TEICNIUIL-PRIORY CONSULTING ENGINEERS Ltd

Sustainable Urban Drainage Statement

Collis Primary School

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Development Information

Address:
Collis Primary School, Fairfax Road, Teddington, TW11 9BS

Description:
Construction of two storey school building & the demolition of 3no. school blocks.

Introduction:
This statement details the SuDS measures to be implemented as part of the development at Collis Primary School, Fairfax Road, Teddington.

Drawings:

To be read with Drainage & External Civil Drawings

- 23-19-0-800 Drainage Layout
- 23-19-0-801 Drainage Layout
- 23-19-0-830 Drainage Details
- 23-19-0-831 Standard Details
- 23-19-0-832 Civil Details
- 23-19-0-833 Attenuation Details
- 23-19-0-850 Hardstandings

Description of site

Collis Primary school is located at Fairfax Road, Teddington, TW11 9BS, within the administrative boundary of London Borough of Richmond upon Thames.

The site is located within a residential area with an access road onto Fairfax Road to the South (fig. 1). The Thames lies to the West & North approx. 800meters. The site is generally quite flat with the site being within a 0 m range. There are large playing fields to the east of the site. The total area of the site is approx. 3.11ha.

Fig. 1 Site Location, boundary shown in red
Source: osmaps.ordnancesurvey.co.uk

Fig. 2 Site Location
Source: Google maps

<u>Fluvial Flood Risk</u>

The school is located in Flood Zone 1 Very Low Risk.   “Very low risk means that each year this area has a chance of flooding of less than 0.1%” (Fig. 3)

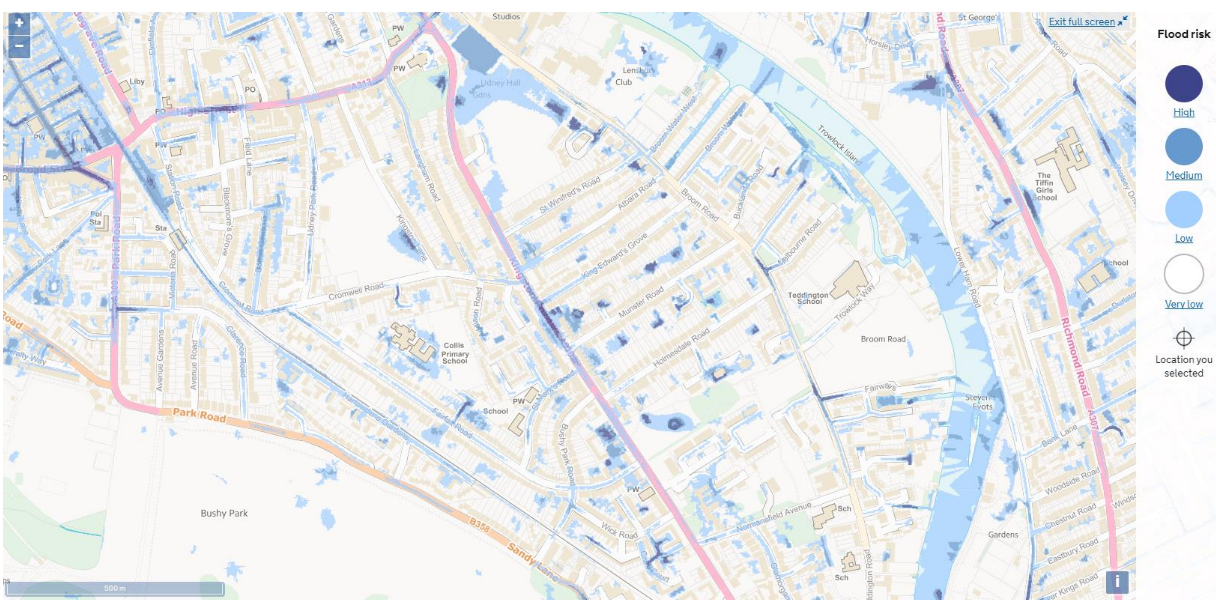

Fig. 3 Shows Flood Risk Zones.
Source: flood-warning-information.service.gov.uk/long-term-flood-risk/map

Groundwater Flooding

The site has been identified as an area with the Potential Groundwater Flooding at Surface. The school is located within the Kempton Park Gravel Formation (source: LFRMS). Permeable ground allows for easier movement of groundwater, thus allowing groundwater flooding to occur. Groundwater is seasonally variable and is noted to present a high degree of local variability.

Surface Water Flooding

The school has reported several incidents occurring each year of the existing soakaways failing. The school reports playgrounds ponding after heavy rainfall, and the storm water system being 'backed-up' during such occurrences. The school additionally reports that the existing soakaways are too small, and blocked-up with debris. Groundwater flooding may also contribute to soakaway failure.

