## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FEH | Winter Storms | Yes |
| Return Period (years) | 30 | Cv (Summer) | 0.900 |
| FEH Rainfall Version | 2013 | Cv (Winter) | 0.900 |
| Site Location | GB 514183 170874 | Shortest Storm (mins) | 15 |
| Data Type | Point | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +0 |

## Time Area Diagram

Total Area (ha) 0.750

| Time (mins) From: | To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.750 |

## Model Details

Storage is Online Cover Level (m) 16.600

## Tank or Pond Structure

Invert Level (m) 10.150

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|---|---|
| 0.000 | 0.0 | 1.100 | 115.0 | 3.551 | 0.1 | 5.000 | 1400.0 |
| 0.999 | 0.0 | 1.101 | 260.0 | 3.850 | 0.1 | | |
| 1.000 | 115.0 | 3.550 | 260.0 | 3.851 | 1400.0 | | |

## Depth/Flow Relationship Outflow Control

Invert Level (m) 10.150

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|
| 0.001 | 0.0000 | 5.000 | 0.0000 |

## Summary of Results for 100 year Return Period

Outflow is too low. Design is unsatisfactory.

| Storm Event | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 11.935 | 1.785 | 0.0 | 189.6 | O K |
| 30 min Summer | 12.150 | 2.000 | 0.0 | 245.6 | O K |
| 60 min Summer | 12.374 | 2.224 | 0.0 | 303.7 | O K |
| 120 min Summer | 12.680 | 2.530 | 0.0 | 383.2 | O K |
| 180 min Summer | 12.866 | 2.716 | 0.0 | 431.7 | O K |
| 240 min Summer | 12.995 | 2.845 | 0.0 | 465.2 | O K |
| 360 min Summer | 13.163 | 3.013 | 0.0 | 508.7 | O K |
| 480 min Summer | 13.270 | 3.120 | 0.0 | 536.6 | O K |
| 600 min Summer | 13.345 | 3.195 | 0.0 | 556.2 | O K |
| 720 min Summer | 13.402 | 3.252 | 0.0 | 571.1 | O K |
| 960 min Summer | 13.483 | 3.333 | 0.0 | 592.0 | O K |
| 1440 min Summer | 13.584 | 3.434 | 0.0 | 618.4 | O K |
| 2160 min Summer | 13.683 | 3.533 | 0.0 | 644.1 | O K |
| 2880 min Summer | 14.012 | 3.862 | 0.0 | 664.5 | O K |
| 4320 min Summer | 14.038 | 3.888 | 0.0 | 700.8 | O K |
| 5760 min Summer | 14.062 | 3.912 | 0.0 | 733.8 | O K |
| 7200 min Summer | 14.085 | 3.935 | 0.0 | 766.6 | O K |
| 8640 min Summer | 14.108 | 3.958 | 0.0 | 799.2 | O K |
| 10080 min Summer | 14.132 | 3.982 | 0.0 | 831.8 | O K |
| 15 min Winter | 11.935 | 1.785 | 0.0 | 189.6 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 15 min Summer | 112.354 | 0.0 | 0.0 | 19 |
| 30 min Summer | 72.767 | 0.0 | 0.0 | 34 |
| 60 min Summer | 44.994 | 0.0 | 0.0 | 64 |
| 120 min Summer | 28.387 | 0.0 | 0.0 | 124 |
| 180 min Summer | 21.318 | 0.0 | 0.0 | 184 |
| 240 min Summer | 17.231 | 0.0 | 0.0 | 244 |
| 360 min Summer | 12.561 | 0.0 | 0.0 | 364 |
| 480 min Summer | 9.937 | 0.0 | 0.0 | 484 |
| 600 min Summer | 8.241 | 0.0 | 0.0 | 604 |
| 720 min Summer | 7.050 | 0.0 | 0.0 | 724 |
| 960 min Summer | 5.482 | 0.0 | 0.0 | 964 |
| 1440 min Summer | 3.817 | 0.0 | 0.0 | 1444 |
| 2160 min Summer | 2.651 | 0.0 | 0.0 | 2164 |
| 2880 min Summer | 2.051 | 0.0 | 0.0 | 2884 |
| 4320 min Summer | 1.442 | 0.0 | 0.0 | 4324 |
| 5760 min Summer | 1.132 | 0.0 | 0.0 | 5768 |
| 7200 min Summer | 0.946 | 0.0 | 0.0 | 7208 |
| 8640 min Summer | 0.822 | 0.0 | 0.0 | 8648 |
| 10080 min Summer | 0.734 | 0.0 | 0.0 | 10088 |
| 15 min Winter | 112.354 | 0.0 | 0.0 | 19 |

## Summary of Results for 100 year Return Period

| Storm Event | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 30 min Winter | 12.150 | 2.000 | 0.0 | 245.6 | O K |
| 60 min Winter | 12.374 | 2.224 | 0.0 | 303.7 | O K |
| 120 min Winter | 12.680 | 2.530 | 0.0 | 383.2 | O K |
| 180 min Winter | 12.866 | 2.716 | 0.0 | 431.7 | O K |
| 240 min Winter | 12.995 | 2.845 | 0.0 | 465.2 | O K |
| 360 min Winter | 13.163 | 3.013 | 0.0 | 508.7 | O K |
| 480 min Winter | 13.270 | 3.120 | 0.0 | 536.6 | O K |
| 600 min Winter | 13.345 | 3.195 | 0.0 | 556.2 | O K |
| 720 min Winter | 13.402 | 3.252 | 0.0 | 571.1 | O K |
| 960 min Winter | 13.483 | 3.333 | 0.0 | 592.0 | O K |
| 1440 min Winter | 13.584 | 3.434 | 0.0 | 618.4 | O K |
| 2160 min Winter | 13.683 | 3.533 | 0.0 | 644.1 | O K |
| 2880 min Winter | 14.012 | 3.862 | 0.0 | 664.5 | O K |
| 4320 min Winter | 14.038 | 3.888 | 0.0 | 700.8 | O K |
| 5760 min Winter | 14.062 | 3.912 | 0.0 | 733.8 | O K |
| 7200 min Winter | 14.085 | 3.935 | 0.0 | 766.6 | O K |
| 8640 min Winter | 14.108 | 3.958 | 0.0 | 799.2 | O K |
| 10080 min Winter | 14.132 | 3.982 | 0.0 | 831.8 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 30 min Winter | 72.767 | 0.0 | 0.0 | 34 |
| 60 min Winter | 44.994 | 0.0 | 0.0 | 64 |
| 120 min Winter | 28.387 | 0.0 | 0.0 | 124 |
| 180 min Winter | 21.318 | 0.0 | 0.0 | 184 |
| 240 min Winter | 17.231 | 0.0 | 0.0 | 244 |
| 360 min Winter | 12.561 | 0.0 | 0.0 | 364 |
| 480 min Winter | 9.937 | 0.0 | 0.0 | 484 |
| 600 min Winter | 8.241 | 0.0 | 0.0 | 604 |
| 720 min Winter | 7.050 | 0.0 | 0.0 | 724 |
| 960 min Winter | 5.482 | 0.0 | 0.0 | 964 |
| 1440 min Winter | 3.817 | 0.0 | 0.0 | 1444 |
| 2160 min Winter | 2.651 | 0.0 | 0.0 | 2164 |
| 2880 min Winter | 2.051 | 0.0 | 0.0 | 2884 |
| 4320 min Winter | 1.442 | 0.0 | 0.0 | 4324 |
| 5760 min Winter | 1.132 | 0.0 | 0.0 | 5768 |
| 7200 min Winter | 0.946 | 0.0 | 0.0 | 7208 |
| 8640 min Winter | 0.822 | 0.0 | 0.0 | 8648 |
| 10080 min Winter | 0.734 | 0.0 | 0.0 | 10088 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FEH | Winter Storms | Yes |
| Return Period (years) | 100 | Cv (Summer) | 0.900 |
| FEH Rainfall Version | 2013 | Cv (Winter) | 0.900 |
| Site Location | GB 514183 170874 | Shortest Storm (mins) | 15 |
| Data Type | Point | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +0 |

