

Bath Western Riverside Environmental Impact
Assessment
Environmental Appraisal

Bath and North East Somerset Council

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QM

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Date	27 April 2005	25 May 2005		
Prepared by	Hannah Price	Hannah Price	Hannah Price	
Signature				
Checked by	William Doughty	William Doughty	William Doughty	
Signature				
Authorised by		Barry Cowell	Barry Cowell	
Signature				
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WSP Environmental UK
1st Floor
Keble House
Southernhay Gardens
Southernhay East
Exeter
Devon
EX1 1NT

Tel: +44 (0)1392 432 748
Fax: +44 (0)1392 412 846



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1 Introduction

1.1 INTRODUCTION

1.1.1 This Environmental Appraisal report has been prepared by WSP Environmental on behalf of Bath and North East Somerset Council (Bath NES Council). Following on from Key Stage 1(Scoping) and Key Stage 2 (Collation of Baseline Information), this report summarises the key environmental constraints and opportunities that need to be considered as part of the Environmental Impact Assessment (EIA) of the comprehensive redevelopment of the Western Riverside at Bath (BWR).

1.1.2 It is intended that the information contained in this report will continue to assist in the design of the Masterplan for the scheme and inform the Supplementary Planning Document for BWR.

1.1.3 The report should be read in conjunction with the March 2005 and September 2004 Baseline reports and with the Scoping Report submitted to Bath NES Council in March 2004.

1.1.4 The remainder of this report deals with environmental topics being assessed by WSP environmental as part of the EIA and for each topic provides details of:

- I. A summary of the work done to date
- II. Key environmental considerations – constraints and opportunities
- III. Implications for the Masterplan

1.1.5 The report is structured as follows:

- Section 2: Townscape and Visual impacts
- Section 3: Archaeology and Cultural Heritage
- Section 4: Ecology
- Section 5: Geo-Environmental (Contamination)
- Section 6: Water Resources
- Section 7: Air Quality and Microclimate
- Section 8: Noise and Vibration
- Section 9: Waste Management
- Section 10: Summary

It should be noted that the Township and Visual impacts section has been written by others and hence WSP takes no responsibility for its content accuracy or validity.



2 Townscape and Visual Impacts

2.1 INTRODUCTION

2.1.1 The richness and diversity of the cultural evolution of Bath has left an invaluable legacy. The contemporary city remains dominated by the planning and architectural developments of the 18th Century. It was a period that defined the buildings, urban spaces, streets and landscapes that structure our understanding of the modern city: The seamless flow of space, the sequence of Queen Square, the Circus and the Royal Crescent. This crucial moment of great change exists however, as one of the many layers of the urban fabric. Each generation has responded to the needs of their time by leaving a distinctive contribution to the City's continuing evolution. In its totality, the compact and homogeneous urban form of Bath survives as a living testimony to three millennia of development. The legacy that resonates in its architecture, town planning, archaeological remains, landscape and rich cultural heritage has earned it the esteemed status of being inscribed as a World Heritage Site.

Yet Bath is also a dynamic living city. Its innovative, robust and flexible urban structure has enabled it to accommodate the challenges and demands of a modern world by providing an exceptional environment for a contemporary, diverse, active city and community. It continues to accommodate considerable pressure for growth; in population; employment; and recreational facilities for its residents as well as responding to a desire to maintain its role as a regional centre. Bath has thereby also come to exist as a successful demonstration of how urban excellence enables and encourages genuine mixed-use development whilst still maintaining composition in form and place making.

The SPD Spatial Masterplan for the development of Bath Western Riverside will bequest another new chapter to the city. As such, it will develop from a perceptive and carefully considered response to its historic and contemporary context. The design strategy will need to ensure that the site is developed as a natural and integrated extension of Bath. It must evolve from an empathetic understanding of the structure and organising principles of the City and its environs. The strategy should learn from these underlying principles and form a tangible and complimentary relationship to both the historic core and the areas with which it interfaces. The new development must enhance and respond to the unique existing fabric, as well as create desire lines that link to innovative and distinctive places of its own. Bath Western Riverside will ultimately develop from modern urban form that is carefully crafted into the environment to create a place of real quality that reflects an innate understanding of its distinctive context.

2.2 SITE AND CONTEXT APPRAISAL

2.2.1 The site is within the Bath World heritage site, the northern bank of the River Avon is within the city centre Conservation Area and there are a number of listed buildings within the site boundary. The area includes the Grade II* listed Victoria Suspension Bridge, and other notable bridges such as Green Park Station Bridge and the Destructor Bridge.

This rich heritage is a key consideration in planning for the future of the site, it has shaped the context of the site which must be respected in the redevelopment proposal. The contextual analysis has led to the overarching design principles and from these the detailed spatial masterplan flows. In addition the design codes accompanying the spatial masterplan will need to be grounded within the contextual language of the area.

2.3 WORLD HERITAGE SITE

2.3.1 The City of Bath was inscribed by UNESCO's World Heritage Committee in 1987 and is designated a world heritage site. The World Heritage Site designation and its considerations apply to all of the urban settlement and areas of countryside that extend in towards the city centre as well as the city centre itself. The city was recognised as a place of outstanding universal significance for its architecture, town planning, landscape, archaeological remains and its role as a setting for social history.

This is the highest level of heritage designation; Bath is one of only 23 World Heritage sites within the United Kingdom. Although the designation offers no additional statutory protection it highlights the international importance of the site, and the need to ensure its survival for future generations. Within the UK, the status is a key material consideration which must be taken into account when considering planning applications.