The site has been identified as containing areas of medium & low risk of surface flooding (fig. 4)

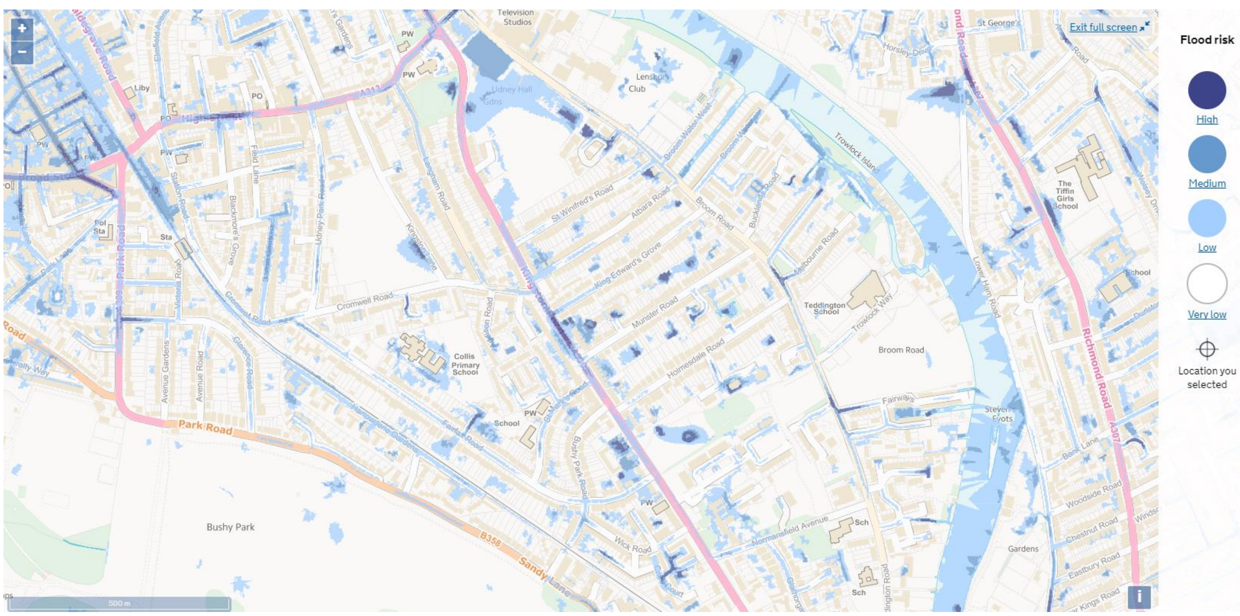

Fig. 4 Showing Surface Water Flood Risk
Source: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

Figurs 5 & 6 shows the direction of flow & velocities of surface waters for medium & low risk areas.

These areas are reflected in information regarding flooding from the school authorities.

Fig. 5 Showing Medium Risk Scenario of surface water flooding – Direction of flow & velocity.
Source: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

