



Lewisham & Catford Flood Alleviation Scheme Environmental Scoping Report

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Executive Summary

The overall aim of this Environmental Scoping Report is to present the findings of the scoping stage undertaken as part of our Environmental Impact Assessment (EIA) process for the Lewisham and Catford Flood Alleviation Scheme (FAS).

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1 Introduction

1.1 Aim of this Environmental Scoping Report

The overall aim of this Environmental Scoping Report (ESR) is to present the findings of the scoping stage of the Environment Agency's Environmental Impact Assessment (EIA) process, for the Lewisham and Catford Flood Alleviation Scheme (LCFAS). This document will also form part of the information required to gain internal Environment Agency approval for the project (i.e. business case) to proceed to detailed design and construction.

This ESR has a number of objectives, namely to:

- Provide a record of the scoping process;
- Identify the methodology for undertaking the assessment and evaluation stage of the EIA;
- Identify which issues have been 'scoped' out of the EIA;
- Identify opportunities for environmental improvements.;
- Summarise the options appraisal process; and
- Provide a means for consulting with statutory bodies and interested parties.

Your comments will be taken into account in the subsequent stages of the EIA process.

1.2 Site Location and description

The London Borough of Lewisham is situated in southeast London. It is bordered to the west by Southwark, to the east by Greenwich and Bromley to the south and it has a small frontage on to the River Thames in the north. It is an inner London Borough comprising a densely populated area with an estimated 2011 population of approximately 275,000. The Borough is mostly residential with key areas of employment around the main commercial centres of Lewisham, New Cross, Catford, Deptford and Sydenham. Lewisham is relatively green with approximately one fifth of the Borough being open space.

The River Ravensbourne, which form the focus of this project, flows from Keston in the south, northwards into Deptford Creek, where it flows into the River Thames upstream of Greenwich. The upper third of the catchment is semi-rural with the remaining component being heavily urbanised. The Ravensbourne catchment incorporates several tributaries: including the Honor Oak, Spring Brook, Pool River, The Beck, Chaffinch Brook, Chaffinch Brook (west branch), St James Stream, Ravensbourne East Branch, Ravensbourne South Branch and the River Quaggy.

The town centres of Catford, Lewisham and Deptford have all developed alongside the banks of the river. As a result, the river has been heavily modified through the creation of concrete channels, narrowing, loss of natural floodplain (i.e. through local defences and development in the floodplain) and the introduction of weirs and other drop structures.

The Honor Oak stream (sometimes referred to as the Chudleigh Ditch) is a surface water drainage channel that outfalls to the Ravensbourne via two concrete culverts. One outfalls to Ladywell Fields and the other near Molesworth Street, hereafter referred to as the northern and southern Honor Oak culverts respectively. The open channel is approximately 1.5m wide and 0.7m deep. The culverts are the limiting factor for capacity of the Honor Oak, the Molesworth Street Culvert capacity is severely restricted by the reduction in pipe size. The Ladywell Fields culvert is affected by high water levels in the Ravensbourne (i.e. which causes backing up). The Honor Oak is difficult to maintain given its location and is often clogged with vegetation and debris (see Plate 1.1).

Plate 1.1: Honor Oak



1.2.1 Scheme study area

The study area for the LCFAS includes the lower reaches of the Pool as far as the A2218, the Honour Oak and the River Ravensbourne from Beckenham Place Park to the tidal limit in Deptford. The study area is shown in Figure 2.1.

The scheme's main focus is to develop a solution for fluvial flooding. Although the effects of the scheme on surface water are being assessed, the project is not specifically concerned with surface water flooding as this is being addressed by other projects.

Figure 2.1: Study Area

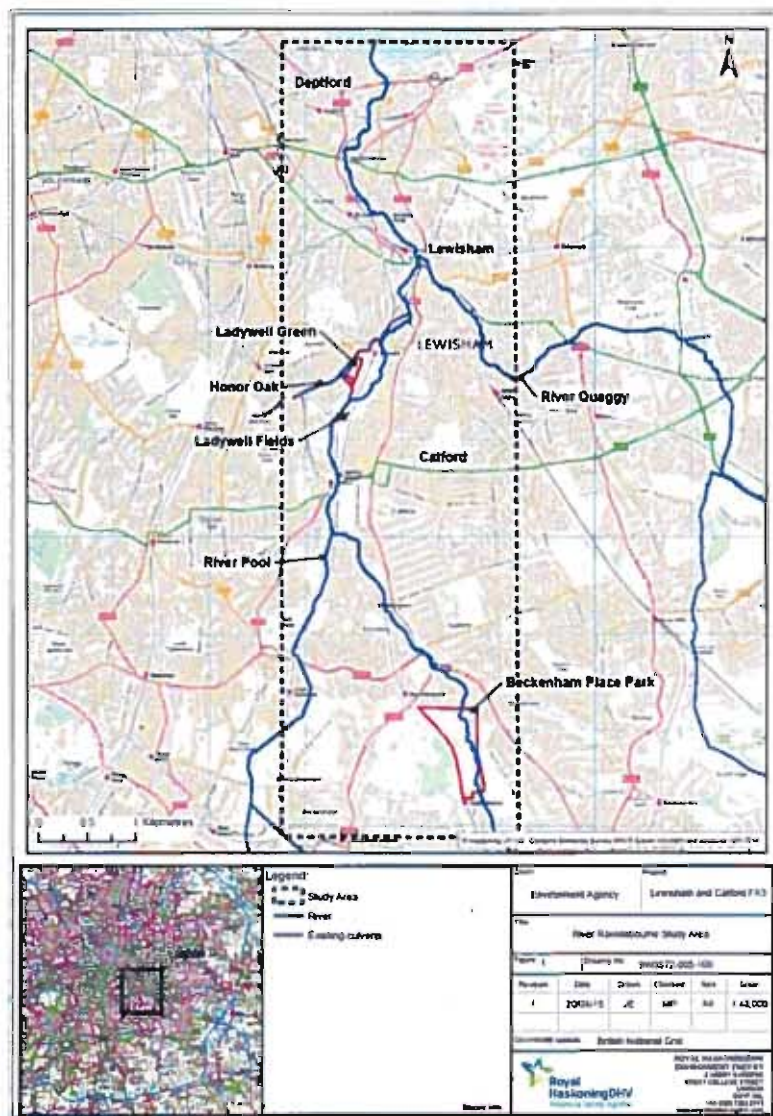


Figure 2.2 - Site Location Ladywell Green

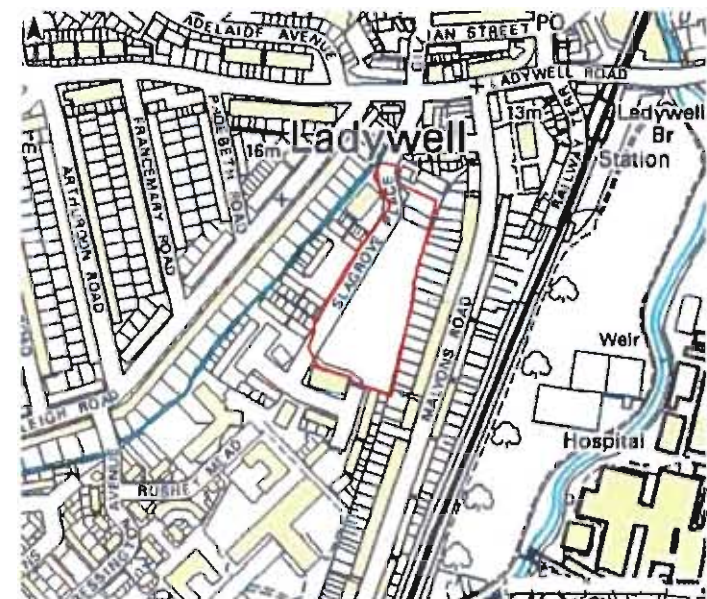


Figure 2.3 - Site Location and Layout, Beckenham Place Park



2 Background

2.1.1 Existing Flood Risk

There is a history of flooding, with varying significance, throughout the Ravensbourne catchment from a variety of sources which include surface water, groundwater and via the numerous watercourses. The last major flood event in the catchment was in September 1968 which caused flooding of a large number of residential and commercial properties.

The last instance of properties flooding on the Ravensbourne was in 1993 although other fluvial events have occurred more recently in 2000, 2001 and 2004 but levels did not reach property threshold levels and only gardens were affected. Many of the channels in the catchment were culverted or converted to concrete channels as part of a major flood alleviation scheme between 1964 and 1974 which aimed to reduce the frequency and severity of flooding.

Surface water flooding has been observed frequently within the catchment. This is caused by urbanisation, insufficient drainage capacity, and backwater effects from the main rivers. A particularly significant surface water flooding event occurred in 2007 in the upper reaches of the catchment and on the River Quaggy. Post 1968, following the construction of the Thames Barrier, there has been no tidal flooding in the catchment.

Flooding at Loampit Vale (1992) and Catford Station (1968)



There is little evidence that groundwater flooding has affected properties apart from a limited number of cellars and gardens in the downstream low lying parts of the catchment.

The occurrence of flooding within the study area is attributable to a range of contributing factors, including rapid runoff from a largely urban catchment, lack of available upstream flood storage, limited channel capacity, low points and gaps in the flood defences and restrictions to flow (e.g. narrow culverts).

Currently, approximately 1,400 homes and businesses are located within the floodplain of the River Ravensbourne and Honor Oak Stream between Catford and Lewisham. Of these, approximately 400 homes and 280 businesses are at 'high' or 'medium' risk of river flooding. If nothing is done, climate change will increase the number of properties affected. Table 2.1 outlines properties and infrastructure at risk in the study area during a 1% annual probability flood.

Table 2.1: Properties and Infrastructure at risk in study area during a 1% annual probability flood

Do minimum (carry on maintaining the river as existing)	Do nothing (no longer maintain river to existing condition)
399 homes and 84 businesses at risk of internal flooding.	993 homes and 242 businesses at risk of internal flooding.
Critical roads, including the A20, A21, A2210 and B236 - including 3.2km of designated 'Red Route'.	Critical roads, including the A20, A21, A2210 and B236. Plus A200, A206, A2, A205, A2218, A2015 and B208.
Docklands Light Railway at Elverson Road and	Docklands Light Railway at Elverson Road and National Rail lines (1: Between Lewisham, Ladywell and Lower Sydenham. 2: Between Catford to Beckenham Hill).
9 electricity substations.	41 electricity substations.
Deptford pumping station for drinking water.	Deptford pumping station for drinking water.
National Rail line (Between Lewisham, Ladywell and Lower Sydenham).	Greenwich Pumping Station for sewerage.
-	Lewisham Police Station.
-	University Hospital Lewisham.

2.2 The Project

The Environment Agency, in partnership with the London Borough of Lewisham, is currently developing a Project Appraisal Report (PAR) (business case) to secure funding for the next stages of the project (i.e. detailed design and construction).

This stage of the project comprises a number of activities to support the PAR submission, including outline design, public consultation, hydraulic modelling, preliminary ecological and environmental surveys, a ground investigation, environmental assessment (including preparation of this ESR), and cost-benefit analysis.

The PAR is due to be finalised in 2015, and subject to securing further funding, construction of the scheme is expected to commence in 2017/18.

In parallel with the LCFAS, the London Borough of Lewisham is developing restoration proposals for Beckenham Place Park through a Heritage Lottery Fund (HLF) project. Beckenham Place Park (the section of park to the east of the railway line) forms a key component of the proposed LCFAS, therefore a partnership delivery approach is currently being developed by the Environment Agency and the London Borough of Lewisham.

2.2.1 Project objectives

The primary objective of the LCFAS is to identify and appraise flood risk management options for properties at risk from fluvial flooding within the study area (see Section 1.2.1), and to deliver the recommended option developed in partnership with key stakeholders.

The key objectives of the project are to:

- Appraise the flood risk management options for approximately 1,000 properties at risk within the benefit area;
- To promote a scheme that will move approximately 307 properties from the very significant/significant risk category to moderate/low risk categories;
- To safely deliver the recommended option with appropriate funding contributions in accordance with current Defra guidance;
- To outline a long-term sustainable approach to manage flood risk in the study area, in line with the policies of the Thames Catchment Flood Management Plan, the River Ravensbourne Policy Unit and the Thames River Basin Management Plan;
- To deliver a business case in 2015 that recommends the best flood risk management option for the study area that aligns with 'Creating a Better Place 2014-2016';
- To provide a Plan for the Implementation of the recommended option;
- To develop solutions following effective engagement of stakeholders and general public, aligning where possible with their objectives and with external funding opportunities identified;
- To undertake Environmental Scoping to allow the systematic environmental appraisal of the proposed scheme;
- To demonstrate how any change in regime addresses the objectives of the Water Framework Directive; and
- To deliver the PAR with exemplar allowance for Health and Safety in both the Appraisal and Delivery.

2.3 Legislative Context

2.3.1 European Policy

The Thames River Basin Management Plan (Environment Agency, 2009) has been prepared under the Water Framework Directive and is about the pressures facing the water environment in the river basin district and the actions to address them. The objectives of the RBMP are to achieve 'good status' and to ensure no deterioration.

The River Ravensbourne falls within the London catchment which is described as highly urbanised with a lack of natural river processes and habitat diversity with water quality remaining a significant issue in the catchment. Pollution is a significant pressure in the catchment, in particular from surface water run-off, storm sewage overflows and misconnections, along with effluent from sewage treatment works.

The 2009 Plan is due to be updated in 2015. Implementation of the RBMP is via local catchment plans, the Ravensbourne Catchment Plan is currently in preparation.

2.3.2 National Planning Policy

The granting of planning permission requires that the provisions of the Town and Country Planning Act 1990 are applied and that the decision is made in accordance with the local authority Development Plan unless other material considerations indicate otherwise. The Development Plan is therefore the starting point for consideration of planning applications.

The Planning and Compulsory Purchase Act 2004 introduced changes to the UK planning system. These changes resulted in the production of plans at two distinct levels:

- Regional Spatial Strategies (RSS): An RSS was prepared for each individual region. In the case of the Lewisham and Catford Flood Alleviation Scheme, the RSS is the London Plan published in July 2011; and
- Local Development Plan Documents (LDDs) of the Local Development Framework (LDF), or the former Local Plan, which are the statutory land use plans for the area. The LDDs typically comprise of a Core Strategy, Development Management (Control) Policies and Site Allocation Documents. Under the new National Planning Policy Framework these documents are now referred to as Local Plans again and can be issued as a single document.

Planning policy for England is outlined in the National Planning Policy Framework (DCLG, 2012), published on 27th March 2012. The National Planning Policy Framework (NPPF) is a material consideration in planning decisions and forms a single overarching planning policy for England, replacing all other Planning Policy Statements and Planning Policy Guidelines. As well as providing guidance to local authorities and communities (Parish Councils or Neighbourhood Forums) on planning policy, for use in preparing Local and Neighbourhood Plans, it provides guidance on individual planning applications and appeals.

It sets out the Government's objectives for the planning system along with the key principles and objectives that should underpin the integration of sustainable development into local planning policy.

That planning should take "full account of flood risk" is part of one of the 12 core planning principles outlined in the NPPF. This should be undertaken through the production of Local Plans by the relevant local authority.

With regards to the issue of flooding, paragraph 100 of the NPPF concerning Local Plans, states that these should "develop policies to manage flood risk from all sources". Furthermore in terms of infrastructure, it goes on to state that "Planning policies should recognise and seek to address potential barriers to investment, including a ... lack of infrastructure". This application aims to ensure that the necessary flood defence infrastructure is developed.

2.3.3 Regional Planning Policy and Guidance

London Plan, Greater London Authority (2011)

The Mayor's London Plan sets out an integrated economic, environmental, transport and social framework for the development of the capital over the next 20-25 years. The

Plan was originally prepared in 2011 and has been updated through Revised Early Minor Alterations to the London Plan Report in October 2013.

The previous Plan (published in 2004) introduced the concept of the Blue Ribbon Network, which includes the Thames, the canal network, the other tributaries, rivers and streams within London and London's open water spaces such as docks, reservoirs and lakes. The Blue Ribbon Network includes the River Ravensbourne. The Plan sets out a number of policies for the protection and enhancement of London's water spaces.

Of particular note, Policy 7.28 of the 2011 London Plan sets out specific policies relating to the restoration of London's rivers:

- Development proposals should restore and enhance the Blue Ribbon Network by:
- Taking opportunities to open culverts and naturalise river channels;
- Increasing habitat value. Development which reduces biodiversity should be refused;
- Preventing development and structures into the water space unless it serves a water-dependent purpose;
- Protecting the value of the foreshore of the Thames and tidal rivers;
- Resisting the impounding of rivers; and
- Protecting the open character of the Blue Ribbon Network.

Thames Catchment Flood Management Plan

The Thames Region Catchment Flood Management Plan (CFMP) (Environment Agency, 2009) sets out a 50 to 100 year framework for river basin management. It sets the context, strategic direction and objectives for the sustainable management of flood risk in the Thames region.

Catchments and floodplains are identified within the Thames CFMP and each have specific targets with the Ravensbourne floodplain falling within the category of 'developed floodplain with typically concrete river channels'.

The Thames CFMP is further divided into policy unit documents for catchments or portions of catchments and the relevant policy is the Ravensbourne Policy Unit. The unit is defined as areas of low, moderate or high flood risk where flood risk is already managed effectively but further actions may be needed to keep pace with climate change.

London Rivers Action Plan, the River Restoration Centre (2009)

The London Rivers Action Plan (LRAP) has been developed to provide a delivery mechanism to take forward London's river restoration strategies - "A strategy for restoring rivers in North London" (2006) and "River restoration - a stepping stone to urban regeneration highlighting the opportunities in South London" (2002). The LRAP contains the following principle aims;

- Improve flood management using more natural processes;

- Reduce the likely negative impacts of climate change;
- Reconnect people to the natural environment through urban regeneration;
- Gain better access for recreation and improved well-being; and
- Enhance habitats for wildlife.

Creating a Better Place - Environment Agency Corporate Plan 2014-2016

The Environment Agency's vision for the environment is a better place for people and wildlife, for present and for future generations. Four major objectives of the strategy are as follows:

- a changing climate
- increasing the resilience of people, property and businesses to the risks of flooding and coastal erosion
- protecting and improving water, land and biodiversity
- improving the way we work as a regulator to protect people and the environment and support sustainable growth
- working together and with others to create better places
- ensuring that we are fit for the future

Creating a Better Place - Thames Local Contribution 2010-2015

The above document sets out the Environment Agency Thames Region's local contribution to the national strategy 'Creating a Better Place'. The document sets out goals to secure the sustainable management of the region's water quality and resources, waste management, flood defences, and its major construction and development projects. Some of the relevant objectives to this scheme are as follows:

- Ensure reducing and adapting to climate change is at the heart of everything the EA does;
- Work with others to identify and deliver new projects that demonstrate innovative approaches to mitigation and adaptation;
- Safeguard the water environment; and
- Will build new flood defences and continue to maintain all our flood management and navigation assets.

2.3.4 Local guidance

Lewisham Local Development Framework: Core Strategy

The London Borough of Lewisham Core Strategy Development Plan Document translates national planning policy into a local context and will guide public and private sector investment to manage development and regeneration in the borough between 2011 and 2026. As outlined in Section 2.1.2 any planning decision must be made in accordance with the policies outlined in the Local Development Framework.

The Core Strategy was produced prior to the creation of the NPPF, and so is based on the Planning Policy Statements and Guidance that was in place prior to 2011.

