below the Alluvium and Brickearth. Fast inflows of groundwater water are frequently recorded in the trial pit records and in the boreholes groundwater was noted to rise as much as 1.0m after the initial strike. In the light of the hydrogeological conditions encountered it is likely that dewatering may be necessary in excavations for remediation or redevelopment purposes. De-watering is likely to be best achieved through a combination of sump pumping and well pointing. It should be noted that both groundwater and perched water are subject to seasonal variations, possibly giving rise to more significant problems during particularly wet periods.

6.0 GROUND CONTAMINATION ASSESSMENT

It has been identified that the site in its entirety has been subject to many phases of historical industrial gas production and storage activities resulting in a corresponding and distinctive zoning of the soil contamination.

A summary of the results and discussion of the findings of both extensive historic third party investigations and the recent WYGE borehole and groundwater monitoring ground investigation to assess this are presented herein.

The following discusses the extent of the contamination within 'zones' (further divided into sub-zones) as well as on a more global basis, ultimately to allow the scoping of the required remediation to facilitate future redevelopment proposals. It is recognised that the degree of site investigation undertaken thus far, although extensive, will require further development before finalising the detailed remediation and construction works. Such enhancement will be undertaken following agreement with the planning authorities in relation to the future phased redevelopment proposals to ensure correct focus as the disturbance to existing operations and investment is extensive. This approach has been agreed in principal with the EHO and the EA.

For ease of reference the zones are referenced as A, B, C and D, reproduced in Drawing SK19. A further reference figure (SK12) details the contaminant concentrations identified from previous third party investigations as compared generally against initial screening values of ICRCL and Dutch Standards (See Appendix C) to assist in further consideration of actual risk.

The groundwater investigation of the site is discussed in greater detail in the Supplementary Groundwater Borehole Contamination Assessment (JUN 2000 – V2) with groundwater contamination monitoring results presented and discussed in summary here, in figures SK13 – SK17.

<u>General Site Overview</u>

A review of the chemical results arising from various previous investigations indicates that the site exhibits ground contamination to varying degrees within the soil and the groundwater. The recent supplementary WYGE borehole ground investigations have updated and verified a similar continuing situation.

Present within the soil on a more or less site wide basis are metals including those of the toxic and phytotoxic groups. Low levels of arsenic are most widespread but various others exist. Rarely however do concentrations of metals reach levels likely to be regarded as significant except very locally or where they may coincide with domestic gardens. PAH's are noticeable centrally in the site (main production areas) and to the northeast (clay pit backfill zone). Although individual concentrations vary across the site it is considered that on the whole the soil levels observed are not overly significant, with the exception of a few key areas, (significant is a qualitative term used to denote a concentration that is considered to be anomalous against the benchmark).

Monitoring of the groundwater regime at the site has shown it to be complicated and extremely variable, likely to be influenced by remnant underground structures, services and past mineral extraction activities, as well as by the prevailing natural geological conditions. The most significant groundwater layer at the site is retained within the Taplow Gravel strata and exhibits varying degrees of contamination impact.

The distribution of groundwater contamination has been assessed both from third party historical data and more recently from monitoring by WYGE over a five month period starting in October 1999 and ending in February 2000. The results of the monitoring indicate that significant fluctuations in the concentration of contaminants occur, but with areas of greater impact identified throughout the monitoring period.

6.1 Summary of results of the WYGE borehole investigation and discussion

Detailed reporting on the results and interpretation of the WYGE borehole investigation and subsequent monitoring is presented in the report referenced above.

6.1.1 Ground Profile

In the recent WYGE investigation Made Ground was encountered in all investigation positions to a maximum thickness of 2.80m in the central eastern area of the site, however, deeper made ground inside historic underground features is known to exist. The Made Ground was variable in composition with sandy gravels to sand, some clay, with varying proportions of rubble, glass, brick, flint and clinker. In two locations a solid concrete slab had to be penetrated. Contamination was visually identified in certain localities within the Made Ground.

WYGE identified below the Made Ground an inconsistent layer of Alluvium/Brickearth. This attained a maximum thickness of 1.1m and consists predominantly of slightly sandy silty CLAY with occasional GRAVELS and sand lenses. The alluvium was generally absent from the northern and central eastern areas of the site. Contamination was visually identified within certain locations in the Alluvium/Brickearth.

WYGE identified below the Alluvium a consistent layer of Terrace Gravel. The precise boundary between the Alluvium and Terrace Gravel was difficult to assess as the lowest deposits of the Alluvium are gravely in nature. The Terrace Gravel attained a maximum thickness of 6.9m and consists predominantly of fine to coarse subangular flint GRAVEL with sand and minor lenses of clay. Contamination was visually identified within certain locations in the Terrace Gravel.

WYGE identified silty sandy CLAY, London Clay, in all locations below the gravel.

6.1.2 Soil Contamination

Soil contamination is discussed in zones illustrated on figure SK19.

