Hannah ▪ Reed

LIDL HAYES, BOTWELL LANE

SITE SPECIFIC FLOOD RISK ASSESSMENT

Lidl UK
London North Property Office
4 – 14 Blackbird Hill
Wembley
London
NW9 8SD

consultancy engineering business environment

Hannah, Reed and Associates Limited
Marlborough House
High Street
Kidlington
Oxford OX5 2DN
Tel No. 01865 841893

X-213440/PS/TB/SK/November 2013

Revision: D

CONTENTS

APPENDICES

INTRODUCTION

This Flood Risk Assessment (FRA) adopts a risk based approach that takes into consideration the requirements set out in the National Planning Policy Framework (NPPF) and accompanying Technical Guidance. It aims to take into account all the information and mitigation techniques available at the time of writing to examine the feasibility of the proposed development.

This report was prepared on behalf of Lidl UK in support of a planning application to be submitted to the London Borough of Hillingdon. The proposed development consists of the construction of new Lidl store on the site of a former swimming pool complex in Hayes, Greater London.

1. SITE INFORMATION

1.1 Site Location

The site of the proposed development lies on Botwell Lane, Hayes, and is located by the postcode UB3 2BG and National Grid Reference 509730 mE, 180080 mN.

The site is bound by Central Road to the east, Botwell Lane to the south and west, and residential properties to the north. Site location maps detailing the site and surrounding area are provided in **Appendix A**.

1.2 Existing Development

The Brownfield site was formerly home to a swimming pool complex which has subsequently been demolished.

1.3 Topography

Ground levels at the site generally fall towards the north west of the site with levels varying between approximately 35.0 m Above Ordnance Datum (AOD) and 33.5 m AOD.

1.4 Geology, Hydrogeology and Indication of Permeability

British Geological Survey (BGS) Superficial Drift and Bedrock Map Sheet 269 describes the underlying geology at the site and in the surrounding area. The map indicates that the site is underlain by the London Clay member which is overlain by superficial drift deposits of the Langley Silt Member.

Neither strata could be expected to have a sufficiently high permeability to provide a suitable medium for Sustainable Drainage Systems (SuDS) utilising infiltration.

The Environment Agency (EA) Aquifer Designation Maps highlight the presence of any aquifers located within the underlying strata in the vicinity of the site and are provided in **Appendix C**. The maps indicate that the site is not underlain by an aquifer, either within the bedrock or the superficial drift geology.

1.5 Nearby Watercourses, Water-Bodies and Structures

The nearest Main River, as classified by the Department for the Environment, Food and Rural Affairs (DEFRA), is the Yeading Brook approximately 1 km to the south east of the site.
The nearest water-body is the Grand Union Canal which lies approximately 300 m to the south of the site.

1.6 Existing Drainage Systems

Thames Water is the local water authority and sewerage undertaker.

An Asset Location Plan detailing existing public and private sewers at and in the vicinity of the site is included in **Appendix D**.

1.7 Existing Mitigation Measures/Defences

The EA's Indicative Flood Zone Map, included in **Appendix C**, does not show the presence of any existing flood defences in the vicinity of the site.

2. RELEVENT LEGISLATION AND LOCAL PLANNING DOCUMENTATION

2.1 National Legislation

2.1.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) describes the Government's planning policies for England and how these are expected to be applied.

With regard to climate change, flooding, and coastal change the NPPF requires local planning authorities to review the variation in flood risk across their district, and to steer development towards areas with the lowest risk.

Where this cannot be achieved and development is to be permitted in areas that may be subject to some degree of flood risk, the NPPF requires the Council to demonstrate that there are sustainable mitigation solutions available that would ensure that the risk to property and life is minimised, throughout the lifetime of the development, should flooding occur.

2.1.2 Sequential Test and Exception Test

As the EA's Indicative Flood Zone Map indicates that the site lies within Flood Zone 1 the Sequential and Exception Tests would not be required to be applied by the Local Planning Authority (LPA).

2.2 Local Planning Documents

2.2.1 Strategic Flood Risk Assessment (SFRA)

The Strategic Flood Risk Assessment (SFRA) is the first step in the process described in the NPPF, providing the building blocks upon which a Council's planning and development control decisions should be made. London Borough of Hillingdon published their Level 1 SFRA in November 2008.

The SFRA recommends that FRA's are to be submitted for all major developments in Flood Zone 1 and defines a major commercial development as those greater than 1 ha or those with a floor area of greater than 1000 m^2.

3. ASSESSMENT OF EXISTING FLOOD RISK TO THE SITE

3.1 Potential Sources of Flood Risk to the Site

3.1.1 Flooding from Main Rivers

The EA's Indicative Flood Zone Map, provided in **Appendix C**, shows the site to lie within Flood Zone 1. This is classified by the NPPF as being at a 'Low' risk of fluvial flooding from Main Rivers, with an annual probability of flooding of less than 0.1%.