Of particular interest in the document is Core Strategy Policy 11, which states that

"1. The Council will work closely with the Environment Agency, English Heritage and a range of community organisations to ensure the River Thames, Deptford Creek and the Ravensbourne River Network are preserved and enhanced and contribute to the Blue Ribbon Network principles. This includes their water quality, landscape, biodiversity, amenity and historical value and wider recreational and health benefits as well as their potential as a transport route.

"2. Development adjacent to rivers and the waterway network should contribute to their special character by improving the urban design quality and natural ability of the rivers and waterways to function, the vitality of the river frontages, and improving access to the foreshore and naturalising flood defences, where appropriate.

"3. The Ravensbourne River Corridor Improvement Plan, in conjunction with the London Plan policies relevant to climate change and water, will be used to guide works and development along this waterway."

Ravensbourne River Corridor Improvement Plan

Ravensbourne River Corridor Improvement Plan was published in September 2010 provides local guidance on how the policies outlined in the Core Strategy should be implemented along the Ravensbourne River corridor.

The plan provides the following specific guidance regarding planning within the River corridor:

Enhance and maintain the unique image and identity of the Ravensbourne

- Strengthen the image and identity of local communities along the river by stimulating development that enhances the landscape and urban characteristics of the river corridor;
- Generate value and a sense of local ownership by providing high quality public spaces as well as stimulating public and community facilities along or nearby the river corridor; and
- Stimulate community facilities, as well as commercial and residential development along the river to acknowledge the river positively.

Reduce and manage flood risk and deal with a changing climate

- Raise awareness of the expected increased risk of flooding and extreme weather conditions and encourage appropriate adaptation and mitigation measures; and
- Maximise opportunities from regeneration to reconsider the location, layout and design of riverside sites to help reduce and manage flood risk both to the site and the wider community.

Ensure an attractive, safe and secure river corridor for people and wildlife

- Use environmentally sensitive designs to enhance the river environment for wildlife, providing better conditions for habitats to flourish and adapt to climate change;
- Provide high quality public open space along the river, encouraging opportunities to access, leisure, cultural and sport facilities;
- Encourage safe and legible cycling and pedestrian routes along and across the river corridor taking into consideration any negative impact onto wildlife and private property; and
- Use environmentally sensitive designs that support the interest of water related activities such as fishing, canoeing and boating.

The River Corridor Improvement Plan is currently undergoing revision.

3 Options and Preferred Scheme

A wide range of options have been identified and appraised as part of the LCFAS. A separate set of options have been considered for the Ravensbourne (see Section 3.1) and the Honor Oak (see Section 3.2). A preferred option has been identified for each of these scheme components.

3.1 Ravensbourne Options

During the option selection process a number of potential flood risk management measures were considered. Appraisal Summary Tables (ASTs) were prepared to assess the relative constraints/opportunities (technical, environmental, social and economic) of each option. A summary of the appraisal process is provided in the following sections.

3.1.1 Do Nothing

This option assumes all planned and reactive maintenance works in the Ravensbourne catchment, and flood warnings, would cease. The existing risk of flooding to private and public assets would continue and worsen over time as the channel becomes clogged with debris and vegetation establishes. The effects of climate change would worsen the standard of protection offered by existing assets.

Advantages and disadvantages of the 'Do Nothing' option

Advantages	Disadvantages
<ul style="list-style-type: none"> • Minimum cost option. 	<ul style="list-style-type: none"> • Existing risk of flooding worsens as the standard of service drops due to the lack of continuing maintenance. • No opportunities for environmental enhancements. • Potential spread of invasive species without any channel maintenance.

3.1.2 Option A1: Do Minimum (Patching)

This option assumes that reactive one-off maintenance activities on the Ravensbourne are undertaken (e.g. repairing existing assets).

Advantages and disadvantages of the 'Do Minimum (Patching)' option

Advantages	Disadvantages
<ul style="list-style-type: none"> Low cost option 	<ul style="list-style-type: none"> After approximately 30 years the assets would have deteriorated to the point where patching is no longer possible and flood risk would be similar to the level of Do Nothing. Flood risk likely to increase due to reduce maintenance and increased blockages. Limited opportunity to deliver environmental / WFD benefits.

3.1.3 Option A2: Do Minimum - Maintenance

This option assumes that planned and reactive maintenance activities on the Ravensbourne continue and the existing flood warning regime continues.

Advantages and disadvantages of the 'Do Minimum - Maintenance' option

Advantages	Disadvantages
<ul style="list-style-type: none"> Low cost 	<ul style="list-style-type: none"> Existing risk of flooding of private and public assets continues and worsens over time due to climate change. Limited opportunity to deliver environmental / WFD benefits

3.1.4 Option A3: Local Defences Scheme

This option comprises raising of the local defences and ground levels along the edge of the river to protect the areas behind, extending from the upstream extent of Ladywell Fields, through Lewisham and further downstream via Molesworth Street.

Advantages and disadvantages of the 'Local Defences Scheme' option

Advantages	Disadvantages
<ul style="list-style-type: none"> Delivers some reductions in flood risk through 	<ul style="list-style-type: none"> Low standard of protection compared to options with flood

Lewisham and Catford	storage.
<ul style="list-style-type: none"> Some opportunities for in-channel improvements (e.g. removing drop structures, grave placement). Potential for partnership funding from third parties. Potential for setting back defences in some locations. 	<ul style="list-style-type: none"> The Honour Oak would be impacted as the northern and southern outfalls would be subject to higher water levels in the Ravensbourne (i.e. causing backing up). The loss of some of floodplain upstream of Ladywell Fields would reduce the attenuation of flood flows possibly increasing flood risk downstream. Environmental disadvantages - contrary to objectives of WFD

3.1.5 Option A5: Flood Storage

Several locations for Flood Storage Areas (FSAs) were considered in the catchment area. This included FSAs at Catford, Crystal Palace, Beckenham Place Park and on the River Pool.

- Catford: The area at Catford Playing Fields would be excavated to provide flood storage (approximately 70,000m³). Appropriate embankment works would be implemented to protect the surrounding areas.
- Crystal Palace: The area at Crystal Palace and Surrey Cricket club training grounds would be excavated to provide flood storage. Appropriate embankment works would be implemented to protect the surrounding areas. It is estimated that 150,000m³ of storage could be provided.
- Beckenham Place Park: The area at Beckenham Place Park would be excavated to provide flood storage (between 50,000 to 140,000m³) - appropriate embankment works would be implemented to protect the surrounding area.
- Pool: The area at the Ravensbourne / Pool confluence would be excavated to provide flood storage (70,000m³ of storage). Appropriate embankment works would be implemented to protect the surrounding areas.

Advantages and disadvantages of the 'Flood Storage Area' option

Location	Advantages	Disadvantages
Option A5.1 - Catford Flood Storage Area	<ul style="list-style-type: none"> Opportunities for environmental enhancement within the storage area (e.g. planting, wetland areas). 	<ul style="list-style-type: none"> Insufficient flood storage for 1:100 event and high costs compared to other storage locations. Technical challenges, difficult to construct requiring embankments

		<p>on all sides.</p> <ul style="list-style-type: none"> • Loss of trees required for embankment construction • Impact to mature trees • Potential impacts/disruption to sports pitches
Option A5.2 - Crystal Palace Flood Storage Area	<ul style="list-style-type: none"> • Opportunities for environmental enhancement within the storage area (e.g. planting, wetland areas, coarser vegetation to provide habitat diversity, bat boxes etc). 	<ul style="list-style-type: none"> • This option would increase risk to properties upstream without extensive wall raising to protect them. • The option whilst providing significant storage could only attenuate flows on the Pool River and may need to be combined with other options on the Ravensbourne.
Option A5.3 - Beckenham Place Park Flood Storage Area	<ul style="list-style-type: none"> • Provides large flood storage volume • Opportunities to regenerate the park • Linkages with the London Borough of Lewisham's Heritage Lottery Fund project for the wider park. • Opportunities to restore several channelised sections of river at southern end of park. • Opportunity to create new footpaths, cycleways and features through the park making it a more multifunctional 	<ul style="list-style-type: none"> • Requires realignment of a more natural stretch of the Ravensbourne. • Known contaminated land • Large embankments (4m) and control structure required. • Loss of mature trees and woodland. • Thames Water assets beneath the park.

	<p>space.</p> <ul style="list-style-type: none"> • Opportunity to improve facilities such as the skate park and play area. • Opportunities to promote natural play • Opportunities for environmental enhancement within the storage area such as tree planting, bird and bat boxes, increased diversity in the habitats within the park. 	
Option A5.4 - Pool Flood Storage Area	<ul style="list-style-type: none"> • Opportunities for environmental enhancement within the storage area. • Opportunities to enhance the river within the FSA. 	<ul style="list-style-type: none"> • Not enough volume to provide significant increase in standard of protection on its own and it would need to be combined with other options • The railway and electrical substation will require protecting from flooding which will reduce the volume that can be stored substantial in the flood area.

3.1.6 Option A6: Flood Storage Area at Beckenham Place Park with Local Defences

Beckenham Place Park offers the optimum location for flood storage, based on available space and opportunities for park regeneration. Option A6 considers a flood storage area at Beckenham Place Park in combination with local defences throughout Lewisham (flood storage alone cannot provide a 1:100 year standard of protection).

Advantages and disadvantages of the 'Flood Storage Area at Beckenham Place Park with Local Defences' option

Advantages	Disadvantages
<ul style="list-style-type: none"> • Combination flood storage and local defences reduces 	<ul style="list-style-type: none"> • Requires realignment of a semi-natural stretch of the

<p>required local defences and offers greatest potential standard of protection</p> <ul style="list-style-type: none"> Increased channel capacity (created by Flood Storage Area) will allow for WFD enhancements to be implemented in the channel (e.g. gravel placement). Reservoir can be sized to allow for climate change impacts Opportunities to regenerate the park Linkages with the London Borough of Lewisham's Heritage Lottery Fund project for the wider park. Opportunities to restore channelised section of river at southern end of park. Opportunity to create new footpaths and features through the park making it a more multifunctional space. Potential for creation of priority habitat (e.g. wetland /reedbeds). 	<p>Ravensbourne.</p> <ul style="list-style-type: none"> Known contaminated land Large embankments (4m) and control structure required. Some loss of mature trees and woodland. Thames Water assets beneath the park.
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Figure 3.1 Existing view across Beckenham Place Park, taken from north eastern entrance



Figure 3.1 Existing view across Beckenham Place Park, taken from southern end looking north



3.1.7 Option A7 Flood warning

A flood warning system would be used to reduce the consequences of flooding by allowing people to make preparations for flooding. A flood warning system is already in place in Lewisham and over 5,000 properties in the Borough have signed up to the Environment Agency's Flood Warnings Direct warning service. A flood warning system for the River Ravensbourne in Lewisham would have a lead in time of over 2 hours. The upper reach of the River Ravensbourne and tributaries, including the Honor Oak, would have lead times of less than one hour.

Advantages and disadvantages of the 'Flood Warning' option

Advantages	Disadvantages
<ul style="list-style-type: none"> Improved effectiveness of the current flood warning system. 	<ul style="list-style-type: none"> Does not increase the standard of protection. Existing risk of flooding of private and public assets continues and worsens over time because of climate change. Flood warning is only partially effective at reducing damage as (i) only some people receive the warning, (ii) only a few of those have time to take action, (iii) some will not be able to take action and (iv) the actions taken may have limited effect. No environmental opportunities.

3.2 Honor Oak Options

As with the Ravensbourne, during the option selection process a number of potential flood risk management measures were considered. ASTs were prepared to assess the relative constraints/opportunities. A summary of the appraisal process is provided in the following table.

Table 3.1 Summary of Honor Oak Options

Option	Summary of Appraisal Process
Baseline Option - Do Nothing	Used as baseline for economic appraisal, although option does not meet project objectives
Option B1 - Do Minimum - Maintenance	Reduces flood risk with a minimum level of investment, although does not meet project objectives.
Option B2 - Seal manhole covers and construct flood walls upstream	Manholes alone do not reduce flood risk and new flood walls are expensive and undesirable from a

	visual/maintenance/environmental perspective.
Option B3 - Improve conveyance within the open channel	Doesn't significantly reduce flood risk, although can be used in combination with other options.
Option B4 - Increase Northern Culvert Size along the existing route	Requires tunneling under the railway line multiple times. Expensive and technically difficult.
Option B5 - Increase Northern Culvert size by constructing a new outfall from Mercury Terrace to the Ravensbourne.	Requires syphon under railway which would be difficult to maintain. Effectiveness of this option uncertain.
Option B6 - Construction of a new culvert from the inlet at Ladywell Green to a new outfall at Mercury Terrace.	This option adds more costs and has no greater benefit than Option B5.
Option B7 - Honor Oak Park Flood Storage Area	The storage area is too far upstream to be effective.
Option B8 - Ladywell Green Flood Storage Area. Improved trash screens on the northern and southern Honor Oak culverts.	Cost-effective. Requires little maintenance. Benefits delivered in terms of landscaping Ladywell Green.
Option B9 - Alternative Storage Areas at downstream end of culverts.	Northern culvert too technically difficult and at the Southern Culvert this would partially occupy floodplain and there is a risk of seepage from the Ravensbourne.
Option B10 - Pumping station on Southern Culvert outfall	Does meet project objectives, although requires ongoing maintenance.
Option B11 - Combination of Options B5 and 8.	See Options B5 and B8
Option B12 - Combination of Options B5 and B10.	See Options B5, and B10
Option B13 - New open channel and culvert to Ladywell Fields	Requires syphon under railway which would be difficult to maintain.
Option B14 - River Ravensbourne improvements at Mallyons Road (channel widening)	Expensive as requires the replacement of two bridges and channel widening.
Option B15 - Combined Options B5 and B14.	See Options B3, B5 and B14.
Option B16 - Combined Options B3, B5 and B14	See Options B3, B5 and B14.
Option B17 - Improve channel plus Northern Culvert improvement	Increasing the capacity of the Honor Oak would not reduce flood risk significantly more than only increasing the capacity of the Northern Culvert as the culvert is limiting conveyance.

Figures showing the Honor Oak options that were considered, in more detail, are presented in Appendix A.

3.3 Preferred Option Selection

Seven options were identified and appraised for the Ravensbourne. 'Do Nothing' and 'Do Minimum' options are considered inadequate as they both would result in an increase in flood risk over time as existing flood defence assets deteriorate and climate

change puts additional strain on the infrastructure. These options also significantly reduce the available options for meeting Water Framework Directive and Thames River Basin Management Plan commitments. Flood storage areas in Catford, Crystal Palace and at the confluence of the River Pool and River Ravensbourne were disregarded due to insufficient storage capacity at all sites to achieve a 1:100 year protection and high construction and compensation costs for Catford and Crystal Palace respectively. There is little opportunity to implement any spatial planning options due to the lack of development in the flood risk areas.

Following an options appraisal process, and consultation, Option A8 was identified as a preferred option. This option reduces the extent and height of local defences through Ladywell and Lewisham, provides an opportunity for enhancing Beckenham Place Park (which complements the LBL's HLF bid), offers a high standard of flood protection and is technically, environmentally and financially in line with the project objectives.

18 options were assessed for the Honor Oak, comprising culvert improvement works, channel widening, pumping and the creation of flood storage. Following consultation and an appraisal process, Option 8 (Flood Storage at Ladywell Green), was identified as the preferred option. This option significantly reduces flood risk, requires little ongoing maintenance, and provides opportunities to enhance Ladywell Green.

3.4 Preferred Option Description

The preferred option comprises three main components:

- Flood Storage Area at Beckenham Place Park (see Section 3.3.1)
- Works to raise low points in existing river walls between Ladywell and Lewisham (see Section 3.3.2)
- Works on the Honor Oak Stream in Ladywell (see Section 3.3.2)

3.4.1 Flood Storage Area at Beckenham Place Park

Key features of preferred option at Beckenham Place Park are described in the Table 3.2.

Table 3.2 Key features of the flood storage area within Beckenham Place Park

Feature	Description
Earth Embankment	<p>The preferred option comprises re-landscaping Beckenham Place Park with an earth embankment around the western, northern and eastern edges of the park. Floodwater would be temporarily stored during a flood event by the embankments and automated control structure (see below).</p> <p>The embankment would vary in height approximately between 0.5m at the southern end (where existing ground levels are higher) and 3.5m at the northern end. Water would only be stored within the park during infrequent extreme flood incidents. When flooded, water would remain within the park for approximately one day before being allowed to drain gradually back into the river. The majority of the fill for the embankments is expected to be won locally from within the park, although some imported material will</p>

	be required. The embankment includes variations in slope and alignment to reduce the visual impact, and improve integration within the park landscape.
Spillway	Three spillways are proposed, on each embankment. The spillways (low points in the embankment) are a health and safety feature required in order to channel flows during extreme flood events (i.e. when the capacity of the reservoir is exceeded, water would flow over the spillways). The surface of the spillway will be reinforced with geo-matting to prevent erosion/scouring.
Control structure and coarse debris screen	<p>A control structure is required at the northern end of the park to retain water with the flood storage area during a flood event. The structure would comprise a twin culvert approximately 15m length through the embankment, set at bed level with automated penstocks on the upstream face, and allowance for a 'sweetening flow' (to prevent the downstream channel from running dry). The structure will be passable to fish. There are no proposals for a trash screen on the upstream face of the control structure, although there would be a coarse debris screen located upstream (comprising vertical wooden tree trunks to prevent large debris blocking the control structure).</p> <p>This option has been selected to provide the maximum standard of protection. Alternative options, such as hydro-breaks do not provide an adequate level of storage.</p>
River realignment and restoration	The River Ravensbourne would be realigned in two locations, at the southern end of the park (for a length of approximately 400m), and in the north eastern end of the park (for a length of approximately 300m). The southern realignment is proposed in order to bring the river out of a straightened concrete channel, mimicking the historic river alignment and restoring natural river processes. The north eastern realignment is necessary to enable construction of the embankment, however this also provides an opportunity to realign the river in the centre of the park, as a focal point for regeneration and recreation.
Landscaping, footpaths and access	Entrances to the park would be improved with signage, way finding and clear sightlines into park. The Green Chain Walk, which currently traverses the park, would be re-routed along the embankment to encourage/maintain access. The existing play area would be replaced and enhanced as natural play features, utilising the embankment. 'Lost' footpaths through the park would be reinstated. Access to the river would be improved, supported by educational signage. Specific provisions will be made for disabled access in certain areas of the park.
Biodiversity	The development would result in some loss of mature trees (see Section 4.3) to enable construction of the embankment; however the alignment of the embankment has been designed to reduce this where possible. 110% of lost trees would be replanted (with the potential to increase planting further), resulting in a net increase in total number of trees following construction. The scheme will encourage the deposition of silt/alluvium on the floodplain, encouraging wetland flora. The realigned river will be designed to support a diverse range of macroinvertebrates, macrophytes and fish. The development includes the creation of

priority wetland habitats.

The proposed development also provides an opportunity to improve in-channel habitat and improve fish passage.

Figure 3.2 - Sketch Masterplan, Beckenham Place Park



3.4.2 Local defences between Ladywell and Lewisham

In addition to the proposed FAS at Beckenham Place Park, low points in the river defences downstream between Ladywell and Lewisham will need to be raised by between 0.3 to 0.7 m to prevent flooding. Raising these low points will allow more water to be held within the river channel. The location of the local defences is shown in Figure 3.3.