## Time Area Diagram

Total Area (ha) 0.750

| Time (mins) From: | To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.750 |

## Model Details

Storage is Online Cover Level (m) 16.600

## Tank or Pond Structure

Invert Level (m) 10.150

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|---|---|
| 0.000 | 0.0 | 1.100 | 115.0 | 3.551 | 0.1 | 5.000 | 1400.0 |
| 0.999 | 0.0 | 1.101 | 260.0 | 3.850 | 0.1 | | |
| 1.000 | 115.0 | 3.550 | 260.0 | 3.851 | 1400.0 | | |

## Depth/Flow Relationship Outflow Control

Invert Level (m) 10.150

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|
| 0.001 | 0.0000 | 5.000 | 0.0000 |

# Appendix G - Drainage Maintenance Schedules

Tully De'Ath Consultants

# Project: St Clare
# Project no. 12153
# SuDS Maintenance Strategy

The below ground surface water drainage system requires regular inspection/clearing to prevent blockages due to accumulation of silt and debris. In general it is recommended that the following items are initially inspected and cleared by a suitably trained person every 6 months for at least the first 2 years of operation and then establish a long term regular inspection/clearing regime appropriate for the site:

- Rainwater roof outlets
- Rainwater downpipe outlets at ground level
- Trapped gullies
- Drainage channels
- Catchpit manholes
- Permeable hardstandings
- Below ground attenuation tank
- Pumps
- Biodiverse roofs

Table 1 provides a more detailed maintenance schedule based on recommendations in the SuDS Manual published by CIRIA. Inspection/clearing should also be carried out after every major storm event and to the manufacturer's recommendations.

If regular excessive accumulation of silts and debris is found in silt-traps/catchpits serving the below ground attenuation tank, a CCTV inspection of the tank should be undertaken. The reinforced concrete tanks (located beneath the basement slab) will be provided with access points to enable inspection and, if required, water jetting to clear the tank of silt/debris. Notwithstanding the above, a CCTV inspection of the tank should be undertaken at least every five years.

Any debris obstructing or in danger of obstructing the surface water flow should be removed within a period not exceeding two weeks from inspection. Any blockage or partial blockages reported to the managing organisation should be removed within a period not exceeding two weeks.

Biodiverse roofs require regular inspection maintenance. This is particularly important during the establishment stage (first 12 to 15 months) and it is recommended that this should be the responsibility of the biodiverse roof supplier. Maintenance should be carried out by personnel with specialist training in the care of these roof systems.

A site-specific drainage maintenance plan is to be incorporated within the Health and Safety file, which, in addition to the details mentioned above, should include all the installed manufacturer's details and maintenance recommendations. In addition it should hold the records of any inspections, together with any remedial measures undertaken. The drainage maintenance plan should be made available for inspection by the council if requested.

The drainage inspection regime and maintenance costs will be the responsibility of a management company appointed by Notting Hill Home Ownership Ltd or their successors in title and must be carried out by suitably trained persons.

**ADDRESS** Sheridan House, Hartfield Road, Forest Row, East Sussex, RH18 5EA
**TEL** 01342 828000
**FAX** 01342 828001
**EMAIL** info@tullydeath.com

Table 1 – SuDS Maintenance Schedule

| Item | Task | Frequency | Location | Access | Comments |
|---|---|---|---|---|---|
| **Main Drainage Network** | | | | | |
| Rainwater downpipes | Clean out at roof level and ground level | Twice yearly for the first 2 years of operation then annually | Around building perimeter | Hard/soft landscaping adjacent to buildings. High level access required to roof outlets. | Works undertaken by appropriately qualified person(s).<br><br>For RWP outlets at roof level follow health & safety regulations dealing with working at height |
| Chambers, silt-traps & catchpits | Clean out chamber/sump | | Throughout the site | Car parking areas and hard/soft landscaping | |
| Pipe network & drainage channels | Pipes to be inspected and condition assessed. Pipes/channels to be cleaned (jetted) as necessary | | | | |
| **Flow Control Devices** | | | | | |
| Pumps | As pump manufacture's maintenance schedule | Annually (or as otherwise defined by pump manufacture's maintenance schedule) | Beneath basement slab | Communal basement carpark | Works undertaken by appropriately qualified person(s)<br><br>It is recommended that an annual maintenance contract is arranged with the pump supplier |

Table 1 – SuDS Maintenance Schedule (continued)

| Item | Task | Frequency | Location | Access | Comments |
|---|---|---|---|---|---|
| **Permeable Hardstandings** | | | | | |
| Pavement structure | Remove organic matter. Brush and vacuum (standard cosmetic sweep over entire surface). | Monthly for first 3 months then twice yearly (in spring and autumn) | Car parking and circulation areas | Car parking and circulation areas | Works undertaken by appropriately qualified person(s). |
| | Replace broken slabs/blocks | As required | | | |
| | Replace jointing material | As required | | | |
| | Remedial sweeping to rehabilitate surface and upper substructure | Every 10 to 15 years (or as required if significant siltation is apparent) | | | |
| **Attenuation Tank** | | | | | |
| Upstream & downstream catchpit chambers | Clean out chamber/sump | Twice yearly for the first 2 years of operation then annually | Beneath basement slab | Communal basement carpark | Works undertaken by appropriately qualified person(s) |
| Inlets, outlets, vents and overflows | Inspect/check to ensure in good condition and correct operation | Annually and after large storms | | | |
| Tank (cast insitu reinforced concrete) | CCTV inspection. Clean (jet) if required | 5 Years or if excessive silt/debris observed in upstream & downstream catchpit chambers | | | |