3.1.2 Flooding from Other Sources

Other potential sources of flooding have been considered with reference to, amongst other sources, the SFRA and the Reservoir Flood Risk Map, and are considered to pose a low risk to the site.

3.2 Climate Change

3.2.1 Estimated Effects of Climate Change

Climate change is expected to result in an increase in surface water run-off as a result of an anticipated 30% increase in rainfall intensities. This would result in an anticipated 20% increase in river flows, increasing the risk of fluvial flooding.

Developments should not increase flood risk at the site or the surrounding area and, where possible, they should aim to reduce the existing surface water run-off rate and flood risk by incorporating Sustainable Drainage Systems (SuDS).

Table 1 - Table 5, Technical Guidance to NPPF: *Recommended national precautionary sensitivity ranges for peak rainfall intensities, peak river flows, offshore wind speeds and wave heights*

<table>
<tr><th>Parameter</th><th>1990-2025</th><th>2025-2055</th><th>2055-2085</th><th>2085-2115</th></tr>
<tr><td>Peak Rainfall intensity</td><td>+5%</td><td>+10%</td><td>+20%</td><td>+30%</td></tr>
<tr><td>Peak River Flow</td><td>+10%</td><td colspan="3">+20%</td></tr>
<tr><td>Offshore wind speed</td><td colspan="2">+5%</td><td colspan="2">+10%</td></tr>
<tr><td>Extreme wave height</td><td colspan="2">+5%</td><td colspan="2">+10%</td></tr>
</table>

4. DEVELOPMENT PROPOSAL

4.1 Description of Proposed Development

The proposed development consists of the construction of new Lidl store and associated hard-standing parking areas.

4.2 Flood Risk Vulnerability Classification

The NPPF requires the application of the Sequential Test using Tables 2, 3 and 4 below, which aims to steer new developments to areas at the lowest probability of flooding.

As shown on the Indicative Flood Zone Map produced by the EA, the site lies within Flood Zone 1.

This is classified by the NPPF as at a 'Low' risk of fluvial flooding from Main Rivers, as outlined in Table 2 below.

Table 2 – Summary of Table 1, Technical Guidance to NPPF: *Flood Zones*

Zone	Risk	Probability
1	Low	1 in 1000 or less (<0.1%)
2	Medium	1 in 1000 to 1 in 100 (0.1% to 1%)
3a	High	1 in 100 or greater (>1%)
3b	Functional Floodplain	1 in 20 or greater (>5%)

As the proposed development would consist of the construction of a retail establishment it would be classified by the NPPF as a 'Less Vulnerable' development, as detailed in Table 3 below.

Table 3 – Summary of Table 2, Technical Guidance to NPPF: *Flood Risk Vulnerability Classification*

Vulnerability Classification	Development Type
Essential Infrastructure	Essential transport infrastructure, wind turbines, essential utility infrastructure.
Highly Vulnerable	Emergency services stations, basement dwellings, caravan parks & hazardous substance installations.
More Vulnerable	Residential dwellings and homes, drinking establishments, hospitals, educational establishments and waste management sites.
Less Vulnerable	Shops, financial, professional and other services; offices; general industry; storage and distribution; land and buildings used for agriculture and forestry.
Water-Compatible	Flood control infrastructure, pumping stations, sand and gravel workings, MOD installations, amenity and conservation areas.

As confirmed by Table 4 below 'Less Vulnerable' developments are deemed an acceptable use of land within Flood Zone 1.

Table 4 – Summary of Table 3.0, Technical Guidance to NPPF: *Flood Risk and Flood Zone 'Compatibility'*

	Essential Infrastructure	Water-compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	√	√	√	√	√
Zone 2	√	√	Exception Test required	√	√
Zone 3a	Exception Test required	√	X	Exception Test required	√
Zone 3b	Exception Test required	√	X	X	X

Key:
√ Development is appropriate
X Development should not be permitted.

4.3 Post-Development Surface Water Management Strategy

4.3.1 Existing and Proposed Site Areas

The site has a total area of 5,170 m^2 (0.52 ha).

Based on the pre-demolition site layout, approximately 3,430 m^2 (0.34 ha) of the existing site is impermeable. This constitutes approximately 66% of the total site area.

The proposed store and associated parking areas would result in a total impermeable area of 4,715 m^2 (0.47 ha) post-development.

This would constitute an increase of approximately 0.05 ha to approximately 91% of the total site area.

4.3.2 Existing and Proposed Surface Water Run-off Rates

The estimated Greenfield run-off rate for the existing site was calculated using the Institute of Hydrology's Report No. 124 methodology for sites with an area between 0 ha and 50 ha.

For a Greenfield site catchment area of 0.52 ha, the Greenfield site's estimated run-off rates are given in Table 5 below.