Figure 3.3 Local defences between Ladywell and Lewisham



3.4.3 Honor Oak and Ladywell Green

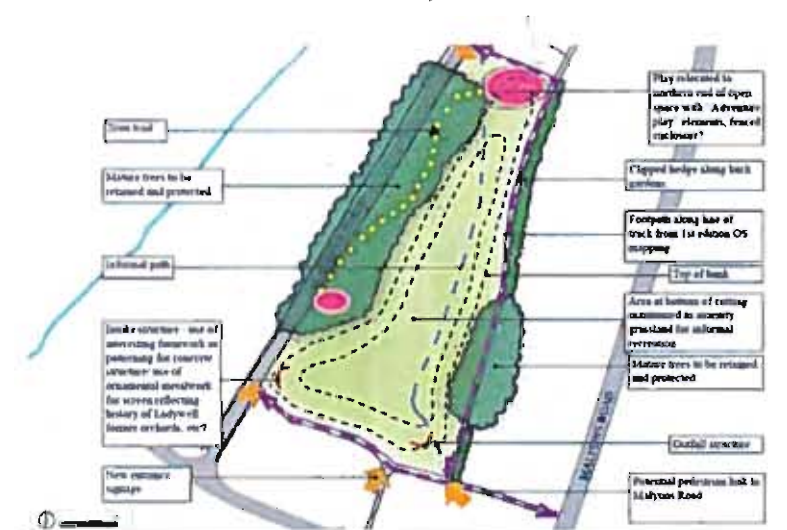
Our preferred option for reducing a localised risk of flooding from the Honor Oak Stream is to provide floodwater storage within Ladywell Green. The green would be re-landscaped by lowering the ground by approximately 1.5m to provide space to safely

store water. Material from the excavation would either be disposed of off-site (following the waste hierarchy) or re-used in Beckenham Place Park. Opportunities for ecological and amenity enhancements have been included. Due to space constraints the localised risk from the Honor Oak Stream will not achieve the same standard of protection that would be provided from the works on the rest of the River Ravensbourne. These local works would alleviate flood incidents from this tributary up to and including those with a 5% (20 to 1) annual probability.

Figure 3.4 - Ladywell Green



Figure 3.5 - Honor Oak and Ladywell Green



In addition the additional storage provided at Ladywell Green, the existing channel would be cleared, silt removed from the existing culvers and new trash screens installed on the northern and southern culverts.

The following sections of this report consider the potential environmental impacts of the preferred option.

4 Existing Environment and Issues for EIA

4.1 Introduction

This section identifies the key characteristics of the existing environment with respect to the following receptors:

- Traffic and Transport (Section 4.2).
- Flora and Fauna (Section 4.3);
- Historic Environment (Section 4.4);
- Soils and Land Quality (Section 4.5);
- Geology and Hydrogeology (Section 4.6);
- Hydrology and Geomorphology (See Section 4.7)
- Landscape and Visual Amenity (Section 4.8);
- Socio-Economics (Section 4.9)
- Air Quality (Section 4.10);
- Noise and vibration (Section 4.11);
- Cumulative assessment (Section 4.12).

Following the description of the baseline environment for each receptor, key issues which will be investigated further through the EIA process have been highlighted. Recommendations for further work are also made.

4.2 Traffic and Transport

4.2.1 Flood Storage Area at Beckenham Place Park

Baseline Conditions

Beckenham Place Park is bounded to the west by the 'Catford Loop' railway line (which runs from central London to Sevenoaks) and to the north-east and south mainly by residential properties.

The main vehicular route into the park is from Old Bromley Road. Old Bromley Road is predominately residential road subject to a 30mph speed limit with a one-way system

allowing traffic to proceed generally north to south only, linking to the A21 Bromley Road.

There are multiple also multiple pedestrian and cycle routes into the park including a bridge over the railway line to the west (Figure 3.1 provides further details), some of these routes are also able to accommodate occasional vehicle movements with appropriate traffic management.

The A21 is a key north-south route from Greenwich to the A232 at Farnborough to the south. Within the vicinity of the Beckenham Place Park the A21 carries approximate 15,085 vehicles per day of which 346 were HGVs. Within the vicinity of the Park the A21 is an urban 'A' road subject to a 30mph speed limit and mainly fronted by shops and residential properties.

Within the vicinity of the park, Old Bromley Road and Branbourne Road are noted as on road cycle routes by Lewisham Council. From Old Bromley Road and the A2015 cyclists can access the park and 'cycle route 60' and the 'Green Chain' route which provide an off road cycle route through the park south towards Ravensbourne.

4.2.2 Local defences between Ladywell and Lewisham

Baseline Conditions

Between Ladywell and Lewisham there are three key routes, namely, the north-south A21 and A2211 and the east-west A20.

The A21 provides a north south route from the junction with the A20 in Lewisham at the north to the A232 at Farnborough to the south. Within the vicinity of the works area as the A21 passes Lewisham Shopping Centre, the road is a dual carriageway subject to a 30pmh limit. South from this point the A21 becomes a single carriageway 'A' road passing close to residential properties, shops and the University Hospital. Within the vicinity of the works area the A21 carries up to 32,564 vehicles per day of which 993 are HGVs.

The A2211 heads north from the A21 at the junction with the A20 into Greenwich. The A2211 in the vicinity of the works are is a single carriageway 'A' road, subject to a 30mph speed limit and predominately passing through residential areas, carrying up to 16,780 vehicles per day of which 458 are HGVs.

The A20 runs east to west from its junction with the A2 at New Cross west towards its junction with the M25 and M20 at junction 3. Within the vicinity of the works area the road is predominantly single carriageway passing through areas of residential properties and retail units. The road carries between 38,153 – 28,990 vehicles of which 1,331 – 1,049 are HGVs.

4.2.3 Honor Oak and Ladywell Green

Baseline Conditions

Ladywell Green is predominantly bounded to the north and east by residential dwellings and to the south and west the park is bounded by Slagrove Place (a cul-de-sac) which provides vehicular access to the Ladywell Green and the a mixture of

businesses (including a children's nursery) and residential properties. Where Slagrove Place meets Malyons Terrace, the road is gated, suggesting that the road maybe private, although further investigations would be required to confirm this. Pedestrian access to Ladywell Green is provided from Slagrove Place from the north. In addition there is also a route from Rushey Mead into Slagrove Place from the south; no other vehicular or pedestrian access points are provided to Ladywell Green. Slagrove Place is accessed from the B236 Ladywell Road to the north. The B236 provides an east west link linking to the A21 to the east and to the B218 to the west. In the vicinity of the junction with Slagrove Place the B236 is predominately fronted by local business and is subject to a 20mph speed limit enforced through the provision of traffic calming measures.

Potential Impacts (for all three scheme components)

The principle guidelines for the assessment of the environmental impacts of road traffic associated with new developments are the 'Guidelines for the Environmental Assessment of Road Traffic' (GEART) published by the Institute of Environmental Assessment in January 1993. The guidance provides a framework for the assessment of traffic borne environmental impacts, such as pedestrian severance and amenity, driver delay, accidents and safety; and noise, vibration and air quality.

GEART suggests the following rules to define the extent and scale of the assessment required:

- Rule 1: Include highway links where traffic flows are predicted to increase by more than 30% (or where the number of HGVs is predicted to increase by more than 30%).
- Rule 2: Include any other specifically sensitive areas where traffic flows (or HGV component) are predicted to increase by 10% or more.

'Sensitive areas' will be sections of highway that have a concentration of sensitive receptors such as, schools, accident sites, residential areas, high streets, etc. In addition to GEART the 'Transport assessment best practice, guidance document published by the Transport for London in April 2010 provides more guidance for the assessment of some impacts (e.g. driver delay and highway safety).

The above GEART criterion applied to the proposed scheme traffic demand will dictate the extent of the study area and the scale of the impact assessment.

During the construction phase there will be a requirement for the export of excavated material import of fill and other construction materials. In addition, it is anticipated that there will be a requirement to deliver plant such as excavators to site.

At scoping stage it is not known what the associated material demand will be; in addition no information is available for workforce numbers and associated traffic generation. Notwithstanding, it is envisaged that materials will be moved by road and that daily traffic demand maybe above GEART thresholds; therefore, the potential impacts of construction traffic are considered below:

- Highway Safety – The increase in construction traffic may lead to adverse impacts upon highway safety.

- **Driver Delay** – The increase in construction traffic has the potential to lead to queuing, and delays, especially during peak periods.
- **Pedestrian Amenity** – The increase in construction traffic and HGV component may lead to adverse impacts upon the amenity of pedestrians.
- **Severance** – Increases in construction traffic could lead to severance of local communities, difficulties accessing facilities and local amenities.
- **Abnormal Loads** – The movements of large Abnormal Indivisible Loads (AILs) may lead to delays on the highway network. If AILs are required an AIL report will be produced to check the suitability of routes.

Once more detail of the likely traffic demand is known a more detailed transport scoping note will be prepared and submitted to the highway authority to confirm the scope of assessment. Notwithstanding, is considered appropriate that as a minimum a Construction Logistics Plan (CLP) is prepared.

A CLP is the equivalent of a workplace travel plan for a specific construction site. It provides a framework to better manage all types of freight vehicle movement to and from construction sites. Having a management plan will improve the safety and reliability of deliveries to a site, reduce congestion and minimise the environmental impact.

In addition to the impacts identified above traffic borne air quality (Section 4.10) and noise and vibration impacts (Section 4.11) will be assessed separately as will the potential impacts resulting from the diversion of any public rights of way, footways or cycleways.

Upon completion of the construction phase, there would be a requirement for continued maintenance of the flood defences. However, currently the Environment Agency undertakes maintenance activities and following completion of the construction phase it is not envisaged that the frequency or intensity of these activities will increase significantly above that currently being undertaken.

Traffic, Transport and Infrastructure: Key EIA issues and recommendations for further work

- The EIA will need to assess the impacts of the scheme on traffic and transport, specifically the impacts during construction.
- Further work is required (with Contractor input) to quantify the demand for material import and export for each site.
- Further work is required (with Contractor input) to quantify the requirement for labour for each site.
- Further work is required (with Contractor input) to define the likely worst case construction programme to inform the likely daily demand for material and personnel for each site and cumulative on the wider highway network.
- Further work is required to capture baseline traffic data including traffic flows and accidents to inform an appropriate access and HGV routing strategy.

- Further work is required to inform the proposed means of access to the work sites. This will be informed by the further work listed above, to understand baseline conditions and proposed traffic demand for each site.
- Engagement with highway stakeholders to understand any local highway issues, such as congested junctions, road safety concerns, HGV routing restrictions, etc.

4.3 Flora and Fauna

A series of ecological surveys have been undertaken to identify the potential ecological constraints upon the LCFAS. These included:

- An Extended Phase I Habitat Survey and ecological desk study (March - April 2011);
- A Badger Potential Survey of Beckenham Place Park (April 2013); and
- A Bat Potential Survey of Beckenham Place Park (April 2013).
- Arboricultural Survey (June 2012)
- Urban River Survey

It is recommended that these surveys are repeated during the EIA phase, in addition to a number of other ecological surveys (outlined subsequently in this section).

The Extended Phase I Habitat Survey and ecological desk study identified the broad habitat types and identified potential ecological constraints to the proposed works. Existing records of notable or protected species were obtained from the Greenspace Information for Greater London (GIGL) and the Environment Agency. Notable species include those which are listed on Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006, identified in a Red Data book or are identified in the UK Biodiversity Action Plan (BAP) or the London BAP (LBAP).

This information has been used to identify the baseline conditions for the scheme and are detailed in the sections below.

4.3.1 Flood Storage Area at Beckenham Place Park

Baseline Conditions

Designated sites

There are no internationally or nationally designated sites (Special Areas of Conservation, Ramsar sites or Special Protection Areas and Sites of Special Scientific Interest) within 2km of the study area.

There are two Local Nature Reserves within 2km of the study area. Table 4.1 provides further details on these sites including their location relative to the study area.

Table 4.1 Local Nature Reserves

Site Name	Distance from Study Area	Reason for Designation
Beckenham Place Park	Within	Contains the most extensive ancient woodland, most diverse acid grassland, most natural state of the River Ravensbourne, perhaps the oldest pond, and the only willow carr in the Borough. In addition several locally rare plant species and nationally rare invertebrates have been recorded
Downham Wood Walk (Site of Borough Importance)	0.43km north east of Beckenham Place Park	Strip of woodland considered to be ancient. Consists of penduculate oak, hornbeam, ash and field maple. Ground flora includes wood millet, wood melick, bluebell and wood avens. Fauna includes greater spotted woodpecker, bullfinch and willow warbler. Notable invertebrates present: brown ant, stag beetle, fungus beetle, bark beetle and the leaf beetle.

Beckenham Place Park is also designated as a Site of Importance for Nature Conservation (SINC). The site contains a range of habitats, including ancient woodland, acid grassland, ancient trees and various wetlands. The woodland supports a number of locally uncommon plants including Solomon's-seal, wild service-tree and scaly male-fern, as well as abundant bluebells and a wide range of fungi. Kingfisher, tawny owl, lesser spotted woodpecker and spotted flycatcher are known to breed within the park. In addition, the invertebrate fauna is also of importance and includes several nationally rare and notable beetle species.

Flora

At the upstream extent, where the River Ravensbourne flows through Beckenham Place Park, the river is lined with broadleaved woodland, scattered trees, scrub and tall ruderal vegetation.

Beckenham Place Park is a large area of amenity grassland with a small area of less intensively managed grassland at the southern end of the park. This area of the park provides important habitat. Scattered trees (horse chestnut, Norway maple, ash, alder, sycamore, lime, oak, willow and silver birch) and scrub are present around the park, with a small area of semi-natural broadleaved woodland located on the western boundary. The woodland is comprised of oak, ash, sycamore, willow, alder, horse chestnut, elder with holly, hawthorn and bramble.

Summerhouse Hill Wood, a 20ha ancient woodland lies within the western section of Beckenham Place Park (beyond the railway line). The woodland to the west of the railway line will not be impacted by the scheme.

There are records of bluebell within 1km of the survey area. Bluebell is listed on Schedule 8 of the Wildlife and Countryside Act 1981 (as amended). There are also records of cornflower within 1km of the survey area, a UKBAP priority species.

Parks and urban greenspaces, rivers and streams, standing water, and woodland were all found in the survey area. These habitats are all a priority for the LBAP for maintenance, enhancement or extension.

Japanese knotweed is present through Lewisham and within Beckenham Place Park, although the London Borough of Lewisham is currently implementing a programme of removal. It is also considered likely that Himalayan balsam is likely to be present.

Fauna

Evidence of badger activity was noted in 2013 at six locations within Beckenham Place Park. Three of these locations lie within 30m of the proposed embankment location.

Common pipitrelle has been recorded within Beckenham Place Park. The bat potential survey conducted in 2013 within Beckenham Place Park found 18 trees with medium-high bat roost potential, eight of which lie within the FAS embankment footprint.

The watercourse within the Park is not considered suitable to support water voles and is considered unlikely to fall within the territory of an otter. This is largely due to the majority of the watercourse being engineered resulting in a lack of suitable habitat.

The scattered scrub and woodland within Beckenham Place Park is considered to have some potential to support foraging and hibernating reptile species. There is therefore the potential for the works to harm/disturb these species.

There are numerous records of stag beetle within 1km of the survey area. No other notable invertebrate species were recorded within 1km of the study area.

The Ravensbourne and Pool rivers support coarse fish populations in the limited areas of parkland where the river has remained in its natural channel. Eel and kingfisher are also present on the river. On parts of the Ravensbourne there has been a noticeable increase in the number of chub and dace in recent years.

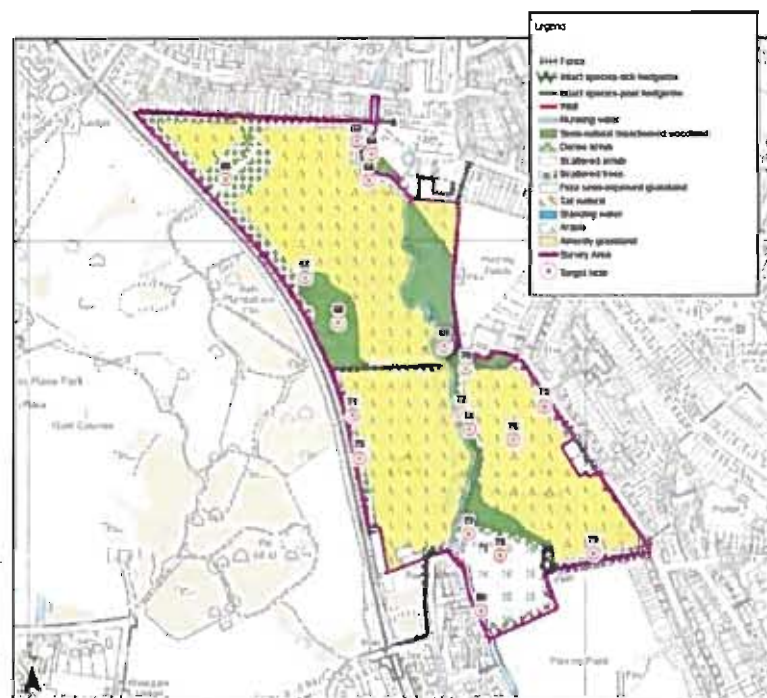
It was confirmed by Dan Morrish of London Borough of Lewisham Council via telephone on 13th June 2012, that no trees within the site or immediately adjacent to the site boundaries are covered by Tree Preservation Orders or located within a Conservation Area.

A total of 196 significant individual trees and 68 groups of trees located within or immediately adjacent to the site boundary were recorded during the arboricultural survey. The number of significant trees, groups and woodland in each category is provided below:

- Category A (Trees of high quality with an estimated life expectancy of at least 40 years) - 5.
- Category B (Trees of moderate quality with an estimated remaining life expectancy of at least 20 years) - 125.
- Category C (Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150mm) - 133.
- Category U (living trees in the context of the current land use for longer than 10 years) - 28.

The arboricultural survey did not cover the area adjacent to Calmont Road, as at the time of survey this area was excluded from the preferred option. This area will require survey during detailed design.

Figure 4.1 Key ecological features Beckenham Place Park (taken from Phase 1 habitat survey, see Appendix E.



Potential Impacts

The construction of the earth bund could directly impact badgers and further assessment (e.g. survey) is needed to ascertain the level of impact and the scope of appropriate mitigation measures.

It is likely that trees with bat roost potential will need to be removed as part of the construction of the scheme. There is therefore the potential for direct damage to a bat roost, as well as noise and lighting disturbance resulting from the construction works. This disturbance could also impact foraging bat species. Further surveys are recommended during EIA (see summary table in this Section).

Construction of the scheme will result in the loss of areas of woodland and a number of individual trees. The following Category A trees will be impacted by the development.

- W1 - An area of mixed broadleaved woodland running parallel with the railway embankment to the west of the park, comprising *Acer platanoides*; Norway maple; *Fraxinus excelsior*; ash; *Quercus robur*; pedunculate oak;
- T75 - a mature horse chestnut located along the existing alignment of the river to the west of Calmont Road
- T164 - a mature ash located along the western boundary of the park.

In addition, a number of category B, C and U trees will also be impacted.

The works are also likely to result in short term, construction related impacts to the river impacting the habitats and species which it supports. This could include the spread of invasive species for which management plans will need to be created and implemented.

Depending on the timing of the works, there could be construction related impacts to nesting birds if appropriate mitigation measures are not put in place prior to works commencing.

The scheme provides an opportunity to restore wetland habitats within the park (which reflect those conditions once present in the park, as indicated by historic mapping). This will need to be fully explored during detailed design. The morphology and capacity of the realigned channel will be designed to encourage the deposition of alluvium on the floodplain, which is likely to increase species richness through the provision of regularly wetted areas.

There are potential impacts to water quality and fish passage as a result of the control structure, although the intention is to mitigate these impacts during detailed design.