Table 1 – SuDS Maintenance Schedule (continued)

| Item | Task | Frequency | Location | Access | Comments |
|---|---|---|---|---|---|
| **Biodiverse Roofs** | | | | | |
| Generally | Inspect all components including soil substrate, inlet/outlets, fire breaks, underside of roof for structural integrity & signs of leakage. Remove litter/debris. | Monthly for first 12 months then annually or after severe storms | Block 1 roofs and podium. | High level access to roof and podium. | Works undertaken by appropriately qualified person(s) following health & safety regulations dealing with working at height |
| Biodiverse areas/planting/shrubs/trees | Pruning, remove cuttings/debris/fallen leaves, weeding, remove invasive species, replace dead plants | Monthly for first 12 months every 6 months or as required | | | |
| Hard landscaped areas (Resin bound gravel e.g. Addaset, Addabound or Terrabound by Addagrip) | Remove organic matter from surface (with brush and suction cleaner) | Monthly for first 3 months then twice yearly (in spring and autumn) | | | |
| Grassed areas | Mowing, remove debris/cuttings | Fortnightly or monthly as appropriate during growing season. | | | |
| Roof outlets | Clean out, inspect, remove plant growth | Monthly for first 12 months every 6 months or as required and always after severe storms | | | |

# Appendix H – Flood Risk Assessment Checklist

LONDON BOROUGH OF RICHMOND UPON THAMES

**PURPOSE - Why is a checklist needed?**

Applicant (external): This checklist sets out what information is required from the applicant to enable the Development Management Team at Richmond to assess the suitability of the proposals against national, regional and local flood risk policy. Each tab provides the applicant with space to cross-reference the information required for assessment to the supporting Flood Risk Assessment. This will enable checks to be made to ensure that all of the required information is included. The template includes information on these policies and links to where additional information can be found.

London Borough of Richmond upon Thames (internal): The purpose of this checklist is to provide the Development Management Team at Richmond a consistent basis for review and assessment of Flood Risk Assessments (FRAs). While the review and assessment of FRAs is primarily done by the Environment Agency (EA), they focus on Fluvial and Tidal risks only - with the remaining sources of flood risk (groundwater, sewer, surface water and ordinary watercourses) being assessed by the Local Authority since 2010.
In addition, the EA review comments on FRAs do not include local planning policies specific to Richmond. As a result of this, Richmond officers need to complete full reviews of FRAs to ensure local policy is being implemented appropriately - particularly with regard to development of basements within areas at risk of flooding. This checklist provides general guidance on review of FRAs coupled with detailed guidance on assessments of applications with basements.

**Notes to internal and external users:**
Grey cells are automatically populated and should remain untouched.
All other boxes should be populated in order for a full assessment to be carried out as per the instructions given in tab *3. Flood Risk Classification.*
Boxes or tabs labelled as ***'for internal use only'*** should be left empty by the applicant filling in the checklist.
Hyperlinks are provided so that additional information can be found in order to aid the completion of this checklist.
A glossary can be found in tab *10. Glossary* for clarification of technical terms used within this checklist.

***The information for the checklist should be inputted by the applicant (external) and supported by a FRA. The London Borough of Richmond upon Thames' reviewing officer (internal) will not go and find missing information if it is not provided in the submission.***

**Pre-application discussions with the Environment Agency**

The Environment Agency encourages early pre application discussions to ensure environmental issues and opportunities are considered early in the planning process especially for sites next to rivers or in high flood risk areas. They can provide a free preliminary opinion if you complete this form and return to **kslplanning@environment-agency.gov.uk**.
For more detailed advice and review of draft reports this is chargeable at £84 per hour. As part of the charged service (£84 per hour) they will provide professional planning expertise and technical feedback to developers, to help to ensure they include all of the relevant information in planning application submissions. They will provide a dedicated project manager to co-ordinate advice from different environmental disciplines, and provide technical advice and other support, as necessary. Please contact them at: **kslplanning@environment-agency.gov.uk**

**Pre-application discussions with Richmond Council**

Richmond Council can provide clear and professional advice to individuals or businesses who are considering applying for planning permission. There are two types of advce:
(1) Information on process - If you would like advice on the application process and procedures. Please note this service does not offer advice on the acceptability of a scheme.
(2) Formal pre-application service - This service is chargeable, and provides informal officer advice on a specific scheme. The fee is dependent on the type of advice you would like and the size of the development.
Visit the following website for more information:

http://www.richmond.gov.uk/services/planning/pre-applications

*Tab: For internal use only*

LONDON BOROUGH OF RICHMOND UPON THAMES

## SECTION 1. Summary

**Assessment Summary Comments**

Risk Summary

| | | | |
|---|---|---|---|
| Fluvial & Tidal - Flood Zone | Flood Zone 1 | Surface Water | Medium |
| Fluvial & Tidal - Defences | Undefended | Groundwater | al flooding of property below grou |
| Tidal Breach - Hazard | Low | Sewer | No historic record of sewer floodin |
| Fluvial - Hazard | Low | Reservoir and artificial | Not in maximum extent |

| | |
|---|---|
| Fluvial & Tidal Flood Risk | [Summarise key points from above assessment covering the key considerations listed above and focussing on areas where further information is needed or the applicant needs to do further work] |
| Surface Water Flood Risk | [Summarise key points from above assessment covering the key considerations listed above and focussing on areas where further information is needed or the applicant needs to do further work] |
| Groundwater Flood Risk | [Summarise key points from above assessment covering the key considerations listed above and focussing on areas where further information is needed or the applicant needs to do further work] |
| Additional Flood Risk | [Summarise key points from above assessment covering the key considerations listed above and focussing on areas where further information is needed or the applicant needs to do further work] |
| Basements | [Summarise key points from above assessment covering the key considerations listed above and focussing on areas where further information is needed or the applicant needs to do further work] |

**Decision and Justification**

We recommend (approval / refusal) [delete as appropriate] of the application for the following reasons [if refused]:

1. Reason 1
2. Reason 2
etc.

To overcome our refusal, please submit information which:

- Shows…
- Demonstrates...
- Justifies…

**Conditions** *(only use if application is approved)*

[Only propose conditions if the application is recommended for approval - i.e. only minor omissions that can be addressed at a later stage]

| SECTION 2. Application Information | | | | | | |
|---|---|---|---|---|---|---|
| Location: | Street Address: | | St Clare Business Park | National grid reference: | 170917 | Northing |
| | Postcode: | | TW12 1QF | | 514197 | Easting |
| Reference number *(if known)* : | | | | | | |
| Date reviewed ***(for internal use only)*** : | | | | | | |
| Name of reviewer ***(for internal use only)*** : | | | | | | |
| Existing site description (including vulnerability classification): https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-2-Flood-Risk-Vulnerability- | Workshops and office buildings with associated parking. (Less vunerable) | | | | | |
| Development proposal (including vulnerability classification): | Residential flats and houses Class C3, Commercial floorspace Class B1. (More vunerable). | | | | | |
| Will the proposals change the nature or times of occupation or use, such that it may affect the degree of flood risk to these people? If this is the case, describe the extent of the change. | Change to nature and times of occupation and use, and therefore the vunerability. | | | | | |
| Does the development include a basement? | Yes | | | | | |
| If so, is it self-contained? | Yes | | | | | |
| What is the expected or estimated lifetime of the proposed development likely to be? | 100 Years | | | | | |