Table 5 – Greenfield site run-off rates

Storm Event (1 in 'n' year)	Greenfield Site's Run-off Rate Peak Flows (l/s)
$QBAR_{rural}$	1.99
1 in 2 year	1.75
1 in 30 year	4.45
1 in 100 year	6.35

The run-off rates for the existing site, including existing impermeable areas, are detailed in Table 6 below.

Table 6 – Exiting site run-off rates

Storm Event (1 in 'n' year)	Existing Site's Run-off Rate Peak Flows (l/s)
$QBAR_{existing}$	5.11
1 in 2 year	4.49
1 in 30 year	11.42
1 in 100 year	16.29

The run-off rates for the proposed development, taking into account the increase in impermeable areas onsite are given in Table 7 below.

Table 7 – Proposed site run-off rates

Storm Event (1 in 'n' year)	**Proposed Site's Run-off Rate Peak Flows (l/s)**
$QBAR_{proposed}$	6.73
1 in 2 year	5.92
1 in 30 year	15.04
1 in 100 year	21.45
1 in 100 year + 30% Climate Change	27.89

4.3.3 Proposed Surface Water Management Strategy

The underlying strata are highly unlikely to provide a suitable medium for infiltration and there are no watercourses within the vicinity of the site in which to discharge the surface water generated by the development.

Therefore, it is proposed to reuse the existing connection to the public surface water sewer.

In order to avoid an increase in flood risk elsewhere as a result of the proposed development it is proposed to attenuate the surface water run-off generated by the site to the existing run-off rate during the 1 in 100 year storm event, including an allowance for Climate change.

Based on the calculations described above the discharge during this storm event should be limited to 16.3 l/s.

The volume of attenuation required in order to limit the run-off from the site post development to this rate has been calculated using WinDes MicroDrainage software.

With the outflow limited using a vortex flow control device or similar, the volume required to attenuate the 1 in 100 year plus climate change storm event was found to be approximately 255 m^3. This value is indicative only and should not be used for design purposes.

Based on the size of the area of hardstanding to be provided for parking, this volume could be practically achieved in the form of an attenuation tank or geocellular crates beneath the parking area.

Should reusing the existing connection to the public sewer prove impractical, a direct connection to the public sewer via gravity would likely be achieved via Thames Water manhole 6008.