Small sections of backwater (i.e. from the original course of the river) will be retained to provide morphological diversity and refuge for fish/invertebrates. A number of root balls from trees removed from the existing river alignment will be used to line the new channel alignment to help retain morphological diversity. Gravels from the existing channel will be retained and placed in the new channel to provide importance substrate for invertebrates and fish.

Planting of the embankments is proposed (some trees and shrubs/BAP priority species). This will provide direct biodiversity benefits, as well as visual interest. The area of less-intensively managed grassland and scrub will be retained in the southern end of the park as this provides valuable habitat.

Closure of the control structure during a flood event will reduce the amount of flow in the downstream section of river. This has the potential to impact upon water quality and supported fish/invertebrate populations, through reductions in the amount of flow available to dilute pollutants. The design outline incorporates a 'sweetening flow' to pass a minimum volume of flow down the main channel during a flood event. The sweetening flow will need to be designed in greater detail during detailed design.

4.3.2 Local Defences between Ladywell and Lewisham

Baseline Conditions

Designated sites

There are no internationally or nationally designated sites (Special Areas of Conservation, Ramsar sites or Special Protection Areas and Sites of Special Scientific Interest) within 2km of the study area.

There are five Local Nature Reserves within 2km of the study area. Table 4.1 provides further details on these sites including their location relative to the study area.

Table 4.2 Local Nature Reserves

Site Name	Distance from Study Area	Reason for Designation
Sue Godfrey Nature Park	2km	Park consists of rough grassland, scrub and ruderal vegetation. More than 200 species of wild flowers, shrubs and trees have been recorded within 15 years. A range of exotic species are present. Roesel's bush-cricket, which is nationally restricted in distribution, has been recorded. Large, small and Essex skippers, small tortoiseshell, common blue and meadow brown all breed on site, speckled wood recorded 1996.
Brookmill Road	1km south of Ladywell Fields	Brookmill Nature Reserve is on part of a disused railway embankment and consists of woodland, two ponds and marsh, and calcareous grassland. The embankment is wooded with a dense stand of stag's-horn sumach. Pond supports breeding frogs and smooth newts. Common darter dragonflies also recorded. Fauna: foxes, long-tailed tit, blackcap and lesser whitethroat.
Dacres Wood	1km south west of the Pool / Ravensbourne confluence	This site is of conservation interest for its ponds and wetlands, the vestiges of the old Croydon Canal. Other habitats include woodland, scrub and grassland. Flora present: bluebell, red campion and wood dock. Fauna: smooth newt, dragonflies, stag beetle and purple hairstreak butterfly. Birds: nuthatch and wren.
Mudchute Park Farm	2km	The park is managed as a rural farm in an urban setting. The park supports many agricultural animals and a range of plants.
One Tree Hill	2km north west of Ladywell Fields	Two hectares of natural woodland, relic of the Greta North Wood

There are 44 Sites of Importance for Nature Conservation (SINCs) within 2km of the study area. Further information on these sites is presented in the 2011 Extended Phase 1 Habitat Survey (Royal Haskoning, 2011). See Appendix E. Due to the distance from the sites to the study area and the lack of pathway by which they could be affected, the majority of the sites are not considered further. However, two sites are located in proximity to the study area and these are detailed in the sections below.

The River Ravensbourne and Brookmill Park SINC is located at the downstream extent of the study area. This site is a 3.65ha park with a re-landscaped section of river Ravensbourne and includes rare habitat of tidally inundated grassland as well as a

large pond. It attracts a range of common birds, butterflies, grasshoppers, damselflies and dragonflies and the song thrush (a BAP species).

Ladywell Fields is designated as a SINC and is a large park with several habitats present including the River Ravensbourne, wooded areas, tall herbs and railway embankment. Lesser pond sedge and kingfisher, both rare within the Borough, have been recorded within the site.

Flora

In the downstream extent (through Lewisham) the River Ravensbourne is predominantly canalised through a concrete channel, with little vegetation. Two sections, through Commill Gardens and Brookmill Park have been restored to a more natural channel. Scattered trees, scrub and amenity grassland, along with small amounts of marginal and tall ruderal vegetation are present within these areas.

In the Ladywell Fields area, the watercourse flows along the edge of amenity grassland. The banks of the River are lined with broadleaved woodland, scattered trees and scrub. Species such as willow *Salix spp.*, ash, elder, cherry, plane Norway maple, silver birch and cypress species were recorded.

Japanese knotweed is present through Lewisham and it is also considered likely that Himalayan balsam is present.

Fauna

The Environment Agency and GiGL provided numerous records of bats within 1km of the study area. Species recorded include common pipistrelle, soprano pipistrelle, noctule and serotine bats. Common pipistrelle have been recorded within Ladywell Fields area. Mature trees are present within the study area which have the potential to support roosting bats. Features of value identified included splits, cracks, woodpecker holes and peeling bark. There is also a single storey, pitched roof toilet block within Ladywell Fields which has bat roost potential. In addition, the study area has the potential to support foraging and commuting bats.

Biological records were provided of four bird species, common quail, redwing, peregrine and black redstart which are listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). These species receive additional protection from disturbance whilst nesting. The latter two are also listed on the LBAP. However, the habitats present within the FAS are not considered to be optimal nesting habitat for any of these species. Bird species identified during the 2011 Extended Phase 1 Habitat Survey included mallard, moorhen, green woodpecker, greenfinch, woodpigeon, great tit, blue tit, chaffinch, rook, black bird, robin, and ringnecked parakeet.

Due to the urban nature of Lewisham, the habitat is not considered suitable to support great crested newts (either terrestrial or aquatic). A small pond is present within Ladywell Fields which has limited potential to support great crested newts due to the lack of suitable vegetation for egg laying. The banks of the river within Ladywell Fields along with the woodland are considered suitable terrestrial habitat for great crested newts.

Lewisham is considered unsuitable for reptiles due to its urban nature. Brookmill Park is considered to offer some suitability to support low numbers of reptiles. Due to the isolated nature of the park and the relatively small area, it is not considered suitable for significant numbers of individuals. The scattered scrub and woodland within Ladywell Fields is considered to have some potential to support foraging and hibernating reptile species.

No setts or definitive signs of badger were detected between Beckenham Place Park and Armoury Road during the 2013 survey. Whilst large areas of the watercourse were inaccessible through Lewisham, due to the urban nature of the area, along with the lack of field signs elsewhere, it is considered unlikely that badger are present within this area.

The watercourses within the study area are not considered suitable to support water voles and were considered unlikely to fall within the territory of an otter. This is largely due to the majority of the watercourse being engineered resulting in a lack of suitable habitat. In addition, the watercourse was not considered suitable to support white-clawed crayfish due to the lack of suitable refuges.

The study area contained areas of woodland, scrub and hedgerows which had limited potential to support dormice. However, the areas of suitable habitat were fragmented, and therefore not considered suitable to support a viable dormouse population.

There are numerous records of stag beetle within 1km of the survey area. No other notable invertebrate species were recorded within 1km of the study area.

The Ravensbourne and Pool rivers support coarse fish populations in the limited areas of parkland where the river has remained in its natural channel. Populations are typically dominated by stone loach and stickleback, which suggests that the habitat within the river may be of limited quality. On parts of the Ravensbourne there has been a noticeable increase in the number of chub and dace in recent years. At sites where the habitat has been restored, such as at Cornmill Gardens in Lewisham, fish have begun to recolonise with species such as chub are thriving in the new habitat (Environment Agency website, accessed May 2011). The presence of eels in the Ravensbourne River is noteworthy as it suggests reasonable access for juvenile eels from the Thames Tideway. Kingfisher are also present on the river.

The Environment Agency use the biological General Quality Assessment (GQA) which uses macro-invertebrate populations to give a long-term indication of water quality. This is because macro-invertebrates can be affected by pollutants that occur at low concentrations or infrequently, and are often missed by chemical sampling. The biological quality of the River Ravensbourne in Lewisham has been historically poor - achieving only grade D since 1995. This means that species sensitive to pollution are scarce, and there is a range of species that tolerate pollution. There a slight improvement was recorded in 2007 to a grade C (fairly good quality).

Potential Impacts

It is likely that trees with bat roost potential will need to be removed as part of the construction of the scheme. There is therefore the potential for direct damage to a bat roost, as well as noise and lighting disturbance resulting from the construction works. This disturbance could also impact foraging bat species.

The works are also likely to result in short term, construction related impacts to the river impacting the habitats and species which it supports. This could include the spread of invasive species for which management plans will need to be created and implemented.

Depending on the timing of the works, there could be construction related impacts to nesting birds if appropriate mitigation measures are not put in place prior to works commencing.

Further assessment of the potential for Ladywell Fields to support great crested newts will be undertaken to determine if there are any construction or operational impacts to this species.

The operational impacts to flora and fauna are likely to be minimal due to the nature of the works undertaken in this area.

The extent of in-channel mitigation (and/or restoration) is currently being determined through the design process. For example, there is the potential of removing or modifying a number of the drop structures along the length of the river, which will help restore longitudinal connectivity and specifically improve fish easement.

4.3.3 Honor Oak and Ladywell Green

Baseline Conditions

Designated sites

There are no additional statutory or non-statutory designated sites other than those listed in the previous sections.

Flora

The predominant habitat type within Ladywell Green is amenity grassland. Other habitats surround the fringes of the green and are comprised of semi-improved grassland in the north-east corner of the site, a disturbed - ephemeral area along the northern edge of the site and scattered mature trees lining the eastern and western boundaries.

There are two records of comflower within 1km of the survey area. Comflower is identified as a UK BAP priority species.

Japanese knotweed is present at the northern and southern ends of the site.

Fauna

No setts or definitive signs of badger were identified in the green. The presence of this species is considered unlikely due to the lack of suitable habitat and it is therefore not considered further.

There are 16 records of common pipistrelle, one record of soprano pipistrelle and four records of lesser noctule within 1km of the survey area. The mature trees within the area are considered to have features suitable for roosting bats. In addition, the study area has the potential to support foraging and commuting bats.

No watercourses are present within the area and as such no impacts to otters, water voles, white clawed crayfish and fish species are anticipated.

There are no records of hazel dormouse within 1km of the study area. It is considered that Ladywell Green is sub-optimal for dormice due to the lack of suitable habitat.

There are 203 records of 13 protected or notable bird species within 1km of the study area. Six of these species are listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). These include common kingfisher, firecrest, redwing, red kite, Eurasian hobby, and peregrine. However, it is considered that the habitat present within the study area is sub-optimal for these species.

The habitats within the study area are suitable to support common species of breeding birds. Without mitigation there is the potential for the works to directly impact nesting birds.

GIGL did not provide any records of great crested newts within 1km of the study area.

The pond present within Ladywell Fields is 150m to the east of Ladywell Green. This pond is considered to have some potential for great crested newts.

The habitat within Ladywell Green is considered to be sub-optimal for reptile species due to its managed nature. However, the small area of disturbed - ephemeral habitat has low potential as foraging / basking habitat for reptile species.

GIGL returned 69 records of stag beetles within 1km of the area. One of these records is located within the survey area. Stag beetles are a UKBAP and LBAP priority species. However, the low amount of dead wood within Ladywell Green and the open nature of the site indicates that it is sub-optimal for stag beetles.

The semi-improved grassland and disturbed-ephemeral habitats have the potential to support common assemblages of invertebrates.

The Honor Oak suffers from poor water quality and hydromorphology and is assumed to have limited ecological value.

Flora and Fauna: Key EIA issues and recommendations for further work

- Designated sites: potential impacts on locally designated sites will be fully assessed as part of the EIA. Consultation will be undertaken with the Wildlife Trust and Council regarding potential impacts and appropriate mitigation measures and enhancement opportunities.
- Woodland: mature trees and woodland habitat will be avoided wherever possible, however some impact will occur. Particular effort will need to be made to protect Category A trees during detailed design. It is recommended that the tree survey is updated to include the eastern side of the park adjacent to Calmont road.
- Invasive species - it is recommended that a specific invasive species survey is undertaken and a management plan produced during detailed design.
- Badgers - due to signs of badger activity within Beckenham Place Park further surveys are recommended to confirm their absence/presence within the proposed area of works.
- Bats - bat emergence/re-entry surveys should be undertaken of mature trees and the toilet block should they be affected by the works. Mitigation will be implemented to avoid disturbance to foraging or commuting bats.
- Breeding birds - mitigation will be implemented to avoid impacts on nesting birds.
- Great crested newts - further assessment of potential impacts on great crested newts will be considered including completion of a Habitat Suitability Index (HSI) assessment.
- Reptiles - mitigation will be implemented to minimise potential impacts on reptiles.
- Fish - mitigation will be implemented to minimise potential impacts on fish. A fish survey is recommended to ascertain existing populations within the

Ravensbourne and to further influence the detailed design phase.

- Aquatic flora and fauna. A survey of aquatic invertebrates and macrophytes in the Ravensbourne is recommended.
- Opportunities for habitat creation and enhancement will be sought, in line with UKBAP and LBAP priority habitat targets.
- The detailed design will explore the possibility of increasing floodplain connectivity through the park to provide regularly wetted areas and improved species diversity.
- The EIA will need to consider the potential impacts of operation of the control structure on downstream fish/invertebrate populations. The sweetening flow will need to be designed to pass a minimum flow.

4.4 Historic Environment

4.4.1 Flood Storage Area at Beckenham Place Park

Baseline Conditions

Beckenham Place Park was established in the late 18th century with Beckenham Place Mansion as its focal point. The park comprised landscape features and plantations set out across approximately 96 hectares. In the late 1920s, the estate became a public park and golf course, with the mansion used as the clubhouse.

Within a 1km study area of the site there are approximately thirteen Listed Buildings, including Beckenham Place Mansion located to the west and Querrmore Secondary School to the east of the site which are both designated as Grade II*. Immediately to the west of the site is Beckenham Place Park Conservation Area which incorporates the 18th century Beckenham Place Mansion and associated parkland. There are no Scheduled Monuments, Registered Parks and Gardens or Registered Battlefields within a 1km study area of the site.

Potential impacts

The proposed re-landscaping works, construction of new embankments and re-alignment of the river could have a potential adverse impact on known archaeological sites as well as any sites which are, at present, unknown. Whilst a large component of Beckenham Place Park is comprised of made ground, there is still the possibility of

During construction, there is the potential for an increase in traffic volumes which could have a potential adverse impact on designated heritage assets, and their settings, located adjacent to any transport route.

4.4.2 Local defences between Ladywell and Lewisham

There are no designated heritage assets located at the proposed flood defence sites along the route of the Ravensbourne River.

There are approximately 75 Listed Buildings located within 1km of all the proposed local flood defence sites, of which six are designated as Grade II*. Site 3 partially falls within St Mary's Conservation Area which includes the historic core of Lewisham. There are no other designated sites located within 1km of the local flood defence sites.

Located to the south of Ladywell is the Catford Centre and Milford Tower which was granted a Certificate of Immunity by the Secretary of State. This means that the building is immune from listing for the period 2012 to 2017.

The site falls within the Lewisham and Catford/Rushey Green Archaeological Priority Area. This area incorporates a section of the Ravensbourne River where, overtime, Lewisham and Catford have merged to form a continuous linear settlement; this was primarily a result of the many medieval mills operating along the river linking the two settlements.

The raising of ground level and/or raising of existing river wall heights at the proposed flood defence sites along the Ravensbourne River will have minimal impact on any known or, at present, unknown archaeological site. Where new river walls are to be constructed, their foundation depth will not exceed 0.5m below ground level. This has the potential to impact upon any known archaeological site or any which are at present unknown, which are buried close to the surface. There is also a potential for impact

upon buried archaeological deposits such as palaeo-environmental remains, if present, as a result of constructing new river walls.

There are potential impacts to the St Mary's listed building associated to construction of the flood wall in this area. Listed Building consent will be required and consultation with regulators.

During construction, there is a possibility of an increase in traffic volumes which could have a potential adverse impact on designated heritage assets, and their settings, located adjacent to any transport route.

During operation, there is likely to be minimal impact or alteration to the setting of heritage assets and the historic landscape character. The proposed flood defence works will, however, afford an improved level of flood protection to designated and non-designated heritage assets.

4.4.3 Honor Oak and Ladywell Green

Baseline Conditions

There are no designated heritage assets within the site.

Within a 1km study area of the site there are approximately 30 Listed Buildings of which three are designated as Grade II*: these include the Church of St Mary the Virgin, St Mary's Vicarage and Hillyfields Sixth Form Centre. To the north of the site is Ladywell Conservation Area and to the north-east is St Mary's Conservation Area. There are no Scheduled Monuments, Registered Parks and Gardens or Registered Battlefields within a 1km study area of the site.

The site also falls within the Lewisham and Catford/Rushey Green Archaeological Priority Area (see section 4.4.2).

Potential Impacts

The proposed re-landscaping works and lowering of ground level would adversely impact upon any known archaeological sites or any which are at present unknown. Including palaeo-environmental remains. There is also the potential for the works to adversely alter the setting of heritage assets and the historic landscape character.

During construction, there is likely to be an increase in traffic volumes which could have a potential adverse impact on designated heritage assets, and their settings, located adjacent to any transport route.

During operation, the changes to Ladywell Green have the potential to alter the setting of designated and non-designated built heritage assets as well as the historic landscape character. However, these works will also afford a higher level of flood protection to known heritage assets, both designated and non-designated, and any archaeological site which is at present unknown.

Historic Environment: Key EIA issues and recommendations for further work

- Beneficial impact of restoring the historic landscape

- Potential damage or loss of known and unknown archaeological sites and palaeo-environmental remains during construction;
- Potential damage to designated heritage assets during construction; and
- Alterations to the setting of heritage assets and the historic landscape character during construction and operation.
- Potential impact to St Mary's Listed Building (listed building consent required).
- As part of the EIA process, a Historic Environment (Archaeology, Built Heritage and Historic Landscape) Baseline Assessment will be undertaken, including, but not limited to:
 - Description of the historic development of the site(s) and of known and potential past human activities that were undertaken over time;
 - Creation of a deposit model for potential impact locations using existing and project site investigation data; and
 - An assessment of the significance (heritage value) of the assets identified in the baseline assessment.
- The Historic Environment ES chapter will identify the impacts of the LCFAS, assess the effects and identify appropriate mitigation measures if required. This process will lead to an assessment of residual effects of the proposed scheme.
- The assessment will consider direct impacts, setting impacts and indirect impacts.
- The assessment will be undertaken in accordance to relevant standards and guidance provided by the Chartered Institute for Archaeology (CIfA) and English Heritage (Historic England). Specific reference will be made to a range of guidance including, but not limited to, the following:
 - CIfA (2014) Standards and guidance for historic environment desk-based assessment;
 - English Heritage (2011) The Setting of Heritage Assets: English Heritage Guidance;
 - English Heritage (2008) Conservation Principles: Policy and Guidance for the Sustainable Management of the Historic Environment; and
 - Highways Agency (2008) Design Manual for Roads and Bridges, Volume 11, Section 3, Part 2: Cultural Heritage (HA 208/07).
- The scope of archaeological works could entail a programme of non-intrusive (i.e. geophysical survey) and intrusive (i.e. trial trenching) archaeological investigations to inform the EIA process and/or prior to construction. There is also the potential for the proposed ground investigation works to be monitored by an archaeologist.
- The scope of further archaeological investigations will be agreed with the

Greater London Archaeological Advisory Service (GLAAS) of English Heritage (Historic England) (advisor to LBL) and the Environment Agency Archaeologist and, where appropriate, consultation with English Heritage's (Historic England) Regional Science Advisor. Consultation will be undertaken at key stages throughout the EIA process with these organisations and other relevant stakeholders.