| SECTION 3. Flood Risk Classification | | | |
|---|---|---|---|
| **Flood Risk Type** | **Further Information** | **Outcome** (Select from drop-down menu) | **Section(s) for Completion** |
| **Tidal and fluvial** - what Flood Zone is the site within? | Environment Agency's flood map for planning: https://flood-map-for-planning.service.gov.uk/<br>Strategic Flood Risk Assessment (see Figures 1-11): http://www.richmond.gov.uk/flood_risk_assessment | Flood Zone 1 | If more than one Flood Zone / hazard rating occurs within the applicants site, then choose the most conservative of the two.<br><br>If development is in Flood Zone 3b and includes a basement, planning permission should not be granted and the application should not progress.<br><br>If development is in Flood Zones 2, 3a or 3b (without a basement), complete **Section 4**. |
| **Flood Defences** - is the site defended or undefended? | Environment Agency's flood map for planning: https://flood-map-for-planning.service.gov.uk/ | Undefended | |
| **Tidal defence breach hazard** - what hazard rating is the site given? | Strategic Flood Risk Assessment (see Figures C1-3): http://www.richmond.gov.uk/flood_risk_assessment | Low | |
| **Fluvial flood hazard** - what hazard rating is the site given? | Strategic Flood Risk Assessment (see Figures C4-10): http://www.richmond.gov.uk/flood_risk_assessment | Low | |
| **Surface water** - what risk is the site given? | Environment Agency's flood map: https://flood-warning-information.service.gov.uk/long-term-flood-risk | Medium | If development is in an area of high, medium or low risk, then select the most conservative and complete **Section 5.** |
| **Groundwater** - what potential to flood is the site given? | Strategic Flood Risk Assessment (see Figure E): http://www.richmond.gov.uk/flood_risk_assessment | Potential flooding of property below ground level | If development is in an area with potential to be susceptible to groundwater flooding, complete **Section 6.** |
| **Sewer** - is there a known risk of sewer flooding at the site? | Applicant can consult with Thames Water to find out whether there are any records of sewer flooding.<br>Strategic Flood Risk Assessment (See Figure I): http://www.richmond.gov.uk/flood_risk_assessment | No historic record of sewer flooding | If a development is at risk of sewer, reservoir or from artificial sources, complete **Section 7**. |
| **Reservoir and artificial sources** - is the site at risk? | Environment Agency's flood map: https://flood-warning-information.service.gov.uk/long-term-flood-risk | Not in maximum extent | |

| SECTION 4. Fluvial and Tidal Flood Risk | | | | | | |
|---|---|---|---|---|---|---|
| **Considerations** | **Summary of information from Flood Risk Assessment** | | | **Reference to Flood Risk Assessment (page number and/or section details)** | **Assessment Comments** (for internal use only) | **Information** |
| Flood Zone | | | | | *Flood Zone 1* *Undefended* | |
| Fluvial flood hazard rating | | | | | *Low* | *Automatically populated from* ***Section 3.*** |
| Tidal Defence Breach hazard rating | | | | | *Low* | |
| Has the latest flood model been used and a Product 4 included from the EA (including location/status of flood defences)? | N/A | | | | | Request detailed flood map from kslenquiries@environment-agency.gov.uk |
| How far is the proposed development from any flood defence structures / rivers edge ? | 220m from Longford River | | | | | FRA and plans clearly show distance to flood defence and river. New Richmond local plan policy aims to increase distance from rivers edge/flood defence i.e 16 metres for tidal Thames and 8 meters for main river (e.g. Beverley Brook). It is essential to consult the Environment Agency for any proposed development within 20 metres of a flood defence/river edge. |
| Is the sequential test required (reviewer, select from drop-down menu) ? | Zone 1, therefore not required. | | | | | The sequential test is required if a development is proposed for Flood Zones 2 and 3. See information in the NPPG at: https://www.gov.uk/guidance/flood-risk-and-coastal-change#sequential-approach<br><br>The sequential test will not be required if it is NOT a major development AND at least one of the following applies:<br><br>- It is a Local Plan proposal site that has already been sequentially tested, unless the use of the site being proposed is not with the allocations in the Local Plan<br>- It is within a main centre boundary as identified within this Local Plan (Richmond, Twickenham, Teddington, Whitton and East Sheen)<br>- It is for residential development or a mixed use scheme and within the 400 meter buffer area identified within the Plan or surrounding the centres referred to above.<br>- Redevelopment of an existing single residential development<br>- Conversions and change of use<br>See the Council's Local Plan Policy LP 21 at: http://www.richmond.gov.uk/local_plan |
| Sequential Test - if yes to above question, what other locations with a lower risk of flooding have been considered for this development? If none, what are the reasons for this? | | | | | | https://www.gov.uk/guidance/flood-risk-and-coastal-change#aim-of-Sequential-Test<br><br>https://www.gov.uk/guidance/flood-risk-and-coastal-change#Sequential-Test-to-individual-planning-applications |
| Is the Exception Test required (reviewer, select from drop-down menu)? | Zone 1, therefore not required. | | | | | The Exception Test is required when a vulnerable development is proposed for an area at risk as per the NPPG: https://www.gov.uk/guidance/flood-risk-and-coastal-change#The-Exception-Test-section<br><br>https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/575184/Table_3_-_Flood_risk_vulnerability_and_flood_zone__compatibility_.pdf |
| Exception Test - if yes to above questions, what evidence is there that the development has wider sustainability benefits and is safe over its lifetime without increasing flood risk elsewhere? | | | | | | https://www.gov.uk/guidance/flood-risk-and-coastal-change#The-Exception-Test-section<br><br>https://www.gov.uk/guidance/flood-risk-and-coastal-change#Exception-Test-for-specific-development-proposals |
| How is flood risk likely to be affected by climate change? (i.e. how will climate change impact predicted flood risk?) | N/A | | | | | Advice on how to take account of climate change can be found at:<br><br>https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances |
| What is the predicted level of the design flood?<br><br>If the site is defended, populate the defended box only<br>If the site is undefended, populate the undefended box only | Fluvial - defended: | N/A | m AOD | | | The fluvial design flood should be that of a 1% chance in any one year event with the appropriate allowance for climate change (if the required climate change flood scenario data is not available, then the applicant can estimate this from currently available information - the approach used must be reviewed and accepted by the Environment Agency) .<br><br>The tidal defence breach design flood level is the year 2100 scenario from the TE2100 study for the closest / worst case breach location to the site.<br><br>This information must be sourced from the Environment Agency (Product 4 dataset) or derived using site specific modelling that has been reviewed & accepted by the Environment Agency. |
| | Fluvial - undefended: | N/A | m AOD | | | |
| | Tidal Defence Breach: | N/A | m AOD | | | |
| If the buildings proposed as part of the development flood during design flood conditions - provide the relevant depths (enter N/A if buildings do not flood) | Fluvial: | N/A | m | | | If the buildings are anticipated to flood and the development is not 'water-compatible', then it should be refused. |
| | Tidal Defence Breach: | N/A | m | | | |