Zone A

Zone A falls to the extreme east of the site and is characterised by an absence of historical gas production infrastructure historically being used as a playing field/sports ground.

Identified contamination of the soil is limited to traces of heavy metals, principally arsenic however the concentrations are not considered significant (all below 40mg/kg). To the west of this zone further metals are identified, including copper, lead and zinc at concentrations exceeding trigger levels assigned to domestic gardens but below those assigned to the less sensitive landscaped areas.

The levels of arsenic, with the exception of those samples recovered from the boundary area with Zone B, are not considered to be as a result of direct contamination from the gasworks. Background arsenic levels naturally within London Clay have been found to vary between 5 and 50mg/kg and published guidelines are widely acknowledged as being unrealistically conservative.

Zone B

Zone B occupies the northeastern area of the site. It is, like zone A, characterised by an absence of historical gas production infrastructure however some activities in the form of gravel and clay extraction (subsequently backfilled) and coke storage have been carried out previously on this area.

The approximate profile and extent of these extraction areas can be seen on Drawing SK03 where filled or made ground thickness of some 2.50m is evident in this area, representing the material used to infill the pits. Geological logs of the area indicate a generally inert soil matrix with variable contents of ash and clinker, plastics, timber and general refuse. Observations of occasional contamination including tars and solvent odours were also logged. The results of the recent WYGE ground investigation confirmed that the made ground is deep in this area clarifying infilling of former pits.

Arsenic is again identified as present, although concentrations remain generally below 40mg/kg, with the exception of a single location which is identified as significant. Of increasing occurrence are organic contaminants with PAH being the most prevalent but also with TPH and BTEX being identified, although only in two locations. Contamination is on the whole restricted to the top 1.0m of material in the made ground.

The contamination profile across this area suggests that the infilling of the pits is in part responsible for some of the more significant concentrations.

Zone C

This occupies the north western area of the site and is historically characterised by the presence of coal and coke stores and a chemical works. An infilled dock delineates the southwest boundary.

Contamination remains to be dominated by metals, in particular arsenic. However the concentrations although elevated as compared to the more sensitive ICRCL values, are not on the whole considered significant with relation to the proposed end uses of open spaces and managed residential. Some localised contamination by BTEX and PAH is also noted. The contamination is generally present to a depth of 1.5m, within the made ground, although in a number of locations it has been identified to a depth of 3.0m, corresponding to samples recovered from the gravels or brickearth where present.

Zone D

This zone represents the main production plant zone of the gasworks, extending from the centre of the site to its western end. Contamination is widespread and variable, comprising of metals (toxic and phytotoxic), organic (PAH's) and phenols with many of the concentrations recorded in excess of relevant ICRCL and Dutch Intervention guidance values. In general the contamination is observed within the made ground (to a depth of 1.5m) although in localised instances it extends deeper.

The contamination within this area is characteristic of the use of the site for gas production. Much of the infrastructure shown by experience to be more of a risk, for example tanks, was sited to the northwest of the zone (between the holders and the Canal) and this exhibits some of the more significant contamination profiles. Investigations indicate that much of the below ground infrastructure associated with the sites operations remains in place. This represents not only a significant consideration for the re-development but also a potential for "contained" sources of contamination.

6.1.3 Groundwater Regime

Summary of the results of the recent WYGE investigation

During the course of the borehole investigation groundwater was encountered at all locations. Groundwater ingress was observed at depths varying between 0.2 and 4.5mbgl.

Local minor ingress within the Made Ground generally occurred rapidly rising from between 1.3 and 0.2mbgl to between 1.2 and 0.2mbgl in 20 minutes. Groundwater strikes in the Made Ground generally occurred only in the western area of the site. Detailed assessment of groundwater within the made ground has been undertaken and is discussed in relation to the apparent conclusions of the NTG report previously in section 2.2.2.

Ingress within the Terrace Gravels generally occurred rapidly rising from between 4.5 and 2.00mbgl to between 3.5 and 1.4mbgl in 20 minutes. Groundwater strikes in the Terrace Gravel were almost ubiquitous across the site and it represents by far the dominant water body. In boreholes 103,109,112 and 114 groundwater was struck twice. An oily sheen and oil contamination was noticed on groundwater from boreholes 102, 103, 104, 106, 111, 112 and 114.

Subsequent monitoring of groundwater in standpipes installed to respond to water in gravel indicated groundwater levels ranging between 0.45 and 2.7mbgl. The results of the groundwater monitoring are presented on figure SK07 – SK10. The detailed results of groundwater monitoring are presented in the Groundwater Borehole Contamination Assessment (JUN 2000).

Permeability tests undertaken on the gravels indicate values of between $7x10^{-6}$ and $2x10^{-5}$.

Interpretation of the Groundwater Regime

The groundwater regime at the site has been shown to be complex, of gradual gradient and variable, likely to be influenced by the underground structures, services and past mineral extraction activities, as well as by the prevailing natural geological conditions. An interpretation of groundwater flow during the WYGE monitoring is presented on figures SK07 – SK10.