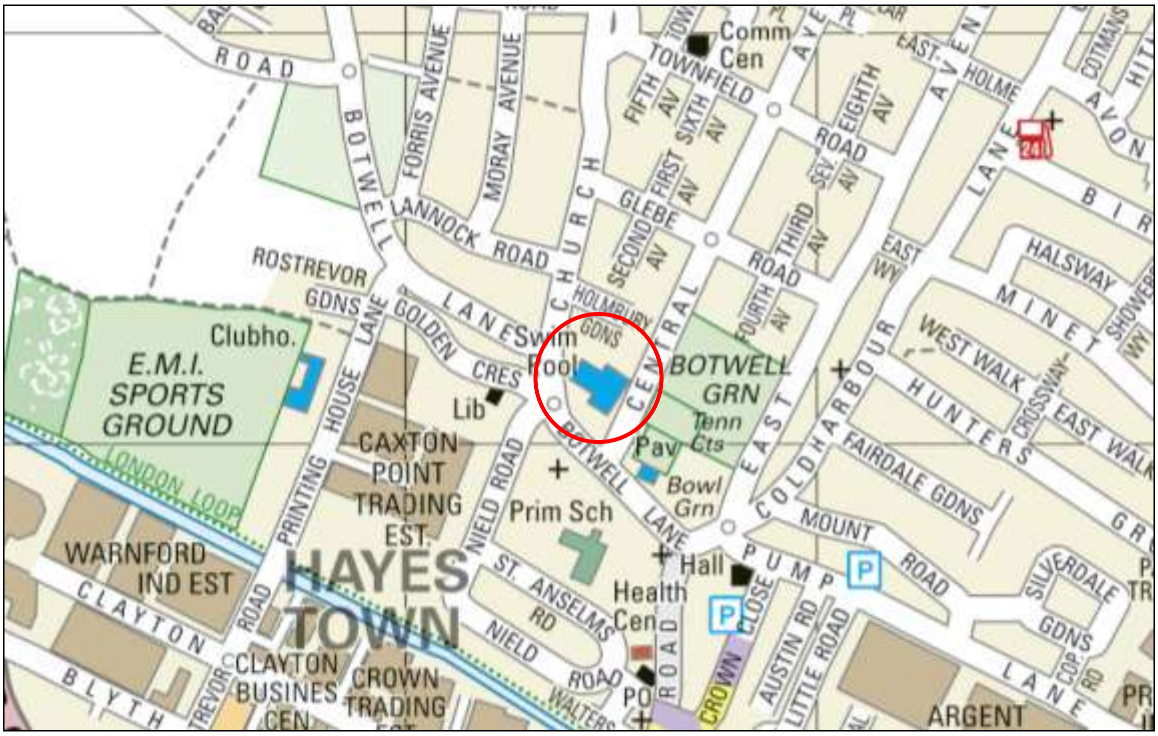
CONCLUSION & RECOMMENDATIONS

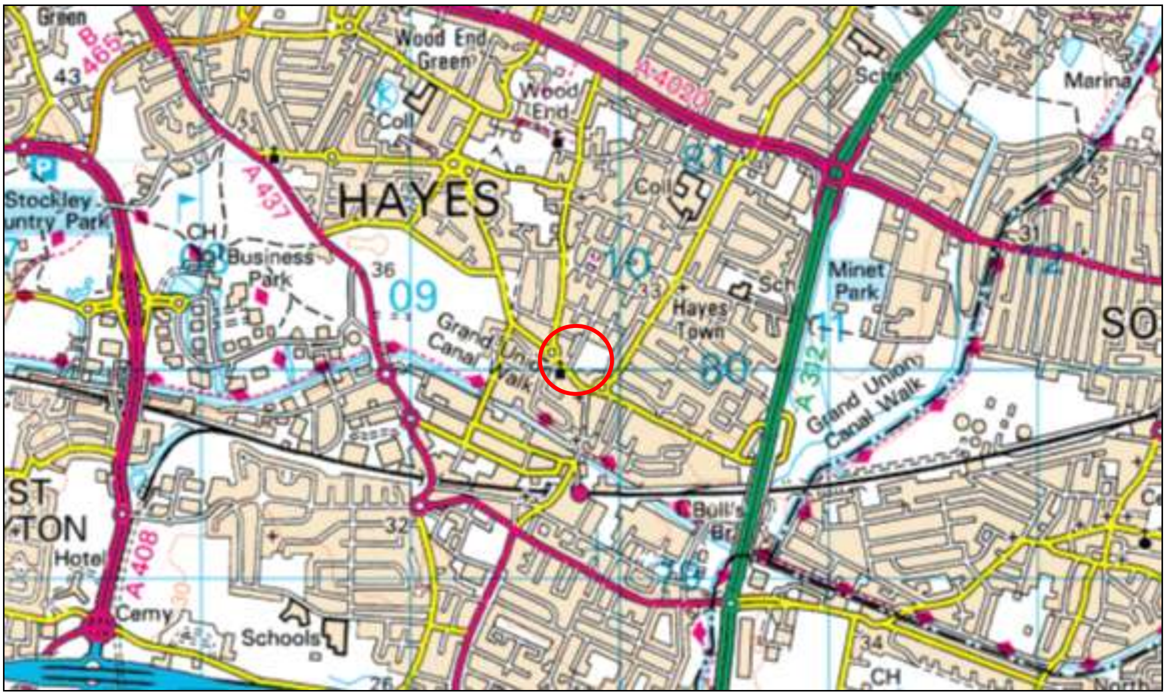
- The proposed development consists of the construction of new Lidl store on the site of a former swimming pool complex in Hayes, Greater London.
- The nearest Main River, as classified by the Department for the Environment, Food and Rural Affairs (DEFRA), is the Yeading Brook approximately 1 km to the south east of the site.
- The nearest water-body is the Grand Union Canal which lies approximately 300 m to the south of the site.
- The EA's Indicative Flood Zone Map shows the site to lie within Flood Zone 1. This is classified by the National Planning Policy Framework (NPPF) as being at a 'Low' risk of fluvial flooding from Main Rivers, with an annual probability of flooding of less than 0.1%.
- Other potential sources of flooding have been reviewed and are considered to pose a low risk to the site.
- As the proposed development would consist of the construction of a retail establishment it would be classified by the NPPF as a 'Less Vulnerable' development and is deemed an acceptable use of land within Flood Zone 1.
- The underlying strata are highly unlikely to provide a suitable medium for infiltration and there are no watercourses within the vicinity of the site in which to discharge the surface water generated by the site.
- It is therefore proposed to reuse the existing connection to the public surface water sewer.
- In order to avoid an increase in flood risk elsewhere as a result of the proposed development, it is proposed to attenuate the surface water run-off generated by the site to the existing run-off rate during the 1 in 100 year storm event, including an allowance for climate change.
- Based on the large area of hardstanding to be provided for parking, the volume of attenuation required could be practically achieved in the form of an attenuation tank or geocellular crates beneath the parking area.
- Should reusing the existing connection to the public sewer prove impractical a direct connection to the public sewer via gravity would likely be achieved.

