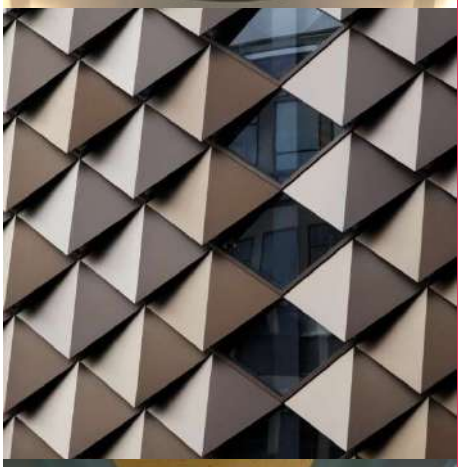

Pinn River School

Flood Risk Assessment & Drainage Strategy

Curtins Ref: 080522-CUR-XX-XX-T-C-92000

Revision: P02

Issue Date: 11 November 2022

Client Name:	Kier
Client Address:	2 Langston Road, Loughton, Essex IG10 3SD
Site Address:	Pinn River School, Fore Street, Pinner, London, HA5 2JQ

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Rev	Description	Issued by	Checked	Date
P01	Preliminary Issue	BPC	MS	28/10/2022
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This report has been prepared for the sole benefit, use, and information for the client. The liability of Curtins Consulting Limited with respect to the information contained in the report will not extend to any third party.

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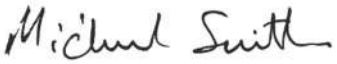
Michael Smith MEng(Hons) CEng MICE Principal Civil Engineer		11/11/2022

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1.0 Introduction

1.1 Project Overview

Curtins has been appointed by Kier Construction to produce a Drainage Strategy and Flood Risk Assessment in support of a full planning application for the SEND School, Pinn River School, previously known as Grangewood Primary School. The proposal is for a 180 student all through SEND school. This meets an established and growing need for SEND places within the Borough and will deliver high quality and purpose-built teaching accommodation, that address the unique needs of the students. The proposed architectural plans can be seen in **Appendix A.**

Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material derivation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

1.2 Site Location

The site is located in Pinner, a suburb within the London borough of Hillingdon in the northwest of Greater London. The site occupies the northern portion of the former Grangewood school site.

The east of the site is bounded by suburban housing and Fore Street. The south-east of the site is bounded by the existing, and to be retained, Coteford Junior School. The remainder of the site is bounded by the London Green Belt. The nearest underground tube station is Northwood Hills, located approximately 1 mile north-east of the site.

The site address is Pinn River School, Fore Street, Pinner, HA5 2JQ. The site is centred on national grid reference TQ 09922 88829

The site location is shown in Figure 1-1:

Figure 1-1: Site Location

1.3 Site Description

The site is a brownfield site with a total area of 2.88ha. The site was previously used as a SEND school and the proposed use of the site will be a SEND school. The site is relatively flat with a maximum elevation of 56.95mOAD located in the north of the site and has a low point of 56.00mOAD located in the east of the site. The Topographical Survey for the site is contained within **Appendix B**.

1.4 Nearby Watercourse

The nearest major watercourse to the site is the River Pinn, located approximately 500m south of the site. Discharging directly into the watercourse has been considered unfeasible due to the distance and third-party land involved. A minor unnamed watercourse has also been identified nearby to the site, located within the London green belt. Discharging into this minor watercourse has been considered unfeasible due to the requirement to construct within the London green belt. The nearest watercourse to the site can be seen in figure 1-2.

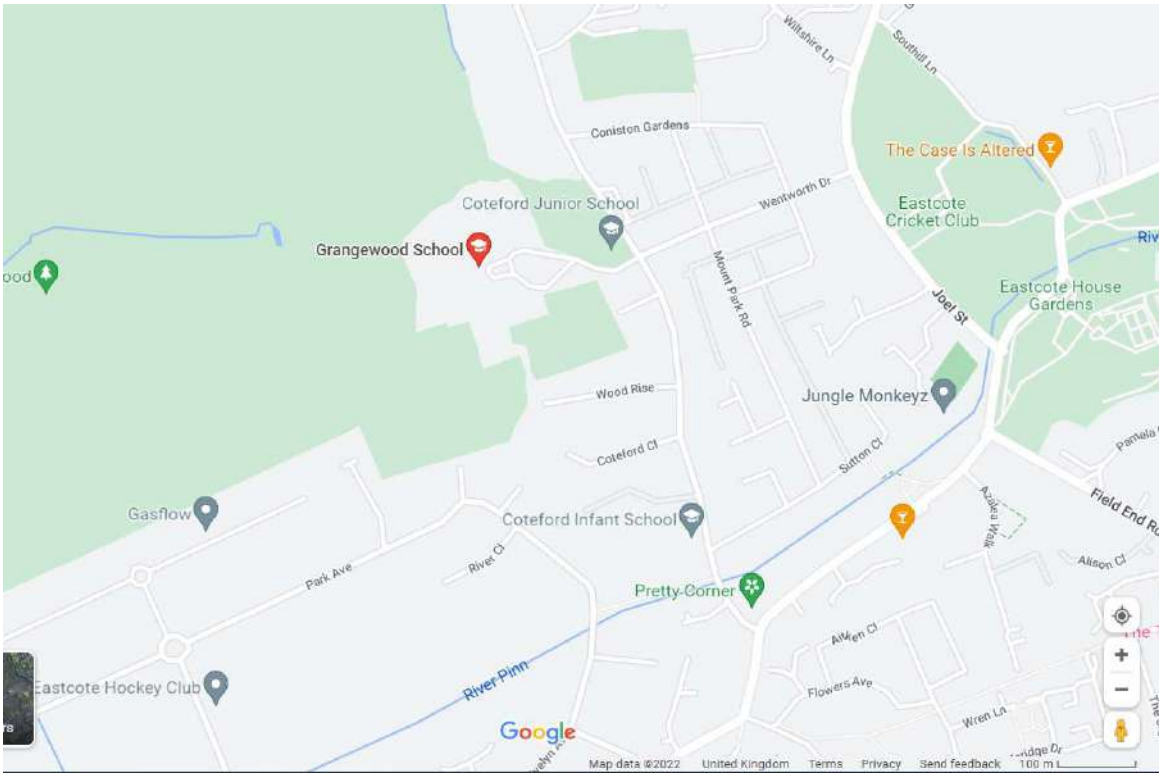


Figure 1-2: Watercourse mapping

1.5 Existing Geology

A site investigation (SI) report has been supplied to Curtins as part of the pre-planning information pack and provided geological information for the site. Several window sample boreholes were taken across the site reaching depths of 5m. It was found that the site is primarily underlain with clay, with sand and silt being evidenced.

1.6 Project Proposals

As discussed in Section 1.1, the project aims to deliver a SEND School for 180 pupils, offering high quality care and education. Curtins have designed a surface water drainage network which will manage flood risk for events up to and including the 1 in 100 year + 40% CC return period through the use of attenuation crates, and limit discharge to greenfield rates. A separate gravity foul water network will also serve the school, connecting to the existing foul water network serving the adjacent junior school.

The proposed site has an impermeable area of 1.36ha. However, of this, only 1.17ha is proposed to be redeveloped. The proposed drained area for the site consists of 0.76ha and has been designed so not to increase the area draining unrestricted to the existing sewerage network. Areas of the proposed car park redevelopment have been permitted to freely drain to the existing network, this has been mitigated by redesigning the area of existing drainage serving existing hardstanding to the north of the car park to now drain to the proposed restricted network. This has resulted in a net decrease in hardstanding draining unrestricted from site.

The proposed architectural plans are contained in **Appendix A.**

The proposed landscape drawings are contained in **Appendix C.**

The proposed Drainage Strategy is contained in **Appendix D.**

2.0 Planning and Policy Considerations

2.1 National Planning Policy Requirements

2.1.1 National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG)

In recent years, the Government and local Councils have placed increased priority on the need for developers to take full account for the risks of their development at all stages of the planning process. The National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG) identifies how the issue of flooding is dealt with through the planning process and with the creation of a site-specific Flood Risk Assessment (FRA) for sites over 1ha in area or in Flood Zones 2 & 3.

2.1.2 DEFRA – Sustainable Drainage Systems

The Department for Environment, Food and Rural Affairs (DEFRA) national standards for sustainable drainage systems provides technical guidance on the design, construction, and maintenance of Sustainable Drainage Systems (SuDS).

2.1.3 Planning Practice Guidance

The Government's Planning Practice Guidance (PPG) provides additional information to be read alongside the NPPF. The online guidance sets out the definitions for the flood zones and defines the permitted uses of development that can be proposed in them.

Table 2-1 - PPG Tables 1 & 2 Summary

Flood Zone	Appropriate Users
Flood Zone 1 - Low Probability This zone comprises land having less than 1 in 1000 annual probability of river or sea flooding (<0.1%)	All uses of land are appropriate in this zone
Flood Zone 2 - Medium Probability This zone comprises land assessed as having between 1 in 100 and 1 in 1000 annual probability of river flooding (1%-0.1%) or between 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5%- 0.1%) in any year	The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure in Table D.2 are appropriate in this Zone Subject to the Sequential Test being applied, the highly vulnerable uses in Table D.2 are only appropriate in this zone if the Exception Test is passed
Flood Zone 3a - High Probability This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year	The water-compatible and less vulnerable uses of land in Table D.2 of the PPG-TG are appropriate in this zone. The highly vulnerable uses in Table D.2 should not be permitted in this zone. The more vulnerable and essential infrastructure uses in Table D.2 should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this should be designed and constructed to remain operational and safe for users in time of flood.
Flood Zone 3b - Functional Floodplain This zone comprises land where water has to flow or be stored in times of flood. SFRAs should identify this Flood Zone (land which would flood with an annual	Only the water-compatible uses and the essential infrastructure listed in Table D.2 that has to be there should be permitted in this zone. It should be designed and constructed to:

probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes)	Remain operational and safe for users in times of flood; Result in no net loss of floodplain storage; Not impede water flows; and Not increase flood risk elsewhere. Essential infrastructure in this zone should pass the Exception Test.

2.2 Local Planning Policy Requirements

2.2.1 The London Plan (2021)

The London Plan (2021) is a Strategic Development Strategy for London, published by the Greater London Authority. The London Plan provides the framework for the development of London, including policies and accompanying information for implementation.

As per the London Plan Policy SI 13 (Sustainable Drainage), discharge of surface water should be via one of the following methods in descending priority.

The policy provides the following drainage hierarchy:

1) Rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
2) Rainwater infiltration to ground at or close to source
3) Rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
4) Rainwater discharge direct to a watercourse (unless not appropriate)
5) Controlled rainwater discharge to a surface water sewer or drain
6) Controlled rainwater discharge to a combined sewer.

2.2.2 West London Strategic Flood Risk Assessment

The London Borough of Hillingdon, in collaboration with five of the six other Boroughs, make up the West London Alliance (Brent, Barnet, Ealing, Harrow, Hillingdon and Hounslow) and published the West London Strategic Flood Risk Assessment (SFRA) report in 2017. The document provides a comprehensive study on the opportunities and policies to reduce flood risk. It includes information about recent flood risk management activities including hydraulic modelling, improvements to the flood extent mapping and the construction of flood alleviation schemes. The document provides a comprehensive set of maps presenting flood risk from all sources. The SFRA also provides a set of comprehensive requirements for site-specific FRA and drainage strategies in line with the NPPF and London Plan.

2.2.3 London Borough of Hillingdon

The Hillingdon local plan sets out the long-term vision and objectives for the borough, what is going to happen within the borough, where, and how this will be achieved. The Hillingdon Local plan is consistent with the Sustainable Community Strategy, which focuses on three key components: People, Place and Prosperity. The Hillingdon Local Plan is separated into two parts; part 1 covers the strategic policies

whereas part 2 covers the development management policies. Part 1 was adopted in 2012 whilst part 2 was adopted in January 2020. Part 2 provides detailed policies that will form the basis of the Council's decisions on individual planning applications and covers the following topics:

- The Economy
- Town Centres
- New Homes
- Historic and the Built Environment
- Environmental Protection and Enhancement
- Community Infrastructure
- Transport and Aviation

Policy BE1: Built Environment states:

"The Council will require all new development to improve and maintain the quality of the built environment in order to create successful and sustainable neighbourhoods, where people enjoy living and working and that serve the long-term needs of all residents."