Groundwater has been identified as two bodies; perched groundwater in the made ground and shallow groundwater in the Terrace Gravel deposits. Deep groundwater at the site, present in the Chalk deposits, was not investigated. Due to the thickness of the low permeability London Clay beneath the site, groundwater within the Chalk is not considered to be at risk from contamination originating at the site.

The perched water in the made ground was encountered mainly in the western area where separate strikes were recorded both in the made ground and the Terrace Gravel Deposits. In the eastern area groundwater strikes were generally recorded in the Terrace Gravels only. Perched water is not consistent across the site and is likely to be in continuity with shallow groundwater.

From the initial and subsequent monitoring visits shallow groundwater flow directions are estimated generally towards the Yeading Brook. The flow is slow and sensitive to changes in weather etc. A locally radial flow is seen towards the south-eastern boundary.

It is understood that in central (D) and northeastern (B) areas brickearth was extracted for the manufacture of bricks. Subsequent backfilling to permit development, with higher permeability material, appears to have had the result of creating sumps, draining the shallow groundwater towards their lowest points. Leakages into service drainage pipes, which are estimated to be located in the vicinity of this area of the site, are also possible sources of variations within groundwater flow. The location of one of the former docks, now infilled, is judged to traverse this area of the site, approximately to the north of BH101 and BH105. It is likely that this has had a significant effect on the groundwater flow patterns in this area of the site.

The groundwater levels are recorded as highest in February, as expected after characteristic groundwater re-charge over the winter months. As a result the hydraulic gradient across the site is steeper at this time, thus the flow of groundwater is likely to be increased. (The site is generally permeable).

6.1.4 Groundwater Contamination

Third party testing identified particular groundwater impact from the presence of phenols and to a lesser extent PAH over large areas of the site. The results of the recent WYGE work again indicated the presence of these two contaminants although at relatively different concentrations and at slightly differing geographic localities. This is to be expected given the dynamic nature of groundwater and the time elapsed since the previous surveys.

The distribution of groundwater contamination across the site was monitored over a five month period starting in October 1999 and ending in February 2000. The results indicate that significant fluctuations in the concentration of contaminants occur, but with generally consistent elevated areas identified throughout the monitoring period. The distribution of phenol and PAH contamination is illustrated on figures SK13 – SK17.

Elevated concentrations of phenols were consistently identified from the borehole immediately to the west of the current Transco retained holder areas and from the borehole installed in the central eastern area of the site in the approximate locality of the area of former mineral extraction. Elevated concentrations of PAH were consistently identified to the southwest and north of the currently retained Transco area. Generally the highest concentrations were identified in the former process areas within zone D, but significant 'others' indicate that areas away from the historical defined process areas are also exhibiting phenol and PAH contamination impact.

6.1.5 Surface Water

Summary of the results of the resent WYGE investigation

The location of sampling points for the Grand Union canal and the Yeading Brook are illustrated in figure SK18.

Samples of canal water collected by WYGE in Feb 2000 revealed a slight presence of some phenol (C5, 18.1µg/l). Repeat sampling in June 2000 (C8) indicated lower concentrations. Canal sampling localities are indicated on drawing SK18. Some traces of phenol occurred both upstream (i.e. before any potential gasworks influence) and downstream of the site and given area context and water classification ‘E’ this is not an unexpected situation.

WYGE collected samples of river water in Feb 2000. These showed no exceedances screened against Dutch Intervention guidelines, considered appropriate in area context and class rating.

Samples taken by WYGE in June 2000 again showed no significant exceedances of this criteria, excepting total phenol in R11 and R12 of 2.8 and 2.1µg/l respectively (criteria 2.2µg/l) see figure SK08. Notably both of these results were at the UPSTREAM edge of the site indicating other site influences.

Interpretation of the surface water regime

The relationship between the canal and the brook is illustrated on the schematic conceptual cross section of the site presented in figure SK20. The canal is at a higher level than the brook and therefore likely to be hydraulically isolated from groundwater in the gravel and surface water in the brook. Although in the past flow into the canal has been observed from the infilled docks, on site, and overland across the tow path, no evidence for ongoing contamination has been identified from the results of this monitoring.

The Yeading Brook bounds the site to the northwest, beyond the Grand Union Canal. The Brook has potential to be influenced by the site's groundwater conditions via groundwater flow within the gravel and via man made conduits such as sewers e.g. the White Street Sewer.

The results of recent monitoring indicate very little evidence of significant contamination in the Brook or the canal as a result of the site, especially in the area context.

*6.1.6 **Landgas***

The presence of soil gases is restricted to a few isolated observations with no consistent trends identified (i.e. three or more consistently elevated observations). In this respect it is concluded at this stage that gaseous phase contamination does not represent a significant issue. Elevated concentrations of primarily carbon dioxide and methane were locally identified as part of the recent WYGE investigations with an indication that the areas historically identified as gravel extraction areas may now be sources of some Landgas due to the nature of the backfill.