4.5 Soils and Land Quality

In order to provide information on baseline conditions, desk-based Land Quality Preliminary Risk Assessments were completed in 2011 for Beckenham Place Park and the Honor Oak area (including Ladywell Green). A preliminary Intrusive Geo-environmental Site Investigation was subsequently undertaken (in 2012) comprising the excavation of the following sample locations:

- Beckenham Place Park:
- Four probe holes to a target depth of 6mbgl;
- Four mechanically excavated trial pits to a target depth of 3mbgl; and
- Two mechanically excavated trial trenches to a target depth of 4.5mbgl.

Ladywell Green:

- Two probe holes to a target depth of 6mbgl.

The focus of this preliminary intrusive site investigation was on the testing of general soil quality across the footprint of the potential flood storage areas, to provide an initial indication of suitability of soils for reuse in embankments.

4.5.1 Flood Storage Area at Beckenham Place Park

Baseline Conditions

Current land use within Beckenham Place Park is predominately recreational, including sports grounds, grassed tennis courts and open park land. There are also a number of heavily wooded areas and an access road and bridge crossing the railway line in the north of the site. A review of historic land uses in and around the site area (Royal Haskoning 2011 reference 9W3572/R001/303855/Lond) indicated that a former gravel pit in the north of the site had been infilled (see Figure 4.5.1). Land uses in the surrounding area included a railway line, further gravel pits, factories, works buildings and a petrol filling station.

The Beckenham Place Park site lies within two Groundwater Source Protection Zones - Zone II (Outer Protection Zone) and Zone III (Total Catchment). The Outer Protection Zone is either 25 % of the source area or a 400 day travel time whichever is greater. The Total Catchment is the area around a source of potable water within which all groundwater recharge is presumed to discharge at the source.

The site is located approximately 750m north west and 850m south east of two Inner Protection Zones (Source Protection Zone I), defined as the 50 day travel time from any point below the water table to the source. These are the most heavily protected (sensitive) areas immediately surrounding a borehole supplying potable water.

The preliminary site investigation encountered topsoil and/or made ground layers, underlain by variably sandy and clayey flint gravel and gravelly clay, over orange/brown sand. This was found to overlie firm to stiff grey clays with shell fragments which overlay grey silty sand. Silt was encountered in two locations overlying the gravel. Bedrock beneath the site is indicated to comprise the Lambeth Group (clay, silty clay, silt, and sands, with local pebble beds) in the north and west of the site and Thanet Sand Formation in the south of the site. Upper Chalk is known to underlie these. The majority of the bedrock underlying the site has been classified, by the Environment Agency, as a Secondary A Aquifer. A small area in the south of the site is shown to be underlain by a Principal Aquifer; this is likely to relate to the Upper Chalk Formation. The superficial (drift) geological deposits, have also been classified as a Secondary A Aquifer. There are no groundwater abstraction licences on site or within 500m of the site.

The preliminary site investigation encountered groundwater in the superficial deposits, with flow indicated to be towards the north east (with and towards the River Ravensbourne).

The Preliminary Risk Assessment report for Beckenham Place Park, identified a number of localised areas of potential concern for contamination in the area of the study site including:

On-site:

- Historical Gravel Pits
- Localised Made Ground
- Pollution Incidents

Off-site:

- Railway Line
- Historical Gravel Pits
- Petrol Filling Stations
- Local Industries
- Golf Course

Potential areas of concern are shown in Figure 4.3.1.

[illegible]

Some elevated concentrations of metals, PAHs and petroleum hydrocarbons were found in soil leachates but these were not mirrored in the results of groundwater analysis. The groundwater results showed marginal exceedences for selenium and some different petroleum hydrocarbon fractions.

The proposed earthworks to create the flood storage area and associated infrastructure have the potential to bring construction workers into contact with soils associated with existing areas of contamination. They also have the potential to mobilise fugitive dust which could impact off-site receptors, particularly as asbestos has been identified in two samples of made ground from the site.

During construction, potentially contaminative materials may be used on site, such as hydraulic oils). Unless controlled, there is the potential for leaks and spills to cause an impact to soil and water during construction.

Increased infiltration of water as a result of use of the site for flood storage may also result in an increase in contaminant leaching.

Works to local flood defences, as described in Section 3.3.3, will comprise building up existing walls and localised placement of imported material in order to raise ground levels. This is not expected to involve significant excavations into existing materials at these locations and hence has been scoped out of the soil and land quality assessment

Baseline Conditions

The review of historic land uses for this area completed as part of the desk study highlighted the presence of a railway line on site and also that the position of the River Ravensbourne channel within the site had changed, indicating possible infilling of stretches of channel. Surrounding land uses included a hospital, council depot, infirmary, works sites and a fire station.

Ground conditions encountered during the preliminary site investigation comprised made ground overlying light brown, mottled red/brown clays. The clays were found to overlie, in order: orange/brown variably sandy and clayey flint gravel or gravelly clay; yellow/orange/brown mottled green clayey sand and blue/grey variably gravelly sandy clay.

Lewisham and Catford FAS Environmental Scoping Report

No groundwater strikes were recorded by the ground investigation in Ladywell Green

The list of potential sources of contamination relating to Ladywell Green was identified in the Preliminary Risk Assessment report:

On-site:

- River Ravensbourne Infilled/alterd River Channels
- Localised Made Ground

Off-site:

- Railway Line
- Lewisham Hospital
- Bermondsey Institution / Infirmary/ Ladywell Lodge
- Council Depot
- Works
- Petrol Filling Stations
- Dry cleaners
- Pollution incidents
- Fire Station
- Vehicle dismantlers

As part of the preliminary site investigation, two window sample holes were completed at Ladywell Green and four samples analysed; two from Made Ground and two from natural ground. The results showed elevated concentrations of lead, mercury and six PAHs in Made Ground. Two PAHs were also found at elevated concentration in the natural ground beneath. Elevated concentrations of some metals, PAHs and petroleum hydrocarbons were also found in soil leachate tests.

No groundwater strikes were encountered within the Ladywell Green during the ground investigation and groundwater was not recorded during subsequent monitoring rounds.

Potential Impacts

Potential impacts as a result of the flood storage works at Ladywell Green are considered to be similar to those for Beckenham Place Park. No ACM was encountered in the sample holes at Ladywell Green however, it is noted that the site investigation was preliminary and small scale, with only four soil samples analysed.

Soils and Land Quality: Key EIA issues and recommendations for further work

- Further ground investigation is required to ascertain the extent and nature of

contamination, particularly within Beckenham Place Park.

- A human health and controlled waters risk assessment is required in order to assess (and mitigate) any potential risks to users of the park areas.
- A remediation strategy will need to be developed (e.g. for management of asbestos containing materials), and agreed with the Local Authority, with regards to re-use of contaminated material on site and for example the thickness of any proposed capping layer.
- Contaminated land input will be required to finalise the detailed design. For example, erosion protection is likely to be required around those areas where contaminants are present.
- Further consideration needs to be given to the movement and handling of materials during construction, with Contractor input.
- Preparation of a materials management plan for the re-use of site won materials.

4.6 Geology and Hydrogeology

4.6.1 Flood Storage Area at Beckenham Place Park

Baseline Conditions

The geology of the site has been established from published mapping and limited ground investigation. Superficial deposits comprise the Kempton Park Gravel Formation (gravel, sand and clay), which is present across the whole of the site, overlain in the lower-lying central area by Alluvium (gravelly silt). The underlying bedrock dips toward the north and comprises the White Chalk Formation, overlain in sequence by the Thanet Sand Formation and Lambeth Group. The Lambeth Group sub-crops below the superficial deposits across the northern half of the site, with Thanet Sand to the south and a small window of Chalk at the southernmost end of the site.

The Chalk and Thanet Sand formations effectively form a single aquifer unit, classified by the Environment Agency as a Principal Aquifer. The Lambeth Group is variably permeable but at this location contains water-bearing sands. The granular superficial deposits are highly permeable and classified as a Secondary A Aquifer but, where they are underlain directly by the Chalk or Thanet Sand, they are expected to be in hydraulic continuity with the Principal Aquifer.

It is expected that a good hydraulic connection is present between the bedrock and superficial aquifers, and the River Ravensbourne; and, that groundwater flow is northward and towards the river. The available data (REFs) indicate that this is likely to be the case. As a result, flow in the river will be affected by local groundwater conditions, which vary seasonally and are influenced by abstraction.

There are several public water supply boreholes in the area, taking water from the Chalk aquifer. The site lies within the Zone 2 Source Protection Zone (SPZ) for Thames Water abstractions at Beckenham, Bell Green and Catford.

The current groundwater level within the Chalk aquifer believed to be artificially low at the site due to pumping at the nearby public supply wells, which has been ongoing since 2004. Under these conditions it is likely that the river loses flow to the aquifer between Bromley and the site. Prior to 2004 the groundwater level was close to ground level and it is likely that the river was gaining flow over this reach. The gain in flow is likely to have been greatest within Beckenham Place Park, due to the contrast in bedrock permeability between the Thanet Sand Formation and Lambeth Group.

Potential Impacts

The effectiveness of the storage area could be impacted under high groundwater conditions, when the river is gaining flow from the aquifer. This would result in reduced unsaturated zone storage and if groundwater flooding occurs, reduced above ground storage. This could occur naturally (such as in the winter of 2013-14) but is unlikely whilst the groundwater level is artificially reduced by abstraction at Beckenham.

Should groundwater flooding occur, it tends to last for days or weeks, which is far in excess of the planned maximum storage duration of 24 hours. However, such flooding occurs relatively infrequently.

When in use, there is potential for contaminated floodwater to be drawn into one of the Thames Water abstraction wells. However, given the proposed short-term usage of the FSA and the fact that it is not located within SPZ1 (which delineates at 50-day travel time to the well), this is unlikely to pose a significant risk. Nevertheless, there is a pollutant pathway to the Principal Aquifer via the superficial deposits.

During design, natural flows into storage area may be underestimated if based on data collected whilst the groundwater level was artificially reduced by pumping. This could lead to an over-estimate in the level of protection provided, should the groundwater level subsequently recover.

A hydrogeological risk assessment, supported by additional ground investigation, would be required to determine the risk to groundwater and the public water supply abstractions.

River-aquifer interactions and the current and future local abstraction regime should be considered in the design stage.

4.6.2 Local defences between Ladywell and Lewisham

Baseline Conditions

The geology of the Ravensbourne channel has been established from published mapping and legacy borehole records. Superficial deposits comprise the Kempton Park Gravel Formation (gravel, sand and clay) overlain by Alluvium (gravelly silt). The underlying bedrock dips toward the north and comprises the White Chalk Formation, overlain in sequence by the Thanet Sand Formation and Lambeth Group. Several north-east to south-west trending faults cross the valley between Ravensbourne Park and Deptford Bridge resulting in a bedrock sub-crop of Chalk between Lewisham Station and Deptford Bridge, with Thanet Sand to the north and south. A similar fault at

the southern end of this reach results in the Lambeth Group sup-cropping at the northern edge of Ladywell Fields.

The Chalk and Thanet Sand formations effectively form a single aquifer unit, classified by the Environment Agency as a Principal Aquifer. The Lambeth Group is variably permeable and may contain water-bearing sands. The granular superficial deposits are highly permeable and classified as a Secondary A Aquifer but, where they are underlain directly by the Chalk or Thanet Sand, they are expected to be in hydraulic continuity with the Principal Aquifer.

There are several public water supply boreholes in the area, taking water from the Chalk aquifer. The site lies within the Zone 1 Source Protection Zone (SPZ) for the Thames Water abstraction at New Cross.

It is expected that a good hydraulic connection exists between the bedrock and superficial aquifers, and the River Ravensbourne. As a result, flow in the river will be affected by local groundwater conditions, which vary seasonally and are influenced by abstraction. Groundwater flow is likely to be northward and towards the river.

The proposed defences are intended to protect against fluvial flooding. Should groundwater flooding could occur simultaneously this could lead to a public perception that the defences are ineffective.

River-aquifer interactions and the current and future local abstraction regime should be considered in the design stage.

4.6.3 Honor Oak and Ladywell Green

Baseline Conditions

The geology of the site has been established from published mapping and limited ground investigation. Superficial deposits comprise the Kempton Park Gravel Formation (gravel, sand and clay), which is present across the whole of the site. The underlying bedrock dips toward the north and comprises the White Chalk Formation, overlain in sequence by the Thanet Sand Formation and Lambeth Group. The Lambeth Group sub-crops below the superficial deposits across the whole site. A north-east to south-west trending fault is inferred through the centre of the site, based on the sub-cropping of the Thanet Sand Formation immediately to the north of the site. The Lambeth Group is therefore likely to be thinner in the north-west of the site.

The Chalk and Thanet Sand formations effectively form a single aquifer unit, classified by the Environment Agency as a Principal Aquifer. The Lambeth Group is variably permeable and at this location contains potentially water-bearing sands. The granular superficial deposits are highly permeable and classified as a Secondary A Aquifer. Where underlain directly by sandy units of Lambeth Group (or Thanet Sand Formation to the north of the site) the Kempton Park Gravel is expected to be in hydraulic continuity with the bedrock Principal Aquifer. At this location a layer of stiff clay is present at the top of the Kempton Park Gravel formation which may act to confine groundwater, if present, and limit connectivity with surface water drainage or the Honor Oak stream to the west (if it extends this far).

There are several public water supply boreholes in the area, taking water from the Chalk aquifer. The site lies within the Zone 2 Source Protection Zone (SPZ) for Thames Water abstractions at New Cross and Catford.

Groundwater flow in the Principal Aquifer is likely to be towards the north or north-east. Faults within the bedrock aquifer can impede groundwater flow, resulting in local increases in groundwater level or high permeability zones within the Chalk, due to flow concentration. However, because the fault is aligned with the likely direction of flow, this effect is unlikely to be significant at the site.

Potential Impacts

The full extent of the clay layer at the top of the Kempton Park Gravel Formation is unknown. Based on available information, it is present to approximately 1 mBGL. Reducing ground levels by 1.5 m would create a pathway for flood waters into the superficial deposits Secondary A Aquifer and potentially, to the underlying Principal Aquifer.

A hydrogeological risk assessment, supported by additional ground investigation, would be required to determine the risk to groundwater and the public water supply abstractions.

River-aquifer Interactions and the current and future local abstraction regime should be considered in the design stage.

Geology and Hydrogeology: Key EIA issues and recommendations for further work

- High groundwater levels could impact on the available storage at Beckenham Place Park and Ladywell Green.
- River-aquifer interactions and the current and future local abstraction regime should be considered in the design of the Beckenham Place Park FSA to ensure that storage capacity is not underestimated.
- Poor quality floodwaters could cause groundwater pollution to the Secondary A and Principal Aquifers at Beckenham Place Park and Ladywell Green, which both lie within a SPZ2 for Thames Water supply wells.
- Hydrogeological risk assessments, supported by additional site investigation, should be undertaken to protect groundwater quality and reduce uncertainty with respect to river-aquifer interaction at Beckenham Place Park and Ladywell Green. The risk assessment would be required to determine the risk to groundwater and the public water supply abstractions.
- Currently no intrusive works are proposed within the SPZ1, located between Ladywell and Lewisham. Should this change, a hydrogeological risk assessment will be required.

4.7 Hydrology and Geomorphology

The Ravensbourne catchment is largely urbanised, particularly in the lower reaches from Bromley to the confluence with the Thames at Deptford. As a result, and the impermeable clay soils, the amount of rainfall-runoff is relatively high (Environment

Agency, 2008). This results in rapid peaks and troughs in the flow hydrograph in response to heavy rainfall.

Average annual rainfall in the Thames catchment is 696mm, compared with the national average of 897mm (Environment Agency, 2008). Average rainfall in Lewisham is 588mm (World Weather Online, 2014). The amount of rainfall does not vary significantly throughout the year, fluctuating between 46 and 71 mm per month (Environment Agency 2008).

The River Ravensbourne is a tributary of the Thames and is 17.4km in length with a total catchment area of 180km². The river rises in Keston and flows in a northerly direction through Hayes, Bromley and Lewisham town centre before meeting the River Thames at Deptford Creek. The main tributaries of the Ravensbourne are the Pool River and the River Quaggy (known as the Kyd Brook in its upper reaches). The River Pool is 5.1km in length and rises between Shirley and West Wickham in the Borough of Croydon and flows through Beckenham and Sydenham before joining the Ravensbourne at Catford. The River Quaggy is 17km in length and rises in Sundridge Park, from where it flows in a northerly direction. When the river reaches Sutcliffe Park, it flows in a westerly direction until it joins the River Ravensbourne to the north of Lewisham town centre.

There have been a number of river restoration projects completed along the River Ravensbourne and its tributaries in the Borough of Lewisham in the last 20 years. These include a project conducted at Ladywell Fields in 2008 to restore the watercourse to a more natural state, increase the quality of habitats for wildlife and create an attractive space for the public to use in this urban environment. Another example is the work carried out along the River Quaggy at Chinbrook Meadows in 2002. This project recreated the natural floodplain to use as a storage area to alleviate flooding.

The Honor Oak is a surface water drainage channel that outfalls to the Ravensbourne via two concrete culverts. One outfalls to Ladywell Fields and the other near Molesworth Street. The open channel is approximately 1.5m wide and 0.7m deep. The culverts are the limiting factor for capacity of the Honor Oak, the Molesworth Street Culvert capacity is severely restricted by the reduction in pipe size. The Ladywell Fields culvert is badly affected by high water levels in the Ravensbourne which reduce its capacity to less than half.

The requirements of the Water Framework Directive (WFD) need to be considered in the planning of all new activities in the water environment. The WFD aims to achieve Good Ecological Status or Good Ecological Potential for all European water bodies by 2015 by setting Environmental Quality Objectives (EQO's) for water chemistry, ecological and hydromorphological parameters. Any activity that has the potential to have an impact will need consideration in terms of whether it could cause deterioration in the Ecological Status or Potential of a water body. Information used for this assessment has been based on the 2009 Thames River Basin Management Plan. The revised Thames RBMP is due for publication in 2015 and therefore these assessments should be updated when fully assessed in the next phase of the project.

A Preliminary WFD Assessment has been included in **Appendix C**.

4.7.1 Flood Storage at Beckenham Place Park

Baseline information

The Beckenham Place Park flood storage area lies within the Keston to Catford water body (GB106039023280). This section of the River Ravensbourne is designated as a Heavily Modified Water Body due to flood protection and urbanisation. The current overall potential is 'Poor' and the status objective is to reach 'Good' status by 2027. The current status for fish is 'Poor' and for invertebrates is 'Moderate' and both are predicted to remain at this status by 2016. The water body does not currently support 'Good' status for quantity and dynamics of flow.

The chemical status of the water body is High for almost all supporting elements, with a designation of Good for phosphate.

The water body does not currently support 'Good' status for quantity and dynamics of flow.

The mitigation measures currently in place in the water body are:

- Appropriate vegetation control technique
- Selective vegetation control regime
- Appropriate timing (vegetation control)
- Appropriate techniques (invasive species)
- Appropriate channel maintenance strategies and techniques - minimise disturbance to channel bed and margins
- Appropriate channel maintenance strategies and techniques - woody debris

Mitigation measures that have not been implemented in the water body include:

- Retain marginal aquatic and riparian habitats (channel alteration)
- Educated landowners on sensitive management practices (urbanisation)
- Appropriate techniques to align and attenuate flow to limit detrimental effects of these features (drainage)
- Remove obsolete structure
- Preserve and where possible enhance ecological value of marginal aquatic habitat, banks and riparian zone
- Structures or other mechanisms in place and managed to enable fish to access waters upstream and downstream of the impounding works
- Alteration of channel bed (within culvert)
- Increase in-channel morphological diversity
- Removal of hard bank reinforcement / revetment, or replacement with soft engineering solution

- Operational and structural changes to locks, sluices, weirs, beach control, etc.