| SECTION 4. Fluvial and Tidal Flood Risk | | | | |
|---|---|---|---|---|
| **Considerations** | **Summary of information from Flood Risk Assessment** | **Reference to Flood Risk Assessment (page number and/or section details)** | **Assessment Comments** (for internal use only) | **Information** |
| How will the development be made safe from flooding and the impacts of climate change, for its lifetime? | N/A | | | For example, providing compensatory flood storage which has been agreed with the Environment Agency, flood resilient design for the buildings and / or appropriate flood evacuation measures (a flood evacuation plan - this must be reviewed and accepted by the Emergency Planning Team)<br>https://www.gov.uk/guidance/flood-risk-and-coastal-change#development-made-safe-from-flood-risk<br>https://www.gov.uk/guidance/flood-risk-and-coastal-change#Flood-resilience-and-flood-resistance |
| How has it been ensured that the development and any flood protection measures will not cause any increase in flood risk off-site and downstream? | N/A | | | Have the levels of the site changed? If yes, has the applicant demonstrated how they will mitigate any increase if flood risk upstream or downstream from the site? The Environment Agency requires any loss of fluvial flood zone storage to be prevented, known as 'compensation storage'. If such an instance occurs, ensure the EA have been consulted and commented on this matter. |
| What flood related risks will remain after the flood risk mitigation measures have been implemented? (residual risks) | N/A | | | Residual risks are those that remain after mitigation measures have been implemented. For example, the finished floor level might be set above the 1% chance event - but the applicant also needs to assess what happens during a 0.1% chance event (such as providing appropriate evacuation routes) |
| How, and by whom, will these risks be managed over the lifetime of the development? | N/A | | | For example, signing up to receive flood warnings and setting up an evacuation plan. Visit the following link for information:<br>https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-warning-and-evacuation-plans |

**Additional applicant comments:**

**Case officer assessment considerations** ***(for internal use only)*** **:**

1. Is the land use (with associated vulnerability classification) suitable for the sites corresponding fluvial / tidal flood risk?
   https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/575184/Table_3_-_Flood_risk_vulnerability_and_flood_zone__compatibility_.pdf
2. Is there an appropriate freeboard (a minimum of 300mm above the 1% chance in any one year event with an allowance for climate change fluvial flood level OR a minimum of 600mm above the 1% AEP fluvial flood level should be adopted if no climate change flood level data is available for a specific location) between the design flood level and the finished ground floor level / access route?
3. Will occupants be able to safely exit the property if a flood event was to occur?
4. Has the application considered the impacts of climate change and proposed measures which will make the development safe for its lifetime?

**Summary comments** ***(for internal use only)*** ***linked to Summary Tab*** **:**

[Summarise key points from above assessment covering the key considerations listed above and focussing on areas where further information is needed or the applicant needs to do further work]

LONDON BOROUGH OF RICHMOND UPON THAMES

| SECTION 5: Surface Water Flood Risk | | | | |
|---|---|---|---|---|
| **Considerations** | **Summary of information from Flood Risk Assessment** | **Reference to Flood Risk Assessment (page number and/or section details)** | **Assessment Comments** (for internal use only) | **Information** |
| Flood risk: | | | Medium | Automatically taken from **Section 3**. |
| How is flood risk at the site likely to be affected by climate change? | A 40% allowance has been made for future climate change | Page 12 Section 8.3 | | Advice on how to take account of climate change can be found at: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances |
| What is the expected flood depth at the site due to a rainfall for all event risk bands within the site? | High risk 0 mm<br>Medium risk 0 mm<br>Low risk 0 mm | Page 12 Section 8.3 | | This may be provided as a depth range (e.g. 300mm to 900mm - if so, select the upper part of this range to assess surface water flood risk) |
| Are properties expected to flood internally due to a rainfall with a 1% chance of occurring in one year (High Risk) and if so, to what depth? | No<br>mm | Page 12 Section 8.3 | | |
| How will the development be made safe from flooding and the impacts of climate change, for its lifetime? | Below ground attenuation has been designed to accomadate the 100 year event with a 40% allowance for future climate change | Page 12 Section 8.3 | | For example, providing flood resilient buildings. Further guidance: https://www.gov.uk/guidance/flood-risk-and-coastal-change#development-made-safe-from-flood-risk<br>https://www.gov.uk/guidance/flood-risk-and-coastal-change#Flood-resilience-and-flood-resistance |
| How has it been ensured that the development and any flood protection measures will not cause any increase in flood risk off-site and downstream? | Discharge resctricted to 5 l/s for all storms which for the more onerous storms is a reduction compared to existing | Page 11 Section 8.2 | | Have the impacts of climate change, over the expected lifetime of the development been taken into account? |
| What flood related risks will remain after the flood risk mitigation measures have been implemented? (residual risk) | In the event of a sustained pump failure surface water would be stored in the basement car park. | Page 12 Section 8.4 | Are the residual risks acceptable? | |
| How, and by whom, will these risks be managed over the lifetime of the development? | Notting Hill Home Ownership Ltd | Page 13 Section 10 | | For example, setting up an evacuation plan. Visit the following link for information: https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-warning-and-evacuation-plans |

**Additional applicant comments:**

**Case officer assessment considerations** ***(for internal use only)*** :

1 Note that the management of surface water runoff should be assessed by the Richmond LLFA Officer (this assessment applies to surface water flood risk only)
Further guidance can be found: http://www.richmond.gov.uk/sustainable_drainage_systems.pdf

2 Are the building floor levels set generally more than 150mm above the surrounding ground levels or above the predicted 'high risk' surface water flood depth? (whichever is greater)

3 Will occupants be able to safely exit the property if a flood was to occur?

**Summary comments** ( ***for internal use only)*** *linked to Summary Tab* **:**

[Summarise key points from above assessment covering the key considerations listed above and focussing on areas where further information is needed or the applicant needs to do further work]

| SECTION 6: Groundwater Flood Risk | | | | | |
|---|---|---|---|---|---|
| **Considerations** | **Summary of information from Flood Risk Assessment** | | **Reference to Flood Risk Assessment (page number and/or section details)** | **Assessment Comments (for internal use only)** | **Information** |
| Flood risk: | | | | ential flooding of property below ground l | Automatically take from **Section 3**. |
| At what level is the water table? | 1.5-3.5m bgl | mAOD | | | This varies throughout the seasons so use the wettest scenario that is not flood conditions - it may also be provided as a depth below ground. |
| Is the water table above the basement floor level? Is groundwater ingress likely? | No | | | | Refer **Section 2.** |
| Is the site within 100m of a watercourse? (Main River or Ordinary Watercourse) Or permanent water body? (pond or lake)<br><br>If yes - state the names of the relevant water features | No | | | | Close proximity to water bodies can elevate the local groundwater table and increase the risk of groundwater flooding. |
| What geological / superficial deposit formation is the basement located in? | Made Ground, upon Taplow Gravel, upon London Clay | | | | Refer to the SFRA - Figure B (link below). Permeable superficial deposits (gravels and alluvium) are more likely to have groundwater flooding and / or displacement issues.<br><br>http://www.richmond.gov.uk/figure_b_geology.pdf |
| Will groundwater displacement negatively impact surrounding properties or infrastructure? | No. See accompanying document. | | | | The applicant should address this issue by providing a *Screening Assessment* (as a minimum) that either confirms low risk of impacts (and therefore no further work is needed) or advises the level of impact and the associated mitigation actions proposed.<br><br>The assessment must be prepared by an individual who is a Hydrogeologist and holds one or more of the following qualifications:<br>- Chartered Member of the Geological Society<br>- Registered Ground Engineering Professional (with the Institute of Civil Engineers)<br><br>The *Screening Assessment* must include the following as a minimum requirement:<br><br>- Description of the proposed basement development<br>- Construction methods proposed<br>- Characteristics of potential impacts (including the impact on soils, land use, water quality and hydrology with descriptions of the nature & scale of impacts and the extent of the impacted area)<br>- Details of mitigation measures (where appropriate) |
| What measures are proposed to manage the risk? (groundwater flooding and any other negative impacts identified in the Screening Assessment) | See accompanying document. | | | | For example, non-return values, pumps, tanking, perforated pipes and gravel drainage blankets can be installed to reduce the risk to underground structures. Further options for mitigation of groundwater flooding can be found:<br><br>http://www.local.gov.uk/sites/default/files/documents/environment-agency-option-6f9.pdf |