Policy BE1 goes on to state under bullet point 10:

"Maximise the opportunities for all new homes to contribute to tackling and adapting to climate change and reducing emissions of local air quality pollutants. The Council will require all new development to achieve reductions in carbon dioxide emission in line with the London Plan targets through energy efficient design and effective use of low and zero carbon technologies. Where the required reduction from on-site renewable energy is not feasible within major developments, contributions off-site will be sought. The Council will seek to merge a suite of sustainable design goals, such as the use of SUDS, water efficiency, lifetime homes, and energy efficiency into a requirement measured against the Code for Sustainable Homes and BREEAM. These will be set out within the Hillingdon Local Plan: Part 2- Development Management Policies Local Development Document (LDD). All developments should be designed to make the most efficient use of natural resources whilst safeguarding historic assets, their settings and local amenity and include sustainable design and construction techniques to increase the re-use and recycling of construction, demolition and excavation waste and reduce the amount disposed to landfill"

Policy EM6: Flood Risk Management states:

"The Council will require new development to be directed away from Flood Zones 2 and 3 in accordance with the principles of the National Planning Policy Framework (NPPF). The subsequent Hillingdon Local Plan: Part 2 -Site Specific Allocations LDD will be subjected to the Sequential Test in accordance with the NPPF. Sites will only be allocated within Flood Zones 2 or 3 where there are overriding issues that outweigh flood risk. In these instances, policy criteria will be set requiring future applicants of these sites to demonstrate that flood risk can be suitably mitigated. The Council will require all development across the borough to use sustainable urban drainage systems (SUDS) unless demonstrated that it is not viable. The Council will encourage

SUDS to be linked to water efficiency methods. The Council may require developer contributions to guarantee the long term maintenance and performance of SUDS is to an appropriate standard."

2.2.4 Flood Risk management Strategy

The Hillingdon Local Flood Risk Management Strategy 2015 adheres to the legislation set out by the Flood and Water Management Act 2010 and assigns Hillingdon Borough Council as the Lead Local Flood Authority (LLFA).

Hillingdon is required to develop, maintain, apply, and monitor a local strategy for local flood risk management in its area.

Local flood risk is defined as flooding caused by the following sources: surface water, groundwater and ordinary watercourses.

The Local Flood Risk Management Strategy provides an overview of the assessment of flood risks already undertaken in other documents and sets out a framework for the management of local flood risk in the London Borough of Hillingdon by the Council and other relevant bodies.

This strategy is supported by the already published Flood Risk Management Portfolio of documentation which contains other critical legal documents such as the Preliminary Flood Risk Assessment, Strategic Flood Risk Assessment and Surface Water Management Plan, Parts 1 and 2. These provide the evidence base for this strategy.

2.2.5 Surface Water Management Plan

The Surface Water Management Plan (SWMP) was produced by completing flood modelling at the borough-wide scale and identified areas of significant modelled flood risk. The SWMP modelling was refined by the EA and published on their website in 2013. It has since been expanded upon, allowing local flood authorities to contribute to the model.

3.0 Flood Risk Summary

As the site is larger than 1 ha, a Flood Risk Assessment has been undertaken for the development site below. The site is located in Flood Zone 1 and is at low risk of all forms of flooding, therefore no mitigation measures are required.

3.1 Fluvial Flood Risk

With reference to the EA's indicative flood maps, it can be seen that the site lies within flood zone 1. Therefore, the risk of flooding from river and tidal influences can be deemed as very low, with a less than 1 in 1000 (<0.1%) annual probability of flooding from river and tidal sources. See figure 3-1 below for further flood zone extent information.

Figure 3-1: Fluvial Flood Risk Map

3.1.1 Pluvial Flooding and Overland Flow

With reference to the EA's online mapping, data related to the risk of potential surface water inundation or flooding is also provided. The online mapping tool identifies that the site is at very low risk of surface water flooding. See figure 3-2 below for further surface water extent information.

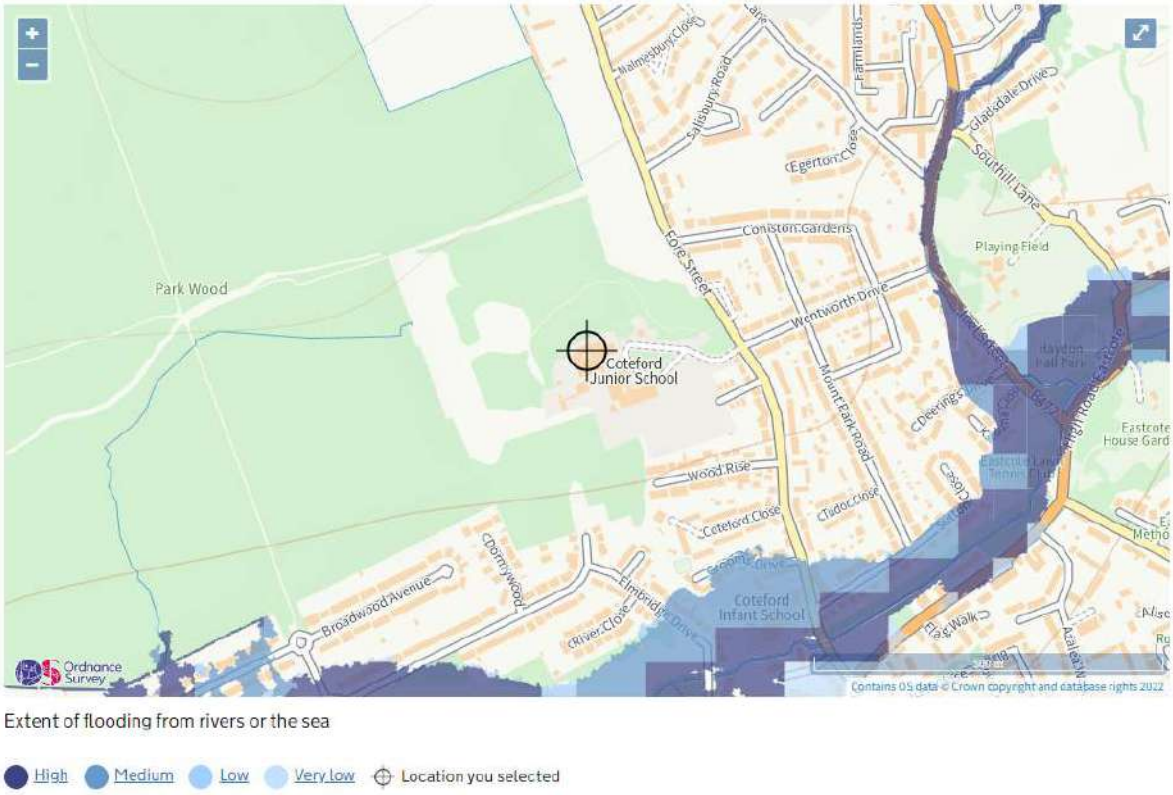


Figure 3-2: Surface Water Flood Risk Map

3.1.2 Ground Water Flooding

The SFRA groundwater mapping tool identifies that the site is in a region that is considered to be at moderate risk of groundwater flooding (The EA have indicated that there is between a 25-50% chance of groundwater flooding). It should be noted that the surrounding areas to the site are considered to be at low risk of groundwater flooding (less than 25% chance of groundwater flooding occurring). This will be considered in the proposed drainage strategy for the site. See Figure 3-3 for the West London SFRA Groundwater flood risk mapping.

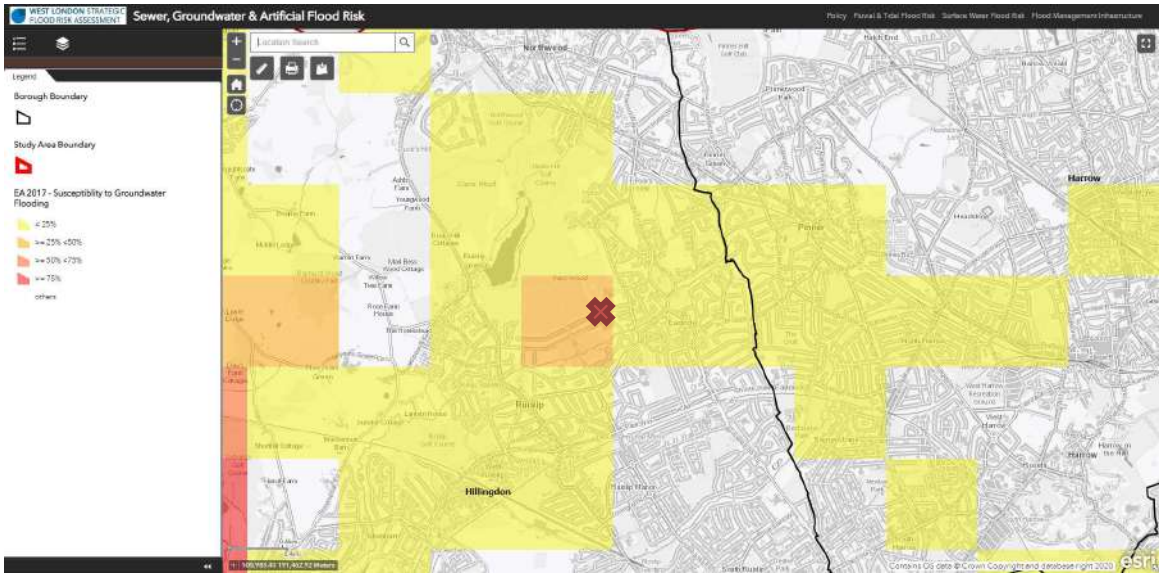


Figure 3-3: Groundwater Flood Risk Map.

However, site investigations have been undertaken on the site and these identified that the presence of ground water was not present on site. It should be noted that the window samples taken on site only reached depths of 5m. Ground water levels should be confirmed on site prior to construction works taking place. It has been calculated that provided the water levels remain below 55.4mAOD, there should be no adverse effects of groundwater on the proposed drainage plan. Mitigation controls for controlling potential groundwater flooding will be considered at the next design stage in the event that groundwater levels are higher than 55.4mAOD. To limit the risk of groundwater flooding, ground levels will fall away from the building. Where this is not possible, surface water channel drains and gullies will be used to divert surface water runoff away from the building.

3.1.3 Historic Sewer Flooding Records

There is evidence of historic sewer flooding occurring nearby to the site, as indicated by the SFRA sewer flooding records map. Information relating to the previous sewer flood events is not available at the time of writing this report. Between 1 and 20 historic sewer flooding events have occurred nearby to the site. The location of these is not known but it is understood they did not affect the site. The risk of flooding from sewerage is considered to be low.