Alluvium and Brickearth are also potential sources of landgas as they frequently comprise material with a natural high organic content.

7.0 RISK ASSESSMENT

7.1 Ground Contamination

Ground contamination can occur through several causes especially historical site usage including processes of waste disposal, underground storage, open storage, process pipework, leaking pipework, material handling and storage areas. Contamination sources on the site may arise from current or past land uses within the boundaries or may migrate via water, land or air from adjacent land leading to long term potential liabilities under current legislation and risks to the environmental development.

The site has therefore been considered in line with the current United Kingdom guidelines for realistic source, pathway, target scenarios to assess risk. This risk assessment represents a qualified appraisal of the site using the initial screening of recovered site results against specified ‘soil contamination’ criteria followed by a consideration of actual risk.

The source pathway target scenario is a methodology adopted within latest UK guidelines whereby contamination within the subsurface can be considered to represent the ‘source’, the ‘pathway’ is the mechanism by which contaminants can move away or spread from the source and the ‘target’ is the end point on which they may have an adverse effect. The source, pathway and target scenario is considered in order to assess the environmental risks posed by the subsurface conditions at the site allowing the development of a suitable remediation strategy. A risk only exists when there is a source and a pathway and a target.

When evaluating this site's ground conditions it is critical that all environmental targets, and the pathways whereby the targets can be reached, are identified at an early stage so the evaluation and remediation can be established to protect or mitigate potential effects on them.

7.2 Hazard *Sources*

The main contaminants related to the site are considered to be:

♦ Soil

Generally the contaminant concentrations across the whole site, although not overly elevated, are widespread and characterised by metals and to a lesser extent PAH’s, with localised areas of notably more elevated concentrations in the site centre.

♦ Leachate

The potential for leachate generation is considered to exist especially in the finer grained soils comprising areas of the made ground and brickearth and alluvium.

♦ Groundwater

Groundwater within the Gravels are exhibiting contamination by phenols and PAH.

- Landgases

  Some locally concentrations of carbon dioxide and methane are recorded although no consistent or widespread elevated trends have been identified.

- Features

  The area beneath the centre and west of the site is known to be characterised by the presence of much of the substructure associated with the gas production plant. Identified within this area are a number of tanks and pits, which are considered to have a high potential of retaining, locally more significant contaminants.

7.3 Migratory *Pathways*

For the targets detailed in Section 7.4, there have been identified both direct and indirect pathways through which they could become affected:

Direct Pathways

- The ingestion of soil within which residues have been identified.
- The inhalation of vapours or dust through the air.
- Skin contact
- Uptake of residues in food plants being grown on site

Indirect Pathways

- Groundwater and run off.
- The impact on drinking water in pipes or running through soil exhibiting the effects of residues.
- Ingress of water into drainage systems, etc. and the systems themselves.

7.4 Potential *Targets*

Present Day On Site Occupants and Redevelopment Construction Workers

The site is expansive and only partially and inconsistently covered by impermeable hardstanding. Occupants may currently come into contact with some surface residues, however this contact risk will significantly reduce once remediation is undertaken and be limited to specialists' excavations on site. Soil gases have been identified locally within the ground, which can migrate into pits or subsurface chambers causing hazards for entry and maintenance. All construction workers will be fully briefed and appropriately protected.

Groundwater

The local geology is characterised by the presence of the Taplow Gravels, which retain a groundwater body, classified as a major aquifer. Conditions at the site are potentially impacting on these groundwaters and risks will require mitigation through remediation.

Surface Water

The Yeading Brook bounds the site to the north, beyond the Grand Union Canal, and this has the potential to be influenced by the sites groundwater conditions although results of tests do not indicate currently significant impact. Additionally the Brook may be being affected by the discharge of groundwater entering storm water sewers that pass beneath the site, such as the former White Street Sewer and the Beaconsfield Road sewer.

Future Redevelopment

In addition to any future occupiers or users of the site the physical fabric of the structures may be affected by the presence of the gasworks residues.

7.5 Risk Assessment

Current environmental legislation in respect of contaminated land includes Environment Act 1995, Water Resources Act 1991, Environment Protection Act 1990, Health and Safety at Work Act 1994, Town and Country Planning Act 1990 and Building Regulations 1985.

The potential environmental risks of the site associated with ground contamination can be addressed broadly within the following areas, with the table below summarising the discussion.