APPENDIX A

Site Location Maps

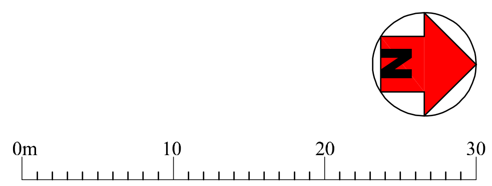
Site Location Maps
Lidl Hayes, Botwell Lane, Hayes, Greater London, UB3 2BG
509730 mE, 180080 mN





APPENDIX B

Proposed Site Plan



SCHEDULE OF ACCOMMODATION

Lidl site area	0.517ha (1.277 acres)
Council site area	0.020ha (0.05 acres)
Total site area	0.537ha (1.327 acres)

PARKING

Standard	58	
Disabled	3	
Parent & child	3	
TOTAL	64	spaces

& POOLE PATTLE chartered architects
TEL: 01473 230580 FAX 01473 231549 E-MAIL mail@pooleandpattle.co.uk
5 OBSERVATION COURT 84 PRINCES STREET IPSWICH SUFFOLK IP1 1RY

Project	Date	Scale	
PROPOSED LIDL, CENTRAL AVENUE, HAYES	SEPT 2013	1:500 @ A3	
Drawing			
PROPOSED SITE LAYOUT	3176	108	E

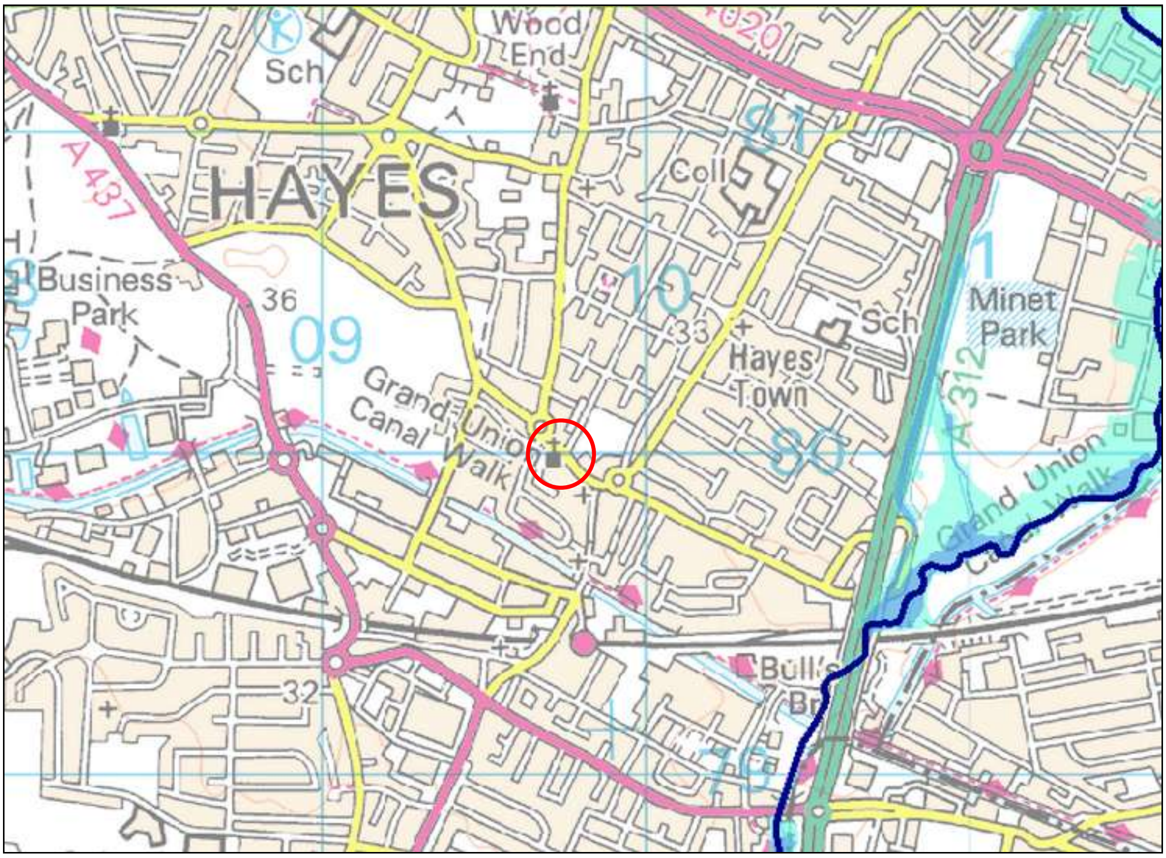
APPENDIX C

Environment Agency Indicative Flood Zone Map

Environment Agency Aquifer Designation Map

Environment Agency Reservoir Flood Risk Map

Environment Agency Indicative Flood Zone Map
Lidl Hayes, Botwell Lane, Hayes, Greater London, UB3 2BG