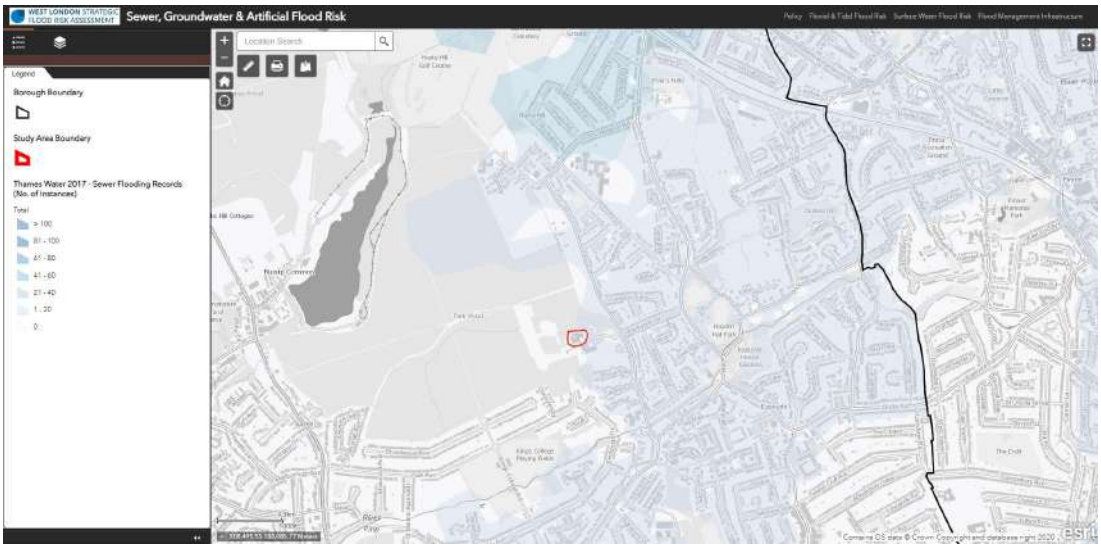


Figure 3-4: Historic Sewer Flooding Map

3.1.4 Source Protection Zone

The proposed site is indicated to lie within zone 3 (Total Catchment) of a source protection zone. The effects of ground water infiltration and other waste will need to be considered in order to prevent contamination within the protection zone.

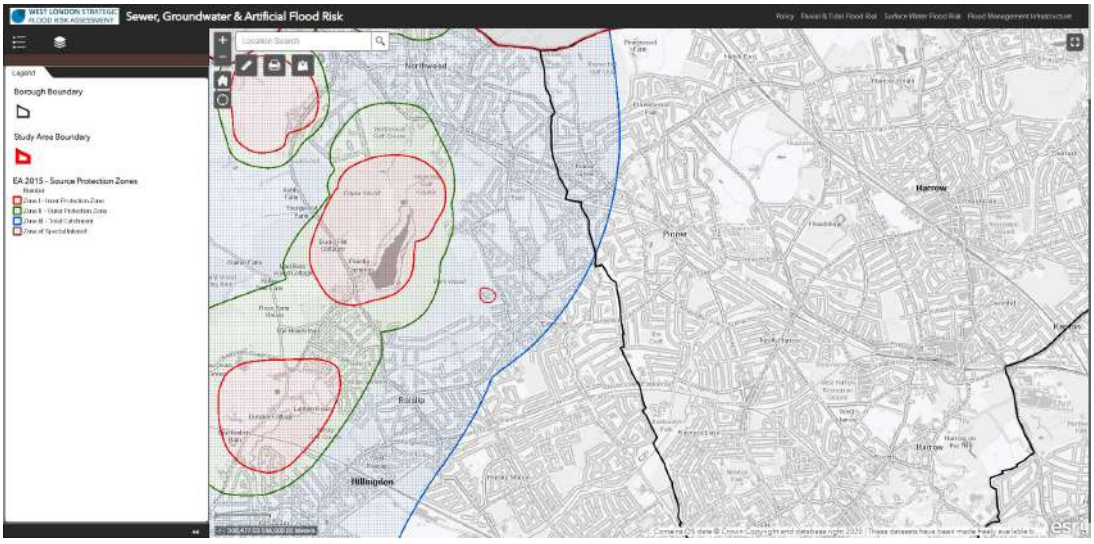


Figure 3-5: Source Protection Zone

3.1.5 Flooding From Artificial Sources

The site is not considered to be at risk of flooding from artificial sources, including when there is additional flooding from rivers. Refer to figure 3-6 below for the flood risk map from artificial sources, provided by the EA for the Pinn River School site.

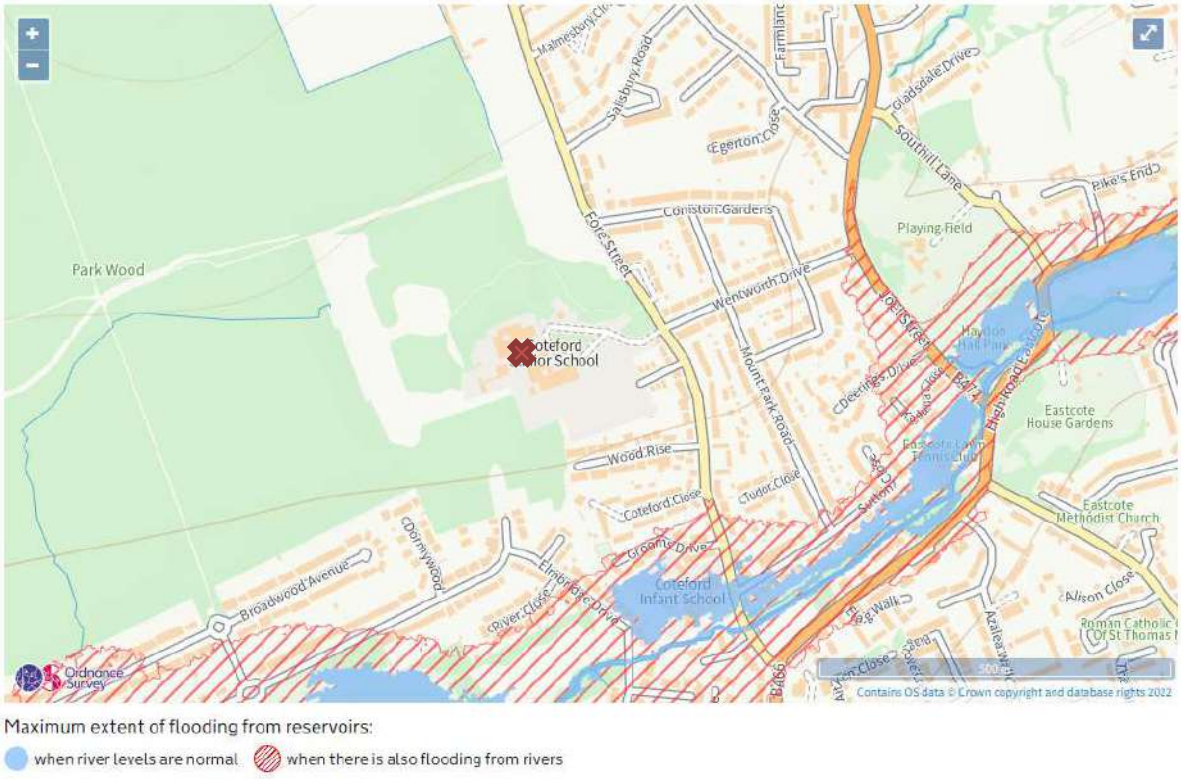


Figure 3-6: Risk of flooding from artificial sources

4.0 Existing Drainage

4.1 Public Sewerage

4.1.1 Foul Water

There are no public foul water sewers located on site. The nearest foul water sewer is located within the playing field for Coteford School, south of the proposed development site. The public Thames Water foul sewers are sized to DN675 and flows southeast, as shown in figure 4-1. It has been recorded that the nearest public foul water sewer has a depth of approximately 10m. The full records are available in **Appendix E.**

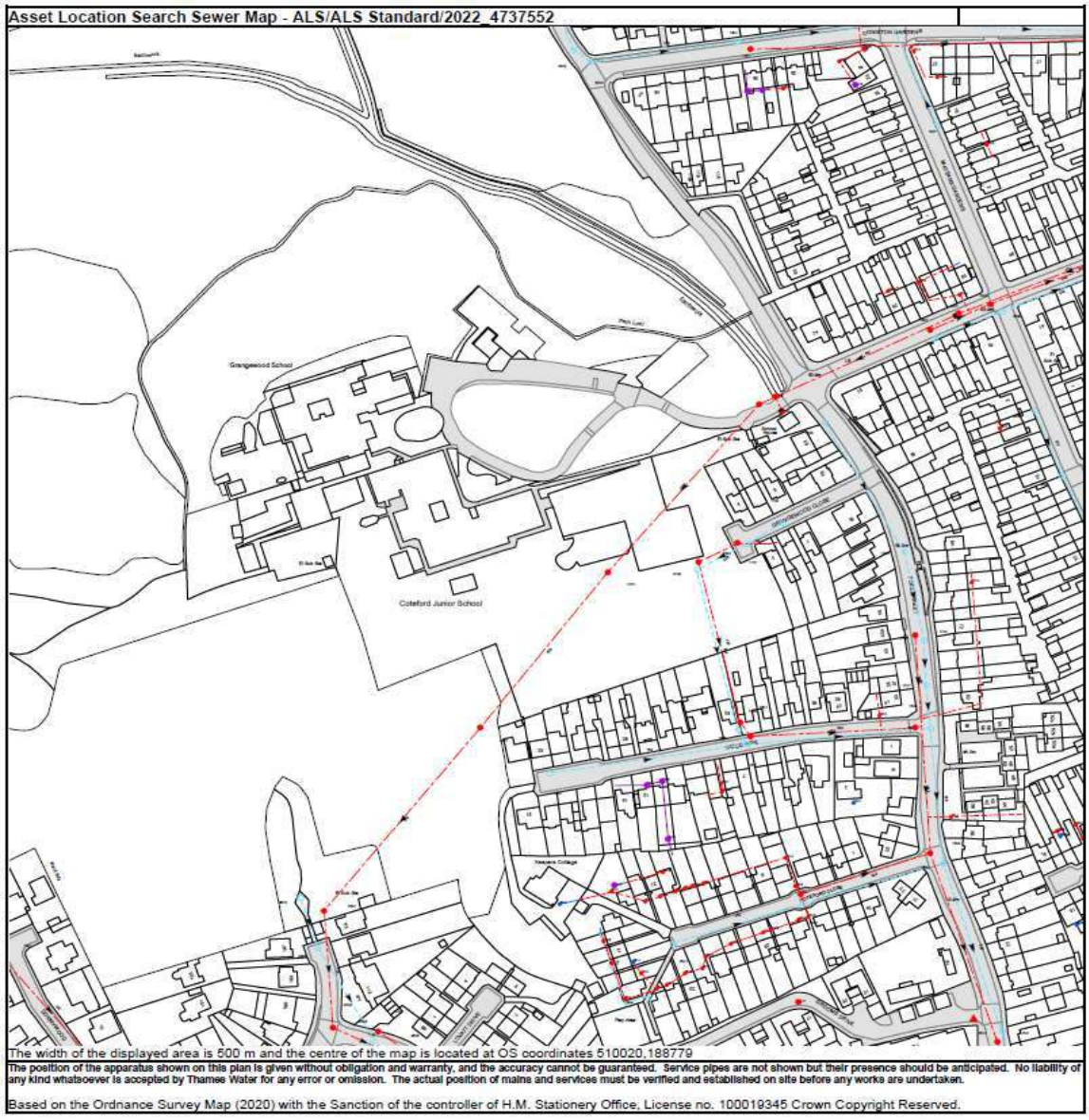


Figure 4-1: Thames Water Asset Location Search

4.1.2 Surface Water

There are no public surface water sewers located on site. The nearest surface water sewer is located within the playing field for Coteford School, south of the proposed development site. The public Thames Water surface water sewers are sized to DN225 and flow southwards as shown in figure 4-1. It has been recorded that the nearest public surface water manhole to the site has an approximate depth of 3.4m. The full records are available in **Appendix E.**

4.2 Private Drainage

4.2.1 Foul Water

A GPR survey was undertaken for the Pinn River school site which identified several private sewers within the site boundary. The existing drainage is currently servicing the existing Grangewood School. Within the site boundary, several DN100 foul sewers connect into an existing manhole proposed to be removed. This length increases into a DN150 sewer and connects into the proposed foul discharge manhole “MH.F2” which is centred on 509918.979, 188788.479. The foul sewer then proceeds to cross the Coteford School playing field and is then anticipated to connect into the public Thames Water foul sewer, although a CCTV survey is required to confirm the connection into the public foul sewer.

It is proposed that all on site foul drainage will be abandoned and tied back to the site boundary, or the existing manhole proposed for retainment, “MH.F2”. A CCTV survey is required to confirm that no upstream properties are served by the identified private drainage prior to sewer abandonment. Refer to **Appendix F** for site plans of the existing foul drainage.