The City of Bath was inscribed as a World Heritage Site with particular reference to three of these established criteria:

Criterion i. Represent a masterpiece of human creative genius

Criterion ii. Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on development s on architecture or technology, monumental arts, town-planning or landscape design;

Criterion iv. Be an outstanding example of a type of building or architectural or technological ensemble or landscape which illustrates a. significant stage(s) in human history;

- Management of the World Heritage Site
- In recognition of the formal requirements and responsibilities of this designation, Bath & North East Somerset Council, in partnership with English Heritage, have developed a Management Plan for the City of Bath World Heritage Site. The main aims of the management plan are:
 - Promote sustainable management of the World Heritage Site
 - Ensure that the unique qualities and outstanding universal values of the World Heritage Site are understood and sustained in the future
 - Sustain the outstanding universal values of the World Heritage Site whilst maintaining and promoting Bath as a living and working city which benefits from the status of the World Heritage Site
 - Improve physical access and interpretation, encouraging all people to enjoy and understand the World Heritage Site
 - Improve public awareness of and interest and involvement in the heritage of Bath, achieving a common local, national and international ownership of World Heritage Site management

Development proposals for the site need to be considered within the context of the relevant requirements and considerations of the World Heritage Site Management Plan including the following key considerations:

- The development sites close physical relationship to the centre and historic core of the city
- The physical size of the proposed area in relation to the historic core
- The importance of the sites visual relationship with the rest of the city. In particular from vantage points on the surrounding hills down into the valley floor

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- The stated aspiration, in both policy documentation and visioning work carried out by the local authority, that Bath Western Riverside forms a new city quarter and contemporary extension to the city centre for the Twenty First Century
 - The future role of the area as a focus for a new community and the established communities to the north and south.

2.4 CHARACTERISATION OF THE CITY AND ITS CONTEXT

2.4.1 A wide range of literature is available which charts the historical development of the city and demonstrates how this has influenced the shape of the city today, it is not necessary to repeat this here; the bibliography includes references to the key texts in this area.


2.5 BATH CITY- WIDE CHARACTER STUDY

2.5.1 The Bath city-wide character study carried out in 2004/05 is an excellent summary document expressing how the historical development has influenced present day character, and from this flows a more detailed examination of the various character areas based on a mixture of desk top and field based research.

Section 6 of the character study describes the key aspects of character that give Bath its distinctiveness and significance. This summary is an excellent starting point as a design reference for any development within the city. There will be departures from the this character that can be justified in a large site like the Western Riverside and to some extent this spatial masterplan is signposting a new interpretation of contextual design. However, all design decisions that depart from the prevailing character must explain, and justify why they have chosen to do so, and why they should be accepted.

The Bath city-wide character study included the bulk of the Western Riverside site within character area 9, (Green Park Station and the area to the north east of the Avon are within character area 10 – the City Centre) the key findings of the study for area 9 are:

- The area is linear in character as a result of the underlying geology of river alluvium
- Generally the area is the flat floodplain of the Avon
- River Avon drains east to west through a gentle 'S' curve
- Very mixed land uses
- Considerable coherence of building heights, by far the most common is 1-2 storeys
- The Gas holders are the most prominent landmark within the area
- The Victoria Bridge is an attractive landmark and a good example of C19 suspension bridge, it is a much loved feature of the area. (Grade II * listed)
- Building form is variable with C19 terraces, mid C20 terraces and commercial sheds
- Most buildings are middle and late C19 or late C20/C21
- Building materials vary with residential a mixture of ornately patterned brick, Bath Stone and less commonly lias limestone.
- Roofs are clay or concrete and always pitched

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- Commercial buildings have a range of cladding materials with profiled metal roofs; there are few brick or stone commercial buildings
 - The long snaking lines of Upper and Lower Bristol Road dominate the street pattern- giving a strong east-west emphasis
 - Housing and commercial areas west of Windsor Bridge Road tend to be grid and curvilinear street patterns
 - To the east of Windsor Bridge and south of the river the layout is more amorphous
 - Degrees of enclosure are generally high, typically terraces on narrow streets
 - There is much movement and activity close to the main roads
 - There are significant pedestrian movements over Victoria Bridge
 - Boundaries throughout the area are mixed
 - Paving is principally concrete slabs or unit paving or tarmac
 - Trees line the river for much of its length, trees are so important along the river that often its presence can only be detected in views by the trees marking its course
 - Throughout the area there are views to the developed slopes and well treed skyline both to the north and south.

2.6 CONSERVATION AREA

2.6.1 The Bath Conservation Area extends to the northern part of the site up to the river. A character appraisal has not been published by the Council; however, there have been various studies as part of drawing up the spatial Masterplan that have informed the proposed design framework.

2.7 CONTEXT CONCLUSION

2.7.1 The analysis undertaken as part of the Bath city-wide character appraisal split the Bath Western Riverside site into two different character zones. This reflects the extent of the city centre influence on the site at present which stops abruptly at the river.

To this end the spatial masterplan must recognise that the site divides at the river to the west of Green Park Station and the challenge is to address that to ensure the city influence goes beyond the river boundary, and that there is a good interface either side of Victoria Bridge Road.

2.7.2 The contextual appraisal has also recognised the absence of a relationship across both banks of the river; the spatial masterplan needs to address this. In 2004 and 2005 a baseline townscape and visual analysis of the three areas has been undertaken and baseline reports prepared. Preliminary information has been used to inform the Masterplanning process. A key aspect of the assessment is the determination of a series of Townscape Character Areas which analyses the different forms, qualities and historical context of the City. This provides the context within which the development sits.



3 Archaeology and Cultural Heritage

3.1 INTRODUCTION

3.1.1 An archaeological Desk-based Assessment was undertaken in May 2001, with an updated version recently completed (April 2005), although not yet issued. A site walkover survey was undertaken by representatives of WSP Environmental and Wessex Archaeology in late 2004, complimented by a second survey in December 2004, conducted by the Wessex Archaeology Project Manager and representatives of the WA Conservation Management section. This second survey formed the basis for a Statement of Significance, completed with reference to Industrial Heritage elements within the Site as a whole. Boreholes and geotechnical test pits across the whole Site were archaeologically monitored and a report produced. A Written Scheme of Investigation was produced with reference to proposed evaluation at the Park and Ride site. This document (and the proposed scheme of archaeological works) is the subject of ongoing negotiation in advance of fieldwork.

3.2 KEY CONSIDERATIONS - CONSTRAINTS AND OPPORTUNITIES

3.2.1 Ground investigations (boreholes and test pits), monitored by Wessex Archaeology, identified no significant buried archaeology on any part of the Site. Although a more comprehensive evaluation is still to be undertaken on the Park & Ride site, the implication is that it is unlikely that archaeological remains of significance will be discovered there. Industrial Heritage aspects of the development should be considered throughout all stages of Masterplanning and it is likely that further comprehensive building survey work will be required to satisfy planning conditions in relation to these issues.

3.3 IMPLICATIONS FOR THE MASTERPLAN

3.3.1 It is understood that Industrial Heritage issues have already been addressed in the iterative design of the Interim Masterplan Framework. It appears, from the initial results, that below-ground archaeology is unlikely to present any major constraints re. Masterplanning, given the degree of disturbance/contamination evident within the Main Site/Transport Corridor, and the perceived low potential within the Park & Ride site.