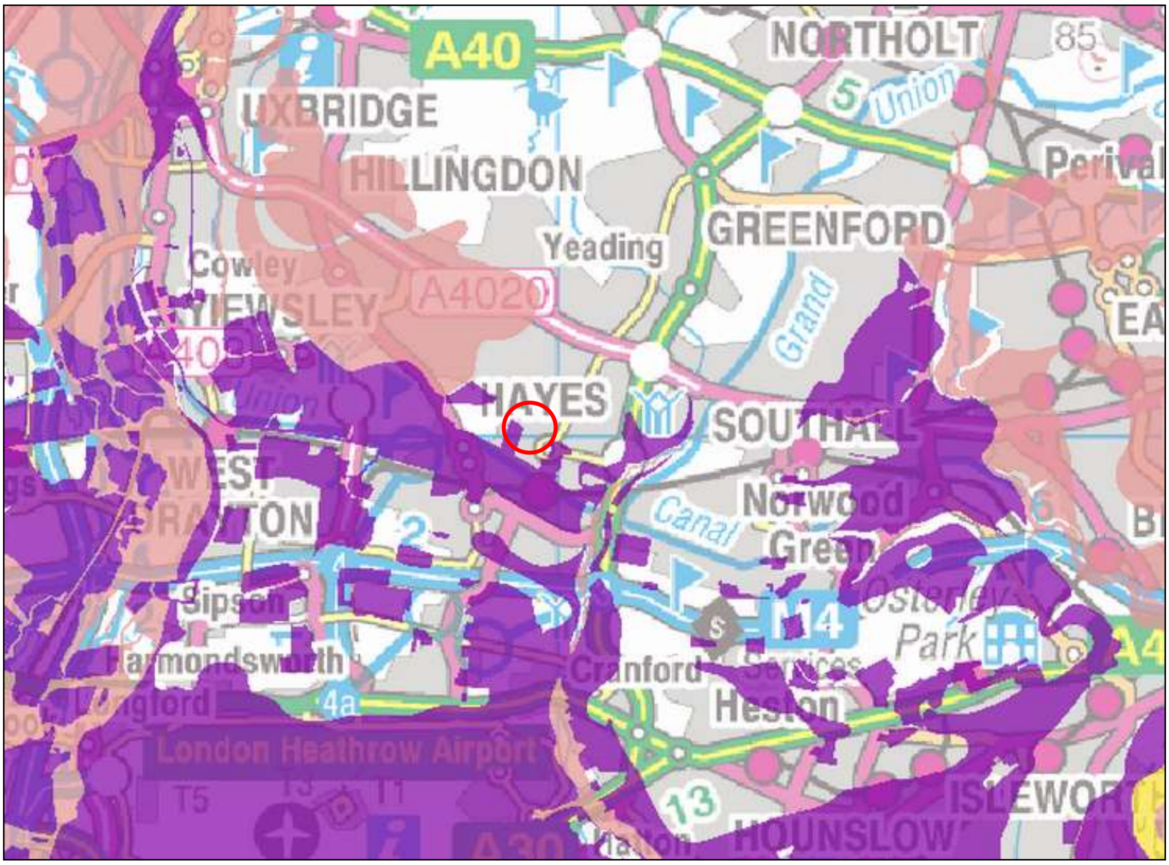


Legend

Map Colour	Flood Zone	Risk of Flooding	Probability of Flooding
	Zone 3	High Risk	> 1.0% - Rivers > 0.5% - Seas
	Zone 2	Medium Risk	0.1% - 1.0% - Rivers 0.1% - 0.5% - Seas
	Zone 1	Low Risk	< 0.1% - Rivers and Seas

Environment Agency Aquifer Designation Maps

Lidl Hayes, Botwell Lane, Hayes, Greater London, UB3 2BG



Legend - *Superficial Deposits*

Map Colour	Aquifer Designation	Description
(purple)	Principle Aquifer	Layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.
(pink)	Secondary A Aquifer	Permeable layers capable of supporting water supplies at a local rather than strategic scale.
(orange)	Secondary B Aquifer	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
(yellow)	Secondary Undifferentiated Aquifer	Assigned in cases where it has not been possible to attribute either category A or B to a rock type

