CASCADES LEISURE CENTRE, GRAVESEND, DA12 4LG

7313

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY

NOVEMBER 2025

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Contents

1 Introduction 1
1.1 Data Sources / References 1
2 Site Description and Location 1
2.1 Location 1
2.2 Existing Development 2
2.3 Proposed Development 2
2.4 Topography 2
2.5 Geology 3
2.6 Hydrology and Hydrogeology 3
3 Policy Context 3
3.1 National Policy – National Planning Policy Framework 3
3.1.1 Sequential Test 4
3.2 Flood and Water Management Act 5
3.3 Regional and Local Development Documents and Policies 5
3.3.1 Local Flood Risk Management Strategy 2017-2023 (KCC) 5
3.3.2 Preliminary Flood Risk Assessment 5
3.3.3 Thameside Stage 1 Surface Water Management Plan (SWMP) 6
3.3.4 Gravesham Local Plan Core Strategy 2014 6
4 Definition of Flood Hazard 7
4.1 Fluvial and Tidal Flood Risk 7
4.2 Flooding from Artificial Sources 7
4.3 Groundwater Flooding 8
4.4 Sewer Flooding 8
4.5 Overland Flooding 8
5 Surface Water Management and SuDS 9
5.1 Existing Surface Water Drainage 9
5.2 Evaluation of Sustainable Drainage Systems 9
5.3 Proposed Surface Water Drainage / SuDS Strategy 10
5.3.1 Proposed Development Impact on Flood Risk / Exceedance Flows 10
5.3.2 Stormwater Treatment Management Train and Runoff Quality 11
5.3.3 Drainage / SuDS Maintenance and Management Schedule 13
6 Foul Water Strategy 14
7 Conclusions 15
APPENDIX A – Existing Site Plan 16
APPENDIX B – Proposed Site Plan 17
APPENDIX C – Topographic Survey Map 18
APPENDIX D – Site Investigation Report 19

APPENDIX E – EA Flood Map 20
APPENDIX F – Utility Survey Map 21
APPENDIX G – Southern Water Asset Plan 22
APPENDIX H – Proposed Below Ground Drainage Layout 23
APPENDIX I – Proposed Drainage Strategy Catchment Area Plan 24
APPENDIX J – InfoDrainage Model Soakaway Sizing Estimate 25

List of Figures

Figure 1 Site Location 2
Figure 2 BGS Site Geology Map 3
Figure 3 EA Flood Zone Classification 4
Figure 4 Sequential Test Summary (Table 3 – PPG, 2022) 4
Figure 5 EA Flood Zone Map 7
Figure 6 Flooding from reservoirs 7
Figure 7 Groundwater vulnerability 8
Figure 8 Flooding from surface water 8

List of Tables

Table 1 Source of Data Reviewed 1
Table 2 Site Referencing Information 1
Table 3 SuDS Hierarchy Summary 9
Table 4 Pollution Hazard Indices 12
Table 5 Pollution Mitigation indices 12
Table 6 SPEL Stormceptor Treatment Train 13
Table 7 Permeable Pavement Treatment Train 13
Table 8 Maintenance Schedule 14

1 Introduction

This document comprises a Flood Risk Assessment in accordance with the National Planning Policy Framework (NPPF), including its technical guidance, in support of a planning application for redevelopment of the existing Cascades Leisure Centre.

Furness Partnership have been commissioned by the client, Gravesham Borough Council, to identify and set out the principles of approaching and managing flood risk pertaining to the proposed redevelopment.

The objective of this FRA is to:

1) Collect and review available information to make a qualitative assessment of all sources of flooding to the development including drainage infrastructure; fluvial and tidal sources; groundwater sources and artificial sources.
2) Assess the flood risk to the application site under existing and post-development conditions; and
3) Outline any mitigating measures needed to meet the requirements of the NPPF.

1.1 Data Sources / References

Data collected during the course of this assessment is presented in Table 1 below:

Purpose	Data and Source	Comment
Identification of Existing Flood Risk	Thameside Stage 1 SWMP	Surface Water Management Plan across the Kent County Council
	Southern Water Sewer records	Identification of the local drainage system near the application site
	Gravesham Water and Flood Risk Background Paper	Flood risk assessment across Gravesham
	Environment Agency	Site specific flood risk data
Identification of Historical Flooding	Thameside Stage 1 SWMP	Details of Historic flooding

Table 1 Source of Data Reviewed

2 Site Description and Location

2.1 Location

The site is situated on Thong Lane, Gravesend, Kent. It is bounded by residential properties to the west, and beyond that the wider town of Gravesend develops, while to the north there is an existing golf centre, and agricultural fields to the eastern side of the site. The site location is shown in Figure 1, with the full address and Ordnance Survey Grid Reference in Table 2.