4 Ecology

4.1 INTRODUCTION

4.1.1 The ecological assessment being undertaken for the Bath Western Riverside development has comprised a two-phased approach as follows:

- *Desk Study:* Consultation has been undertaken with a number of statutory and non-statutory consultees in order to determine the scope of work and identify any existing records and information on protected species and designated sites within 2km of the site boundary.
- *Field study:* A Phase 1 habitat survey has been undertaken for the Core Site, Newbridge Park and Ride Site and Transport Corridor. This survey followed JNCC guidelines and identified the need for further and more detailed surveys prior to the submission of the Environmental Statement. These surveys are summarised in Table 4.1 below:

Table 4.1: Recommended Further Surveys

Survey	Core Site	Newbridge Park and Ride	Transport Corridor
Badgers	Ongoing monitoring of badger sett May – June	N/A	N/A
Reptiles	N/A	Undertaken 2004	N/A
Bats	Undertaken 2004	Undertaken 2004	Undertaken 2004
Botanical	Being undertaken April-June 2005	N/A	N/A
Terrestrial Invertebrates	Being undertaken April-September 2005	N/A	N/A
Otter and water vole	Undertaken 2004	Undertaken 2004	N/A

4.2 KEY CONSIDERATIONS - CONSTRAINTS AND OPPORTUNITIES

CONSTRAINTS


4.2.1 The main ecological constraints identified so far include:

Core Site

Invasive species

4.2.2 Japanese knotweed has been identified within two areas of the Core Site. The presence of this invasive species will have implications on costs associated with its control and the reuse of soil from these areas.

4.2.3 Himalayan balsam has also been identified within the Core Site, particularly along the River. This will require management however the costs associated with



this are not as great as those with Japanese knotweed. Neither species are considered to be an overriding constraint to development, but a control strategy would be needed prior to site clearance, allowing sufficient time for implementation.

Badgers

4.2.4 A badger sett has been identified within the former Stothert and Pitt area. Recent monitoring undertaken in May 2005 has identified this sett as being active. Future monitoring of this sett will assist in further determining the level of activity and status of this sett. The presence of badgers will require consideration within the Masterplan in order to ensure their protection and enable free movement around The Site.

4.2.5 To incorporate this badger population into the development it would be necessary to protect the sett or build an artificial sett, have an appropriate buffer, identify and protect suitable and sufficient foraging habitat and retain or create corridors to enable badgers to continue foraging. This would potentially reduce the area available for built development. The option of closing the setts and moving the badgers out of the way is likely to be highly contentious and it is considered unlikely that this would be agreed with English Nature and the Local Authority.

Bats

4.2.6 The River Avon has been identified as a well used corridor and foraging area for a number of common bat species. Increased lighting along the River front will deter bats from this area. A lighting impact assessment is recommended. It is not expected that this would be an overriding constraint provided that appropriate mitigation is incorporated within the detailed Masterplan. Such mitigation would include additional planting along the River and directional lighting for example.

Otters


4.2.7 The presence of otters within the River Avon should be given consideration within the Masterplan. Lighting should be avoided along the River as this may deter otters from using these areas. Any construction within the River or any culverting etc should be avoided and where necessary mitigation measures will be required in order to minimise impact on this species. Appropriate pollution control measures should also be in place throughout the development in order to ensure that this species is not directly or indirectly (through loss of food resources) impacted upon as a result.

Post Industrial Land

4.2.8 'Post Industrial Land' is identified as a Local Biodiversity Action Plan (LBAP) Priority Habitat. Many such sites have potential to support rare and important invertebrates and terrestrial flora species. The former Stothert and Pitt site is considered to be of some interest and further surveys will enable the necessary compensation and mitigation to be provided if this area is to be redeveloped. The former Gasworks site may also be of interest, however access restrictions have prevented a survey to determine this.

Calcareous grassland

4.2.9 A small area of potential calcareous grassland has been identified along the top of the railway corridor on the former Stothert and Pitt site. Further survey work which is scheduled for April – June 2005 will confirm the nature of this grassland. Calcareous grassland is generally of interest due to the diverse flora it supports. Species rich grassland such as this is identified as a LBAP priority habitat



and therefore the loss of this habitat will require mitigation/compensation to reduce the impact of this loss.

4.2.10 The Phase 1 habitat survey has yet to be completed on the Gasworks site. Following this survey, it should be possible to consider further the potential constraints associated with this site.

Newbridge Park and Ride

Invasive species

4.2.11 Two discreet infestations of Japanese knotweed have been recorded within the Newbridge site. Himalayan balsam has also been recorded throughout much of this site to the north of Lower Bristol Road. The constraints posed by the presence of such species are discussed in sections 4.2.2 - 4.2.3..

Bats

4.2.12 The River Avon has again been identified as a well-used corridor and foraging area for a number of common bat species. The implication of the presence of these species is discussed in section 4.2.6..

Reptiles

4.2.13 A small reptile population has been identified within the land behind the bowling green. The loss of this habitat would be considered to have a slight negative impact on reptile populations. It is considered that this loss could easily be compensated/mitigated through a translocation exercise and habitat management elsewhere within the Site.

Otters

4.2.14 The presence of foraging and commuting otters along the River Avon and Newton Brook should be considered during the Masterplanning process. The constraints posed by the presence of otters is discussed in section 4.2.7..

Calcareous Grassland

4.2.15 The fields to the southeast of the Newbridge site where calcareous grassland has been recorded should be retained within the development proposals where possible. The importance of this habitat has been summarised in section 4.2.9. The loss of this habitat would not easily be mitigated due to its size and the time it takes for such habitat to establish. Development within this location should therefore be avoided.

Transport Corridor

Invasive Species

4.2.16 A further two stands of Japanese knotweed infestation has been recorded along the Transport Corridor. The constraints posed by the presence of such species are discussed in section 4.2.2.


OPPORTUNITIES

4.2.17 The ecological opportunities that have been identified so far are:

Core Site

Invasive species

4.2.18 There are opportunities throughout the development of this site to control the spread of invasive weeds including Japanese knotweed and Himalayan balsam.



This could be implemented through a Control Strategy for each species and integrated into future landscape management plans.