4.2.2 Surface Water

Several surface water sewers have been identified within the site boundary. The existing drainage is currently servicing the existing Grangewood School. All on site surface water sewers are sized to DN100, with exception given to the discharge surface water sewer which is sized to DN150. The discharge manhole is centred on 509909.337, 188783.855. The surface water sewer then proceeds to cross the Coteford School playing field and is then anticipated to connect into the public Thames Water sewer, although a CCTV survey is required to confirm the connection into the public surface water sewer.

It is proposed that all on site surface water drainage will be abandoned and tied back to the site boundary. A manhole is proposed to be installed on the identified DN150 discharge sewer as shown within **Appendix D**. A CCTV survey is required to confirm that no upstream properties are served by the identified private drainage prior to sewer abandonment. Refer to **Appendix F** for site plans of the existing surface water drainage.

4.3 Land Drainage

No existing land drainage has been identified on the Pinn River School site.

5.0 Proposed Drainage Strategy

5.1 General

It is proposed that the drainage strategy for the site utilises separate surface water and foul water drainage systems. The proposed Drainage General Arrangement drawing is shown in **Appendix D**.

The proposed surface water network will utilise rainwater pipes, gullies, channels, and pipes to collect and convey storm water. A larger attenuation tank will be utilised prior to the outfall from site to attenuate excess surface water during high intensity rainfall events. A permeable pavement utilised beneath the MUGA will also offer further storage whilst draining the MUGA pitch.

Surface water discharge from site will be limited to 2.9l/s using a vortex flow control installed in the final proposed chamber.

The proposed surface water network drains an area of 0.76ha. The design of the network was intended to ensure that the pre-development area draining unrestricted to the school network was either equal to or less than the post-development undrained area. Due to the existing site levels and fragmented increases of impermeable areas to the car park, the drainage strategy has proposed to re-design an area of existing hardstanding so that it drains to the proposed network and allow some new hardstanding additions to drain freely to the existing network. The proposed drainage strategy results in a marginal net decrease in the area of the site draining unrestricted to the existing network.

The foul water will discharge via an existing manhole (FW23) via gravity.

All drainage will be designed and constructed in accordance with the Building Regulations Part H, the Sewerage Sector Guidance (SSG), the Design and Construction Guidance (DCG) and any other relevant legislation, guidance or standards as deemed appropriate.

A capacity check has been submitted and accepted by Thames Water for both the surface water and foul water connections.

5.2 Surface Water

In line with the 2021 London Plan Drainage Hierarchy (Policy SI 13), surface water run-off from a site should endeavour to be controlled as close to the source as possible. Discharge from site should be via one of the methods detailed in **Table 5-1**, in descending priority.

Table 5-1: Discharge Opportunities

London Sustainable Drainage Hierarchy	Site Specific Application
Store rainwater for later use	Due to the spatial constraints and nature of the development, rainwater harvesting measures have not been proposed on this development.
Use infiltration techniques, such as porous surfaces in non-clay areas	Geological data obtained from site investigations indicates that the site is underlain by London Clay. The geology is therefore expected to have a low permeability rate. Due to the location of the site, there are very few locations within the site boundary that are 5m or more away from a structure, as required by Building Regulations Part H. it is deemed inappropriate to utilise ground infiltration. The site is located within source protection zone 3. As the site is a brownfield site, it is deemed inappropriate to utilise ground infiltration.
Attenuate rainwater in ponds or open water features for gradual release	There is limited open space available on site. Utilising an open water feature would be unviable due to this space restriction. Furthermore, the utilisation of above ground features would reduce the available land for play space, which is deemed a necessary amenity of the site.
Attenuate rainwater by storing in tanks or sealed water features for gradual release	A below ground geo-cellular attenuation tank is proposed on the site. Currently, this will provide the attenuation required on site. Attenuation storage to be optimised further at the next design stage. The proposed attenuation tank will provide approximately 487.9m³ of storage for the site.
Discharge rainwater direct to a water course	The nearest watercourse is the River Pinn located approximately 500m away to the south of the site. Discharging to the watercourse under gravity is not considered feasible due to the distance and third-party land involved.

London Sustainable Drainage Hierarchy	Site Specific Application
	A minor unnamed watercourse has also been identified nearby to the site, located within the London green belt. Discharging into this minor watercourse has been considered unfeasible due to the requirement to construct within the London green belt and the density of established trees on the route.
Discharge rainwater to a surface water sewer/drain	There are public surface water sewers that serve the immediate area, including the previous Grangewood school. It is proposed that the site discharges to the surface water sewer located adjacent to the site boundary. Surface water will be discharged at a maximum rate of 2.9 l/s. Channel drains along the eastern edge of the proposed building will be required in order to protect the building from surface water runoff. This will discharge into the existing drainage located south of the site.
Discharge rainwater to a combined sewer	There are no public combined sewer networks that serve the immediate area. It is therefore not feasible to discharge to a public combined sewer network.

5.2.1 Proposed Site Discharge

The proposed surface water drainage network shall be designed so that the surface water runoff generated up to the 1 in 100 year + 40% climate change rainfall event shall be contained within areas on site, so not to cause damage to buildings, essential services or adjoining developments and services. It is possible to discharge surface water by gravity by managing the above ground drainage design in such a way as to achieve optimal connectivity into the below ground drainage network.

A Causeway Flow pre-development discharge calculation was carried out to determine the greenfield run off rate of the site. The greenfield run off rates for the entire site area are presented in **Table 5-2**.

Table 5-2: **Greenfield Runoff Rates**

Rainfall Event	Greenfield Runoff Rate
1 in 1 Year	2.9
QBAR	3.4
1 in 30 Year	8.1
1 in 100 Year	10.8

A pre-development enquiry was previously submitted to Thames Water and is contained in **Appendix G.** The enquiry was sent following a prior revision of the scheme where the site catchment was reduced. Since then, the discharge rate has been increased from 2.5l/s to 2.9l/s – a revised pre-development enquiry has been submitted but at the time of writing no response has yet been received.

A vortex flow control will be used to reduce and control the flow rate. This will ensure that the proposed discharge rates are achieved and reduce the impact on the receiving public sewer network, reducing the risk of the sewer overflowing and causing flooding. This discharge rate has been used for all Causeway Flow calculations; see **Appendix H** for this information.

5.2.2 Attenuation

As highlighted previously, excess surface water will be attenuated through the use of a below ground attenuation tank, although this is likely to be expanded upon at the next design stage. The attenuation storage tank is placed at the end of the proposed surface water system, only prior to the discharge and flow control manhole SW33. The design of the attenuation tank will provide storage for rainfalls up to and including the 1 in 100 year + 40% CC storm event. A hydraulic model has been developed for the site, the results of which are contained within **Appendix H**.

Attenuation tank specifications:

- Tank to be placed underneath the permeable MUGA pitch
- Area – 456.5m²
- Depth – 1.125m
- Porosity – 95%
- Approximate Storage Volume – 487.9m³
- Cover Level – 56.10 mOAD – *(to be confirmed following receipt of the levels plan)*
- Invert Level – 54.14 mOAD

5.2.3 Sustainable Drainage Systems

Developments should utilise sustainable drainage systems (SuDS) unless there are practical reasons for not doing so. As mentioned previously, the design should aim to reduce run-off rates and ensure

that run-off is managed as close to its source as possible as per the drainage hierarchy (see **Table 5-1**).

The SuDS Hierarchy sets out the preferred method of discharging and managing water from a development site and aims to highlight why each item has been utilised or discounted.

Table 5-3 analyses the SuDS hierarchy and the appropriate techniques with specific focus on this project.

Table 5-3: SuDS Opportunities

SuDS Technique	Site Specific Analysis
Rainwater Harvesting	As discussed in Table 5-1, a rainwater harvesting system has not been proposed on this site due to the nature of the development and spatial requirements.
Living Roofs/Areas	As discussed in Table 5-1, living roofs have not been included on this scheme due to the implication of increased loading on the proposed structure.
Basins and Ponds	Due to the spatial requirements of ponds and basins, they have not been incorporated into this scheme.
Filter Strips and Swales	Green SuDS features such as filter strips and Raingardens could be implemented on site at a later design stage. However, these are not currently proposed for use.
Infiltration Devices	Infiltration, as discussed previously, is not appropriate for this scheme
Permeable Surfaces	Permeable paving is proposed for use across the site. Currently, this is proposed exclusively over the MUGA pitch in the south of the site.
Tanked Systems	A below ground attenuation tank is proposed to manage flood risk on site.

5.2.1 Water Quality

The Site has been assessed in line with the 'Pollution hazard indices for different land use classifications' table as presented in the CIRIA SuDS Manual C753. See figure 5-1 for further details.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Figure 5-1: Extract of CIRIA SuDS Manual C753. Pollution Hazard Indices for Land Use Classification

The site has been assessed as having a 'low' pollution hazard level. At roof level, the land use has been classified as 'Other roofs' due to the roof being used for a school rather than a residential development. At ground level, land use has been identified as being equivalent to 'individual property driveways' as there is no vehicle access to the majority of the site and the site meets the example use of being a school.

The only area within the proposed drained area at heightened pollution risk is the area of proposed parking to the north and additional parking incorporated into the scheme. It is proposed to mitigate pollution from this area using a bypass separator.

5.2.2 Car Parking Drainage Strategy

As previously discussed, the existing car park is being upgraded to accommodate the proposed scheme. The strategy is to largely retain the majority of this car park, however there are some areas where additional parking and hardstanding is to be required. As the addition of hardstanding is not concentrated to one place but fragmented over the whole proposed car park, areas of existing parking have been drained into the proposed network to compensate for the addition in area.

It has been calculated that the increase in impermeable area from the additional car parking is 0.107ha. It is proposed that some of the new areas of hardstanding will discharge unrestricted into the existing drainage system (0.07ha). In order to compensate for the increase in hardstanding area entering unrestricted into the existing drainage network, the car parking area in the north of the site has been included within the proposed drainage network's catchment area (0.12ha). This has been deemed acceptable as the car parking area in the north has a marginally larger surface water catchment area than the increase in hardstanding area across the remaining car park, i.e., the area draining unrestricted is marginally less than in the pre-development case. The total increase in the impermeable network (in addition to the school) as a result of the car parking is 0.107ha – therefore there is a net decrease in unrestricted discharge to the existing network. Refer to **Appendix D** for the proposed drainage general arrangement.

5.3 Foul Water

The foul water drainage strategy includes the proposed location of external below ground drainage. Due to the existing levels being relatively flat, in addition to Curtins not yet receiving the proposed levels strategy, the foul drainage strategy aims to minimise the fall across the site in order to adequately provide foul drainage. The foul drainage design is subject to change following coordination with the M&E Engineers and the proposed levels plan. Thames Water have confirmed that the public foul water network has sufficient capacity to service the proposed site, as can be seen in **Appendix G**.

The foul water drainage is currently proposed to discharge via a direct gravity connection into the existing foul manhole FW23 as can be seen in **Appendix D**.

6.0 General Maintenance

It is assumed that all drainage within the site will be maintained as a private network. A suitable maintenance strategy will be included within handover documentation by the contractor once final details and suppliers have been chosen for the individual drainage elements. This strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

An Operation and Maintenance Manual has been written by Curtins and should be referenced for general maintenance, 080522-CUR-XX-XX-T-C-92001, this can be found in **Appendix I.**

7.0 Conclusions and Recommendations

This report is intended to provide further details on the design of the drainage systems for the proposed redevelopment of Pinn River School and to act as additional information in support of the planning application. The project proposes the demolition of an existing building, Grangewood School, and the construction of a new school providing capacity for 180 students and staff members. The conclusions to be drawn from this report are as follows:

- The site has not been identified to be at risk of flooding from fluvial or surface water sources.
- The site has been identified to be at moderate risk of ground water flooding.
- The site is not located within a critical drainage area and is located in Flood Zone 1.
- The proposed scheme will limit discharge to the 1 in 1-year greenfield return period by using a vortex flow control device, limiting the discharge rate from site to 2.9 l/s.
- Excess surface water will be managed using a below ground attenuation tank.
- The surface and foul water will discharge to separate surface and foul water Thames Water sewers.
- The site is seen to be a low risk of surface water pollution.
- Additional information is still required in order to fully develop the proposed drainage strategy.