Specifically within Beckenham Place Park, the channel is likely to represent the most natural section of river channel in the Ravensbourne catchment (see Figure 4.2). The channel follows a naturally meandering course, although there is evidence of some historical resectioning that has resulted in relatively uniform banks and an over-large channel capacity. The river also supports natural coarse substrates, exposed sediments and a variety of flow types. However, flows are frequently sluggish (particularly in low flows), and some siltation issues are evident. The presence of mature trees on the bank top is a key characteristic of the channel morphology, with exposed roots constraining bank erosion and increasing bank stability. Overshading prevents the establishment of marginal vegetation. Large woody debris in the channel, although not extensive, locally changes flow conditions (and provides associated biodiversity benefits).

Figure 4.2 Typical reach of the Ravensbourne through Beckenham Place Park



Potential impacts

There are a range of potential impacts associated with the creation of the proposed flood storage area within Beckenham Place Park.

During construction, there is the potential for direct impacts to the river as a result of construction of the embankment, earthworks and realignment of the river itself. There is a potential for impacts to a wide range of receptors, including sediment transport and supply, water quality and suspended sediments, morphological conditions and quantity and dynamics of flow. These impacts will need to be assessed during the EIA.

During operation, the flow control structure has the potential to restrict flows and create impounded conditions upstream during low flow conditions (as well as during high flow conditions for which they are designed). This may reduce flow velocities and promote fine sedimentation on the channel bed. This could potentially cause deterioration in the status of the hydromorphological and biological quality elements of the water body and would need to be assessed during the EIA.

The creation of the flood storage area will limit the magnitude of flows that pass through the river channel. A significant reduction in these flows can potentially lead to enhanced in-channel sedimentation, since lower flows do not necessarily have the energy to transport the existing load, and more uniform conditions within the channel could potentially cause deterioration in the status of the hydromorphological and biological quality elements of the water body.

The potential impacts of the control structure on water quality and biology are described in Section 4.3.1.

A series of design principles have been identified which seek to reduce the geomorphological impacts of the scheme. These will provide the framework for the detailed design and are provided in Appendix D.

During operation, the proposed scheme includes plans to restore a section of Ravensbourne in the southern end of the park. The southern realignment is proposed in order to bring the river out of a straightened concrete channel, mimicking the historic river alignment and restoring natural river processes. Gravels from the existing river channel will be retained and used to seed the new channel. The new channel will be allowed to meander, although erosion protection measures will be required around key features (e.g. embankment toes, and areas of contamination). Overall, realigning this section of the river is likely to result in the same hydromorphological value.

Whilst it is not possible to immediately replicate the section of realigned river in the northern part of the park, the existing channel has been used as a reference point for the outline design of the new realigned channel. Furthermore, there is the potential for increasing floodplain connectivity within the park, by slightly narrowing the realigned river channel, and through careful design of ground levels. This will need to be explored further during detailed detail. Following the establishment of vegetation and geomorphological processes post construction, there is potential for the scheme to have a positive impact on hydromorphology.

4.7.2 Local defences between Ladywell and Lewisham

Baseline information

The proposed wall raising through Lewisham and Catford falls within the Catford to Deptford water body (GB106039023270). This section of the River Ravensbourne is designated as a Heavily Modified Water body due to flood protection and urbanisation. The current overall potential is 'Poor' and the status objective is to reach 'Good' status by 2027. The current status for fish is 'Poor' and for invertebrates and macrophytes, 'Moderate'. The status of these biological elements is not expected to change by 2015.

The chemical status of the water body is High for a number of supporting elements, but designated as Moderate for pH and Poor for phosphate. The status of these physico-chemical elements is not expected to change by 2015.

The water body does not currently support 'Good' status for quantity and dynamics of flow.

The mitigation measures currently in place in the water body are:

- Appropriate vegetation control technique.
- Selective vegetation control regime.
- Appropriate timing (vegetation control).
- Appropriate techniques (invasive species).
- Appropriate channel maintenance strategies and techniques - minimise disturbance to channel bed and margins.
- Appropriate channel maintenance strategies and techniques - woody debris

Mitigation measures that have not been implemented in the water body include:

- Retain marginal aquatic and riparian habitats (channel alteration)
- Educate landowners on sensitive management practices (urbanisation)
- Appropriate techniques to align and attenuate flow to limit detrimental effects of these features (drainage)
- Remove obsolete structure
- Preserve and where possible enhance ecological value of marginal aquatic habitat, banks and riparian zone
- Structures or other mechanisms in place and managed to enable fish to access waters upstream and downstream of the impounding works
- Alteration of channel bed (within culvert)
- Increase in-channel morphological diversity
- Removal of hard bank reinforcement / revetment, or replacement with soft engineering solution
- Operational and structural changes to locks, sluices, weirs, beach control, etc

Figure 4.3 Typical Channel Section, Lewisham Town Centre



Potential impacts

There are a range of potential issues associated with the creation of new flood walls and raising existing walls. These include:

- Efforts have been made to reduce the height and extent of local defences, however the potential exists for loss of floodplain connectivity;
- A reduction/prevention of sediment input
- A reduction/prevention of channel in/outflow; and
- An increase in bank-full capacity.

There are potential impacts during construction relating to water pollution and associated impacts on water quality.

4.7.3 Honor Oak and Ladywell Green

Baseline information

The proposed flood storage area at Ladywell Green and the Honor Oak do not fall into a Thames RBMP water body. As such, there is no data available regarding physico-chemical or geomorphological status objectives. The Honor Oak stream has limited geomorphological value, due to its constrained alignment, artificial construction and lack of connectivity with open sections of river.

Potential impacts

Creation of a flood attenuation area within Ladywell Green has the potential to increase sediment supply into the Ravensbourne (i.e. through an increased exposure of flood water to soils).

Hydrology and Geomorphology: Key EIA issues and recommendations for further work

- Potential for direct impacts to morphology through construction of the embankment and realignment of the river.
- Potential impacts on longitudinal sediment transport and sediment supply.
- Hydrological impacts, i.e. changing the magnitude of flood events downstream of the control structure.
- Potential for loss of floodplain connectivity through local defences
- Potential positive impacts on hydromorphology by restoring the southern section of the Ravensbourne through Beckenham Place Park
- Further work is required during detailed design to optimise the characteristics of the realigned river channel within Beckenham Place Park.
- Detailed WFD assessment will be required.
- Detailed design will need to be informed by the Design Principles developed during outline design.
- Further geomorphological survey is recommended, using the same methodology (fluvial audit) and fixed point photography to monitor geomorphological change.

4.8 Landscape and Visual Amenity

4.8.1 Flood Storage Area at Beckenham Place Park

Baseline Conditions

There are no national or local landscape designations (e.g. National Parks, Areas of Outstanding Natural Beauty (AONBs) or Special Landscape Areas) within 2km of the study area. In addition, the study area itself is not covered by a Conservation Area designation. Beckenham Place Park Conservation Area is located approximately 500m to the west of the study area and is designated for the Grade II* listed Beckenham Place mansion and associated parkland.

This southern part of the study area including Beckenham Place Park lies within Natural England's National Character Area 113: North Kent Plain. This NCA comprises the strip of land between the Thames Estuary to the north and the chalk of the Kent

Downs to the south. The western end of this NCA includes the transitional edge between the dense urban development of inner London and rural, agricultural land to the east. Generally, the area is characterised as open, low and gently undulating with significant ancient woodlands in the west.

Natural England's document 'London's Natural Signatures' (Natural England, January 2011) provides a landscape character framework for London. It divides greater London into 22 Natural Landscape Areas. The study area lies in Area 18 - River Ravensbourne Valley, which comprises a valley system which drains from Bromley and Penge northwards to the River Thames at Deptford, including stretches of the Pool River, the Ravensbourne, the Quaggy and the Kyd Brook. It is described as a "...network of small rivers, bounded by gravel terraces, which flow through water meadows and tidal flood meadows before reaching the Thames as a navigable channel, bordered by working wharves...". It continues by stating that "The Natural Signature of the Ravensbourne River Valley has been largely lost to 19th- and 20th-century suburban and railway development.... Only at one point, Beckenham Place Park, does a sense of the relationship between the stream and its wider valley survive".

Lewisham Borough Wide Character Study (Urban Practitioners, October 2010) was prepared for LB Lewisham to provide the evidence for policies set out in the Lewisham LDF Core Strategy and act as a general reference document for the council and residents, developers, designers, planners and other stakeholders. It provides a description of the physical form of the borough, its origins, places, streets and buildings to inform an understanding of the particular attributes which make the borough what it is today. It divides the borough into a series of 20 'places' which are felt to have a reasonably cohesive character, and sets out their key characteristics, features and issues. This southern part of the study area lies within the 'Beckenham Place' area, the key characteristics of which are described as a "large landscaped park formerly the grounds of a Georgian country house, now a public park and golf course..." with a "...strong sense of high ground, but surprisingly few long views". It recognises the Conservation Area and listed buildings as key heritage assets and describes the "maintenance of the historic park and accommodating the operation of the golf course" as key issues. The immediately adjacent residential streets to the north and east lie within the 'Downham' area, which is described as a "very large Council estate built in the 1920s-30s by the London County Council and amongst the most ambitious of its 'cottage' estates. Laid out as perimeter blocks but on undulating form with a conscious attempt to follow the rural vernacular models, as espoused by the Garden City movement".

An arboricultural survey of Beckenham Place Park was undertaken by Thomson Ecology in 2012. A total of 203 significant individual trees, 88 groups of trees and one woodland are located within or immediately adjacent to the site boundary. Of these, five are categorised as 'Category A', and all but 28 were assessed as worthy of considering for retention. No trees within the site boundary are covered by a Tree Preservation Order (TPO).

The River Ravensbourne corridor within the Park is visually well contained and medium and long distance views of the wider area are limited by built form and mature trees. The flood storage area is bordered by the railway line to the west and the tree-lined river provides screening to the east.

The Green Chain Walk, which is designated in the Lewisham Unitary Development Plan is an extensive and intricate network of footpaths, covering 65km in ten sections and links open spaces between the River Thames and Crystal Palace Park. Part of the

walk passes through the proposed flood storage area at the northern limit, and crosses the River Ravensbourne. A spur route off of The Waterlink Way, also designated in the Lewisham UDP, runs through Beckenham Place Park.

Potential Impacts

Due to the distance of the works from the Conservation Area and the presence of screening vegetation, no significant impacts on the Beckenham Place Park Conservation Area are anticipated.

The proposed scheme is likely to require the loss of a number of trees to enable the construction of the flood embankments resulting in impacts during construction and beyond. However, replacement planting will be undertaken as part of the scheme and therefore longer term impacts could be mitigated.

There is the potential for temporary negative impacts on the character of the Park during construction. Access and use of the area will also be affected (see Section 4.9 - Socio-Economics). However, in the context of the proposals, which are not considered to have a significant visual impact on the wider urban area, medium and long distance views have been scoped out.

During operation there is the potential for a positive impact on landscape character (and therefore park usage). The scheme provides an opportunity to regenerate Beckenham Place Park, through the provision of improved access, planting, and play facilities. The indicative landscape design includes proposals for wildflower meadows, wetland areas, shrub/herbaceous planting and tree planting. Entrances to the park will be improved through improved access and signage. Sightlines will also be improved by raising tree canopies and removing undesirable vegetation and fencing; however, some medium distance views across the park will be obscured from the park entrances due to the introduction of the embankment. There is also the potential for views from properties overlooking the park to be impacted by the embankment, although such views will be screened or filtered by existing retained vegetation in most places.

Visitors to the park will be encouraged up the embankment slopes through new access routes and planting. The embankment incorporates variations in alignment and slope to provide visual interest and asymmetry.

The realigned river will provide a focal point for the newly created park landscape. This is likely to improve the landscape setting and sense of place (i.e. through improved connectivity and access to with the river).

4.8.2 Local Defences between Ladywell and Lewisham

Baseline Conditions

There are no national or local landscape designations (e.g. National Parks, AONBs, or Special Landscape Areas) within 2km of the study area.

St Marys Conservation Area is located within the study area. The Conservation Area overlaps with the site immediately downstream of Ladywell Fields. The Conservation Area is designated for the Grade II* listed St. Mary's Church and its cluster of Edwardian civic buildings.

There are three other Conservation Areas (Ladywell, Culverley Green and Brookmill Road) adjacent to the study area. These are located north-west of Ladywell Rail

¹ Trees of high quality and value capable of making a significant contribution to the area for 40 or more years.

Stallion; immediately downstream of the works at Watermead Road to Pool Court; and immediately downstream of the works at Armoury Road respectively. They are designated for their late Victorian suburban housing; Edwardian residential suburban nature; and for uniform mid-Victorian housing.

The study area lies within the Natural England NCA 112: Inner London. This NCA is predominantly urban and lies at the centre of the Thames Basin on a broad flood plain which rises in gentle terraces, providing panoramic views of London's skyline from the clay plateaux and ridges in the north and south. Despite the urban nature of the area, Inner London is usually 'green' for a large city, containing 2,280ha of woodland and 33,012 ha of accessible green space (8% of the NCA). The extensive network of green infrastructure throughout the NCA, including Local Nature Reserves such as Camley Street, provides outdoor recreation and wildlife habitat close to people's homes and places of work.

Natural England's document 'London's Natural Signatures' (Natural England, January 2011) provides a landscape character framework for London. It divides greater London into 22 Natural Landscape Areas. The study area lies in Area 18 - River Ravensbourne Valley, which is described in the previous section.

Lewisham Borough Wide Character Study (Urban Practitioners, October 2010) divides the borough into a series of 20 'places', and this northern part of the study area lies within the 'Deptford', 'Lewisham' and 'Ladywell' areas. The key characteristics of 'Deptford' include a description of the south of this area comprising "...Brookmill conservation area (laid out as Deptford New Town) and St John's, coherent and well preserved 19th century terraces." Quality of the public realm is recognised as a key issue. The key characteristics of 'Lewisham' are described as "...the commercial heart of the Borough and its principal shopping centre... grown up at the confluence of the Borough's two rivers, the Quaggy and the Ravensbourne, as well as junctions of busy roads, railway lines and the Docklands Light Railway." St Mary's Conservation Area and the Church of St Mary the Virgin are identified as key heritage assets, and quality of the public realm is recognised as a key issue. The key characteristics of 'Ladywell' are described as "...1880s development around the railway station..." comprising "...tightly defined terraces..." and "...varied neighbourhood..." with a "...real mix of layouts and architecture around the river valley".

The Waterlink Way, designated in the Lewisham Unitary Development Plan, follows the River Ravensbourne and River Pool. National Cycle Route 21 follows a similar route to the Waterlink Way.

An arboricultural survey of Ladywell Fields was undertaken by Thomson Ecology in 2012. A total of 117 significant individual trees and 32 groups of trees were recorded during the survey. Of these, 15 are categorised as 'Category A²', and all but one were assessed as worthy of considering for retention. A copy of the survey is presented in Appendix E. No trees within the site boundary are covered by a TPO.

The River Ravensbourne is visually well contained and medium and long distance views of the wider area are limited by the surrounding residential properties and vegetation.

² Trees of high quality with an estimated remaining life expectancy of at least 40 years, as classified in BS5837:2012. High quality is defined in terms of the tree's arboricultural, landscape and cultural values

Potential Impacts

These works have the potential to impact upon the setting of St Mary's Conservation Area and any tree removal in this area may require permission from the Council.

Local defences could sever the visual connection with the river. The quality of finishes on walls will have an effect on landscape and townscape character. However, in the context of the proposals, which are not considered to have a significant visual impact on the wider urban area, medium and long distance views have been scoped out.

The scheme will result in the loss of some trees, which whilst not being protected do affect the views in the area. At the operation stage, the proposed replacement planting is likely to mitigate this impact once established.

4.8.3 Honor Oak and Ladywell Green

Baseline Conditions

There are no national or local landscape designations (e.g. National Parks, AONBs, or Special Landscape Areas) within 2km of the study area. There are two Conservation Areas (Ladywell and St. Mary's) adjacent to the study area. These designations are described in the previous sections.

This central part of the study area lies within the Natural England NCA 112: Inner London. Details of this NCA are presented in the previous section.

Natural England's document 'London's Natural Signatures' (Natural England, January 2011) describes this central part of the study area as lying in Natural Landscape Area 18 - River Ravensbourne Valley, which is described in the previous section.

Lewisham Borough Wide Character Study (Urban Practitioners, October 2010) divides the borough into a series of 20 'places', and this central part of the study area lies within the 'Ladywell' area. The key characteristics of which are described above.

The Waterlink Way, designated in the Lewisham Unitary Development Plan, follows the River Ravensbourne and River Pool. National Cycle Route 21 follows a similar route to the Waterlink Way.

An arboricultural survey of Ladywell Green was undertaken by Thomson Ecology in 2012. No trees within the site boundary were covered by either a TPO or within a Conservation Area. A total of 28 significant individual trees located within or immediately adjacent to the site boundary were recorded during the survey. Of these, 15 are categorised as 'Category A', and all were assessed as worthy of considering for retention.

The River Ravensbourne corridor is visually well contained and medium and long distance views are limited by built form and mature trees.

Potential Impacts

Existing open views could be impacted by local defences, resulting in a detrimental impact on the character of an open space. There is also the potential for local defences to impact access and use of a space.

The scheme will result in the loss of some trees, which whilst not being protected do affect the views in the area. At the operation stage, the proposed replacement planting is likely to reduce this impact, although planted trees will take many years to mature.

During operation, there is likely to be minimal impacts to landscape features. However, in the context of the proposals, which are not considered to have a significant visual impact on the wider urban area, medium and long distance views have been scoped out. However, the scheme may affect close range views and affect the visibility of the river channels.

Landscape and Visual Amenity: Key EIA issues and recommendations for further work

- Potential visual impacts as a result of construction activity associated with creation of the earthworks and flood walls, the loss of trees and from the introduction of new features within existing views.
- Potential landscape impacts as a result of the construction works, change of character associated with the loss of trees and introduction of new features, such as the proposed earthworks at Beckenham Place Park.
- Impacts to mature trees and root protection areas
- Potential for loss of sports pitches and open space used for informal recreation at Beckenham Place Park
- Potential beneficial impacts to landscape character and visual amenity through park regeneration, restoration of historic landscape character, introduction of new planting and diversified habitats, and improvements to access and amenity facilities.
- A Landscape and Visual Impact Assessment (LVIA), including a landscape character assessment, will be undertaken using a methodology based on published guidance, in particular Landscape Character Assessment Guidance for England and Scotland (Countryside Agency and Scottish Natural Heritage, 2002) and Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (Landscape Institute and Institute of Environmental Management and Assessment, 2012). The likely effects of the proposals will be assessed in terms of changes to the character and/or quality of landscape and visual amenity, referencing representative viewpoints agreed with the London Borough of Lewisham.
- Due to the enclosed nature of the sites and the scale of the proposals, long and medium distance views have been scoped out. Therefore a Zone of Theoretical Visibility (ZTV) will not be required. The main receptor types are local residents in nearby properties, those who travel through the area as pedestrians, motorists, cyclists, etc. and users for the public open spaces and footpaths / cycle routes such as the Waterlink Way / NCN 21 and Green Chain Walk.
- Further visual materials are likely to be required to facilitate public consultations.