Bats

4.2.19 Significant potential opportunities for bat enhancement measures are presented by the scheme, including the strengthening of linear habitat features through the Site, design of bat access points into some new buildings and the erection of bat boxes on trees (particularly adjacent to the River Avon).

4.2.20 The above measures, along with the 'greening' up of new roads, cyclepaths etc through the Site, and the creation of amenity areas to include native shrubs and trees, will allow the current range of bat species at the Site to continue foraging within and moving through the Site post-development.

River Corridor

4.2.21 Opportunities exist to improve riparian habitat along the River through planting a continuous tree canopy.

Newbridge Park and Ride

Invasive species

4.2.22 Both Japanese knotweed and Himalayan balsam have also been recorded at Newbridge. The same opportunities exist to manage and control these infestations as discussed in section 4.2.18.

Bats

4.2.23 There is an exciting opportunity here for simple modifications to a disused feature that could significantly benefit a range of wintering bats in the locality. Such modifications would include bricking up the entrance to the arch and adding a metal door and some board cladding inside.

Reptiles

4.2.24 Management of the southern bank of the River Avon at Newbridge could easily improve the habitat potential for reptiles. Incorporating a raised bund would provide good opportunities for basking and hibernating reptiles. Encouraging a wild flower meadow in this location would also increase the insect diversity and improve this as a foraging area for reptiles. This location would be ideal for a translocation exercise of the small population of slow worm and common lizard from the bowling green.

Otters

4.2.25 Some opportunities may exist to improve the habitat for otters, particularly along the Newton Brook. By undertaking some habitat management of the woodland along the Brook, it may be possible to increase the natural light levels reaching the banks which would assist scrub and grassland establishment which would provide more cover for this species. It may also be possible to build an artificial otter holt along this brook.

Water voles

4.2.26 Water vole habitat is limited within the Newbridge site. Habitat management along the banks of the River Avon at this site such as planting rushes will assist in enhancing this site for water voles by providing some shelter from the currents. Future habitat management along the banks would also ensure that grassland and rush areas are protected from scrub encroachment.



River Corridor

4.2.27 The provision and management of a buffer zone alongside the River Avon would be an added opportunity to enhance the wildlife value of this riparian habitat. This would benefit invertebrates such as dragonflies, water voles, reptiles and bats.

Transport Corridor

Invasive species

4.2.28 Japanese knotweed has been recorded along the Transport Corridor. The same opportunities exist through the development of this area to manage and control these infestations as discussed in section 4.2.18.

Bats

4.2.29 There is potential to increase the use of this linear feature through planting a continuous green corridor and minimising lighting along this route.

4.3 IMPLICATIONS FOR THE MASTERPLAN

4.3.1 Table 4.2 below summarises the implications of the above constraints on the Masterplanning.

Table 4.2: Implications of Ecological Constraints on Development

CS = Core Site; N = Newbridge Park and Ride; TC = Transport Corridor

Constraints	Implications for the Masterplan	CS	N	TC
Invasive Species	Where ground disturbance is unavoidable in these areas, careful measures will be necessary in order to control the spread of these species and avoid potential future damage to the new development. There are costs associated with its control and the reuse of soil from these areas. An invasive weed control strategy should be prepared in order to manage implications of these species.	Yes	Yes	Yes
Badgers	Work within 30m of the active sett will be subject to English Nature licensing procedures. In order to obtain a licence to disturb or destroy the sett it must be demonstrated that satisfactory measures will be in place to sustain the population and minimise disturbance to this species. Such measures will include the retention of green corridors, a buffer around the sett and where necessary, the construction of a new sett.	Yes	No	No
Bats	Avoid the loss of roosting sites where possible (buildings with high potential and mature trees), and design sensitive lighting schemes along the watercourses. Where the loss/renovation of buildings with bat potential is unavoidable further surveys will be required at a more detailed stage in order to confirm the status of roosts.	Yes	Yes	No
Reptiles	Avoid the loss of reptile habitat. Where unavoidable, identify suitable habitat to translocate reptiles and manage for this	Yes	Yes	No



	species.			
Otters	At the detailed Masterplan stage the lighting plan should aim to minimise lighting along the watercourses.	Yes	Yes	No
Watercourses	Avoid construction within the watercourses. The Masterplan should aim to incorporate a buffer and enable the enhancement of vegetation along the River banks. The lighting plan should aim to minimise lighting levels on the watercourses. A potential suitable location would be adjacent to the River Avon at the Newbridge site.	Yes	Yes	No
Post Industrial Habitats	The further invertebrate and botanical surveys which are being undertaken at the Stothert and Pitt Site will enable the value of this site as a Post Industrial Habitat to be further assessed. The full implications will be assessed following the completion of these surveys however, if it is determined that this site is of particular value, it will be necessary to mitigate or compensate the loss of this habitat. Such measures may include retaining key areas of importance, considering roof gardens or managing an alternative site.	Yes	No	No
Calcareous grassland	Avoid the loss of calcareous grassland, particularly the larger area within the southeast of the Newbridge site. If such sites are lost it will be necessary to mitigate or compensate the loss of this habitat.	Yes	Yes	No



5 Geo-Environmental (Contamination)

5.1 INTRODUCTION

5.1.1 Two phases of ground investigation have been undertaken on the three sites to assess potential geo-environmental contamination issues. The investigations comprised targeted borehole and trial pit locations, as identified from desk study information. Soil samples from Made Ground and natural strata were screened and analysed for key contaminants according to the previous and current land uses. A similar suite of contaminants was then selected for the analysis of groundwater and surface water (from the River Avon) samples. Two rounds of soil gas analysis have been undertaken since completion of the investigations. The monitoring wells have also been surveyed and levelled to allow the hydrogeological regime to be assessed in relation to contaminant distributions.

5.2 KEY CONSIDERATIONS - CONSTRAINTS AND OPPORTUNITIES

CONSTRAINTS

5.2.1 Areas of soil and groundwater contamination have been encountered on the Core Site, consistent with a history of industrial use. These do not present any overriding constraint to new development, but the risk to human health will have to be dealt with appropriately and robustly in accordance with best practice techniques. Key contamination constraints in the Core Site, Newbridge Park and Ride and Transport Corridor are highlighted in the following paragraphs.

Core Site

5.2.2 Westmark Site – This is a former gas works extensively contaminated with hydrocarbons, metals and inorganics, especially ammonium. The potential exists for hydrocarbon vapours to be generated.