| SECTION 6: Groundwater Flood Risk | | | | |
|---|---|---|---|---|
| **Considerations** | **Summary of information from Flood Risk Assessment** | **Reference to Flood Risk Assessment (page number and/or section details)** | **Assessment Comments (for internal use only)** | **Information** |
| What flood related risks will remain after the flood risk mitigation measures have been implemented? (residual risk) | See accompanying document. | | Are the residual risks acceptable? | |
| How, and by whom, will these risks be managed over the lifetime of the development? | See accompanying document. | | | |

**Additional applicant comments:**

**Case officer assessment considerations** ***(for internal use only)*** **:**

1 Have the necessary measures been put in place to mitigate groundwater flood risk to the property and adjacent properties?

**Summary comments** ***(for internal use only)*** *linked to Summary Tab* **:**

[Summarise key points from above assessment covering the key considerations listed above and focussing on areas where further information is needed or the applicant needs to do further work]

| SECTION 7. Additional Sources of Flood Risk | | | | |
|---|---|---|---|---|
| **Considerations** | **Summary of information from Flood Risk Assessment** | **Reference to Flood Risk Assessment (page number and/or section details)** | **Assessment Comments** (for internal use only) | **Information** |
| Sewer flood risk: | | | No historic record of sewer flooding | Automatically take from **Section 3**. |
| Reservoir and artificial sources of flood risk: | | | Not in maximum extent | |
| What measures are proposed to manage the risk? | No recorded sewer flood. | | | |
| What flood related risks will remain after the flood risk mitigation measures have been implemented? | N/A | | | For example, non-return values to prevent backflows and pumped systems to manage sewerage. |
| How, and by whom, will these risks be managed over the lifetime of the development? | N/A | | | For example, setting up an evacuation plan. Visit the following link for information: https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-warning-and-evacuation-plans |

**Additional applicant comments:**

The TW12 1 postcode area has had between 11-15 sewer flooding incidents (based on DG5 data), as shown on Figure I from the Borough's SFRA. This suggests surcharging of the local Thames Water network. However, no incidents are known to have occurred on site, specifically. GOV.UK flood maps show the site is not within an area subject to reservoir flooding.

**Case officer assessment considerations** *(for internal use only)* :

1 Have the necessary measures been put in place to appropriately manage sewer and artificial sources of flood risk?

**Summary comments** *(for internal use only) linked to Summary Tab* :

[Summarise key points from above assessment covering the key considerations listed above and focussing on areas where further information is needed or the applicant needs to do further work]

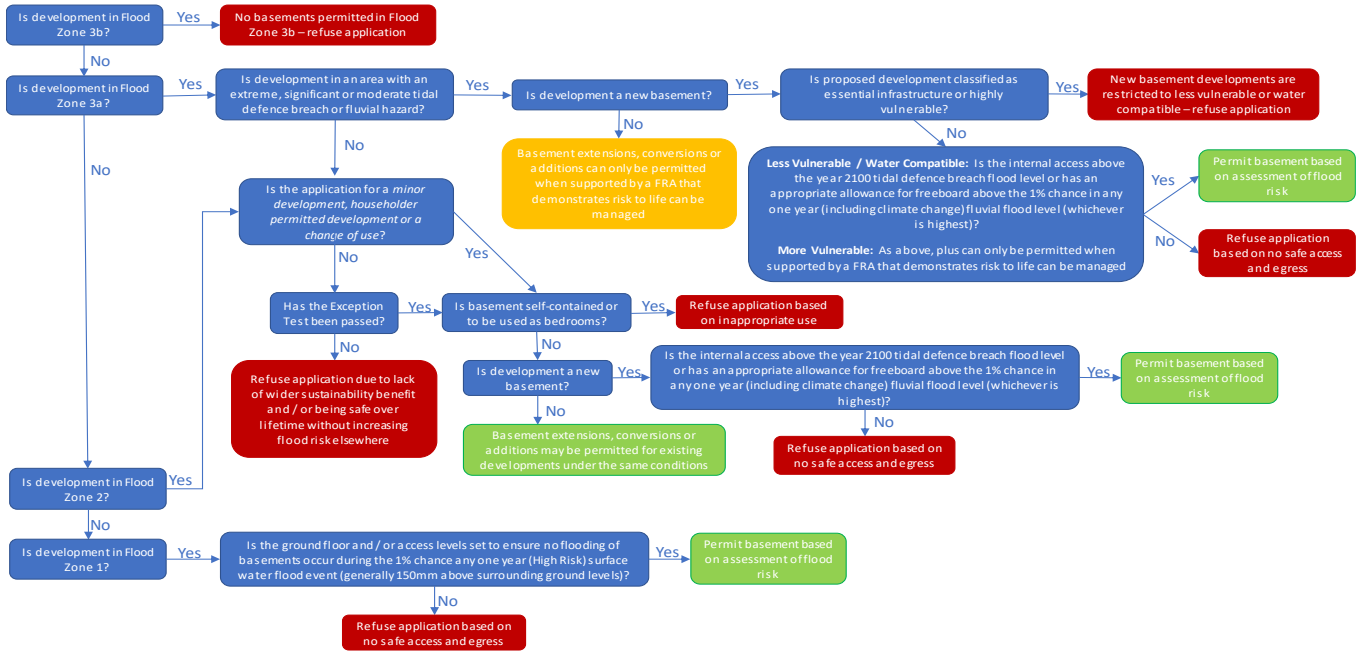
| SECTION 8. Basements | | | | |
|---|---|---|---|---|
| **Considerations** | **Summary of information from Flood Risk Assessment** | **Reference to Flood Risk Assessment (page number and/or section details)** | **Assessment Comments** (for internal use only) | **Information** |
| Is the basement self-contained? | No | | | If so, the access / egress will need to be assessed separately from the rest of the building. No self-contained basements will be permitted in Flood Zones 2 and 3. |
| Is there a safe access / egress route above the flood level shown in Box C in **Section 9**? | Yes | | | |
| Are there any points below the worst case flood level (Box C in **Section 9**) where water could enter the basement? | No | | | If so, permission should not be granted. Checks should be made that the basement is watertight. For example, there should be no airbricks, windows, light wells etc. below the flood level. |
| What mitigation measures have been implemented? | See below. | | | Drainage measures such as perforated pipes and gravel drainage blankets can be installed to reduce the risk structures due to groundwater. Non-return values can help to prevent backflows and pumped systems can manage sewerage. Sustainable Drainage Systems can help prevent surface water flooding issues. Internal staircases may be installed for safe egress. Electricity circuit boards should be located in an area at minimal risk.<br>Lightwells can be constructed with surrounds higher than the design flood level or constructed in way that can resist entry of flood water (for example using smaller glass apertures within a re-enforced concrete slab) |
| What flood related risks remain after the flood risk mitigation measures have been implemented? | In a sustained pump failure water would be stored in the basement car park. | Page 12 Section 8.4 | | |
| How, any by whom, will these risks be managed over the lifetime of the development? | Notting Hill Home Ownership Ltd | Page 13 Section 10 | | For example, having a pump, signing up to receive flood warnings and setting up an evacuation plan.<br><br>https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-warning-and-evacuation-plans |