Risk Arising	Risk Rating
From the presence of historical contamination	Medium
To Taplow Gravels aquifer	High
To surface water	Medium
From on site migration from surroundings	Low to Medium
From off site migration from this site	Medium
From airborne transportation of contaminants	Medium
To present on site workers	Medium
To future construction workers	Medium to High
On site generation of landgas	Low to Medium
Overall Risk Rating	**Medium**

- The site has operated as a gasworks with ancillary chemical production operations for over one hundred and twenty years. Investigation works have identified the presence of site wide and in places significant concentrations of contaminants including metals, organics and soil gases, within the soil and groundwater environments. The risk assigned to the presence of high levels of this **historical contamination** is considered to be **medium.**
- Concentrations of phenols and PAH's within the **groundwater** are locally significant. This is considered to have the potential to reduce the quality of the aquifer. As such the risk assigned to the Gravels is **high.**

- The Yeading Brook, although likely to some extent to be hydraulically restricted from waters within the Taplow Gravels, is being discharged to from storm water sewers that pass beneath or close to the site. It is believed that the integrity of the former sewer may not be complete. Subsequently the **River Yeading** is assigned a **medium** order of being at risk. The **Grand Union Canal** is assigned a **low to medium** order of risk. Recent quality checks have shown no significant impact at present, although potential for impact is considered to exist.
- The site is bounded on all sides by low impact activities (residential, light industry; railway line and open land). The risk of contamination from these activities is considered as limited and hence the potential for **on site migration of contamination** is assigned a **low to medium order.**
- Given the presence of contaminants within the groundwater and the identified groundwater regime the potential risks associated with **off site migration** is considered as **medium**.
- Much of the site is covered only by fine granular material, when conditions are dry this has the potential to migrate via wind blown dust. Additionally localised areas of spent oxide have been observed on the surface. Subsequently a **medium** order of risk is assigned to the potential from **airborne transportation of contamination**.
- **Workers on the site today** operate primarily as drivers. With the exception of the above it is considered unlikely that they will come into contact with concentrations of contaminants sufficient to affect health. A **medium** order of risk is assigned.
- **Future construction workers** are assigned a **medium to high** order of risk given the potential for exposure to contaminants and require a high level of protection.
- The potential environmental risk associated with **on-site** generation of **landgas** is considered as being **low to medium.** This relates to the recording of inconsistent and low levels of landgas during previous investigations but also takes into account the fact that no discernible trends were observed. This requires further monitoring prior to redevelopment.

8.0 OUTLINE REMEDIATION DISCUSSION

In order for the site to be safely and appropriately redeveloped it is recognised that the soil and groundwater conditions will require remediation to a standard such that the receptors outlined in Section 6.0 are not at significant risk. This will be achieved through a programme of controlled contamination source removal or treatment and pathway disconnection. Further soil and groundwater investigation will be undertaken to further develop the detailed design of the remediation strategy once support and agreement through the planning process has been achieved. Standards will be adopted to achieve appropriate risk reduction for the end use proposed and will be more stringent in residential areas than industrial use areas.

8.1 Phasing and Zoning

At this stage the proposed redevelopment area can be initially divided into approximate zones reflecting the levels and types of residues identified within the soil as shown on figure SK19. Following investigation and remediation of these defined zones, the northeastern area is to be developed first for managed residential end use (Phase 1) with the remainder of the site investigated and remediated, in zones (Phase 2) for mixed commercial use.

These zones will be further delineated within the next stage of ground investigation. The scope of remediation will depend on the proposed end usage (e.g. residential, open land, hardstanding etc.). Primarily, this will lead to soil and groundwater remediation geared to likely risks, with the site as whole remediated adopting a 'suitable for use' strategy, in line with the recently introduced part IIa of the Environmental Protection Act.

The zoned approach will address the less impacted land to the east first, allowing it to be released for effective redevelopment, with a progressive move to the west thereby releasing further parcels of land for redevelopment. It is considered that this approach not only allows the land to be suitable for redevelopment more quickly, but is sympathetic with the direction of groundwater flow facilitating best strategy groundwater quality management.

8.2 Soil Remediation

8.2.1 *Continued Use of the Secure Storage Area (Zones D1 – D7)*

During the continued parking use of the site, to facilitate long term development, a planned programme of detailed investigation will take place in accordance with the presented strategy to gather more detailed information.

From the results of the investigation the remediation strategy will be further developed in detail and certain key elements of remediation may be undertaken, although the majority of the works will practically occur following clearance prior to site redevelopment (Phase 2) works to follow.

Given the potential presence of a considerable number of subsurface features and obstructions it is considered undesirable to undertake a single phase of site wide remediation within this area. It is considered that progressive remediation in a westerly direction would be the most practical at this stage, allowing the current use of the site to be maintained during these initial works, albeit on an ongoing, reducing scale.

The remediation areas would be extensively probed to better characterise features potentially holding significant gasworks residues (e.g. tanks), which constitute the most significant areas of risk possibly requiring action in the shorter term. These would be remediated, where appropriate after assessment. In order to mitigate direct pathways the area would be capped with hardstanding, where currently permeable, rendering the surface impermeable.

Any remediation undertaken would follow stringent procedures and controls discussed in 8.5, and be undertaken using pragmatic, economic and sustainable technologies with controlled revaluation of site derived materials for maximum potential recycling.

8.2.2 *Residential Development (Phase 1 – Zones A, B and C1 to C3.)*

To facilitate residential redevelopment site remediation will be undertaken using pragmatic, economic and sustainable technologies.