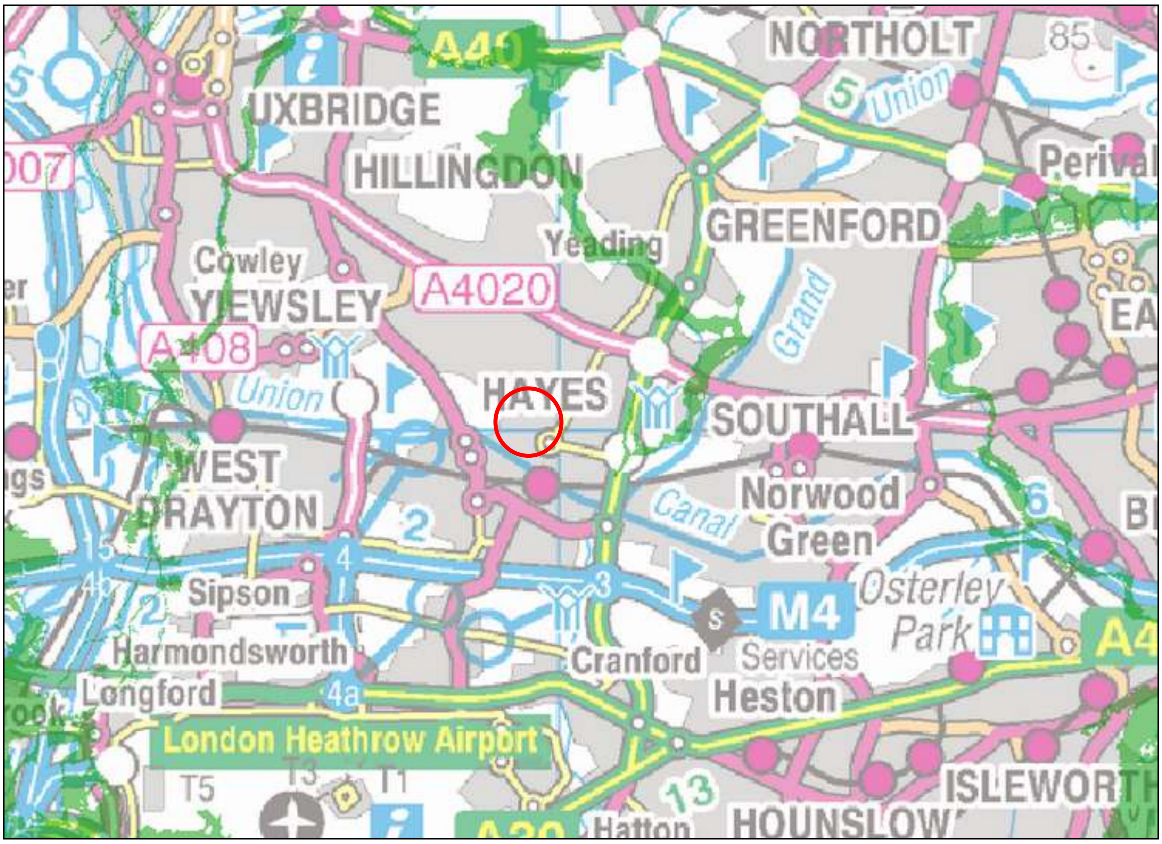
Environment Agency Aquifer Designation Maps

Lidl Hayes, Botwell Lane, Hayes, Greater London, UB3 2BG

Legend – *Bedrock*

Map Colour	Aquifer Designation	Description
	Principle Aquifer	Layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.
	Secondary A Aquifer	Permeable layers capable of supporting water supplies at a local rather than strategic scale.
	Secondary B Aquifer	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
	Secondary Undifferentiated Aquifer	Assigned in cases where it has not been possible to attribute either category A or B to a rock type

Environment Agency Reservoir Flood Risk Map
Lidl Hayes, Botwell Lane, Hayes, Greater London, UB3 2BG