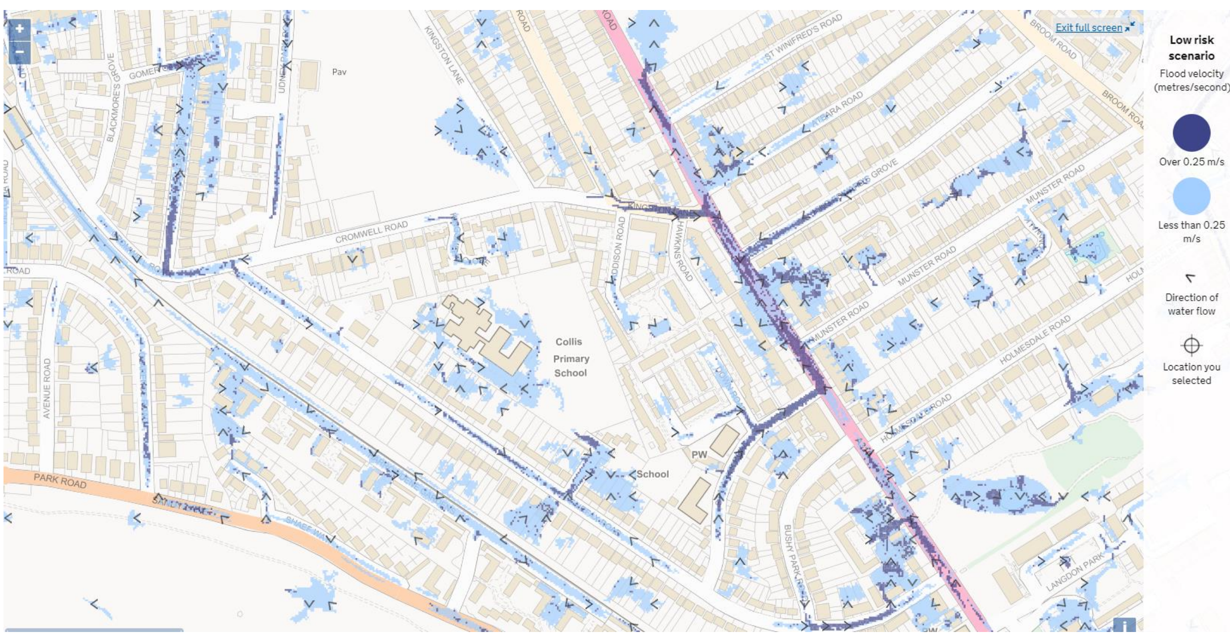

Fig.6 Showing Low Risk Scenario of surface water flooding – Direction of flow & velocity.
Source: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

<u>Discharge Routes Off Site</u>

A number of discharge options have been considered for the school site, namely:

- Soakaways
- Attenuation
- Attenuation Ponds
- Permeable Paving / asphalt

<u>Soakaways</u>

There is a Potential for Ground water Flooding, with existing soakaways failing annually. The area is susceptible to groundwater flooding. The Ground Investigation report (undertaken by *Mott Macdonald*) carried out for this site, included for groundwater monitoring in boreholes. It is stated with the GI report that groundwater was encountered at approx. 3m deep – but could potentially be much shallower than this and is quite variable locally. No soakaway tests (BRE 365) has been carried out. The infiltration rate of the soil is unknown. Further infiltration testing and trial holes may be carried out the location of the proposed infiltration/attenuation areas – although it is unlikely infiltration methods would be suitable, given the high probability of groundwater flooding – potentially being quite close to the surface.

<u>Attenuation</u>

There is scope within the confines of the site for surface water attenuation & discharge to the public sewers incorporating a flow limiting device.

<u>Attenuation Ponds</u>

Given the nature of the site (being a school) and the size of pond required, this option does not seem feasible.

<u>Permeable Asphalt</u>

There is scope within extent of the of the 'relocated courts' area to provide a porous asphalt surface and allow storm water to be attenuated within the stone sub-base, forming the construction layers of this pavement. A network of perforated conveyancing pipes could discharge to the proposed main conveyancing system, to the public sewers incorporating a flow limiting device.

Recommended Discharge Option

Attenuation with discharge to the public sewers is the recommended option, using a combination of a proprietary crate system and a stone sub-base layer. However, it is also recommended that soil infiltration testing is carried out at proposed attenuation locations., as some element of infiltration methods may be possible in conjunction with attenuation and discharge to the existing storage system. The London Borough of Richmond states in the Strategic Flood Risk Assessment (SFRA) that "Any discharge should be reduced to greenfield run-off rates wherever feasible". Greenfield run-off rates are considered as 5L/s/Ha, with a minimum limiting outlet flow 5l/s, to prevent blockages. (EA policy document "Rainfall Management for Developments")

Attenuation is to be designed for a 1 in 100year rainfall event plus a climate change allowance of 40%.

An increase in impermeable area of 10% will be allowed to consider urban creep as per BS8582:2013.

The maximum required attenuation storage is calculated by determining the maximum surface Run-off for a given storm duration, allowing a maximum outlet flow of 5L/s. These results are tabulated in the calculations.

The total area of the existing site is approx. 3.11ha. 1.70ha of which is permeable, and 1.41ha impermeable. Three existing school blocks are to be demolished and replaced with hard play area (assumed to be impermeable). The proposed building is to be largely located on existing impermeable surface, & new green areas added. There will be an increase in permeable areas by 0.013ha (130m2), thus providing a 0.4% betterment.

The maximum allowable run-off from the site is taken as 5l/s/ha for 1 in 100 year storm event plus 40% climate change. The greenfield run-off rate per unit area is 1.5L/s/ha for this site.

The gross proposed considered impermeable development area measures 0.6461Ha , which includes the modular building, playground, courts, road and perimeter footpaths. If no infiltration component is possible, the storm water run-off from this proposed development will be attenuated with flow control and considered as two aspects:

1. An off-line modular crate system, constructed underground, which will attenuate surface water from the proposed modular building, road, footpaths and playground. The attenuation storage volume required for this aspect is 216m3. The crate system is considered to have a void ratio of 95%.
2. Permeable asphalt over the courts area, with the underlaying sub-base as attenuation storage. The attenuation storage volume required for this aspect is 179m3. The stone sub-base system is considered to have a void ratio of 30%.