Site Referencing Information	
Site Address	Cascades Leisure Centre, Thong Lane, Gravesend, DA12 4LG
Grid Reference	(TQ67100 71751) (567100E, 171751N)

Table 2 Site Referencing Information



Figure 1 Site Location

2.2 Existing Development

The site sits within land designated as greenbelt, however, as it currently houses existing buildings for leisure use, it is considered a brownfield site. It covers a total area of 4.5 hectares and is irregular in shape. The site contains the existing Cascades Leisure Centre together with a car park, external tennis courts, play area and a café. See Appendix A for the existing site location plan.

2.3 Proposed Development

The main proposals as part of the redevelopment will comprise (full specification of the proposed work is yet to be confirmed):

- Demolition of the existing leisure centre and Regans Bar & Café;
- The main leisure centre building is to be relocated to the south-east corner of the site where the existing main car park sits;
- The car park is to be relocated to the northern part of the site, which will comprise a total of 257 parking spaces.

The proposed site plan can be found in Appendix B.

2.4 Topography

The site lies on a small plateau within the wider Greenbelt area, and is approximately 67 metre above sea level. This tallies up with the topographical survey, which reveals a level of 66.70m at the landscaped area to the east of the existing car park, and a low point of 62-63m to the north of the existing leisure centre building. The topographic survey can be found in Appendix C.

2.5 Geology

According to the British Geological Survey 'Geology' viewer tool, the site has a bedrock geology of Lewes Nodular chalk formation, Seaford chalk formation and Newhaven Chalk Formation.

A Phase 2 Geo-environmental and geotechnical Site Investigation was undertaken by RSK GEOSCIENCE in May 2023, which states ground conditions encountered during the site investigation comprise made ground (0.30–1.20 m thick), overlying variable topsoil (0.10–0.50 m), and reworked ground (0.15–1.30 m). These strata are underlain by the White Chalk Sub-Group, proven from approximately 0.40–1.70 m depth to the full depth of investigation (20 m bgl). The Phase 2 Site Investigation report can be found in Appendix D.



Figure 2 BGS Site Geology Map

2.6 Hydrology and Hydrogeology

The desk study confirms there are no watercourses within the site boundary or within a 500m radius of the site. The site is, however, underlain by a Principal Aquifer of high vulnerability relating to the Seaford Chalk Formation, and the Thanet Sand formation is a Secondary A Aquifer. The River Thames is located approximately 2.5km away to the north.

3 Policy Context

3.1 National Policy – National Planning Policy Framework

The National Planning Policy Framework (latest version issued in December 2024) Section 14, paragraphs 170 – 182, outlines the latest guidance on Planning and Flood Risk. The policy outlines:

- The need to avoid inappropriate development in areas at risk of flooding and direct development to low-risk areas.
- The use of the Sequential Test and Exception Test as appropriate, consideration of all flood risks and consideration of safeguarding land for current or future flood management.
- A site-specific Flood Risk Assessment should be produced as appropriate.
- A risk-based approach is retained within the NPPF through the delineation of Flood Zones (Zone 1, Zone 2, and Zone 3, with Zone 3 further divided into 3a and 3b), which form the basis for the application of the Sequential Test. This framework aims to direct development toward areas of lowest flood risk, acknowledging the potential for flood

extents to increase under future climate change scenarios. The Flood Zones applicable for assessing fluvial and tidal flood risk are defined in Figure 3 below:

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.(Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Figure 3 EA Flood Zone Classification

3.1.1 Sequential Test

The existing site is proposed to be used as a Leisure Centre, and is in Flood Zone 1 (low probability for river and sea flooding, refer to Appendix E). As the site is used for leisure purposes, the site is classified as 'Less Vulnerable' in accordance with Table 2 of the Flood Risk and Coastal Change section of the NPPF which has been shown in Figure 4 below.

In accordance with the NPPF and the Planning Practice Guidance (PPG), 'Less Vulnerable' development is appropriate in Flood Zone 1. As the development is located within the lowest flood risk zone and is confirmed to have a low risk from all other flood sources as outlined in Section 4 of this report, the Sequential Test is deemed satisfied and Exception Test is not required.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✔	✔	✔	✔	✔
Zone 2	✔	Exception Test required	✔	✔	✔
Zone 3a †	Exception Test required †	X	Exception Test required	✔	✔
Zone 3b *	Exception Test required *	X	X	X	✔ *

Key:

✔ Exception test is not required

X Development should not be permitted

Figure 4 Flood Risk Vulnerability and Flood Zone Incompatibility

3.2 Flood and Water Management Act

The Flood and Water Management Act (FWMA) 2010 outlines roles and responsibilities for the implementation of Sustainable Drainage Systems (SuDS) in developments. Drainage systems must comply with National Standards. Kent County Council (KCC) is the Lead Local Flood Authority (LLFA) for the development area and in accordance with the FWMA is responsible for coordinating the management of flood risk from surface, groundwater, and ordinary watercourses. The LLFA acts a statutory consultee on surface water and SuDS proposals.