8.0 Appendices

Appendix A – Proposed Architect's Plans

Appendix B – Topographical Survey

Appendix C – Proposed Landscape Architect's Plans

Appendix D – Proposed Below Ground Drainage General Arrangement

Appendix E – Thames Water Sewer Record

Appendix F – CCTV & Utilities Survey

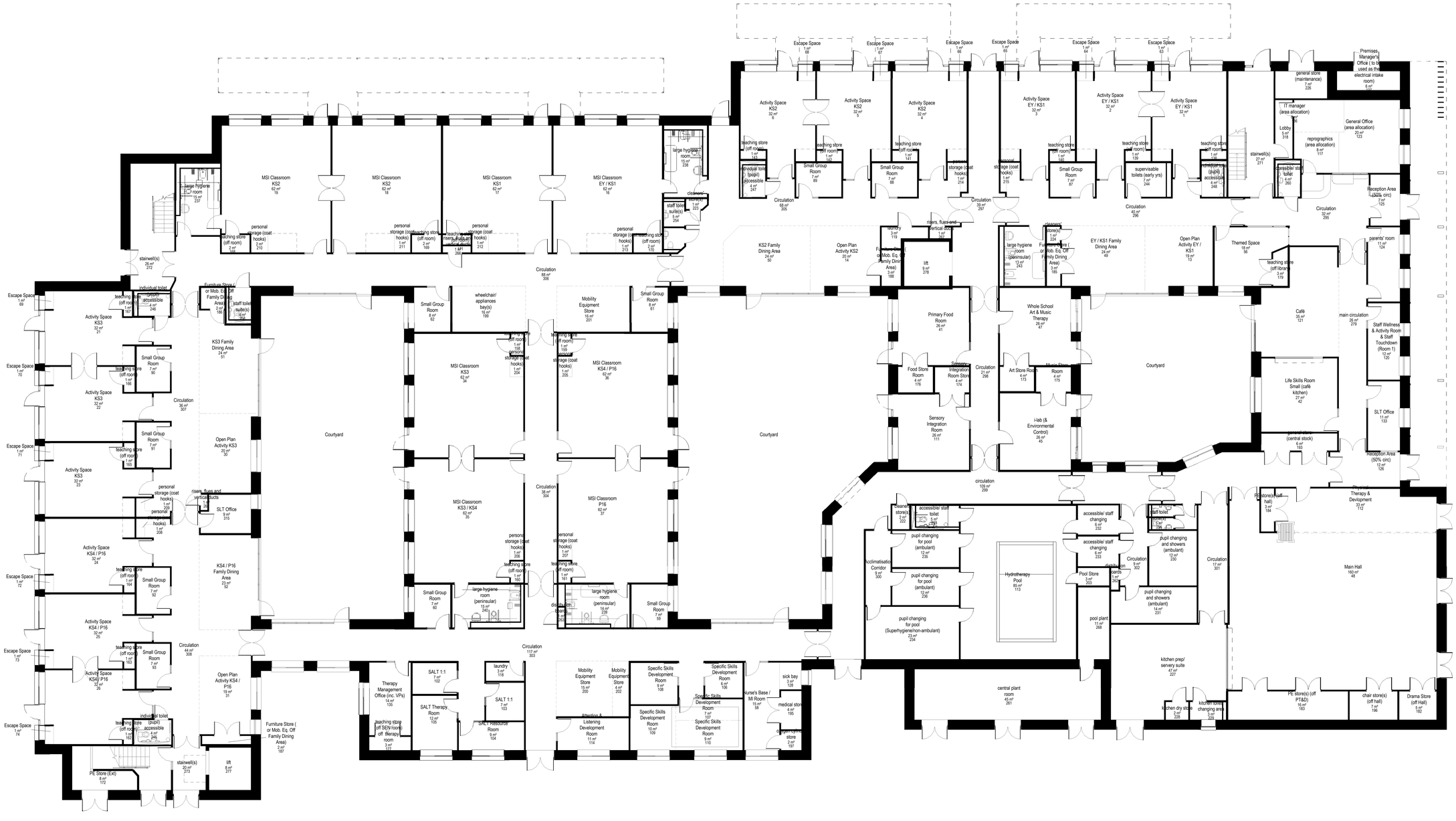
Appendix G – Thames Water Pre-Development Enquiry

Appendix H – Causeway Flow Calculations

Appendix I – O&M Manual

8.1 Appendix A – Proposed Architect's Plan

Notes:



Scale 1 to 100 — 1 0 1 2 5 Metres

Amendments

No.	Description	Date	Issued by
1	Issued for planning	2022 11 07	MR

Use figured dimensions only. All levels and dimensions to be checked on site. This drawing is to be read in conjunction with all other relevant drawings and specifications.

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Project Name:
Pinn River SEND School LB Hillingdon

Dwg Reference:
Ground Floor Plan

Drawn: MR Checked: MG

Scale: 1 : 100 @ A0 Project Issue Date: September 2022

Project:	Originator:	Volume:	Level:	Type:	Role:	Number:
FS0728 -	NOV -	V1 -	00 -	DR -	A -	PL05

Status:	Suitability Description:	Orig Paper Size:
S2	INFORMATION	A0
Revision:	Revision Description:	Noviun Job No:
P0 1	PLANNING	Z0575

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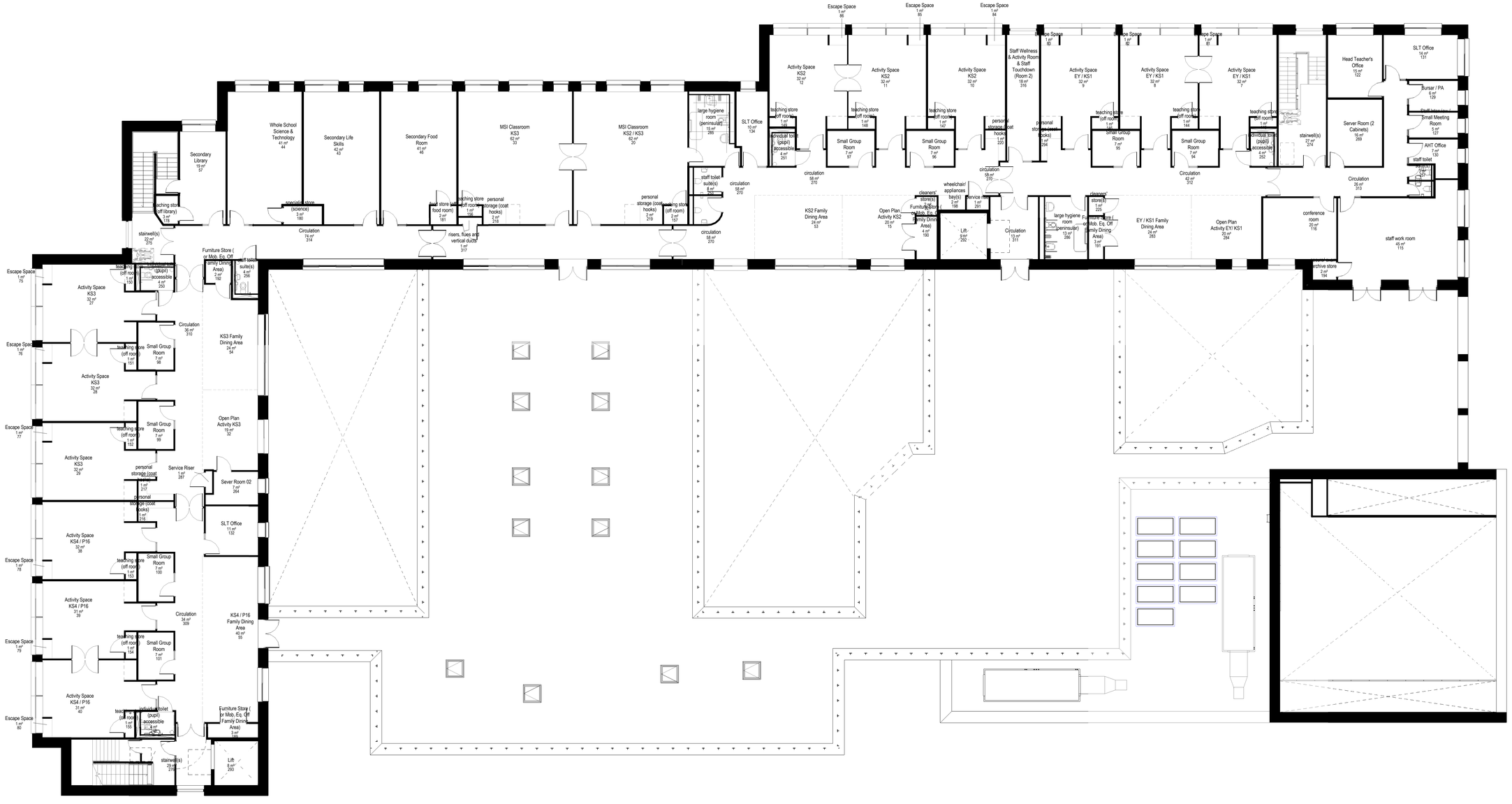

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Project Name:
Pinn River SEND School LB Hillingdon

Dwg Reference:
First Floor Plan

Drawn: MR Checked: MG

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Status: S2 Suitability Description: INFORMATION Orig Paper Size: A0

Revision: P0 1 Revision Description: PLANNING Noviun Job No: Z0575

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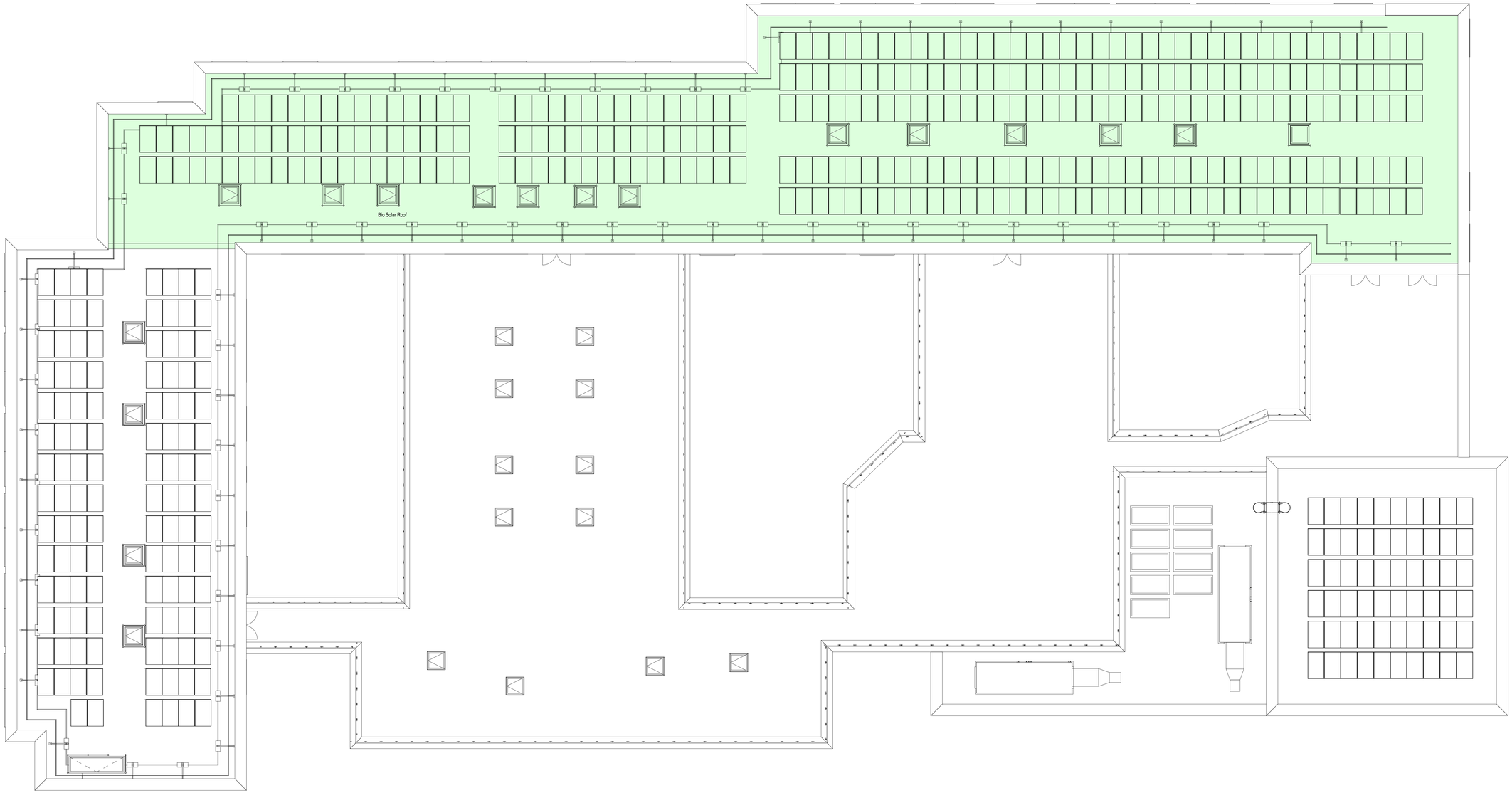
Green Roof



