

Morgan Structural Limited
Blending Structure with Architecture

SRP1155: University Academy Long Sutton

Civil Design Philosophy

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1.0 Introduction

Morgan Structural Limited have been appointed by Bowmer and Kirkland to provide Civil Engineering Consultancy services for the proposed new school development at University Academy Long Sutton.

The civils design philosophy report will identify the key considerations and design parameters associated with the below ground drainage and the external hard landscaping design.

This document has been developed in conjunction with the following:

- University Academy Long Sutton; Flood Risk Assessment; February 2023; Mott MacDonald; 100110481 | SRP1117-MMD-XX-XX-T-C-001-064FRA
- Geotechnical reports prepared for the scheme by The Geotechnical Centre (SRP1155-GEO-XX-XX-T-G-0002-058IntrusiveGI-S5-P02; July 2023 & SRP1155-GEO-XX-XX-T-G-0001-058DesktopGI-S5-P02; December 2022)
- CCTV Drainage Survey & Report; Survey Solutions; December 2023
- Topographical & Utility Survey; Greenhatch Group; October 2023

Surface water from the site will be discharged via both positive and Sustainable Systems (SuDS) into the existing reed system surrounding the site, as is currently the case.

Flows will be limited to greenfield rates, or suitable rates agreed with South Holland Drainage Board, with attenuation provided within the network as necessary.

Foul flows will be pumped into an existing Anglian Water foul sewer in Little London Road, as is currently the case.

2.0 The site

The existing overall site is approximately 8.84Ha located to the North of Long Sutton in Lincolnshire and sits delineated on the North by houses, East and South by farmland, and West by Little London Road.

The existing topographic survey provided by Greenhatch Group (45301_T_REV0) indicates that the site is generally plain with an average elevation of 3.50mAOD.

The site is located within the catchment area of the South Holland Drainage Board, and there is a main ditch along the boundary to the south of the site.

There is an existing SuDS basin feature located near the main entrance to the existing school which is understood to receive surface water from the existing access and the visitors parking area.

There are two concrete bagwork headwalls with 100mm diameter pipes discharging from each, it is understood that this basin does not connect positively to any other drainage system and uses infiltration, evaporation and transpiration as a means to dissipate water.

Anecdotally this basin is dry the majority of the time, however some water was observed in the base of the basin during a design team meeting on 13 December 2023.

Topographical and buried services surveys show that the existing buildings and external areas discharge towards the northern boundary of the site, however due to the poor condition of the network it is not conclusive where the exact discharge point is for surface water – it is recommended that further survey work be undertaken outside the boundary of the site to understand the extent and topography

of any ditches around the school.



Figure 1.1 Proposed School Layout

3.0 Geo-Environmental

From the geotechnical reports prepared for the scheme by The Geotechnical Centre (SRP1155-GEO-XX-XX-T-G-0002-058IntrusiveGI-S5-P02; July 2023 & SRP1155-GEO-XX-XX-T-G-0001-058DesktopGI-S5-P02; December 2022) it is noted that the ground water table is close to existing ground level with groundwater being encountered as high as 0.5m below ground level.

The intrusive report concludes (pp. 14): *The monitoring was undertaken on 28th April and the 3rd, 11th and 18th May 2023. The results suggest a water table within the Tidal Flat Deposits that is relatively close to ground level, being generally less than 1.5m below current ground level.*

It should be noted that groundwater levels can vary both seasonally and after prolonged periods of wet or dry weather, therefore further groundwater monitoring is required. Additional anti-flotation measures for drainage SuDS features and attenuation tank may be required if shallow groundwater levels are recorded. Traditional sumps and dewatering may also be required during the earthworks/excavations.

Infiltration

Infiltration testing was not undertaken during the site investigations carried out on site. From the known geology and high groundwater table of the site, it is unlikely that discharging of surface water into the ground will be a viable option. Therefore, at this stage of the project, infiltration is not considered viable.

Soakaway testing in accordance with BRE 365 will be undertaken on site to determine the suitability of the underlying soils for infiltration drainage.

Geotechnical Assessment

Based on the current information available the recommended CBR for the site is unknown and will need

to be reviewed upon receiving further ground investigation planned in the near future. However, at present an assumed minimum CBR value of 2% has been used for design purposes.

The design CBR value will need to be reviewed and confirmed by suitable in-situ testing at formation levels following earthwork operations and prior to construction.

4.0 Flooding

The site is within Flood Zone 3 but is protected by defences although less than a 1 in 150-year event.

To meet this criteria the finished floor levels will be set at 4.80m AOD which is the level set to meet flood resilience, therefore some 300mm above the FFL recommended in the FRA.

This will have the benefit of raising the foundations higher and avoiding the high water table.

Consideration of any potential flood risk has been given with the development of the drainage strategy by providing a new sustainable drainage system, which will effectively discharge the surface water from all hardstanding areas, and by providing an adequate attenuation storage volume to accommodate the runoff from the site. By incorporating SuDs features the development is likely to achieve the requirement of discharging at greenfield run-off rates.