Conveyancing pipework is to be PVCu, of suitable gradients to allow gravity flow for inlet and outlet from the attenuation system, using a flow control device limiting the flow to a rate to 5l/s, to be approved by the LA, to the boundary manhole. A pump will be required at the boundary MH to provide for elevation to the Existing Public SW sewer in Fairfax road,

Planning Policy

This proposal is to be developed in-conjunction with the National Planning Policy Framework (2019).

A National Planning Policy Framework (NPPF) Flood Risk Assessment has been provided by *Ambiental Technical Solutions Ltd.* Cognizance has been taken of a sequential, risk based approach within the Flood Risk Assessment document.

This is an existing development site, and no increase of impermeable area is proposed – a slight increase of permeable area of 130m2 is anticipated (0.4% betterment). The area has been deemed to be at a very low risk of surface water flooding, and is not considered inappropriate development.

The site is deemed not significant, for Fluvial / Tidal flood risk, that being within Flood Zone 1.

The generally site is mostly deeded a 'very low' risk and the proposed building site, a 'low risk', for Surface water flooding.

There is a relatively high risk of ground water flooding – any SUDs design will take cognizance of this (see policy 5.13, hierarchy of surface water management, mentioned below)

Flood risk management measures have been identified with the Flood Risk Assessment document, along with off-site impacts.

Mitigation methods are proposed within the Flood Risk Assessment, including elevating the ground floor of the proposed building by a least 150mm from ground level, providing permeable surface alternatives to impermeable surface, and providing non-return valves to drain and sewer outlets. These mitigation methods will be reviewed and implemented within the design.

Consideration has been given to off-site impacts. The proposed development will have no impact with regards to flood plain storage capacity and the hydraulics of the local watercourse.

It is recommended within the Flood Risk Assessment that the surface water runoff is discharged via the existing management system. To provide a betterment, it is also advised that impermeable surfaces should be replace with permeable surfaces. This will be incorporated into the design.

It is further advised that a bespoke Suds design is undertaken to cater for surface water runoff generation. This is considered is the following hierarchy of surface water management and SUDS systems:

London Plan (2016) Policy 5.13 Flood Risk Management: " *A Development should utilize sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to it's source as possible in line with the following hierarchy"*

1. Store water for later use.

Due to site constraints, the storage of rainwater for later use is not considered a feasible option.

2. Use infiltration techniques

Existing soakaways on this site are reported to be ineffective and failing annually. There is a high potential for ground water flooding on this site. Infiltration techniques are not appropriate in this case, due to probable seasonally high ground water.

3. Attenuate rainwater in ponds op open water features for gradual release

Due to site constraints and usage (ie school), any such pond or open water features are not appropriate and are considered a potential safety hazard.

4. Attenuate rainwater by storing in tanks or sealed water features for gradual release

This option maybe considered. There is scope within the confines of the site for surface water attenuation & discharge to the public sewers incorporating a flow limiting device. Attenuation maybe proposed via tanks, crates, and/or an enclosed granular stone sub-base, connected to the existing SW system, via a flow control device to facilitate a gradual release.

5. Discharge rainwater direct to a watercourse

There is no available watercourse, for such methods

6. Discharge rainwater to a surface water sewer/drain

This option maybe considered; discharge through limited and controlled flow to the existing system, from attenuation devices, is feasible on this site

7. Discharge rainwater to the combined system.

This option is the least preferred – although there is no combined sewer on this site.

It is considered that compliance with the National Planning Policy Framework - Planning and flood risk is demonstrated by the implementation of the above.

Management of Surface Water Attenuation System

The school is to bear the responsibility for the maintenance of the attenuation system. A Maintence record and management plan is to be kept on-site by a designated responsible person.

Calculation method and Design Methodology:

Software: TEKLA / TEDDS 2018

Attenuation

The Greenfield run-off rate is calculated in accordance with CIRIA C753 – The SUDS Manual

The Rainfall Intensity in accordance with the Wallingford Procedure, for given storm durations

Return period considered: 1 to 100 year rainfall event
Climate Change Factor is taken as 40%.

Conveyancing System

The SW pipework is sized between relevant points (eg between MH's), according the maximum calculated rainfall intensity over a 5minutes period, for a 1 to 100 year return period and a 40% climate change factor. This rainfall intensity equates to 249.9mm/hr. (see Drainage Calculations) The cumulative impermeable area taken by each section of pipe is considered to determine maximum flow rate, to calculate the diameter and gradient of each section of pipe.

References

The SUDS manual (CIRIA 753)
Approved Document Part H (Drainage and Waste Disposal)
Joint Defra//EA Flood and Coastal Erosion Risk Management R+D Program, Technical Report W5-074/A/TR/1 Revision E (Jan 2012)
BSEN752:2008 Drain and Sewer Systems Outside Buildings
BS8582:2013 Code of Practice for Surface Water Management for Development Sites
EA Document – Rainfall Management for Development