Controlled revaluation of site derived excavated materials would be undertaken in areas specifically chosen to mitigate against the potential effects of noise and dust on adjacent site users. Screened materials tested for re-use suitability would be directly recycled as fill across the site, with the some of the finer or unacceptable material being subject to treatment utilising 'low impact' bioremediation technologies.

Certain materials generated through remediation maybe of a character or form not fulfilling specific criteria for re-use on site or treatment and as such may require removal and disposal at a suitably licensed waste disposal facility.

The strategy would be developed alongside enhancement of form and layout as design develops.

To minimise any potential adverse effect of other future development zones to the south on the remediated areas, in the interim period subsurface control barriers will be installed as required, keyed into the London Clay to control any potential for a eastward groundwater pathway and separate the areas of development, reflecting practical remediation phasing, locations shown on Figure SK19. This reflects the phased approach to development effectively separating groundwater in the phase 1 remediated area from the remainder of the site.

8.2.3 *The Employment Development (Phase 2 – Zones D1 to D7)*

This end use proposal is considered to effectively be one of lesser sensitivity than proposed residential use in terms of ground conditions. This site area contains major zones of impact centrally, some of which will have been addressed for car storage use proposals (8.2.1).

Given the potential presence of a considerable number of subsurface features and obstructions it is considered most practical to progress remediation in a westerly direction in phases.

In ground features and soil identified during the preceding site investigation that still retain unacceptable levels of contamination, but were not removed during the Secure Storage remediation works (e.g. tanks, former foundations) will be further assessed based on the required standards and remediated if necessary. In ground features and soils exceeding site specific criteria based on end use would be remediated, where appropriate, and the impermeable surfacing re-established as part of the development.

Remediation undertaken would follow the stringent procedures and controls discussed in section 8.5, and be undertaken using pragmatic, economic and sustainable technologies with controlled revaluation of site derived materials for potential re-use suitability assessed.

8.3 <u>Groundwater</u>

The results of groundwater monitoring indicate that impact has been identified, particularly centrally on the site, in addition to other local areas. It is considered that in specific areas it is the groundwater that represents the major consideration for remediation. As such the general strategy for groundwater remediation is considered holistically at this stage but acknowledging key elements of the strategy may take place following contamination source removal in phases.

Although it has been identified that groundwater quality fluctuates significantly with time, it is considered that groundwater remediation first by soil (source) removal or treatment then by zonal product removal from the water or treatment will be essential elements in the redevelopment process. Free product gasworks residues (e.g. tar) identified during further SI works will be removed as part of the strategy and disposed of under full duty of care requirements at a suitably licensed waste disposal facility

In certain elements pathway disconnection will also form part of a phased strategy. The investigation and short term deployment of hardstanding over the area would be undertaken in association with extensive and detailed groundwater monitoring with particular regard to Yeading Brook (considering the Grand Union Canal), which are regarded as sensitive environmental receptors.

Building on the site in general will reduce the area available for infiltration of rainwater, including a managed drainage system, thus potentially reducing levels of groundwater recharge across the site area. A managed surface water drainage system will also reduce potential infiltration levels and consequently the possibility of any potential wash through of residually impacted soils. The effect of reduced infiltration is unlikely to be environmentally significant in the general groundwater context of the area which comprises the extensive (significantly beyond the boundaries of this site) gravel aquifer thought to be supplying base flow to the Yeading Brook.

Careful further consideration of the results of current and future monitoring, and a suitable assessment of risk, would be undertaken in conjunction with the key regulatory authorities to achieve a practical and appropriate solution.

8.4 Consultation

Consultations have been, and will continue to be, undertaken with the relevant Authorities at key stages throughout the design and implication of the remediation strategy. In particular agreement will be sought regarding aspects relating to environmental monitoring and control procedures alongside validation of works and completion reporting.

8.5 Environmental Controls

The remediation works will be undertaken in line with good industry practice under appropriate site set up facilities. These will include designated 'clean' and 'dirty' areas separated by health and safety hygiene units, odour mitigation systems, wheel wash and sheeting facilities for vehicles, induction programs for contractors and site visitors, and environmental controls similar to those detailed within the Health & Safety Executive documentation HSG66.

Ongoing monitoring for noise, dust, groundwater impact and odour etc. will be undertaken for the duration of the works which will be agreed through ongoing consultation with the relevant Statutory Authorities. The site will be available for inspection by the Statutory Authorities at any time.

A dedicated independent resident (RE) engineer will be in full time attendance at the site to oversee the works and ensure that all contractors and subcontractors maintain appropriate records of site activities and the ongoing remediation works. The RE will also ensure that all works are undertaken with appropriate duty of care. Unauthorised public access to the site will be discouraged with a 24hr security presence.

Facilities would be set up on site for the temporary storage of potentially contaminated water encountered in excavations. This water would be regularly monitored for quality and if necessary treated on site prior to discharge or disposal, both only after authority approval.