Scale 1 to 100 1 0 1 2 5 Metres

Amendments

No.	Description	Date	Issued by
1	Issued for planning	2022 11 07	MR

Use figured dimensions only. All levels and dimensions to be checked on site. This drawing is to be read in conjunction with all other relevant drawings and specifications.

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Project Name:
Pinn River SEND School LB Hillingdon

Dwg Reference:
Roof Plan

Drawn: MR Checked: MG

Scale: 1 : 100 @ A0 Project Issue Date: September 2022

Project:	Originator:	Volume:	Level:	Type:	Role:	Number:
FS0728	NOV	V1	02	DR	A	PL07

Status: S2 Suitability Description: INFORMATION Orig Paper Size: A0

Revision: P0 1 Revision Description: PLANNING Noviun Job No: Z0575

1 North Elevation
1 : 100

2 South Elevation
1 : 100

3 East Elevation
1 : 100

4 West Elevation
1 : 100

Notes:

Elevation Material Legend

1. PPC aluminium coping.
2. Buff brick. Exact brick TBC at planning stage.
3. Hit & miss buff brick screen. Exact brick TBC at planning stage.
4. Aluminium coloured panel. Exact colour TBC at planning stage.
5.
6. Aluminium window with aluminium louvre and / or opening lights - Grey or similar. Exact colour TBC at planning stage.
7. Aluminium door with with glazed infill panels with fixed / opening light above - Grey or similar. Exact colour TBC at planning stage.
8. Aluminium door with with glazed infill panels with fixed / opening light above aluminium opening light and glazed side screen - Grey or similar. Exact colour TBC at planning stage.
9. Aluminium louvre doors - Grey or similar. Exact colour TBC at planning stage.
10. Aluminium curtain wall - grey or similar. Exact colour TBC at planning stage.
11. Glazed spandrel panel. Colour TBC at planning stage.
12. Timber column. Exact colour TBC at planning stage.
13. Proposed signage. Exact material TBC at planning stage.
14. Entrance canopy - Grey. Exact colour TBC at planning stage.
15. Glass balustrade panels.
16. External canopy. Exact material colour TBC at planning stage.
17. Metal guard rail. Exact colour TBC at planning stage.
18. Photovoltaic array.
19. Metal step-over ladder. Exact colour TBC at planning stage.

Scale 1 to 100 1 0 1 2 5 Metres

Amendments

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Project Name:
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Dwg Reference:
Elevations

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Scale: As indicated @ A0 Project Issue Date: September 2022

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FS0728	NOV	V1	XX	DR	A	PL08

Status: S2 Suitability Description: INFORMATION Orig Paper Size: A0

Revision: P0 1 Revision Description: PLANNING Noviun Job No: Z0575

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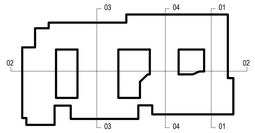

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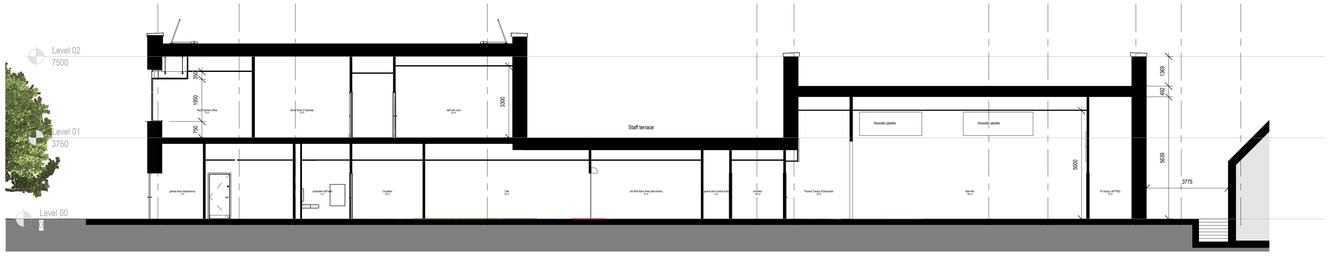

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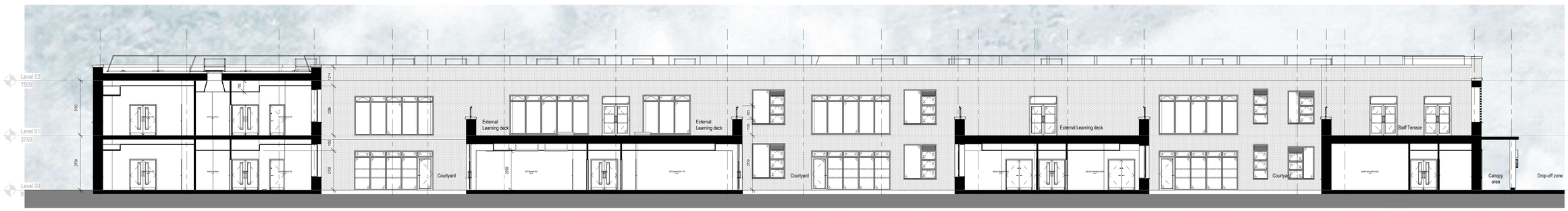

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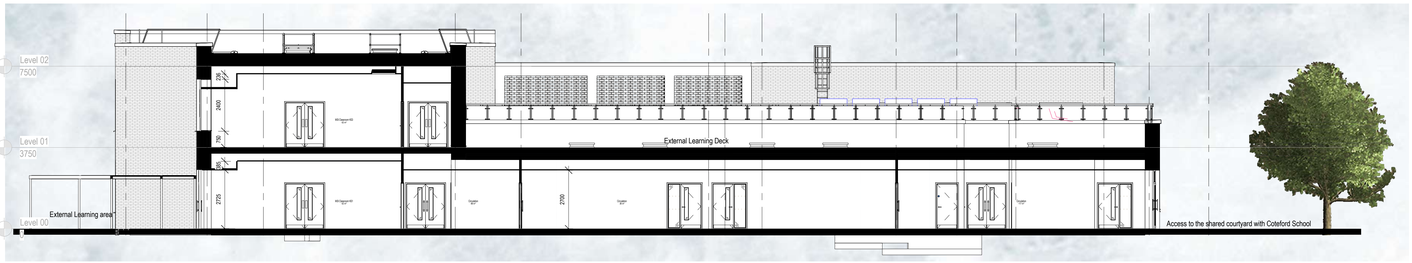

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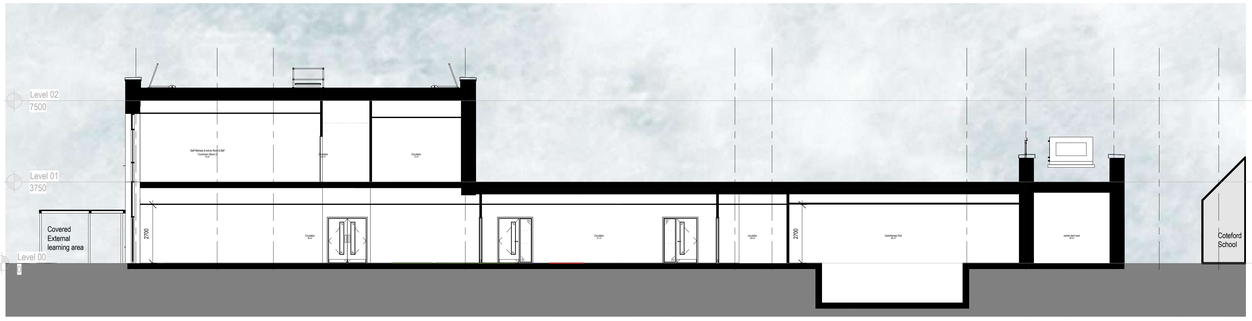

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Project Name:
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Dwg Reference:
Sections

Drawn: MR Checked: MG
Scale: As indicated @ A0 Project Issue Date: September 2022

Project:	Originator:	Volume:	Level:	Type:	Role:	Number:
FS0728	NOV	V1	XX	DR	A	PL09

Status: S2
Suitability Description: INFORMATION
Orig Paper Size: A0
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Revision Description: PLANNING
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Dwg Reference:
External Visuals 01

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FS0728	NOV	V1	XX	DR	A	PL10

Status: **S2**
Suitability Description: **INFORMATION**
Orig Paper Size: **A1**
Revision: **P0 1**
Revision Description: **PLANNING**
Noviun Job No: **Z0575**

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Project Name:
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Dwg Reference:
External Visuals 02

Drawn: MR Checked: MG

Scale: @ A1 Project Issue Date: September 2022

Project:	Originator:	Volume:	Level:	Type:	Role:	Number:
FS0728	NOV	V1	XX	DR	A	PL11