**Additional applicant comments:**

Sustainable drainage system proposed to accomdate the 100 year event with 40% allowance for climate change, internal staircases for safe egress, sensitive equipment in basements will be protected with flood boards.

**Case officer assessment considerations** ***(for internal use only)*** **:**

1 Use the flow chart below to determine whether the **basements** proposals are acceptable.




**Summary comments** ***( for internal use only) linked to Summary Tab*** **:**

[Summarise key points from above assessment covering the key considerations listed above and focussing on areas where further information is needed or the applicant needs to do further work]

LONDON BOROUGH OF RICHMOND UPON THAMES

## SECTION 9. Ground levels

Please fill in the boxes (orange shaded) for the proposed ground levels and finished flood levels below. If the development does not include a basement, complete Figure 1 (boxes A and B). If it does include a basement, complete Figure 2 (boxes A, B and F). Levels should be presented in metres above Ordnance Datum, mAOD.

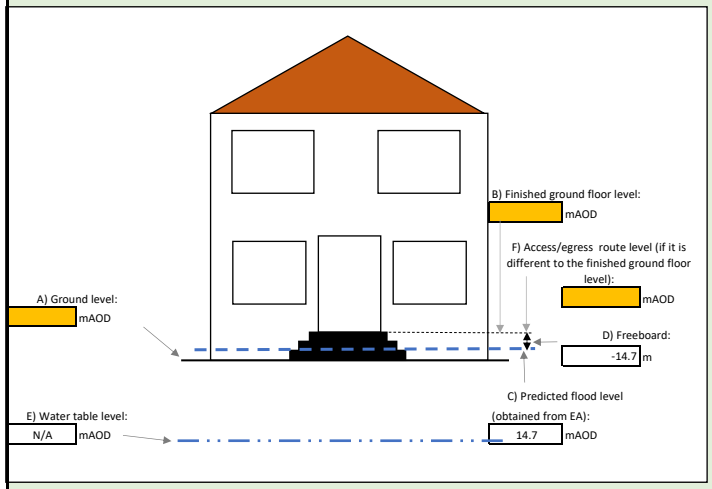



**Figure 1.** Development with no basement

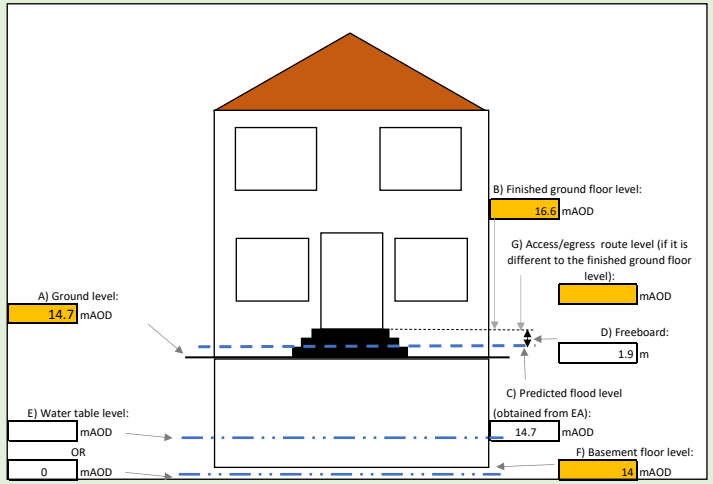



**Figure 2.** Development with basement

***Box C takes the most conservative value from the levels below:***

| | | |
|---|---|---|
| *Fluvial design flood level:* | *0* | *m AOD* |
| *Tidal defence breach flood level:* | *0* | *m AOD* |
| *Surface water flood level:* | *14.7* | *m AOD* |

| SECTION 10. Glossary | |
|---|---|
| **Term** | **Definition** |
| Artificial sources | Sources of water which are man made such as reservoirs, lakes and canals. |
| Basement | The floor of a building which is partly or entirely below ground level. A **habitable basement** includes rooms which are living, sleeping, eating and cooking rooms. A **non-habitable** basement is only made up of rooms which are not habitable, such as bathrooms, laundry rooms, closets, storage rooms, equipment rooms and hallways |
| Design flood | Design floods are hypothetical floods used for planning and floodplain management investigations. In this case, the fluvial design flood should be that of a 1% chance in any one year event with the appropriate allowance for climate change. The tidal defence breach design flood level is the year 2100 scenario from the TE2100 study for the closest / worst case breach location to the site. |
| Exception Test | Applied in line with Sequential Test in the case where there are no reasonably available sites for a proposed development in Flood Zones 1 or 2 and the suitability of sites in Flood Zone 3 (areas with a high probability of river or sea flooding) needs to be considered. |
| Finished floor levels | The final level or position of the finished floor, including any tiles, as opposed to the level of the concrete or wood subfloor surface or floor joists. |
| Fluvial | Flooding caused by rivers. |
| Freeboard | An allowance for uncertainty in estimating flood levels and for potential wave action (for example, as a result of for example vehicles driving through flood water) |
| Groundwater | Water held underground in the soil pores and crevices in rock. |
| Hazard | Hazard is considered to be a combination of risk and probability. |
| Mitigation | The action of reducing the severity, seriousness or painfulness of something. |
| Sequential Test | The test ensures that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. Detailed in the National Planning Practice Guidance. |
| Self-contained unit | A self-contained unit of accommodation is one which has a kitchen / cooking area, bathroom and toilet inside it for the exclusive use of the household living within the unit. |
| Surface water | Water that collects on the surface of the ground as a result of rainfall or overflow from Ordinary Watercourses. |
| Water table | The level below which the ground is saturated with water. |

# London Borough of Richmond upon Thames
# Validation Checklist

## Section 6: Groundwater Flood Risk Accompanying Document

Intrusive investigation established that below a significant depth of made ground (1.5m to 3.5m thick) the natural geology was gravels (1.5-3.5m bgl) over London Clay. Ground water levels recorded across the site varied between

1.3 and 3.5m below existing ground level, which combined with the variable ground suggests that ground water on the site is perched.