Specific areas will be set aside for short term stockpiling of contaminated soils and backfill materials. The soil would be placed on impermeable matting or sheeting and be covered for longer periods with sheet type impermeable material to reduce the potential for generation of leachate from stockpiled materials.

The residential areas to the north and east are identified as being of key importance alongside the groundwater environment. Adequate measures will be installed prior to the commencement of works to prevent the uncontrolled migration of noise, dusts and odours to these areas. Furthermore permanent monitoring station, augmented by hand held monitoring devices, will be positioned in strategic locations around the site. Personnel will be instructed to be aware of the potential for dust and odour generation and will act accordingly should they consider a potential for nuisance developing.

Material transport to and from the site will be strictly controlled and fed into the road network at pre-agreed rates and times only in line with impact and flow studies. Later phases will benefit from the new proposed western link road.

A full environmental management strategy will be in place for the duration of the works, focusing all party attention towards reducing potential environmental impacts as a result of the remediation works.

9.0 REMEDIATION TRANSPORT

9.1 General

Following both a pragmatic and sustainable approach to remediation outlined above (section 8) the strategy aims to keep the volume of materials transported off site to licensed disposal facilities to a practical minimum. Three transportation options have been considered for this material, the applicability of each being assessed with due consideration to the on going characterisation of the site and the external constraints and impact that necessarily apply to such activities.

For phase 1 of the works, comprising the proposed residential development in the northeastern area of the site, the environmental effects of transportation required to facilitate the remediation works has been considered through assessment of road, rail and canal options. It is expected that for phase 2 of the works, comprising the full remediation and development of the remaining areas of the site, new road infrastructure is expected to be constructed comprising an extension from Hayes bypass onto site from the west presenting the best option (permission granted). The works for the ongoing use of the site as car storage will be road accessed due to the minor and incremental nature of the works.

9.2 Discussion of Transport Options

9.2.1 *Road Transport*

For Phase 1 it is estimated that approximately 20,000m^3 of material will be removed from site, when combined with other activities, will probably be represented by approximately 4,500 lorry movements (in and out). For phase 2 it is estimated that 40,000m^3 of material will be removed from site, represented by approximately 8000 lorry movements.

The uncontrolled use of the existing road infrastructure for phase 1 could result in potential impacts to the local environment and road network; comprising congestion, increased noise, impact on air quality and raise perceived and real road safety issues.

Due to planning negotiations, the Hayes by pass link is unlikely to be in place prior to the remediation works in the northeastern residential area of the site (phase 1). Therefore, the road option has been assessed based on the predicted remediation traffic requirement from this area, and the ability of the current road infrastructure and capacity to accept this increase. Attention is drawn to the detailed construction road traffic impact assessment report by Savell, Bird & Axon (SBA). Traffic analysis indicates current network capacity to exist for the envisaged volume of vehicle movements generated through site remediation when logistics are effectively and strictly managed.

The surrounding road infrastructure has constraints at specific locations at certain times around the site and as such the use of road transport has been considered in detail to minimise potential impacts to current road users and residents in the vicinity of the site, primarily on a time and despatch frequency control basis. Procedures to mitigate environmental impacts resulting from use of the local road infrastructure are outlined below.

The adoption of a road based solution for essential redevelopment traffic would be implemented through carefully and strictly controlled measures. These would involve temporary short term stockpiling of materials on site whilst feeding the site traffic into the current system avoiding peak times, utilising preferred agreed routes and on a timed and spaced basis, not as and when transport is available. All vehicles will comply with appropriate vehicle emissions legislation and will be subject to regular safety checks. A computer controlled dispatch and arrival system will be applied to the site to further control the frequency and volume of site generated remediation traffic utilising the local road infrastructure.

As part of the development of the detailed remediation strategy on going assessments will be conducted on possible alternative road traffic routing schemes to further enhance this option. The traffic route envisaged at present will be via roads to the north of Beaconsfield Road.

9.2.2 *Rail Transport*

The site is bounded to the south by the main West Coast rail line, and associated suburban rail lines with Southall station some 0.5km to the east. It is prudent to consider if adaptation of the rail network may potentially provide a removal transport solution. The rail option would require the construction of new rail siding infrastructure and loading facilities dropping down from a higher level than the tracks in the vicinity of the site. Unloading facilities would also be required at an approved locality away from the site, where it is envisaged that site derived materials would have to be transported again by road to reach a suitable waste disposal facility. It is understood that only one tip at present in the area has rail receipt handling facilities.

In theory, there are certain environmental advantages with the rail option. However, in the context of the relatively short period of use there are a number of potentially prohibitive issues that significantly reduce the viability of this option, these include:

- Further study of the environmental impact of increased freight rail use, probably during night hours.
- The location of the new rail infrastructure for phase 1 remediation would preferably be to the east but this will provide no long term capacity. If located on phase 2 land, to the west, access problems will arise, until the Hayes bypass link is built, restricting current high employment use.
- A probable need for an off loading facility, from which material would be transferred to lorries to complete the journey to the designated waste facility thus offering no global environmental advantages.
- The likely length of time and complexity of the negotiations required to establish a siding principal.
- Costs and time scale associated with constructing a siding and associated linkages and logistics (signalling etc) to the main line are disproportionately high compared to remediation costs.
- Most critically, with the safety consideration of slow moving freight trains on the main west-east line.