Status: **S2**
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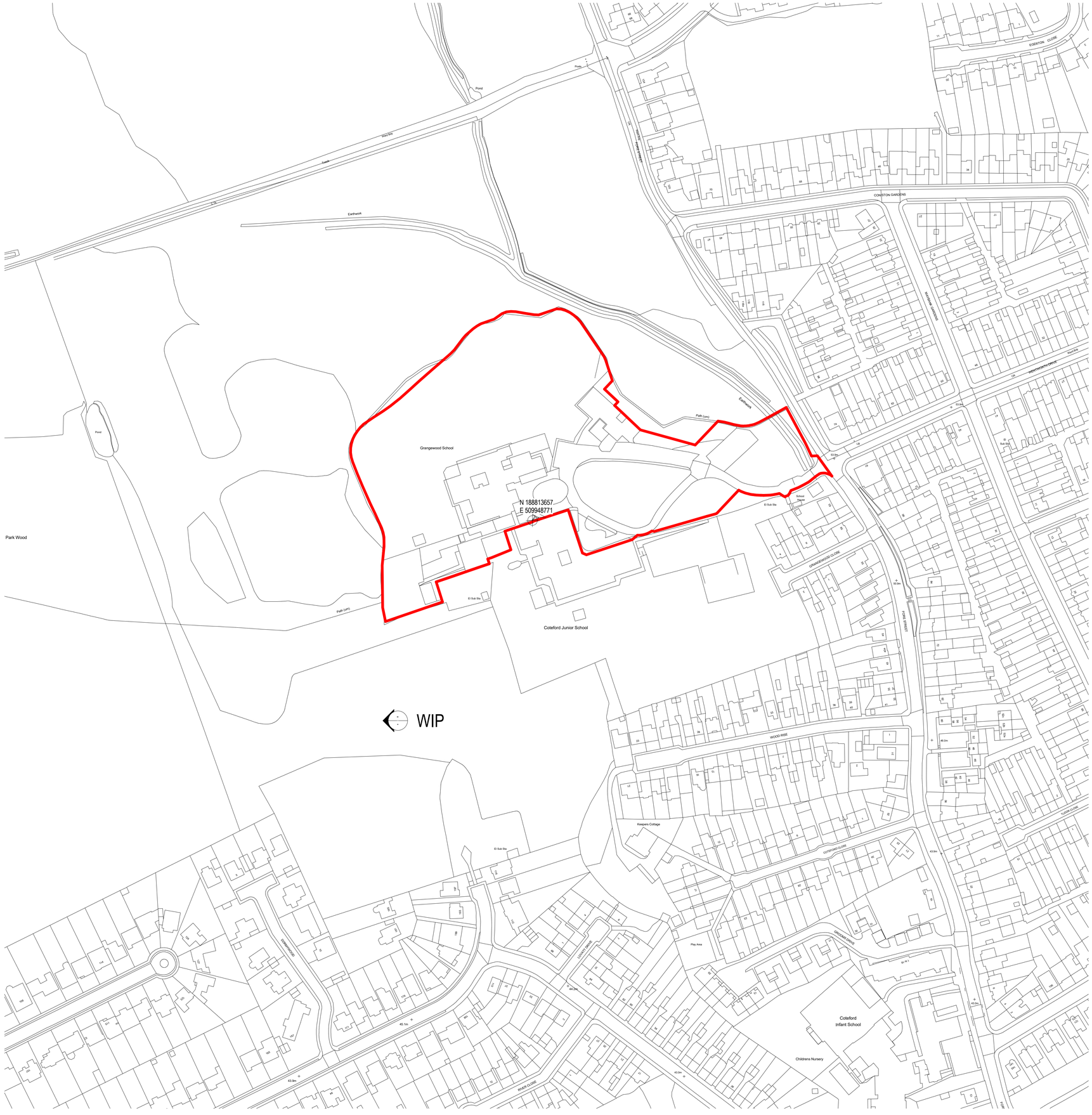
Revision Description: **PLANNING**
Noviun Job No: **Z0575**



Notes:

Development boundary

Scale 1 to 1250 — 12.5 0 12.5 25 62.5 Metres

Amendments

No.	Description	Date	Issued by
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Project Name:
Pinn River SEND School

Dwg Reference:
Location Plan

Drawn: MR Checked: MG

Scale: 1 : 1250 @ A1 Project Issue Date: Sep 2022

Project:	Originator:	Volume:	Level:	Type:	Role:	Number:
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Status: **S2** Suitability Description: **FOR INFORMATION** Orig Paper Size: **A1**

Revision: **P0 1** Revision Description: **PLANNING** Noviun Job No: **Z0575**

Notes:

WIP

Development boundary

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Amendments

No.	Description	Date	Issued by
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Project Name:
Pinn River SEND School

Dwg Reference:
Proposed Block Plan

Drawn: MR Checked: MG

Scale: 1 : 500 @ A1 Project Issue Date: Sep 2022

Project:	Originator:	Volume:	Level:	Type:	Role:	Number:
FS0728	NOV	V2	00	DR	A	PL02

Status: S2
Suitability Description: FOR INFORMATION
Orig Paper Size: A1
Revision: P0 1
Revision Description: PLANNING
Noviun Job No: Z0575

8.2 Appendix B – Topographical Survey

Notes

1. The survey grid is a local grid, coincident with Ordnance Survey National Grid at 14STN.
2. Surveyed boundary features are not necessarily legal boundaries.
3. Dimensions should not be scaled. All dimensions should be checked on site before any fabrication / construction.
4. Copyright of all data produced by Technics Group shall remain with Technics Group unless otherwise specifically agreed.
5. Information provided should not be altered or modified in any way. It should not be used for any purpose other than for which it was intended and should not be issued to other parties without prior agreement of Technics Group.
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8. All utilities have been identified to the best of the surveyors knowledge. The correct identification of the utility types can not be 100% guaranteed, therefore these should be independently verified prior to use in any design and building works.
9. External eaves levels are surveyed to lowest tile position.
10. Contours, if applicable, are not shown over hard standing, gravel, banking or flower borders.

Level Datum

ALL LEVELS ARE ORTHOMETRIC HEIGHTS RELATED TO OSGM15 GPS DATUM, COMPUTED USING LEICA SMARTNET RTK NETWORK.

Topo Key

STREET FURNITURE
BB Belisha Beacon
BL Basement Light
Bin Litter Bin
BO Bollard
BS Bus Stop
CPO Concrete Post
ECP Electric Charging Point
EP Electric Pole
FB Flower Bed
FHM Fire Hydrant Marker
FL Flood Light
FP Flag Pole
FPO Fence Post
JB Junction Box
GB Grit Box
GMK Gas Marker Post
GPO Gate Post
IBO Illuminating Bollard
LH Lamp Hole
LP Lamp Post
LPO Lockable Post
MK Marker
MPO Metal Post
NP Name Plate
PB Post Box
PM Parking Meter
RPO Reflector Post
RS Road Sign
SI Sign
STN Survey Station
Tap Water Tap
TCB Telephone Call Box
TL Traffic Light
TLCB Traffic Light Control Box
TP Telegraph Post
TPO Timber Post

PIPES & SERVICES
ACU Air Condition Unit
DP Down Pipe
FWP Foul Water Pipe
GP Gas Pipe
RWP Rain Water Pipe
SP Stand Pipe
SVP Soil Vent Pipe
VP Vent Pipe
WP Waste Pipe

LEVELS & DEPTHS
A Approximate
BD Back Drop Depth
BDL Back Drop Level
CD Chamber Depth
DHL Door Head Level
DSL Door Sill Level
DPC Damp Proof Course
EL Eaves Level
FFL Finished Floor Level
FRL Flat Roof Level
ICL Cover Level
ID Invert Depth
IL Invert Level
OD Outlet Depth
OL Outlet Level
PWL Parapet Wall Level
RL Ridge Level
SD Sump Depth
SFD Soffit Depth
SFL Soffit Level
SiltL Silt Level
SL Sump Level
SSL Structural Slab Level
TFL Top of Fence Level
THL Threshold Level
TTL Top of Tree Level
TWL Top of Wall Level
USL Underside Level
WL Water Level
WHL Window Head Level
WSL Window Sill Level

FENCES & WALLS
BW Block Wall
BRP Brick Pier
BRTW Brick Retaining Wall
BRW Brick Wall
BWF Barbed Wire Fence
CBF Close Board Fence
CIF Corrugated Iron Fence
CLF Chain Link Fence
CPF Chestnut Pailing Fence
CRW Concrete Retaining Wall
CW Concrete Wall
CWF Chicken Wire Fence
Dil Dilapidated
HR Handrail
IWF Interwoven Fence
LF Lattice Fence
MF Miscellaneous Fence
MRF Metal Railing Fence
OBF Open Board Fence
PCF Post & Chain Fence
PNF Panel Fence
PRF Post & Rail Fence
PWF Post & Wire Fence
RTW Retaining Wall
STW Stone Wall
SRTW Stone Retaining Wall
WMF Wire Mesh Fence

INSPECTION CHAMBERS
BH Borehole
CATV Cable Television
CDC Concrete Drainage Channel
EIC Electric Inspection Cover
ER Earth Rod
FH Fire Hydrant
FWIC Foul Water Inspection Cover
GIC Gas Inspection Cover
GM Gas Meter
GV Gas Valve
G Gully
IC Inspection Cover
KI Kerb Inlet
LHP London Hydraulic Power
MDC Metal Drainage Channel
MW Monitoring Well
NFI No Further Information
RE Rodding Eye
SDIC Service Duct Inspection Cover
SV Stop Valve
SWCP Storm Water Catch Pit
SWIC Storm Water Inspection Cover
TCIC Traffic Control Inspection Cover
TIC Telecom Inspection Cover
UIC Unidentified Inspectional Cover
UTR Unable to Raise
WIC Water Inspection Cover
WM Water Meter
WWO Water Wash Out
WSV Water Stop Valve

SURFACES
BPav Brick Paving
Conc Concrete
CPav Crazy Paving
CPS Concrete Paving Slabs
FB Flower\Shrub Border
KFC Kidney Flint Cobbles
SPM Soft Play Matting
T Tiles
Tmac Tarmac
TPav Tactile Paving
TS Trench Scar

MEASUREMENTS
d Depth(m)
Ø Diameter (mm)
Ext. Ø External Diameter (mm)
H Object Height (m)

Symbology

Single Gate
Double Gate
Banking
Step Up
Ø Diameter shown in mm
Survey Station

Linetypes

Telecom Overhead
Power Overhead
Foul Water
Surface Water
Combined Water
Unknown Services
Change of Surface
Drop Kerb
Fence
Wall
Kerb
Building Face
Overhead Feature
Trench Scar
Tree Canopy
Bushes\Foliage\Overgrowth
Tree Canopy Extents

Trees

SPECIES ABBREVIATION

AL Alder
BE Beech
CE Cedar
CH Cherry
CON Coniferous
CY Cypress
DE Dead
DEC Deciduous
ED Elder
EU Eucalyptus
FR Fruit
HA Hawthorn
HB Hornbeam
HC Horse Chestnut
HL Hemlock
HO Holly
HZ Hazel
LA Larch
LB Laburnum
LM Lime
LO Locust
LU Laurel
MA Maple
MG Magnolia
NS Norway Spruce
PI Pine
PO Poplar
PL Plane
RH Rhododendron
RO Rowan
SAP Sapling
SB Silver Birch
SCN Sweet Chestnut
SHR Shrub
ST Stump
SY Sycamore
WB Whitebeam
WG Wellingtonia
WI Willow
WN Walnut

NOTES:
1. The tree species have been identified to the best of the surveyors knowledge. They have not been verified by an arborist and are not guaranteed. If they are important they should be verified.
2. Tree heights are estimated.
3. A CAD layer exists with the full tree canopies intact which is turned off.
4. Trees with bole diameters below the specified minimum size may not have been surveyed.
5. Multibole sizes are indicative.

SURVEY STATIONS

Name	Easting	Northing	Height
1STN	510016.776	188858.542	55.573
2STN	510062.780	188851.279	54.367
3STN	510084.060	188873.631	54.675
4STN	510119.758	188892.190	54.363
5STN	510136.910	188843.182	54.083
6STN	510087.047	188824.656	53.057
7STN	510091.790	188795.827	51.599
8STN	510106.240	188759.079	49.649
9STN	510086.895	188739.553	51.194
10STN	510039.859	188727.133	51.558
11STN	509994.299	188741.217	52.625
12STN	509963.975	188750.429	54.247
13STN	509936.880	188761.693	54.912
14STN	509925.063	188784.226	55.915
15STN	509894.490	188771.687	56.118
16STN	509883.010	188801.869	56.521
17STN	509889.305	188848.197	56.344
18STN	509931.611	188868.800	57.082
19STN	509968.667	188855.279	56.673
B1STN	509899.279	188809.312	56.378
K1STN	509992.431	188880.257	56.837
K2STN	509970.916	188829.891	56.110
SL1STN	510033.484	188808.821	53.807
SL2STN	509982.145	188800.162	55.401

CLIENT
HSP Consulting Engineers Limited

SITE
Grangewood School
Fore Street, Pinner
HA5 2JQ

DRAWING TITLE
Topographical Survey

PROJECT NUMBER	DRAWING NUMBER	DATE
SP21725	SD21725-01	Sep 2021
SURVEYED BY	DRAWN BY	CHECKED BY
BC / CJ	BC / CJ	CJ
SCALE	SHEET SIZE	SHEET
1:200	A0	1 OF 3