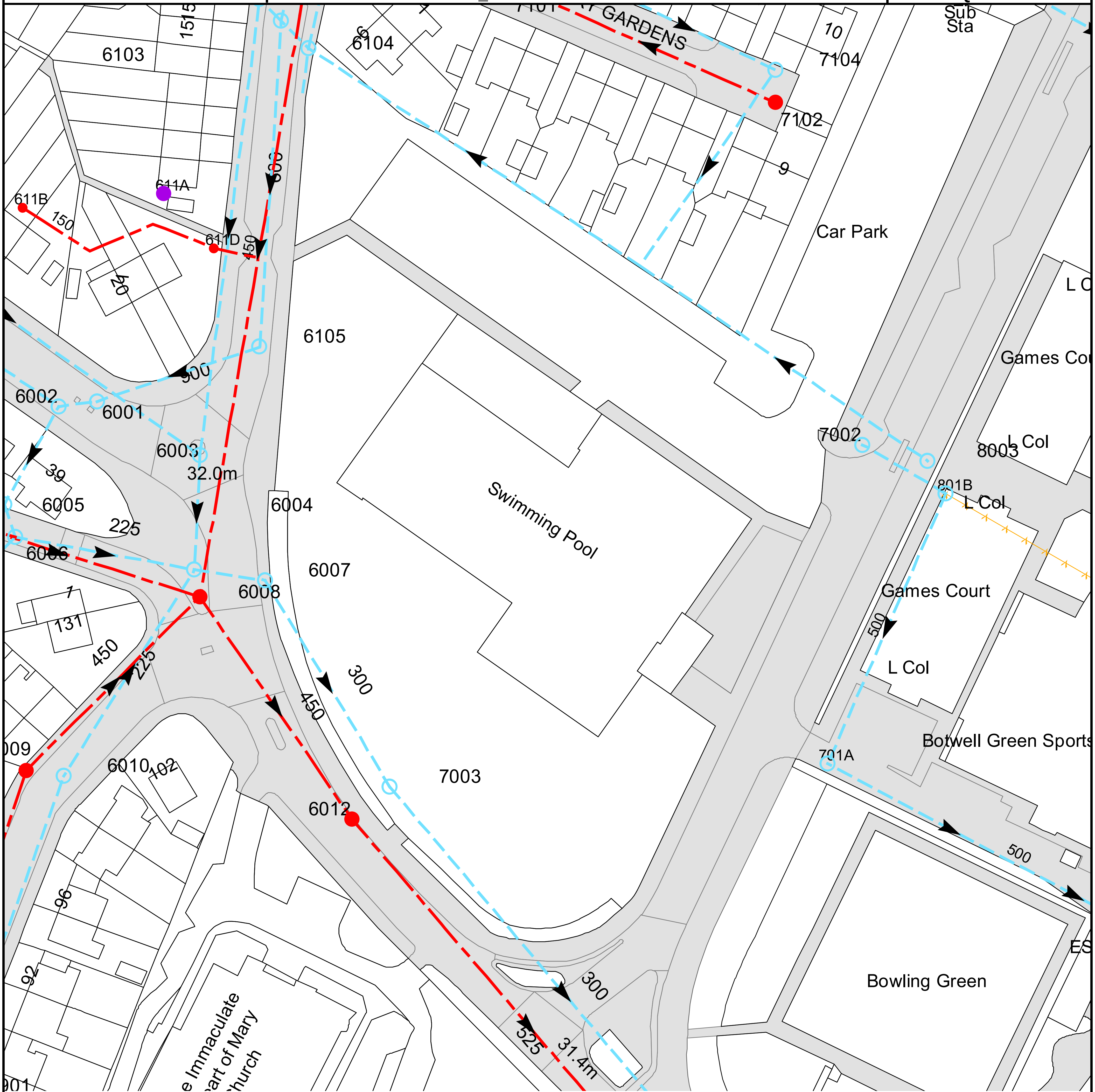
Legend

Map Colour	Description
	Worst case flooding that could result from reservoir failure

APPENDIX D

Thames Water Asset Location Plans

Asset Location Search Sewer Map - ALS/ALS Standard/2013_2576933	TQ0980SE



The width of the displayed area is 200m and the centre of the map is located at OS coordinates 509735,180070

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
6012	31.59	29.2
7003	n/a	n/a
701A	31.34	30.09
6007	n/a	n/a
801B	31.5	30.3
8003	n/a	n/a
7002	n/a	n/a
7102	n/a	n/a
7104	n/a	n/a
6104	n/a	n/a
6103	n/a	n/a
6105	n/a	n/a
611D	n/a	n/a
611B	n/a	n/a
611A	n/a	n/a
6005	n/a	n/a
6006	n/a	n/a
6009	n/a	n/a
6002	n/a	n/a
6010	n/a	n/a
6001	n/a	n/a
6004	n/a	n/a
6008	32.78	30.24
-	-	-
6003	n/a	n/a

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.

2) All measurements on the plans are metric.

3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

5) 'na' or '0' on a manhole level indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

APPENDIX E

Surface Water Drainage Calculations

X213440 – L.DL, Hayes, Greater London

Surface Water Drainage Calcs, Revised

A. Area Summary

- Total site area = 5,165 m² (0.52 ha)
- Existing impermeable area = 3,425 m² (0.34 ha)
- Proposed impermeable area = 4,705 m² (0.47 ha)

B. Runoff Rates

- Greenfield
  - QBAR = 1.99 l/s
  - 1 in 100 year = 6.35 l/s
- Existing
  - QBAR = 5.11 l/s
  - 1 in 100 year = 16.29 l/s
- Proposed
  - QBAR = 6.73 l/s
  - 1 in 100 year = 21.45 l/s
  - 1 in 100 + CC = 27.89 l/s

C. WinDes MicroDrainage Calculations

- Quick Storage Estimate (DF)
  - Input

    Rainfall data = FEH
    Return period = 100+30%
    Max discharge = 16.29 l/s
    Infiltration Coefficient = 0 m/hr
    Impermeable area = 0.47 ha

  - Output

    Required storage volume = 213 – 293 m³ ~255 m³

Hannah · Reed

Job no:	X215440	Sheet no:	02
Calculation by:	SK	Revision:	P3
Checked by:		Date:	Nov 2013

- Quick Storage Estimate (BF less 20%)
  - Input

    As above with max discharge = 13.05 l/s
  - Output

    Required storage volume = 224 m^3 - 311 m^3 ~ 270 m^3