5.0 Existing Drainage

The proposed school development is located on the existing school site and is made up of the existing school buildings, ancillary buildings and sports fields. Survey works indicate existing private surface and foul water drainage networks are present within the existing site boundary.

From the utility survey carried out it is apparent that there are separate foul and surface water networks that serve the existing buildings and hardstanding areas on site.

The existing foul water is shown to currently flow into an existing pumping station, with anticipated connections into the existing public system on Little London Road.

The existing surface water is collected via a series of gullies and rain water pipes and appear to discharge into the perimeter re-en network (not within the site boundary) – further investigation is proposed to understand the exact location of any discharge points that may be re-used.

There is a single suds feature within the site, an attenuation basin that serves the existing visitors car park and drop-off zone, it is proposed to re-use this feature as part of the storm water management for the new school.

The Anglian Water public sewer records indicate that there is a public foul water drain located within the public highway that surround the existing site.

Based on the survey information it is understood that the existing private foul from the existing site discharge into the existing public sewer in Little London Road. The exact point of connection is unclear and will require further survey. However, based on the existing infrastructure, it is believed that connections from the proposed foul drainage system will need to be pumped.

Existing drainage features serving the existing building and hardstanding areas that are to be demolished will predominantly become redundant and replaced with the new drainage systems.

6.0 Proposed Surface Water Drainage

The impermeable area of the site has been measured to be approximately 0.89Ha.

It is noted that new developments should achieve greenfield run-off rates, to ensure that surface water run-off is managed as close to its source and prioritise green SUDs features. Therefore, surface water from the site will discharge at a restricted greenfield runoff rate into the existing perimeter reën system, maintained by South Holland Drainage Board.

The surface water proposal for the site involves capturing the surface water from the new teaching block, new MUGA, access road, drop-off zone, car park and surrounding hardstanding areas, and conveying this via gravity to the proposed attenuation basin to the south of the site.

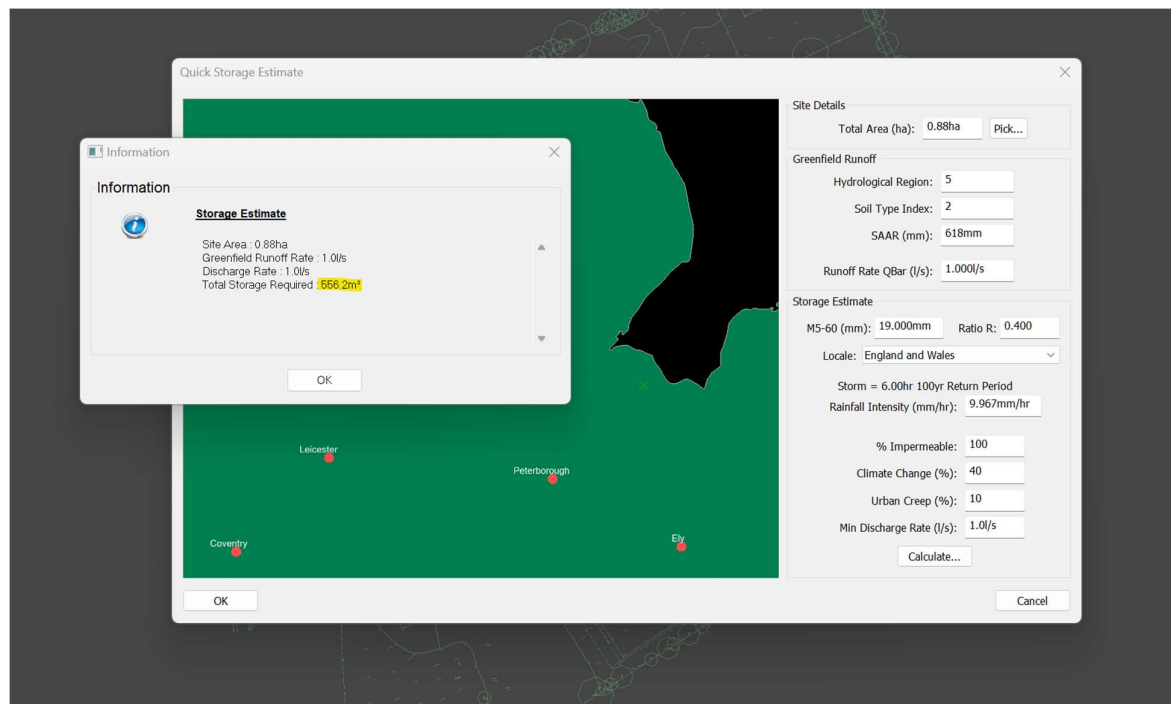
Storage requirements have been calculated based on a discharge rate of 1.0l/s for the 1 in 100 year storm, plus 40% climate change as 556m³ in total.

Storage will be provided throughout the site with the main volume being the attenuation basin and smaller storage volumes being controlled in the proposed permeable paving and brain gardens.