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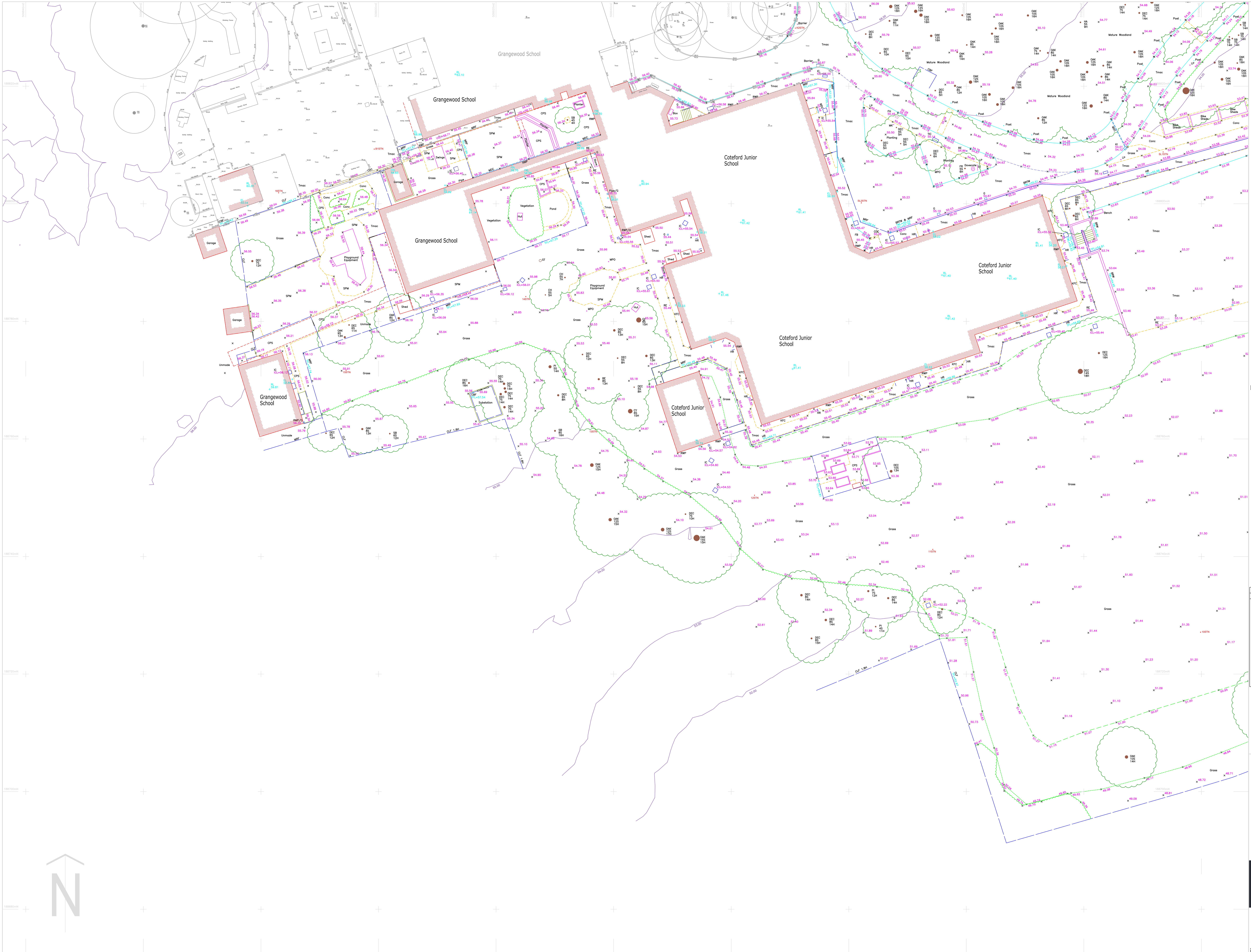

Notes

1. The survey grid is a local grid, coincident with Ordnance Survey National Grid at 14STN.
2. Surveyed boundary features are not necessarily legal boundaries.
3. Dimensions should not be scaled. All dimensions should be checked on site before any fabrication / construction.
4. Copyright of all data produced by Technics Group shall remain with Technics Group unless otherwise specifically agreed.
5. Information provided should not be altered or modified in any way. It should not be used for any purpose other than for which it was intended and should not be issued to other parties without prior agreement of Technics Group.
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7. If the AutoCAD drawing is being read by any system other than AutoCAD it should be checked against a hard copy. Technics Group cannot accept liability for omissions.
8. All utilities have been identified to the best of the surveyors knowledge. The correct identification of the utility types can not be 100% guaranteed, therefore these should be independently verified prior to use in any design and building works.
9. External eaves levels are surveyed to lowest tile position.
10. Contours, if applicable, are not shown over hard standing, gravel, banking or flower borders.

Level Datum

ALL LEVELS ARE ORTHOMETRIC HEIGHTS RELATED TO OSGM15 GPS DATUM, COMPUTED USING LEICA SMARTNET RTK NETWORK.

Topo Key

STREET FURNITURE

BB	Belisha Beacon
BL	Basement Light
Bin	Litter Bin
BO	Bollard
BS	Bus Stop
CPO	Concrete Post
ECP	Electric Charging Point
EP	Electric Pole
FB	Flower Bed
FHM	Fire Hydrant Marker
FL	Flood Light
FP	Flag Pole
FPO	Fence Post
JB	Junction Box
GB	Grit Box
GMK	Gas Marker Post
GPO	Gate Post
IBO	Illuminating Bollard
LH	Lamp Hole
LP	Lamp Post
LPO	Lockable Post
MK	Marker
MPO	Metal Post
NP	Name Plate
PB	Post Box
PM	Parking Meter
RPO	Reflector Post
RS	Road Sign
SI	Sign
STN	Survey Station
Tap	Water Tap
TCB	Telephone Call Box
TL	Traffic Light
TLCB	Traffic Light Control Box
TP	Telegraph Post
TPO	Timber Post

PIPES & SERVICES

ACU	Air Condition Unit
DP	Down Pipe
FWP	Foul Water Pipe
GP	Gas Pipe
RWP	Rain Water Pipe
SP	Stand Pipe
SVP	Soil Vent Pipe
VP	Vent Pipe
WP	Waste Pipe

LEVELS & DEPTHS

A	Approximate
BD	Back Drop Depth
BDL	Back Drop Level
CD	Chamber Depth
DHL	Door Head Level
DSL	Door Sill Level
DPC	Damp Proof Course
EL	Eaves Level
FFL	Finished Floor Level
FRL	Flat Roof Level
ICL	Cover Level
ID	Invert Depth
IL	Invert Level
OD	Outlet Depth
OL	Outlet Level
PWL	Parapet Wall Level
RL	Ridge Level
SD	Sump Depth
SFD	Soffit Depth
SFL	Soffit Level
SiltL	Silt Level
SL	Sump Level
SSL	Structural Slab Level
TFL	Top of Fence Level
THL	Threshold Level
TTL	Top of Tree Level
TWL	Top of Wall Level
USL	Underside Level
WL	Water Level
WHL	Window Head Level
WSL	Window Sill Level

FENCES & WALLS

BW	Block Wall
BRP	Brick Pier
BRTW	Brick Retaining Wall
BRW	Brick Wall
BWF	Barbed Wire Fence
CBF	Close Board Fence
CIF	Corrugated Iron Fence
CLF	Chain Link Fence
CPF	Chestnut Pailing Fence
CRW	Concrete Retaining Wall
CW	Concrete Wall
CWF	Chicken Wire Fence
Dil	Dilapidated
HR	Handrail
IWF	Interwoven Fence
LF	Lattice Fence
MF	Miscellaneous Fence
MRF	Metal Railing Fence
OBF	Open Board Fence
PCF	Post & Chain Fence
PNF	Panel Fence
PRF	Post & Rail Fence
PWF	Post & Wire Fence
RTW	Retaining Wall
STW	Stone Wall
SRTW	Stone Retaining Wall
WMF	Wire Mesh Fence

INSPECTION CHAMBERS

BH	Borehole
CATV	Cable Television
CDC	Concrete Drainage Channel
EIC	Electric Inspection Cover
ER	Earth Rod
FH	Fire Hydrant
FWIC	Foul Water Inspection Cover
GIC	Gas Inspection Cover
GM	Gas Meter
GV	Gas Valve
G	Gully
IC	Inspection Cover
KI	Kerb Inlet
LHP	London Hydraulic Power
MDC	Metal Drainage Channel
MW	Monitoring Well
NFI	No Further Information
RE	Rodding Eye
SDIC	Service Duct Inspection Cover
SV	Stop Valve
SWCP	Storm Water Catch Pit
SWIC	Storm Water Inspection Cover
TCIC	Traffic Control Inspection Cover
TIC	Telecom Inspection Cover
UIC	Unidentified Inspectional Cover
UTR	Unable to Raise
WIC	Water Inspection Cover
WM	Water Meter
WWO	Water Wash Out
WSV	Water Stop Valve

SURFACES

BPav	Brick Paving
Conc	Concrete
CPav	Crazy Paving
CPS	Concrete Paving Slabs
FB	Flower\Shrub Border
KFC	Kidney Flint Cobbles
SPM	Soft Play Matting
T	Tiles
Tmac	Tarmac
TPav	Tactile Paving
TS	Trench Scar

MEASUREMENTS

d	Depth(m)
Ø	Diameter (mm)
Ext. Ø	External Diameter (mm)
H	Object Height (m)

Symbology

- Single Gate
- Double Gate
- Banking
- Step Up
- Diameter shown in mm
- Survey Station

Linetypes

- Telecom Overhead
- Power Overhead
- Foul Water
- Surface Water
- Combined Water
- Unknown Services
- Change of Surface
- Drop Kerb
- Fence
- Wall
- Kerb
- Building Face
- Overhead Feature
- Trench Scar
- Tree Canopy
- Bushes\Foliage\Overgrowth
- Tree Canopy Extents

Trees

SPECIES ABBREVIATION

AL	Alder
BE	Beech
CE	Cedar
CH	Cherry
CON	Coniferous
CY	Cypress
DE	Dead
DEC	Deciduous
ED	Elder
EU	Eucalyptus
FR	Fruit
HA	Hawthorn
HB	Hornbeam
HC	Horse Chestnut
HL	Hemlock
HO	Holly
HZ	Hazel
LA	Larch
LB	Laburnum
LM	Lime
LO	Locust
LU	Laurel
MA	Maple
MG	Magnolia
NS	Norway Spruce
PI	Pine
PO	Poplar
PL	Plane
RH	Rhododendron
RO	Rowan
SAP	Sapling
SB	Silver Birch
SCN	Sweet Chestnut
SHR	Shrub
ST	Stump
SY	Sycamore
WB	Whitebeam
WG	Wellingtonia
WI	Willow
WN	Walnut

NOTES:
1. The tree species have been identified to the best of the surveyors knowledge. They have not been verified by an arborist and are not guaranteed. If they are important they should be verified.
2. Tree heights are estimated.
3. A CAD layer exists with the full tree canopies intact which is turned off.
4. Trees with bole diameters below the specified minimum size may not have been surveyed.
5. Multibole sizes are indicative.

SURVEY STATIONS			
Name	Easting	Northing	Height
1STN	510016.776	188858.542	55.573
2STN	510062.780	188851.279	54.367
3STN	510084.060	188873.631	54.675
4STN	510119.758	188892.190	54.363
5STN	510136.910	188843.182	54.083
6STN	510087.047	188824.656	53.057
7STN	510091.790	188795.827	51.599
8STN	510106.240	188759.079	49.649
9STN	510086.895	188739.553	51.194
10STN	510039.859	188727.133	51.558
11STN	509994.299	188741.217	52.625
12STN	509963.975	188750.429	54.247
13STN	509936.880	188761.693	54.912
14STN	509925.063	188784.226	55.915
15STN	509894.490	188771.687	56.118
16STN	509883.010	188801.869	56.521
17STN	509889.305	188848.197	56.344
18STN	509931.611	188868.800	57.082
19STN	509968.667	188855.279	56.673
B1STN	509899.279	188809.312	56.378
K1STN	509992.431	188880.257	56.837
K2STN	509970.916	188829.891	56.110
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