5.2.3 SecondSite Land – Main area of gas works to the south of the River, which is also known to be extensively contaminated in and around the associated infrastructure. This area of land is also considered to be the source of a groundwater contaminant plume, extending towards residential properties to the south east. The potential exists for hydrocarbon vapours to be generated.

5.2.4 Former Landscape Estates Land/Stothert & Pitt Site – A degree of contamination has been determined in Made Ground, which poses a potential risk to human health. The potential exists for hydrocarbon vapours to be generated.

Newbridge Park and Ride

5.2.5 Newbridge, the area of landfill to the north of the River - the landfill area has been shown to be generating carbon dioxide, but not methane. The former is sufficient to require basic gas protection measures in future buildings.

Transport Corridor

5.2.6 No areas of potentially significant contamination were encountered along the Transport Corridor.



OPPORTUNITIES

Core Site

5.2.7 Remediation of the Site to an appropriate standard will support the beneficial redevelopment of the Site as described in the Masterplan. Soil and groundwater treatment would also reduce the potential risks to Controlled Waters and allow the return of the aquifer to improved status for future utilisation, if required.

5.3 IMPLICATIONS FOR THE MASTERPLAN

5.3.1 The contamination have specific issues for the Masterplan in terms of whether remediation will be required, or whether certain areas may be more appropriate for an alternative, less sensitive use. These implications are summarised in the following paragraphs.

Core Site

5.3.2 Westmark Site - This area will require extensive remediation to provide a site which is suitable for residential use. The potential impact on groundwater (i.e. potential for release of contaminants into groundwater) will need to be addressed fully, as previously advised by the Environment Agency to a third party. Both soils and groundwater treatment have major cost implications. Any soils removed for undercroft parking are unlikely to be reusable (at least without some form of pre-treatment) and this would increase disposal costs further.

5.3.3 SecondSite Land - As for the Westmark site, areas proposed for new residential development with domestic gardens will require extensive remediation. The risk to human health is reduced in areas proposed for flats or commercial use (i.e. it assumed that any contamination will be capped by hard development). Any soils removed for undercroft parking are unlikely to be reusable (at least without some form of pre-treatment) and this would increase disposal costs further. The apparent impact on groundwater will need to be addressed fully in terms of the risks to controlled waters and adjacent properties, since the plume poses a risk of vapour exposure and would limit the feasibility of undercroft parking. The plume would require treatment to address risks, which may take a year or more and would incur additional costs, beyond direct soil and groundwater treatment on site.

5.3.4 Landscape Estates Land/Stothert & Pitt Site – Due to flood risk, this area is to be raised and effectively capped with clean material. In such a case, the risk to human health would be minimised and extensive excavation and removal of the contaminated land would not be required. The exception is some hotspots posing a risk to water resources. General soil arisings, e.g. undercroft parking, would require off-site disposal as hazardous waste, unless these can be successfully treated.

5.3.5 Embankment on former Landscape Estates Land/Stothert & Pitt Site – approximately 80% of this material would be suitable for use in land-raising on this site, but only in areas for flats or commercial use. The material is unsuitable for finished levels in residential gardens. The presence of Japanese knotweed may limit potential use of this material, depending on the extent of contamination with this pernicious weed.

Newbridge Park and Ride

5.3.6 Newbridge, area of landfill to the north of the River – buildings in this area would require a gas membrane and passive venting measures to be installed as protection for future users and occupants.



6 Water Resources

6.1 INTRODUCTION

6.1.1 Baseline work is currently being completed by Peter Brett Associates and WSP Env. Constraints and Opportunities will be established following the completion of this work.

6.1.2 Key issues that will need to be considered include:

- Water quality of the River Avon (currently classified as Fair).
- Integrity of the Hot Springs
- Contamination of groundwater
- Flood risk.



7 Air Quality and Microclimate

7.1 INTRODUCTION

7.1.1 Detailed consultation has been carried out with Bath & North East Somerset Environmental and Consumer Services Department in order to agree the scope and methodologies for the detailed air quality assessment. Baseline monitoring for nitrogen dioxide has also been carried out over a 6 month period at two locations which will be used for validating the modelled predictions.

7.1.2 The next stage of the assessment will involve carrying out dispersion modelling once the traffic data has been finalised.

7.1.3 In addition to the air quality assessment, microclimate studies have also been initiated. These include the assessment of the wind environment and daylight and sunlight assess to properties.

7.1.4 Measured wind data for the last five years (2000-2004) was obtained for the nearest weather station. Lyneham (55°12'N, 01°59'W, altitude 145m) was selected for proximity (20km from the Site) and for quality and consistency of the data. The data was reviewed and an initial desktop study has been conducted to identify key constraints and opportunities for the development.

7.1.5 The baseline study combines the use of a desktop-based preliminary wind assessment to identify potential air flow patterns around the development, the use of wind data and recommended comfort and safety standards (the Lawson criteria).

7.1.6 Further to the desktop study, a full numerical assessment will be undertaken using a three-dimensional model, to establish the air movement and velocity at any location around specific areas of the development. In assessing the current proposal and acknowledging the overall size of the development we recommend that the residential and the commercial areas be assessed separately.

7.1.7 As far as the daylight and sunlight studies are concerned, the current proposal was assessed and key constraints and opportunities were identified ahead of the next stage.

7.1.8 The next stage will quantify and establish the nature, scale and duration of the impact of the new development in terms of sky light and sunlight on windows of existing properties adjacent to the Site, as well as public gardens and amenity areas. The relevant British Standards and BRE Guidelines, which are usually the norm to follow for planning submissions, will be used to ensure compliance with best practice.

7.2 KEY CONSIDERATIONS - CONSTRAINTS AND OPPORTUNITIES

AIR QUALITY

7.2.1 Existing concentrations of nitrogen dioxide adjacent to the Upper Bristol Road, Lower Bristol Road and Windsor Bridge area currently indicate exceedance of the annual mean nitrogen dioxide objective due to high traffic flows and congestion.

7.2.2 The results from baseline monitoring show concentrations of 43.0 $\mu\text{g}/\text{m}^3$ and 40.8 $\mu\text{g}/\text{m}^3$ compared with the 40 $\mu\text{g}/\text{m}^3$ annual mean objective. Based on these figures, which were recorded over a six month period, it is likely that the annual mean objective for this pollutant is currently exceeded in the area. It is also possible

that higher concentrations than those recorded may exist in highly congested areas such as those in the immediate vicinity of Windsor Bridge Road junction.