The rail option is therefore considered not to present a practical option for remediation/construction works.

9.2.3 *Canal Transport*

The use of the canal to move materials on and off site is considered in the context of the phase 1 works.

The Grand Union Canal runs adjacent to Southall Gasworks along its northwestern boundary for a length of approximately 1km. At this locality the canal is approximately 7m wide and bounded to the south (BG site side) by a 3m wide canal towpath. Historically it is known that canal basins extended into the area of the gas works at three localities to form docks. These have been infilled as part of the decommissioning of the gasworks. The possibility of opening up these former basins has been considered to facilitate a more convenient loading facility but is unlikely to provide a practical solution for the materials volume required and bridging of the tow path would be necessary.

Construction of infrastructure to facilitate loading and unloading of material onto barges would be required. Following processing of site derived materials; unusable material would have to be stockpiled in an appropriate area prior to exportation. An overhead conveyor belt would be utilised to transport materials directly from the stockpile to barges moored along the canal. Tugs would be utilised to take loaded barges to the unloading area.

Several possible unloading areas have been identified, the closest, Bulls Bridge, is approximately 1km to the southwest of the site. There is a large industrial estate located here, with apparently currently unused land adjacent to the canal. This site also has good road access to the nearby M4 motorway. The option is considered without specific land negotiations at present, but knowing that in similar situations agreement to construct and use an unloading facility is understood to have been achieved with local landowners. To the east of the site other unloading options have been identified, one near Alperton (3km) and two near Wormwood Scubs (6km). Maps are attached detailing the locality of these unloading options. Specific usage agreements would need to be obtained for these three options, although practically they may be less appealing because they are much further away and in potentially more sensitive traffic areas.

Site derived materials would have to be transferred to road following unloading and it is necessary that a further traffic impact assessment would have to be undertaken at the new locality to assess the feasibility of this option. It is also considered likely that the site would potentially have to be licensed as a waste transfer station, resulting in lengthy Environment Agency negotiations and the need for legislative requirements for monitoring, its own planning permission environmental impact assessment and risk assessments. This may introduce unworkable delays to the site remediation programme.

Operational Factors

Transport of special waste on barges is expected to require that the operators are registered waste carriers with appropriate licenses and that pre-notification prior to transportation would have to be issued by the EA. It is also anticipated that British Waterways will have to issue a licence to permit transport of special waste on the canal.

Excavation, stockpiling and transference of material to barge undertaken within the site boundary are unlikely to require special licensing other than statutory approval and permission of EBC and the EA. It is however likely that the unloading area, located at Bulls Bridge would have to be licensed as a waste transfer station with several issues be addressed including; area drainage, noise, odour, security and pollution of the canal. In general application and issue of these type of license can be a lengthy and relatively expensive process.

Environmental factors

The loading and unloading facilities will introduce air quality, noise and potential nuisance impacts, although these will be strictly controlled or mitigated as with the rest of the works.

The operation will effect towpath amenity and established wildlife on the canal route for a period of several months. It is envisaged that procedures could be put in place to mitigate these effects, with the advantage that the perceived environmental benefit of utilising the canal may justify, to an extent these types of impact.

A major problem arises as a result of the proximity of a primary school to the canal adjacent to the northern area of the site. For phase 1 the loading activities will be, by necessity, close the to the school and although controlled, could potentially be regarded as disturbing to school activities. The area of phase 1 development is illustrated on the attached drawing 106 with the primary school marked on and the furthest possible locality of the loading area for phase 1 illustrated. The distance between the loading area and the school is approximately 150m.

Factors for further consideration

In the context of the canal being an alternative solution to road for renewal of remediation and construction materials, the following is noted.

- A solution is likely to exist to the usage of the canal for remediation works but this will involve time, cost and impact penalties that do not achieve global environmental gain. The main reason for this is the element of 'problem shifting' in this solution. Although the local impact of extra traffic in the vicinity of Southall is removed, there will be a new impact, albeit to a potentially lesser degree, in the vicinity of the unloading area.

- The timescale of works will be extended and will therefore have a longer period of potential disturbance to site neighbours.

- The canal option may be utilised to assist reduction of actual and perceived impact on the local transport infrastructure. This could be considered to have value in terms of good publicity in relation to the scheme in general.

Operational and environmental impacts need to be considered further in a global context. One of the major disadvantages of the proposed canal based transport scheme is the construction of the unloading facility and associated licensing as a waste transfer station. In the context of British Waterway's identified policy for promotion of reuse of the canal network and infrastructure the works are compliant.