Initial Attenuation Assessment

Drainage modelling software was used to do an initial assessment of the required attenuation for the site based on a discharge rate of 1.0l/s

Attenuation will be refined during detailed design, but will utilize available features including rain gardens, permeable paving sub-base and attenuation basin.



Main building & Hardstanding

The main building and hardstanding surrounding the building (at approx. 4.8m) could discharge to the

SE corner of the building and then southwards toward the proposed attenuation basin before discharging via a flow control device into the South Holland Drainage Board ditch that runs along the southern edge of the site.

Main Car Park & Informal Hardstanding

The car park area will drain via channel drains which will connect into the sub-grade of the permeable paving.

The informal hardstanding area would drain via permeable paving and ultimately discharge into the attenuation basin, the permeable paving having acted to slow down the flow of water and acted as a filter for pollutants before being discharged.

Areas around the car park and hard standing area could also be designed as rain gardens which would store water before discharging via a high-level overflow into the main system – again adding biodiversity and amenity, as well as improving the water quality before discharge.

A flow control structure can be added to this system before discharge into the perimeter swale, therefore utilising the full potential to use the sub-grade of the permeable paving for storage, and allowing several control points around the system which would help stop any one part of the system becoming overwhelmed in extreme rainfall.

Drop-off Zone

This area could drain into the existing SuDS basin feature, with the potential to add planting to the area to aid transpiration and enhance biodiversity and amenity.

MUGA

The MUGA, which is shown as falling from north to south could drain via a bio-retention system along the southern edge before utilising the proposed habitat area to the south in a similar manner to the existing SuDS basin on site.

The bio-retention area would connect to the proposed attenuation basin via a high level overflow.

Footpaths

The proposed footpaths would drain into the surrounding green areas, however there would be opportunity to place areas of rain garden along the edges of the footpaths to provide additional storage as well as increase biodiversity and enhancement.

The drainage network is proposed not to surcharge in a 1 in 1-year storm, not to flood any part of the system in a 1 in 30-year storm and not to flood the buildings or outside of the site boundary in any event up to and including the 1 in 100-year storm event with a 40% allowance for climate change.

It should also be noted that, following further ground water monitoring, it is likely that SuDS features will need to be lined with impermeable membrane due to high groundwater table. Anti-flotation measures may be also required – subject to further groundwater monitoring records.

Therefore, the proposed drainage design is subject to LLFA approval.

The construction of the connections will be subject to agreement and technical approval with South Holland Drainage Board.



9.0 Further Surveys/Actions

Further CCTV/drainage survey works will be required to confirm the connectivity and condition of any existing pipes to remain as well as existing connections onto the reën system.

Infiltration testing in accordance with BRE 365 should be undertaken on site to determine the suitability or to discount the underlying soils for infiltration drainage.

Further ground investigation is proposed to take place to confirm ground contamination and CBR.

Further ground investigation at formation level should be undertaken on-site to confirm CBR values.

Further discussion with Anglian Water and the South Holland Drainage Board to confirm the public sewer capacity and gain an approval for the proposed connections to the existing foul water network and reën system.

10.0 Design Standards

The following British Standards and design guides shall be used for storm water design purposes. Please note that this list is not exhaustive but covers the overall general drainage requirements.

1. BS EN 752 - Drain and Sewer Systems Outside Buildings
2. BS EN 12056-3 - Gravity Drainage Systems Inside Buildings – Part 3 Roof Drainage
3. BS EN 16933-2 - Drain and Sewer Systems Outside Buildings – Part 2: Design
4. The Code - Design and Construction Guidance for foul and surface water sewers offered for adoption under the code for adoption agreements for water and sewerage companies operating wholly or mainly in England
5. CIRIA C753 - The SuDS Manual
6. DEFRA/EA - Preliminary Rainfall Run Off Management for Developments (2013)
7. CIRIA - Interim Code of Practice for Sustainable Drainage (2004)
8. CIRIA C635 - Designing for Exceedance in Urban Drainage - Good Practice (2006);
9. HR Wallingford - Wallingford Procedure for Design and Analysis of Urban Storm Drainage
10. SSG 2019 - Sewer Sector Guidance (formerly Sewers for Adoption)
11. Building Regulations 2010 - Approved Document H – Drainage and Waste Disposal 2015

In accordance with Building Regulations 2010 Approved Document H, Section H5, separate foul and surface water systems shall be designed for the proposed development before connection into an existing combined Public Sewer.

The following British Standards and design guides shall be used for foul water design purposes. Please note that this list is not exhaustive but covers the overall general drainage requirements.

1. BS EN 752 - Drain and Sewer Systems Outside Buildings
2. BS EN 12056-2 - Gravity Drainage Systems Inside Buildings – Part 2 Sanitary Drainage
3. BS EN 16933-2 - Drain and Sewer Systems Outside Buildings – Part 2: Design
4. SSG 2019 - Sewer Sector Guidance (formerly Sewers for Adoption)
5. BW COP 4 - British Water Flows and Loads 4
6. Building Regulations 2010 - Approved Document H – Drainage and Waste Disposal 2015