7.2.3 Bath and North East Somerset Council has been consulted on the results of air quality monitoring studies carried out. The Council has indicated that additional monitoring at one site would be useful but not essential prior to submitting the planning application for Bath Western Riverside, in order to clearly define exceedance over a 12 month period and therefore reducing uncertainty (additional cost of £1500 per month, if required).

7.2.4 Bath and North East Somerset Council has indicated they are currently considering declaration of an Air Quality Management Area (AQMA) in the vicinity of Upper Bristol Road, Lower Bristol Road and Windsor Bridge areas due to existing high levels of nitrogen dioxide.

7.2.5 Where possible, it will be necessary to demonstrate some form of mitigation to reduce impacts on air quality. This may be achieved by optimising traffic signalisation and encouraging sustainable modes of transport such as bicycle use.

MICROCLIMATE (WIND ENVIRONMENT)

7.2.6 Wind data from the weather station at Lyneham Airfield was used to assess the wind conditions surrounding the site of the proposed development at Bath Western Riverside. Over the last five years (2000-2004) the prevailing wind direction is from the southwest quadrant blowing for approx 50% of the year, followed by the northeast quadrant for approx 20% of the year (Figures 7.1 and 7.2).

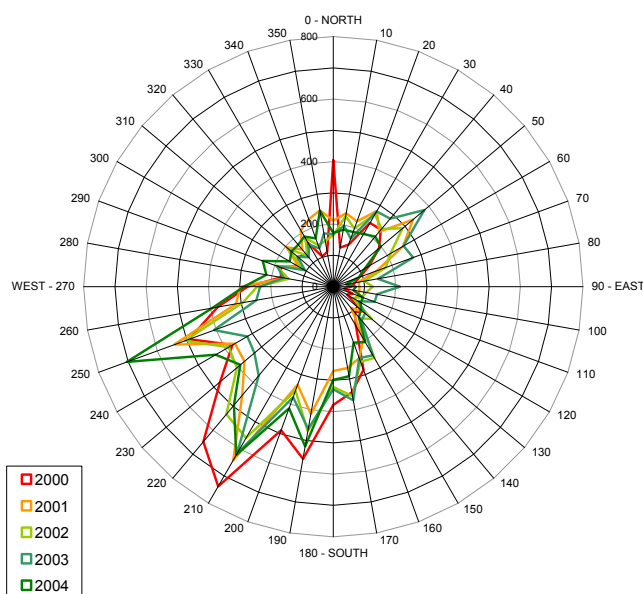


Figure 7.1: Seasonal wind rose for Lyneham Airfield (2000-2004)

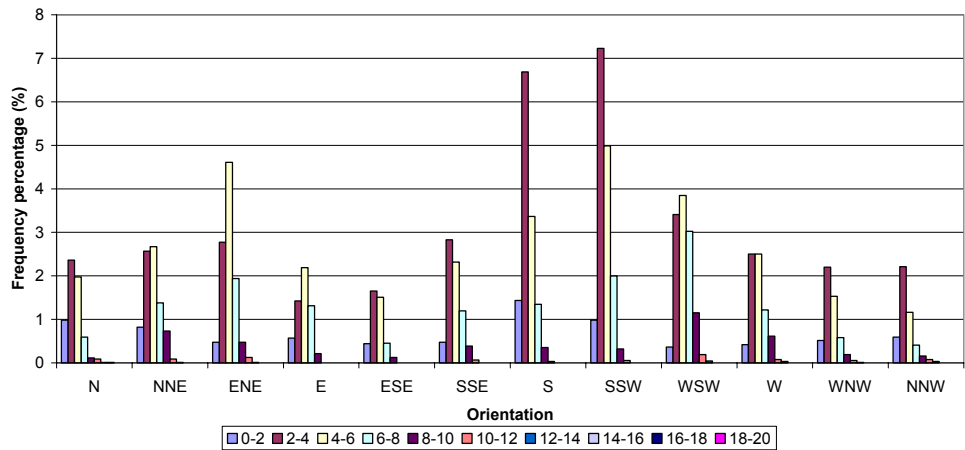


Figure 7.2: Annual frequency of wind speed by orientation for Lyneham for 2003

7.2.7 The annual frequency of wind speeds at the station was divided into three groups to reflect the ranges in the Lawson¹ pedestrian comfort and safety criteria used to assess the wind environment. The range of 0 to 4m/s is suitable for all pedestrian activities and occurs for 46% of the year from all directions. This is followed by the range of 4 to 10m/s, which are suitable for standing, leisurely and business walking, and occurs for 53% of the year from all directions. Winds above 10m/s are outside the comfort criteria but are less frequent. In fact, these higher winds speeds occur for only 1% of the year and are therefore below the mean hourly wind speed threshold of 5% of the year.


7.2.8 Seasonal variations in the prevailing wind speed and direction occur in most locations. In this region the prevailing direction for both summer and winter seasons is southwesterly. However, in winter easterly and northerly winds can also be observed. On these occasions the combination of wind speed and air temperature will result in a drop of effective air temperature felt by pedestrians, known as wind chill.

7.2.9 There are a number of wind effects caused by the height and form of buildings. Based on research and wind tunnel experiments carried out by others² it is possible to anticipate in general terms the likely effect of building form on the wind environment at pedestrian level. Listed below are possible generic effects resulting from the proposed development:

- The building height is an important factor, as taller buildings potentially deflect high-level winds towards ground level. This phenomenon is known as downwash effect and windy conditions can occur near tall buildings even on a relatively calm day. Depending on wind direction the wind speed may increase by up to 35% for eleven storey buildings.
- The funnelling or channelling of the wind flow between adjacent buildings is not as influential as might be expected since air will always follow the path of least resistance and this is often over the top of a building complex rather than through it. Adverse funnelling effects occur when the relevant buildings are more than five storeys high, more than 100 metres long, and the upstream and downstream funnels are clear of obstructions. Discomfort is worst when the width of the

¹ T.V. Lawson, *Building Aerodynamics*, Imperial College Press, 2001

² Design Guide for Wind, Wellington City Council, New Zealand.



opening is two to three times the mean height. Buildings eight to ten storeys high may cause a 30% increase in local wind speed.