4.9 Socio-Economics

4.9.1 Flood Storage at Beckenham Place Park

Baseline Conditions

Beckenham Place Park is the largest green space in the Borough with 96ha of open space with large areas of woodland. The park is sited in a predominantly residential area, with a number of schools in close proximity and four mainline train stations nearby.

This area of the park is predominantly amenity grassland and includes Millwall Football Club training ground and a children's play area. The park also includes several football pitches as well as a network of footpaths within the woodland in the southern section of the park. The park is widely used by the public for outdoor leisure activities and the friends of Beckenham Place Park arrange a number of events in the park, including walks and talks (Lewisham Council, 2011).

The Green Chain Walk, which is also designated in the Lewisham UDP is an extensive and intricate network of footpaths, covering 65km in ten sections and links open spaces between the River Thames and Crystal Palace Park. Part of the walk passes through the proposed flood storage area at the northern limit, and crosses the River Ravensbourne.

BPP has a very narrow range of visitors, primarily used for golf or for dog walking. A 2013 Movement and Usage Survey found the park to be extremely underused, especially when compared to other parks in Lewisham. It was reported that the 'concentration of users remains low and the atmosphere very quiet' with most of the areas 'monofunctional'. Furthermore, the park suffers a notable lack of children. Despite current low-level usage, there is precedent for successful community engagement in the park, and existing volunteer groups and targeted activities do exist – one successful example is the NHS Change for Life walking group that meets in the park weekly.

There are records of crime and anti-social behaviour in the Park, typically restricted to secluded areas.

Potential Impacts

Construction of the scheme has the potential to impact nearby residents, commercial properties and park users (i.e. through noise, vibration etc.). Dog walkers, recreational users of the park and local residents will likely experience restricted access during construction. During times of flooding, there will be a temporary loss of land; however this is not expected to last more than a day. The proposed scheme incorporates alternative routes and raised walk ways if the area is to be flooded for an extended period of time.

Regeneration of Beckenham Place Park is likely to bring significant benefits to the local community in terms of recreation and access to high quality green space. The scheme is likely to attract a broader demographic to the park, associated to improved facilities and accessibility. The scheme has the potential create a community 'hub' in one of the most deprived parts of the Borough. Increased park usage is also likely to bring about health benefits in terms of increased use of green space in a relatively urban area.

Informal learning opportunities such as nature walks, pond-dipping, and foraging walks will also be created, creating further benefits to the community.

Local cycling groups are keen to see the park opened up for cycling and teaching cycle safety, with enhancement of existing Green Chain and Waterlink Way routes improving accessibility through the park and allowing new routes to connect to local schools, facilities and nearby train stations. The scheme also incorporates disabled access to key areas of the park.

The network of footpaths will be enhanced and extended to provide a hierarchy of accessible routes which offer shared-use and provide year-round access for all. The restored landscape will be accessible for all and a range of play experiences provided within the landscape suitable for all ages and abilities.

The scheme will also deliver direct benefits to the community in terms of reduced flood risk (direct damage to property and disruption).

The scheme also provided an opportunity to reduce crime and anti-social behaviour in the park by designing out secluded areas, providing alternative routes and improving visibility.

4.9.2 Local defences between Ladywell and Lewisham

Baseline Conditions

The study area contains several recreational resources. At the northern (downstream) end of the study area, a section of the river has been restored through Brookmill Park. The river has been broken out of its culvert and now provides a more natural habitat. Within the park, there is an ornamental garden, a lake and children's play area. A footpath and cycle way run through the park and form part of the Waterlink Way; designated in the Lewisham Unitary Development Plan (UDP) for riverside walking and cycling. This forms a green route through the borough from the Thames at Creekside to the south coast at Eastbourne, following a similar route to the National Cycle Route 21. The Waterlink Way follows the course of the river through many stretches of the study area through Lewisham and Catford, and continuing south beyond Ladywell Fields.

Further south of Brookmill Park, in Lewisham town centre, Commill Gardens is an open space that was restored in 2007 and provides direct access to the river. Along this stretch, the river has been broken out of its concrete walls and the river banks have been planted with native trees and plants. The river restoration scheme formed part of the 'Urban Renaissance in Lewisham' programme which aimed to create a new public open space within the town centre.

At the southern (upstream) end of the study area, the River Ravensbourne flows in close proximity to a public sports ground that comprises a cricket pitch and several football pitches. Just to the north of this, Ladywell Fields runs alongside the River Ravensbourne. This is a large formal park that has recently undergone extensive enhancements to improve the quality of the recreational area, both for wildlife and for the public. The project has involved the restoration of the River Ravensbourne, including bridges, a backwater and a separate wildlife pool as well as new young children's play area, a re-opened café and improvements to the entrance and signage (Lewisham Council, 2011).

This was followed by a further £2m enhancement project funded by the London Development Agency that has been recently completed. As a result of these works the

park now has boardwalks, a new play area, an orchard, new footpaths, cycle paths and lighting as well as new tennis courts, and a skatepark. In addition, there is an athletics track and a new multi-sports ball court. The park is one of the main centres for outdoor sports in the borough as well as providing a valuable resource for dog walkers and other outdoor leisure activities. The Waterlink way continues through the length of Ladywell Fields.

The study area is highly accessible to most parts of London, and therefore it is well located for access to markets and jobs in central London as well as the surrounding area. According to the 2012 Lewisham Council Economic Assessment Report, around 70% of local working residents travel outside of the borough for work. The report also states that local businesses are predominately small or SME businesses, mainly in retail, business services and construction.

Potential Impacts

Potential impacts during construction include disruption in terms of noise, vibration, and increased traffic. However, it is envisaged that the majority of these impacts could be mitigated through timing of works and construction stage mitigation. Temporary access restrictions to footpaths and cycle pathways are also likely to occur during the construction phase.

The local defences have been designed to integrate within the existing landscape setting (i.e. incorporating flood defences into raised footpaths etc.) where possible. Increased wall heights may interrupt views of the river in some locations, although the majority of local defence works are proposed in areas out of public view.

4.9.3 Honor Oak and Ladywell Green

Baseline Conditions

Ladywell Green is a small green space to the west of Ladywell Field consisting primarily of amenity grassland. The green includes a children's play area to the south, and is surrounded by several mature trees. There is no information available on current usage of the green, although the space is not thought to be used extensively by the local community (i.e. through feedback received at the public consultation, see Section 6). It is assumed that the majority of the local community use Ladywell Fields for amenity and recreation given the facilities available there.

Potential Impacts

The potential impacts during construction of the flood storage at Ladywell Fields to the local community and park users are likely to be noise and traffic impacts from construction due to the transportation of construction materials.

During construction, there are also likely to be impacts to the park users (e.g. joggers, dog walkers, cyclists): there will be restricted access to certain areas of the park. During times of flooding, there will be a temporary loss of usable space, but this is not expected to last more than a few days.

During operation, the scheme provides an opportunity to regenerate the space, through improved planting, habitat creation, access provisions and landscaping.

Socio-Economics: Key EIA Issues and recommendations for further work

- Potential impacts to nearby residents, commercial properties and users during construction (i.e. through noise, traffic and park closures).
- Potential positive benefits in terms of recreation and access provisions.
- Potential for health benefits through increased use of green space (esp. Beckenham Place Park).
- Potential for educational benefits through interpretive material and outdoor learning.
- Potential improvements in terms of sense of place and connectivity with the river/nature.
- Potential beneficial impacts through designing out crime and anti-social behavior.

4.10 Air Quality

4.10.1 Flood Storage Area at Beckenham Place Park

Baseline Conditions

The Beckenham Place Park site is not located within a designated statutory Air Quality Management Area (AQMA). However the southern boundary is located adjacent to the London Borough of Bromley (LBB) AQMA which has been declared for the potential exceedence of the annual mean air quality objective for nitrogen dioxide (NO₂). The north eastern boundary of the Beckenham Place Park site is also located approximately 300m from the London Borough of Lewisham (LBL) AQMA 5 which has been declared for the potential exceedence of the annual mean air quality objective for NO₂ and the daily mean objective for PM₁₀.

Existing sources of air pollution in the vicinity of the Beckenham Place Park are likely to include road sources, including the A21, A2218, A2015 and local road network, and industrial sources.

Potential Impacts

The potential air quality impacts associated with the proposed flood storage area at Beckenham Place Park will principally relate to the construction phase of the proposed works. These will include:

- Dust emissions generated from earth excavation works and removal of material, which have the potential to cause nuisance to, and soiling of, sensitive receptors;
- Emissions of air pollutants, particularly NO₂ and PM₁₀ from construction related traffic, which will have the potential to adversely impact local air

quality at sensitive receptors, especially those situated adjacent to utilised roads located within the existing AQMAs;

- Emissions of NO₂ and PM₁₀ from non-road mobile machinery operating on the site, which will have the potential to adversely impact air quality at adjacent sensitive receptors.
- Potential receptors include those existing residential areas in the vicinity of the works and those located adjacent to affected local road network routes which will be utilised by construction phase traffic. Sedgemoor School is also a potential receptor location.
- Beckenham Place Park is a designated Local Nature Reserve. There are no other designated ecological sites located within close proximity of Beckenham Place Park.

4.10.2 Local defences between Ladywell and Lewisham

Baseline Conditions

The area of works between Ladywell and Lewisham are all located within LBL statutory AQMA 3 which has been designed for the potential exceedence of the annual mean NO₂ air quality objective and daily mean PM₁₀ air quality objective.

Existing sources of air pollution in the vicinity of the local defence works between Ladywell and Lewisham are likely to include road sources, including the A20, A21, A212, A259, A2210, A2211, A205 and local road network, and industrial sources.

Potential Impacts

The potential air quality impacts associated with the proposed local defences between Ladywell and Lewisham will principally relate to the construction phase of the works. These will include:

- Dust emissions generated from wall raising activities, earth excavation works and removal of material, which have the potential to cause nuisance to, and soiling of, sensitive receptors;
- Emissions of air pollutants, particularly NO₂ and PM₁₀ from construction related traffic, which will have the potential to adversely impact local air quality at sensitive receptors, especially those situated adjacent to utilised roads located within the existing AQMAs;
- Emissions of NO₂ and PM₁₀ from non-road mobile machinery operating on the site, which will have the potential to adversely impact air quality at adjacent sensitive receptors.
- Potential receptors include those existing residential areas in the vicinity of the works and those located adjacent to affected local road network routes which will be utilised by construction phase traffic. Lewisham Hospital is also a potential receptor location.

- Brookmill Road Local Nature Reserve (LNR) is located within 50m of the local defence works between Ladywell and Lewisham. There are no other designated ecological sites located in the vicinity of the Honor Oak and Ladywell Green works.

4.10.3 Honor Oak and Ladywell Green

Baseline Conditions

The Honor Oak and Ladywell Green site is located within LBL statutory AQMA 3 which has been designed for the potential exceedence of the annual mean NO₂ air quality objective and daily mean PM₁₀ air quality objective.

Existing sources of air pollution in the vicinity of the local defence works between Ladywell and Lewisham are likely to include road sources, including the A21, A205, A212, B236, B218 and local road network, and industrial sources.

Potential Impacts

The potential air quality impacts associated with the proposed Honor Oak and Ladywell Green re-landscaping and material excavation works will principally relate to the construction phase of the proposed works. These will include:

- Dust emissions generated from material excavation, removal of material and re-landscaping works, which have the potential to cause nuisance to, and soiling of, sensitive receptors;
- Emissions of air pollutants, particularly NO₂ and PM₁₀ from construction related traffic, which will have the potential to adversely impact local air quality at sensitive receptors, especially those situated adjacent to utilised roads located within the existing AQMAs;
- Emissions of NO₂ and PM₁₀ from non-road mobile machinery operating on the site, which will have the potential to adversely impact air quality at adjacent sensitive receptors.
- Potential receptors include those existing residential areas in the vicinity of the works and those located adjacent to affected local road network routes which will be utilised by construction phase traffic.
- There are no designated ecological sites located in the vicinity of the Honor Oak and Ladywell Green works.

Air Quality: Key EIA issues and recommendations for further work

- Dust emissions associated with the construction phase, such as excavation and removal of earth material, which have the potential to cause nuisance and soiling of sensitive receptors.
- Construction vehicle exhaust emissions potentially affecting local air quality

at sensitive receptors adjacent to the construction traffic route, particularly within the designated AQMAs.

- Non-road mobile machinery operating on the site, which will have the potential to adversely impact air quality at sensitive receptors.
- A construction phase dust assessment will be undertaken in accordance with guidance provided by the Institute of Air Quality Management (IAQM) in the document 'Guidance on the assessment of dust from demolition and construction, February 2014'. Mitigation measures will be recommended as part of the assessment to minimise potential dust emissions during the flood alleviation works.
- Predicted construction phase road traffic movements will be screened using the criteria provided in the Design Manual for Roads and Bridges, May 2007 and Environmental Protection UK guidance 'Development Control: Planning for Air Quality (2010 Update)' to determine whether an assessment of construction phase road traffic emissions is required. If an assessment is required this will be undertaken in accordance with guidance by Defra in the document 'Local Air Quality Management Technical Guidance, 2009'.
- An operational phase air quality assessment is not proposed as the number of vehicle movements associated with the maintenance of the flood alleviation scheme will be minimal.

4.11 Noise and Vibration

This section examines the potential environmental noise and vibration impact arising from the proposals described in Section 3. This section does not examine occupational noise and vibration issues nor does it include underwater noise and vibration impacts.

4.11.1 Flood Storage Area at Beckenham Place Park

Baseline Conditions

Baseline noise monitoring has not been undertaken and existing monitoring data within the study area is not available. The potential for the proposed scheme to increase noise and vibration levels remains an important consideration. The existing residential dwellings, road traffic, rail and recreational activities are the main contributor to the ambient noise environment. Local noise within the proposed construction area is expected to be high during certain activities.

There are no significant sources of ground-borne vibration in the local environment and vibration levels are expected to be negligible.

Potential Impacts

The potential effect of noise and vibration during the construction phase include nuisance impact to local communities (earthworks and piling noise) and disturbance to birds (increased human activity).

There may be potential impacts to the local residents through increased noise during lorry movements, deposition of material onto the site by construction machinery. The proposed works will have the potential to generate high levels of noise. However, the construction works will be of short duration and the potential impact is deemed temporary moderate adverse.

An assessment will be required to identify all potential noise sensitive receptors that are likely to be affected by the proposed construction works. During the construction phase, potential mitigation measures to reduce the significance of impact could include adherence to the principles of Best Practicable Means (BPM), as defined in BS5228:2009+A1:2014 Parts 1.

No significant noise impacts will occur during the operational phase. Occasional maintenance to the embankment may be required but the earthworks and traffic movements associated with this maintenance is likely to be minimal.

4.11.2 Local defences between Ladywell and Lewisham

Baseline Conditions

Baseline noise monitoring has not been undertaken and existing monitoring data within the study area is not available. The potential for the proposed scheme to increase noise and vibration levels remains an important consideration. The existing residential dwellings, road traffic, rail and recreational activities are the main contributor to the ambient noise environment. Local noise within the proposed construction area is expected to be high during certain activities.

There are no significant sources of ground-borne vibration in the local environment and vibration levels are expected to be negligible.

Potential Impacts

The potential effect of noise and vibration during the construction phase include nuisance impact to local communities (earthworks and piling noise) and disturbance to birds (increased human activity).

There may be potential impacts to the local residents through increased noise during lorry movements, deposition of material onto the site by construction machinery. The proposed works will have the potential to generate high levels of noise. However, the construction works will be of short duration and the potential impact is deemed temporary moderate adverse.

An assessment will be required to identify all potential noise sensitive receptors that are likely to be affected by the proposed construction works. During the construction phase, potential mitigation measures to reduce the significance of impact could include adherence to the principles of Best Practicable Means (BPM), as defined in BS5228:2009+A1:2014 Parts 1.

No significant noise impacts will occur during the operational phase. Occasional maintenance to the embankment may be required but the earthworks and traffic movements associated with this maintenance is likely to be minimal.

4.11.3 Honor Oak and Ladywell Green

Baseline Conditions

Baseline noise monitoring has not been undertaken and existing monitoring data within the study area is not available. The potential for the proposed scheme to increase noise and vibration levels remains an important consideration. The existing residential dwellings, road traffic, rail and recreational activities are the main contributor to the ambient noise environment. Local noise within the proposed construction area is expected to be high during certain activities.

There are no significant sources of ground-borne vibration in the local environment and vibration levels are expected to be negligible.

Potential Impacts

The potential effect of noise and vibration during the construction phase include nuisance impact to local communities (earthworks and piling noise) and disturbance to birds (increased human activity).

There may be potential impacts to the local residents through increased noise during lorry movements, deposition of material onto the site by construction machinery. The proposed works will have the potential to generate high levels of noise. However, the construction works will be of short duration and the potential impact is deemed temporary moderate adverse.

An assessment will be required to identify all potential noise sensitive receptors that are likely to be affected by the proposed construction works. During the construction phase, potential mitigation measures to reduce the significance of impact could include adherence to the principles of Best Practicable Means (BPM), as defined in BS5228:2009+A1:2014 Parts 1.

No significant noise impacts will occur during the operational phase. Occasional maintenance to the embankment may be required but the earthworks and traffic movements associated with this maintenance is likely to be minimal.

Noise and Vibration: Key EIA issues and recommendations for further work

- Consultation with the London Borough of Lewisham will be undertaken to determine existing noise or vibration survey data within the development area. A background noise and vibration survey may be necessary to establish existing baseline levels around the area and alongside sensitive receptors, where necessary. The scope and methodology of this survey will be agreed with the local Environmental Health Department who may be able to identify additional potential receptors which may be sensitive to noise and vibration. The survey will be carried out in accordance with current best practice guidance and standards as appropriate.
- Noise and vibration generated by mobile and static plant and equipment associated with the construction phase of the scheme.
- Construction phase noise affecting existing receptors will be assessed using the guidance and datasets contained in British Standard 5228.

1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Part 1, and based on knowledge of similar projects. The noise calculations will be undertaken using the calculation methodology within BS5228, taking into account the sound power levels of construction equipment, distance to receptors, screening from barriers or topography, 'on-times' of equipment and soft ground absorption. Predicted impacts will be assessed against the proposed limits provided in Annex E of the standard and reported within the ES alongside any mitigation measures. The noise and vibration assessment will identify potential noise and vibration impacts and provide recommendation of suitable mitigation measures to reduce the likelihood of adverse comments.

- Off-site noise and vibration levels generated by construction-related traffic on surrounding local roads.

4.12 Cumulative Assessment

A review of Lewisham Council website has been undertaken to identify any key proposed projects or plans within the wider area which may have potential for cumulative or in-combination environmental impacts.

The largest single development with Lewisham town centre, Lewisham Gateway, is to be situated at the confluence of the Rivers Ravensbourne and Quaggy, which is directly adjacent to the preferred option works at the A20.

The development involves a new road layout, a new bus interchange and a new development comprising shops, restaurants, bars and cafes, leisure facilities, up to 800 new homes, a park where the Ravensbourne and Quaggy rivers meet, a town square.

This change of use has the potential to alter the noise and dust emissions during construction and levels of use, traffic flows in the area during operation and may have a cumulative impact upon environmental variables depending on the anticipated timing on works.

5 Our Proposed Method of Environmental Impact Assessment

5.1 Level of Assessment

It has not yet been determined in conjunction with the Local Planning Authority the extent of works that can be undertaken using the Environment Agency's permitted development rights. For such works the EIA (Land Drainage Improvement Works) Regulations are relevant.

It is anticipated that the works will require a statutory EIA under Schedule 2, 10(h) of the Town and Country Planning (EIA) Regulations. The Environment Agency intends to undertake an EIA for the project (regardless of whether a statutory impact assessment is required), so we do not intend to submit a screening opinion request. We will however submit a scoping request to agree the scope of the EIA.