The Figure 3.5.1 in the Borough's SWMP report also shows that although there have been no groundwater flood incidents on or near to the site, there is an increased potential for elevated groundwater on permeable superficial deposits along the railway line to the west of the site.

Ground levels adjacent to the northern boundary of the site are significantly lower to form the railway cutting and as a result would inevitably have an impact on the natural ground water levels to the surrounding areas. Network Rail have advised that there is a history of flooding of the railway cutting.

Much of the site currently discharges surface water via soakaways which potentially may be contributing to the flooding of the railway cutting. Due to the significant depth of made ground on the site, potential contamination issues associated with the made ground, and ongoing concerns of flooding issues in the adjacent railway cuttings, soakaways will not be used for the new development. Consequently, the risk of ground water flooding should reduce as a result of the new development.

The proposed basement carpark to Block B1 will be below the existing ground level. However, adjacent to the western boundary, the basement level is approximately 1.5m below existing ground level, which is 1.0m above the recorded ground water levels in the vicinity (2.5m bgl). As the levels rise, the eastern end of the basement carpark is potentially below the ground water level, however as mentioned above, the water levels vary across the site and in some instances no ground water was found, which suggests that the ground water levels on site are perched. Consequently, with the mitigation measures mentioned above the addition of the basement carpark is considered unlikely to have a detrimental effect on groundwater levels offsite.

LONDON BOROUGH OF RICHMOND UPON THAMES

GREATER LONDON AUTHORITY

LoDEG

## 1. Project & Site Details

| | |
|---|---|
| Project / Site Name (including sub-catchment / stage / phase where appropriate) | St Clare Business Park |
| Address & post code | St Clare Business Park,<br>Hampton Hill<br>Hampton TW12 1QF |
| OS Grid ref. (Easting, Northing) | E 514197<br>N 170917 |
| LPA reference (if applicable) | Richmond |
| Brief description of proposed work | Construction of a mixed use building 3 to 5 storeys with basement comprising 98 resi units and 1172 sq.m commercial space, a 3 storey building comprising 893 sq.m commercial floor space, and 14 houses, with associated access, landscaping and parking |
| Total site Area | 8600 $m^2$ |
| Total existing impervious area | 8100 $m^2$ |
| Total proposed impervious area | 7450 $m^2$ |
| Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)? | There some limited areas of surface water flood risk on the site which related to trapped areas of hard standing |
| Existing drainage connection type and location | Most surface water discharges to soakaways with some to SW sewer in Windmill Rd<br>Foul to adopted sewers in adjacent roads |
| Designer Name | Andrew Picton |
| Designer Position | Director |
| Designer Company | Tully De'Ath |

## 2. Proposed Discharge Arrangements

### 2a. Infiltration Feasibility

| | |
|---|---|
| Superficial geology classification | Taplow Gravels |
| Bedrock geology classification | London Clay |
| Site infiltration rate | 6.2 to 7.06x10-5 m/s |
| Depth to groundwater level | varries - 1.3 to 3.5 m below ground level |
| Is infiltration feasible? | No due to concerns over contamination & GWL |

### 2b. Drainage Hierarchy

| | *Feasible (Y/N)* | *Proposed (Y/N)* |
|---|---|---|
| 1 store rainwater for later use | Y | Y |
| 2 use infiltration techniques, such as porous surfaces in non-clay areas | N | N |
| 3 attenuate rainwater in ponds or open water features for gradual release | N | N |
| 4 attenuate rainwater by storing in tanks or sealed water features for gradual release | Y | Y |
| 5 discharge rainwater direct to a watercourse | N | N |
| 6 discharge rainwater to a surface water sewer/drain | Y | Y |
| 7 discharge rainwater to the combined sewer. | N | N |

### 2c. Proposed Discharge Details

| | |
|---|---|
| Proposed discharge location | Windmill Road |
| Has the owner/regulator of the discharge location been consulted? | Yes - as part of previous application |

**3. Drainage Strategy**

**3a. Discharge Rates & Required Storage**

| | *Greenfield (GF) runoff rate (l/s)* | *Existing discharge rate (l/s)* | *Required storage for GF rate ($m^3$)* | *Proposed discharge rate (l/s)* |
|---|---|---|---|---|
| *Qbar* | 1.3 | | | |
| *1 in 1* | 1.1 | 3.3 | 785 | 5 |
| *1 in 30* | 3.0 | 7.5 | 690 | 5 |
| *1 in 100* | 4.2 | 9.6 | 652 | 5 |
| *1 in 100 + CC* | | | | 5 |
| *Climate change allowance used* | | 40% | | |
| 3b. Principal Method of Flow Control | | Hydrobrake & Surface water pump | | |

**3c. Proposed SuDS Measures**

| | *Catchment area ($m^2$)* | *Plan area ($m^2$)* | *Storage vol. ($m^3$)* |
|---|---|---|---|
| Rainwater harvesting | 0 | | 0 |
| Infiltration systems | 0 | | 0 |
| Green roofs | 584 | 584 0 | 0 |
| Blue roofs | 0 | 0 | 0 |
| Filter strips | 0 | 0 | 0 |
| Filter drains | 0 | 0 | 0 |
| Bioretention / tree pits | 180 | 180 0 | 0 |
| Pervious pavements | 917 | 917 0 | 0 |
| Swales | 0 | 0 | 0 |
| Basins/ponds | 0 | 0 | 0 |
| Attenuation tanks | 7450 | | 611 |
| **Total** | 7450 | **0** | 611 |

**4. Supporting Information**

| **4a. Discharge & Drainage Strategy** | *Page/section of drainage report* |
|---|---|
| Ly[illegible] factual and interpretive reports, including infiltration results | Chapters 3 & 8 |
| Drainage hierarchy (2b) | Chapter 8 |
| t[illegible] plans, correspondence / approval from owner/regulator of discharge location | Chapter 8, Appendix B & F |
| 5[illegible] hydrologic and hydraulic calculations | Chapter 8 & Appendix F |
| Proposed SuDS measures & specifications (3b) | Chapter 7 |
| **4b. Other Supporting Details** | *Page/section of drainage report* |
| Detailed Development Layout | Apendix E |
| Detailed drainage design drawings, including exceedance flow routes | Appendix F |
| Detailed landscaping plans | Appendix E |
| Maintenance strategy | Chapter 10 |
| Demonstration of how the proposed SuDS measures improve: | |
| a) water quality of the runoff? | Chapter 8 |
| b) biodiversity? | Chapter 7 |
| c) amenity? | Chapter 7 |

**Feasibility** Research

EIA, **Flood Risk** &
**Transportation**
Assessment

Urban Planning and
**Design**

**Integrated** Transport
Solutions

**Infrastructure**
Development

**Structural** Design

Eco and MMC
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