- The corner geometry is important because sharp edge corners cause separated flows with strong wind speed gradients (rapid changes over a short distance). The increase in discomfort levels due to the corner effect can be similar to the range experienced from the downwash effect.
- When wind flows over rows of buildings of a similar height, as in older parts of a town, pedestrian areas are generally sheltered; usually considerably better than if there were no buildings at all.
- However, where low buildings are upstream of higher buildings and these exceed five storeys, it is likely that material increases in wind speed occur at ground level.
- When a building is set within an urban context, the cumulative wind effect must be considered. This cumulative increase in wind speed may be substantially reduced if existing or subsequent constructions nearby are of sufficient height to give a localised stepping effect.
- Entrances to buildings are particularly sensitive areas of any building development. Pedestrians are particularly vulnerable to wind conditions at entrances because of the potentially marked change between the controlled environment inside the building and external conditions. For this reason it is important that conditions immediately adjacent to an entrance are relatively benign or that there is a sheltered 'buffer' zone, which allows pedestrians time to acclimatise. For recessed entrances, the recess creates a buffer zone but is also prone to accumulating wind-blown debris because of the trapped vortex, or rotational, flows that can occur in the recess. Entrances are also used throughout the year so that even during the windiest days of the year the entrance should be relatively sheltered.

Daylight and Sunlight

7.2.10 The purpose of the daylight and sunlight studies is to establish the extent to which the proposed development meets current best practice guidelines as defined in the British Standard (BS8206-2) 'Lighting for Buildings' and 'The BRE's Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice'.

7.2.11 The Masterplan should aim at minimising overshadowing onto adjacent properties and amenity spaces, thus maintaining or improving current daylight and sunlight levels. In cases where the development blocks light to key windows, or causes overshadowing to open spaces the study will identify the magnitude of the problem and advise how the scheme can be modified in order to meet the guidelines. The daylight, sunlight and overshadowing studies will primarily focus on the impact of the new and existing buildings on adjacent existing properties and open spaces at different times of the year.

7.2.12 Given the nature and size of the development, studies will also be conducted to determine the daylight and sunlight availability to properties and open spaces within the Bath Western Riverside redevelopment.

7.3 IMPLICATIONS FOR THE MASTERPLAN

7.3.1 The Masterplan should aim to minimise public exposure to high pollutant concentrations adjacent to these roads and incorporate a layout to minimise the need for car travel.



7.3.2 If an AQMA is declared in the area, Bath and North East Somerset Council will be looking for sustainable measures that will help reduce pollutant concentrations in the area and that can be incorporated into an Air Quality Action Plan.

7.3.3 In addition, the Masterplan should aim at promoting a wind environment suitable for all pedestrian activities anticipated for the areas in and around the Site. Particular attention must be given to areas around tall buildings and areas where sensitive pedestrians (children and elderly) are most likely be present, i.e. close to schools, clinics and elderly homes.

7.3.4 The Masterplan should also aim at minimising overshadowing on to existing and proposed properties. This can be achieved by considering building orientation and height, as well as spacing between buildings, and using the BRE guidance in the design process.

8.2.4 PPG 24 recommends the use of four Noise Exposure Category (NEC) bands, designed to assist local planning authorities in evaluating applications for residential development in noisy areas.

8.2.5 Results of noise measurements undertaken for the Westmark site indicate that, at existing ground level the Site would be classified as falling within NEC B/C. In order to determine the noise level affecting the upper storeys of the proposed residential developments, further measurements were undertaken at this site on an embankment adjacent to the Lower Bristol Road boundary. This location is approximately 8m higher than the existing ground level, the measurement results indicate that at this location and height, building facades would fall within the higher ends of NEC C and B.

8.2.6 Whilst the measurement results for the Westmark site are expected to represent the worst case scenario for the whole of the proposed residential development, due to its proximity to two busy main roads, noise constraints also exist for the remaining residential development sites located adjacent to the Upper and Lower Bristol Roads, Windsor Bridge Road and James Street. These noise constraints, although not likely to be as significant, are likely to require mitigation measures and therefore have cost implications, albeit not as severe.

8.2.7 Classification of the remaining proposed residential development sites will change substantially due to the demolition of existing buildings that currently provide screening for central areas of the Site. The degree of screening is likely to be increased significantly due to an increased density and height of buildings to replace the existing buildings on the Site. The net benefit of this will be to create areas of development land within NEC B and possibly also NEC A.

8.2.8 The guidance to the local planning authority given in PPG 24 for areas identified as falling into NEC A, B or C respectively is given below:

NEC A *“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.”*

NEC B *“Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise”*

NEC C *“Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.”*

8.3 IMPLICATIONS FOR THE MASTERPLAN

8.3.1 The provision of sufficient mitigation measures will result in an increase in net costs where a higher specification of building materials is required, such as glazing and the provision of alternative ventilation where non-openable windows are specified.

8.3.2 There may also be a potential reduction in flexibility, in terms of:

- the internal layout of individual dwellings, such that non-habitable rooms are located on the façade closest to the noise source;



- the positioning of building blocks to ensure sufficient screening to parts of the Site further into the development, whilst, maintaining a commensurate level of protection for future occupants of the building block itself.

8.3.3 The provision of external amenity areas, gardens and balconies will be restricted to dwellings and areas screened from road traffic noise levels, although this is considered not to be a significant development constraint.

8.3.4 Where new noise sources are to be introduced to an existing residential or amenity area, consideration will need to be given to how the potential effects, once assessed, are to be mitigated. Such measures will include ways of maximising existing screening where present, noise control at source and the provision of additional screening where needed and possible restrictions on their operation.



9 Waste Management

9.1 INTRODUCTION

9.1.1 Consultations have been undertaken with Bath and North East Somerset Council's Waste Officer. The Environment Agency and WSPE are currently awaiting a formal response on the issues raised in the consultation letter.

9.1.2 In addition, a review has been carried out of national, regional and local level waste policy. This has included national level policy in the form of the Landfill Directive which was implemented in July 2004 and its implications for new developments, regional level policy on waste in the form of the Regional Waste Strategy for the South West and local level policy on waste in the form of the Bath and North East Somerset Waste Management Strategy.

9.1.3 Available statistical information on waste at a regional and local level has also been assessed including statistics on demolition / construction waste arisings data, Household waste statistics and commercial (offices, employment) waste statistics for the South West.