If a statutory EIA is not required by either of the above routes, a voluntary statutory EIA will be completed by the Environment Agency.

5.2 Next Stage of Assessment

The next stage of the project will include some level of assessment relating to the significance of impacts on environmental receptors and resources. The following outline EIA methodology will be used:

1. Evaluation of the value or importance of a resource according to a five-point scale (i.e. very high, high, medium, low, negligible) and the sensitivity of a receptor. This will be informed by the surveys and further assessments identified in Section 4;
2. Assessment of the magnitude of each impact considering factors such as nature, extent, duration, directness, reversibility, etc.; and classification of the magnitude as minor, moderate or major positive or negative; and
3. Determination of the significance of the an effect resulting from an impact (of a certain magnitude) on a resource (of a particular value or importance) or receptor (of a particular sensitivity) and classification as minor, moderate or major beneficial or adverse.

Defined criteria will be used at each stage of this process. These are specific to each environmental aspect and will be identified using industry accredited guidance. Current best practice will be followed in the absence of any such guidance. For this environmental assessment a significant impact would be considered to be one which is assessed as "Moderate" or "Major". Where appropriate, mitigation will be set out for impacts at all levels of significance to remove or minimise effects.

The nature of impact (which can be positive or negative) is defined in relation to duration and whether it can be reversed i.e.:

- Temporary - lasting for the duration of the construction works;
- Short term - within the 1st year following construction
- Medium term - extending over 1-10 years from the start of works;
- Long term - extending beyond 10 years from the start of works; and
- Reversible/irreversible - impact can be reversed by impact reduction/mitigation or by natural environmental recovery within reasonable timescales (5-10 years after construction).

5.3 Water Framework Directive

The Water Framework Directive (WFD) (2000/60/EC) sets a target for all EU Member States to aim towards achieving Good Ecological Status (GES) (or in the case of Heavily Modified Water Bodies, Good Ecological Potential) in all waters by 2015 or, where justified, by 2021 or 2027. The WFD requires that Environmental Objectives are set for all surface and ground waters in each EU Member State.

The WFD was transposed into law in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. The regulations mean that the requirements of the WFD need to be considered at all stages of the river planning and development process.

A preliminary assessment has been completed to determine whether the works associated with the proposed FAS are WFD compliant or will cause an adverse impact and consequently whether an assessment under Section 4.7 of the WFD is required.

The preliminary assessment did not identify any risk of the scheme resulting in a deterioration of the current status of the water body or lead to detrimental effects on any of the mitigation measures identified as already being in place.

Further WFD assessment will be undertaken during the impact assessment stage.

6 Consultation

Throughout the development of the scheme, a wide range of consultation has been undertaken by the project team. This has comprised internal consultation (with the Environment Agency's own technical experts) as well as consultation with key stakeholders, such as the London Borough of Lewisham, Thames Water and Network Rail, and public consultation events.

This Environmental Scoping Report also forms part of the consultation process.

6.1 Internal Consultation

A number of meetings, site visits and design workshops have been held with the Environment Agency's throughout the development of the scheme. This input and feedback has been used to inform the outline design.

Further feedback is anticipated through consultation on this ESR. This feedback will also be incorporated into the development of the scheme.

A summary of key feedback received to date is provided in Table 6.1.

Table 6.1 Summary of key internal feedback received to date

	Comment	Action
Biodiversity	<p>Concerns over impacts of control structure on water quality and fish downstream during closure.</p> <p>Importance of retaining coarse vegetation within BPP FSA as habitat diversity.</p> <p>Re-use tree root balls (removed from existing river alignment) to shape new alignment.</p> <p>Narrow new channel slightly to encourage flooding and wetting of the flood plain.</p>	<p>Sweetening flow and coarse vegetation incorporated into design.</p> <p>Design principles established.</p>
Fisheries	<p>Re-use gravels from the existing channel in the new channel alignment.</p> <p>Retain pool/riffles in new channel alignment.</p> <p>Use sections of the existing channel as backwaters.</p> <p>Reduce culvert in BBP length as much as possible.</p> <p>Avoid large steps in channel bed through control structure.</p>	<p>Re-use of gravels incorporated into design.</p> <p>Outline design for new channel incorporates backwaters and pools/riffles.</p> <p>Fisheries survey recommended during detailed design/EIA.</p> <p>Control structure minimised in length with continuous bed.</p>

Landscape	<p>Lessons learned from other large earthworks schemes need to be incorporated.</p> <p>Embankments need to be integrated into the landscape.</p> <p>Adjust embankment to retain important trees where possible.</p> <p>Entrances require sensitive design. Embankments should not be seen as a barrier, but should attract visitors into the park.</p> <p>Tree planting required compensating for losses.</p> <p>Local defences should be set back where possible.</p> <p>Do not assume a one year construction programme.</p>	<p>Input from experienced Contractor during design and costing. Worst case scenario assumed in terms of contaminated land potential.</p> <p>Feedback incorporated into outline design.</p>
Recreation	<p>Include high and low footpaths to allow access when ground is wet in BPP and Ladywell Green.</p> <p>Incorporate disabled access where possible.</p> <p>Incorporate play into embankment in BPP.</p> <p>Provide multiple routes and pathways to provide alternative routes. Reduces intimidation.</p>	Feedback incorporated into outline design.
Heritage	Historic Environment Record search recommended at EIA stage.	Recommendation included in this ESR.
Water Resources	Consulted through this ESR	

6.2 Stakeholder Consultation

A summary of stakeholder consultation is provided in Table 6.2.

Table 6.2 Summary of key stakeholder feedback received to date

Stakeholder	Comments
London Borough of Lewisham	<p>Please see Appendix D for full details of consultation feedback. Key feedback included:</p> <p>Need to design out crime where possible (i.e. improving</p>

	<p>sightlines, avoiding secluded areas)</p> <p>Loss of trees within the park is likely to be very emotive. The park should have amenity value with biodiversity benefit and easy to maintain.</p> <p>Further survey work recommended during detailed design to understand desire lines.</p> <p>Highlighted need to minimise disruption during construction, particularly where construction schemes have recently taken place.</p> <p>Concerns of visual impact of embankment at park entrances. These areas in particular need careful landscape design, planting and access planning.</p> <p>Scheme needs to incorporate disabled access.</p> <p>Feedback from the London Borough of Lewisham has been incorporated into the scheme design.</p>
Thames Water	Thames Water has provided details of known assets within Beckenham Place Park, including water mains and sewers. This has informed the outline design (i.e. the alignment of the embankments). The condition of these assets is currently unknown, therefore protection (i.e. cover) will be required to prevent the assets being damaged by the temporary storage of water. This has been incorporated within the design, however further surveys will be required during detailed design.
Network Rail	<p>A site meeting with Network Rail was held in November 2015. Network Rail was supportive of the scheme, however provided guidance on which trees species were acceptable in terms of planting adjacent to the railway line.</p> <p>Network Rail also provided details of the culverts beneath the railway line which have been used to inform the design.</p>
Transport for London	TfL has been consulted regarding potential impacts (economic damages) from a 1:100 year flood event. This information has been used to inform the business case for the project.
Friends of Beckenham Place Park	A site meeting with the friends group was held in December 2014. The group were supportive of the scheme, however identified specific trees and habitats of high ecological/landscape value. This has influenced the design (although it has not been possible to retain all of the high priority trees).
Heritage England	Heritage England did not raise any objections to the options (and preferred option) outlined in the report. Heritage England endorsed the awareness of the archaeological potential within the areas indicated and the potential harm that may occur as stated in the Scoping Report. Heritage England supported the

	proposed undertaking of an archaeological desk-based assessment during EIA.
Natural England	Natural England has provided a comfort letter for the project and confirmed that the proposal is likely to lead to an environmentally acceptable solution.

6.3 Consultation events

Public consultation of the outline design for the LCFAS has been undertaken in two phases:

- January 2014 – Consultation on the concept of floodwater storage at Beckenham Place Park - as part of the council's Heritage Lottery Fund bid consultation.
- June / July 2014 – Consultation on the whole flood alleviation scheme concept.

6.3.1 January 2014

Consultation drop-in sessions were carried out over two days under the context of the council's Heritage Lottery Fund bid at Beckenham Place Park. The four Heritage Lottery Fund bid scenario options for the whole park were displayed, all of which incorporated the floodwater storage concept in the eastern half of the park. We also displayed information explaining the background need for the flood alleviation proposal and case studies of similar flood alleviation sites.

Those invited included:

- Current park users including golfers and friends group
- Community Groups
- Sports Groups
- Heritage and Conservation Organisations
- Local residents (through assemblies contact lists for local wards and Phoenix Community Housing's contact lists)
- Local children and young people including the Young Mayor and Young Advisers
- Local assemblies (a drop in session at Whitefoot Assembly and a presentation/drop in session at Downham Assembly)
- Key parties e.g. English Heritage, Heritage Lottery Fund

Feedback was collected using a questionnaire.

6.3 2 June and July 2014

Five consultation drop-in sessions were carried out over four days. These were spread between Catford, Downham and Lewisham. Materials were displayed showing all aspects of the outline proposal. Opportunity was also provided for written representations from those unable to attend a session.

Over 800 letter invites were sent to those with properties within / adjacent to a works site. Press releases were distributed to local press. Open email invites were distributed amongst local environmental and recreation user / interest groups, attendees of the January consultation events, as well as relevant parties on the council's consultation databases. Advertising posters were displayed within Beckenham Place Park. Notifications were sent out using Environment Agency and council social media accounts.

Feedback was collected using a questionnaire.

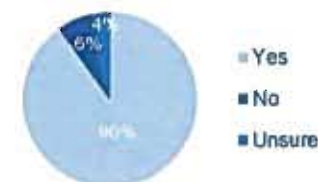
6.4 Consultation Feedback

Due to the different materials provided and focussed questions asked over the two phases of consultation, feedback received is discussed separately below.

6.4.1 January 2014

Approximately 300 people attended the sessions. Of those who viewed the materials, 121 responded to the question of whether flood storage in the park was a good idea. Those attending were a diverse group representing individuals and organisations active in the London Boroughs of Lewisham and Bromley.

After having viewed the materials and talked with the project team, responders were asked if they thought floodwater storage at Beckenham Place Park was a good idea? Results are shown below:



Responders largely thought the concept of floodwater storage at the park was a good idea. They were keen that, whatever works be undertaken for floodwater storage, the park retains a natural park appearance. Those responders living close to the area of works were interested to know more detail when available.

6.4.2 June / July 2014

Approximately 130 people either attended a session or requested to view the materials through other means. Only a few visitors had also attended the January sessions. Of those who viewed the materials, we received 64 completed feedback forms. The majority of people providing feedback were those who lived adjacent / close to the works sites at Beckenham Place Park and Ladywell Green.

After having viewed the materials and talked with the project team, responders were asked if they were comfortable / indifferent / uncomfortable with any of the different aspects to the scheme. Results are shown below:



These results are separated below into individual components of the proposal.

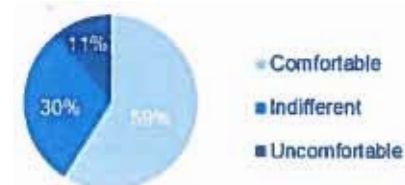
The concept of providing floodwater storage within Beckenham Place Park



The proposed associated amenity improvements in the eastern half of Beckenham Place Park



The proposed works to raise ground levels / river walls between Ladywell and Lewisham



The majority of responders were comfortable or indifferent to the proposal. The change in percentages from the January sessions are likely to result from the high proportion of responders being residents living adjacent to works sites / directly affected by the works. Feedback may, therefore, not fully reflect wider public opinion. No unforeseen concerns were raised by responders and were matters we have been working through with the council, including discussions with Development Control.

Primary interest was towards the proposal at Beckenham Place Park where people were more engaged and able to visualise tangible changes to the public landscape. Primary concerns raised by residents near Beckenham Place Park were in relation to:

- Impact on views from their property across the park due to the embankment / wall
- Impact on privacy from people walking on top of the embankment at the northern end
- Increased risk of flooding at the southern end of the park and the impact on
- Insurance premiums disruption during construction.

It is thought the high level of indifference to the ground / wall raising sites through Ladywell to Catford may be due to them mainly being considered as less prominent locations.

Primary concerns raised for the Ladywell Green site were in relation to the routes of Indicative footpaths shown on the consultation drawing which can easily be rectified.

Whilst we have successfully been able to capture the views of those directly affected by the construction works, or users of Beckenham Place Park (which has been mainly positive), it has proven challenging to engage with the community benefitting from reduced flood risk from the works. This may be in part due to the infrequent nature of the risk. We will look to find new ways of engaging with flood beneficiaries for the future consultations through detailed design.

7 Conclusion and Next Steps

7.1 Key Issues for EIA

The following key issues have been identified for the preferred option. These will be taken forward in the EIA process.

Topic	Key Issues
Traffic and Transport	<ul style="list-style-type: none"> Potential impacts on the road network (esp. during construction). Further work is required to quantify the baseline conditions, vehicle movements/labour required for construction, and confirm the construction programme. Engagement is required with highway stakeholders
Flora and Fauna	<ul style="list-style-type: none"> Impacts to mature trees and woodland (including some Category 'A' trees). An update of the 2012 tree survey is required. Potential impacts to protected species (e.g. bats, badgers, breeding birds etc). A number of additional ecology surveys are recommended to ascertain impacts (and mitigation), including a Habitat Suitability Index assessment for Great Crested Newts, fish, aquatic invertebrates, and macrophytes. Impacts of the control structure (during operation) in BPP on the downstream fish/invertebrate populations. Potential positive impacts on flora and fauna through river restoration, planting and habitat creation
Historic Environment	<ul style="list-style-type: none"> Potential impacts to known and unknown archaeology sites and palaeo-environmental remains during construction; Potential alterations to the setting of heritage assets and the historic landscape character during construction and operation. An Archaeological Desk Based Assessment (ADBA) is recommended during EIA.

	<ul style="list-style-type: none"> The scope of further archaeological investigations (intrusive and non-intrusive) will be agreed with the Greater London Archaeological Advisor (advisor to LBC), the Environment Agency's own advisors (NEAS), and where appropriate consultation with English Heritage's Regional Science Advisor. Listed building consent required for work to wall around perimeter of St Mary's Church.
Soils and Land Quality	<ul style="list-style-type: none"> Further ground investigation is recommended to ascertain the extent and nature of contamination, particularly within Beckenham Place Park. A human health and controlled waters risk assessment is recommended in order to assess (and mitigate) any potential risks to users of the park areas. A remediation strategy will need to be developed (e.g. for management of asbestos containing materials), and agreed with the London Borough of Lewisham, with regards to re-use of contaminated material on site and for example the thickness of any proposed capping layer. Erosion protection is likely to be required around those areas where contaminants are present. Further consideration needs to be given to the movement and handling of materials during construction, with Contractor input. Preparation of a Materials Management Plan for the re-use of site won materials will be required.
Geology and Hydrogeology	<ul style="list-style-type: none"> Potential impacts of high groundwater levels on the available storage at Beckenham Place Park and Ladywell Green. River-aquifer interactions and the current and future local abstraction regime should be considered in the design of the Beckenham Place Park FSA to ensure that storage capacity is not underestimated. Poor quality floodwaters could cause groundwater pollution to the Secondary A and Principal Aquifers at Beckenham Place Park and Ladywell Green, which both lie within a

	<p>SPZ2 for Thames Water supply wells.</p> <ul style="list-style-type: none"> Hydrogeological risk assessments, supported by additional site investigation, are recommended to protect groundwater quality reduce uncertainty with respect to river-aquifer interaction at Beckenham Place Park and Ladywell Green.
Hydrology and Geomorphology	<ul style="list-style-type: none"> Potential for direct impacts on hydromorphology as a result of embankment construction and realignment of the river Potential impacts on sediment supply and transport Potential loss of floodplain connectivity through local defences Detailed Water Framework Directive Assessment required during detailed design and EIA Potential positive impacts on geomorphology by restoring the southern section of the Ravensbourne through Beckenham Place Park Detailed design will need to be informed by the Design Principles developed during outline design.
Landscape and Visual Amenity	<ul style="list-style-type: none"> Potential beneficial impacts to landscape setting through park and open space regeneration, restoration of the historic landscape, and improved amenity facilities. Potential for impacts to views as a result of the construction of earth embankments and local defences. Potential setting impacts as a result of the construction works and the loss of trees. A Landscape and Visual Impact Assessment (LVIA) is recommended at EIA stage.
Socio-Economics	<ul style="list-style-type: none"> Potential impacts (i.e. disruption) to nearby residents, commercial properties and users Potential positive impacts in terms of recreation and access provisions. Potential for health benefits through increased use of green space (esp. Beckenham Place Park).

	<ul style="list-style-type: none"> Potential for educational benefits through interpretative material and outdoor learning. Potential increase in connectivity with the river, and sense of place. Potential beneficial impacts in terms of designing out crime and anti-social behaviour
Air Quality	<ul style="list-style-type: none"> Dust emissions associated with the construction phase, such as excavation and removal of earth material, which have the potential to cause nuisance and soiling of sensitive receptors. Construction vehicle exhaust emissions potentially affecting local air quality at sensitive receptors adjacent to the construction traffic route, particularly within the designated AQMAs. Non-road mobile machinery operating on the site, which will have the potential to adversely impact air quality at sensitive receptors. A construction phase dust assessment will be undertaken in accordance with guidance provided by the Institute of Air Quality Management (IAQM) in the document 'Guidance on the assessment of dust from demolition and construction, February 2014'. Mitigation measures will be recommended as part of the assessment to minimise potential dust emissions during the flood alleviation works. Predicted construction phase road traffic movements will be screened using the criteria provided in the Design Manual for Roads and Bridges, May 2007 and Environmental Protection UK guidance 'Development Control: Planning for Air Quality (2010 Update)' to determine whether an assessment of construction phase road traffic emissions is required. If an assessment is required this will be undertaken in accordance with guidance by Defra in the document 'Local Air Quality Management Technical Guidance, 2009'. An operational phase air quality assessment is not proposed as the number of vehicle movements associated with the maintenance of the flood alleviation scheme will be minimal.
Noise and vibration	<ul style="list-style-type: none"> Consultation with the London Borough of Lewisham will be undertaken to determine

	<p>existing noise or vibration survey data within the development area.</p> <ul style="list-style-type: none"> • A background noise and vibration survey may be necessary to establish existing baseline levels around the area and alongside sensitive receptors, where necessary. The scope and methodology of this survey will be agreed with the local Environmental Health Department. • Potential impacts associated to noise and vibration generated by mobile and static plant and equipment associated with the construction phase of the scheme. • Construction phase noise affecting existing receptors will be assessed using the guidance and datasets contained in British Standard 5228-1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Part 1, and based on knowledge of similar projects. • The noise and vibration assessment will identify potential noise and vibration impacts and provide recommendation of suitable mitigation measures to reduce the likelihood of adverse comments. • Potential for off-site noise and vibration levels generated by construction-related traffic on surrounding local roads.
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7.2 Conclusion

This ESR has identified potential impacts (adverse and positive) associated to the construction and operation of the proposed Lewisham and Catford Flood Alleviation Scheme. These impacts have been identified through desk-based study, surveys and preliminary consultation. Further consultation with key stakeholders is now required to ensure that all potential impacts have been identified. The ESR will be updated following consultation responses.

We are currently preparing a business case for the scheme. If we obtain approval and funding we will start the detailed design and assessment stages of the project in Autumn/Winter 2015.

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Appendices

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