9.2 KEY CONSIDERATIONS - CONSTRAINTS AND OPPORTUNITIES

9.2.1 At this stage no key constraints have been identified associated with waste management. The further assessment work currently being undertaken will feed into the Masterplanning process. This further work includes the following:

- Consideration of waste related issues associated with the contaminated land / remediation strategy for the scheme.
- A review of the details relating to phasing of the development required - construction programme relating to remediation, demolition, site clearance, excavation works, etc.
- Consideration of the treatment and disposal options for the Japanese knotweed at the Site during the construction phase.
- A review of the details relating to the types and potential quantities of material likely to be generated during the construction phase, i.e. material requiring offsite disposal, material to be reused / recycled on-site. This is particularly important with regards to offsite disposal and the number of vehicles entering and leaving the Site.
- Details of contractors commitment to waste minimisation / recycling initiatives during construction - this is important to ensure that there is a commitment to such initiatives from the outset.
- A review of the details relating to the types and potential quantities of material likely to be generated during the operational phase.
- The opportunity to provide adequate storage for waste receptacles during the operational phase of the scheme in accordance with Bath and North East Somerset guidelines.
- The opportunity to provide outline guidance to residents and tenants on the facilities available for waste disposal. This will include recycling and residual general waste disposal options, purpose of waste receptacles and collection arrangements.



9.3 IMPLICATIONS FOR THE MASTERPLAN

9.3.1 To date no key constraints regarding waste management have been identified with regards to the Masterplan for BWR. However, early consideration into the provision of storage space for each aspect of the development should be undertaken to ensure that sufficient allocation is provided for waste receptacles for both recycling and residual general waste.

9.3.2 Although not an implication for the Masterplan the opportunity also exists to implement waste initiatives from the outset of the development and educate / raise awareness of residents and commercial tenants to the contributions that they can make towards sustainable waste management.

9.3.3 An opportunity also exists to phase the Masterplan appropriately to enable the effective integration of the development with the local authority waste collection services.

10 Summary

10.1

Technical Discipline	Core Site		Newbridge Park and Ride		Transport Corridor	
	Constraints	Opportunities	Constraints	Opportunities	Constraints	Opportunities
Townscape and Visual	<ul style="list-style-type: none"> - Sensitivity to internationally important cityscape - very visible site - Strong visual relationships to surrounding areas 	<ul style="list-style-type: none"> - opportunity to substantially enhance the quality of the townscape. - valuable design freedom. -enhancement of settings for listed buildings. - potential landmarks - establish new connections with the City and extensive areas of high quality public realm. 	<ul style="list-style-type: none"> - views of the proposed site - proximity of AONB, Green Belt and Bath World Heritage Site. - sensitivity in terms of current land use. - four important landscape features on site 	<ul style="list-style-type: none"> -manipulate traffic movement within the City to bring about benefits to the ambience and physical fabric of the town. 	<ul style="list-style-type: none"> - visible from a large number of a large number of public and private viewpoints 	<ul style="list-style-type: none"> - space allowing there is opportunity to establish larger incidental green areas. - more pedestrian and cycling links.
Archaeology and Cultural Heritage		<ul style="list-style-type: none"> - below ground archaeology unlikely to present any major constraints. 		<ul style="list-style-type: none"> - below ground archaeology unlikely to present any major constraints. - Additional intrusive ground investigations still to be carried out. 		<ul style="list-style-type: none"> - below ground archaeology unlikely to present any major constraints.



Ecology	<ul style="list-style-type: none"> -Active badger sett in embankment. - presence of invasive species (Japanese Knotweed and Himalyan Balsam). -Bats – River Avon is a well used corridor and foraging area. - Otter present within River Avon. - Post industrial land – the former Stothert and Pitt site. - potential calcareous grassland along the top of the railway corridor on the Stothert and Pitt site. 	<ul style="list-style-type: none"> - removal and control of invasive species. -potential for bat habitat enhancement measures. - improve riparian habitat along the river corridor. 	<ul style="list-style-type: none"> - presence of invasive species (Japanese Knotweed and Himalyan Balsam). - Bats – River Avon is a well used corridor and foraging area. - presence of foraging and commuting otter along River Avon and Newton Brook. - calcareous grassland in fields to southeast of Newbridge site. 	<ul style="list-style-type: none"> - removal and control of invasive species. - potential for bat habitat enhancement measures. - improved habitat potential for reptiles. - otter and water vole habitat improvements. - improve riparian habitat along the river corridor. 	<ul style="list-style-type: none"> - presence of invasive species (Japanese Knotweed). 	<ul style="list-style-type: none"> - removal and control of invasive species. - potential for bat habitat enhancement measures.
Geo-Environmental (Contamination)	<ul style="list-style-type: none"> - extensive contamination of westmark site (hydrocarbon, metals and inorganics) - Second site former gasworks. Heavy contamination. Possible source of groundwater contaminant plume. -Stothert and Pitt site – contamination in Made 	<ul style="list-style-type: none"> -remediation of the Site will support the beneficial redevelopment of the Site. - Soil and groundwater treatment would also reduce the potential risks to controlled waters 	<ul style="list-style-type: none"> - area of landfill to the north of the River generating carbon dioxide but not methane. 		<ul style="list-style-type: none"> - no constraints identified. 	



	Ground					
Water Resources	- key issues include water quality of River Avon (currently fair), integrity of the Hot Springs, contamination of groundwater, flood risk.	- to enhance the water and landscape quality of the River Avon - to integrate water management procedures into design.				
Air Quality and Microclimate	- existing concentrations of nitrogen dioxide adjacent to the Upper Bristol Road, Lower Bristol Road and Windsor Bridge exceed annual mean objective.	-opportunity to demonstrate mitigation to reduce impacts on air quality e.g. optimising traffic signalisation, encouraging sustainable modes of transport. - there is an opportunity to beneficially influence the wind environment and effects of overshadowing through design.	- no constraints identified		- no constraints identified.	
Noise and Vibration	- constraints effecting residential development due to existing high noise categories adjacent to key roads surrounding site	-reduction in noise levels on key roads by appropriate traffic management.	- introduction of new noise sources.	- mitigation of impacts from new noise sources	-introduction of new noise sources.	- mitigation of impacts from new noise sources.
Waste Management	-no constraints identified	-opportunities to improve waste management by incorporating into design process.	-no constraints identified	- opportunities to improve waste management by incorporating into design process.	-no constraints identified	- opportunities to improve waste management by incorporating into design process.