3.3 Regional and Local Development Documents and Policies

3.3.1 Local Flood Risk Management Strategy 2017-2023 (KCC)

The aims of KCC's local flood risk management strategy are as follows:

- *To support and improve the safety and wellbeing of Kent's residents and the economy of Kent through appropriate flood risk management;*
- *To ensure that we all work together effectively to understand and deliver appropriate flood risk management in Kent*
- *To contribute to sustainable development, regeneration and land management in Kent through the promotion of sustainable flood risk management practices that utilise natural processes where appropriate.*

3.3.2 Preliminary Flood Risk Assessment

A Preliminary Flood Risk Assessment (PFRA) was published in 2011 for Kent County Council. The aim of the PFRA is to provide an assessment of local flood risk across the study area; the key objectives of the document are listed below:

- *Summarise the methodology adopted from the PFRA with respect to data sources, availability and review procedures.*
- *Assess historic flood events within the study area from local sources of flooding (including flooding from surface water, groundwater and ordinary watercourses), and the consequences and impacts of these events.*
- *Establish an evidence base of historic flood risk information, which will be built up on in the future and used to support and inform the preparation of Kent's Local Flood Risk Strategy.*
- *Assess the potential harmful consequences of future flood events within the study area.*
- *Review the provisional national assessment of indicative Flood Risk Areas provided by the Environment Agency and provide explanation and justification for any amendments required to the Flood Risk Areas.*
- *Describe arrangements for partnership and collaboration for ongoing collection, assessment and storage of flood risk data and information.*

3.3.3 Thameside Stage 1 Surface Water Management Plan (SWMP)

Northern Kent (Gravesham Borough Council) falls within Thameside's SWMP, which aims to investigate local flooding issues arising in sewers, drains, groundwater and runoff caused by periods of heavy rainfall. According to KCC's website, the benefits of the SWMP are:

- *an increased understanding of local flooding,*
- *an increased understanding of where local flooding will occur,*
- *an action plan to identify measures to mitigate local flooding,*
- *an increased awareness of the duties and responsibilities for managing flood risk of different partners and stakeholders, and*
- *improved public engagement and understanding of local flooding.*

The plan has been produced in partnership with internal drainage boards, sewerage companies and the Environment Agency.

3.3.4 Gravesham Local Plan Core Strategy 2014

The Local Plan Core Strategy is the key document in the Gravesham Local Plan. It sets out the main panning policies for any new development or proposed redevelopment within Gravesham Borough Council.

The key policy relevant to this report is 'Policy CS18: Climate Change', which requires all proposed sites at risk of flooding to be accompanied by a Flood Risk Assessment, and they must pass the Sequential and Exception Tests. Section 5.14.40 in the document also states:

'*The Council will seek to minimise the impact of drainage from new development on waste water systems. In particular, the Council will:*

- *Require that surface water run-off from all new development has, as a minimum, no greater adverse impact than the existing use; and*
- *Require the use of Sustainable Drainage Systems on all developments where technically and financially feasible.*'

4 Definition of Flood Hazard

4.1 Fluvial and Tidal Flood Risk

River (fluvial) flooding takes place when a river's capacity is exceeded and it bursts its banks, forcing the overtopping water onto surrounding land.

The application site lies within Flood Zone 1 as identified within the Environment Agency's indicative flood zone map (Figure 5). This indicates that the application site has been assessed as having between 0.01% (1 in 10000) and 0.1% (1 in 100) annual probability of river flooding i.e., low probability of flooding.

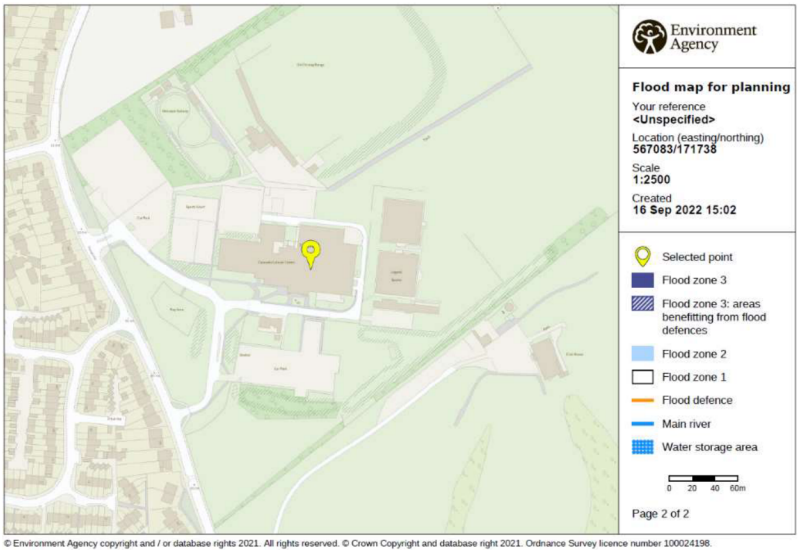


Figure 5 EA Flood Zone Map

4.2 Flooding from Artificial Sources

Artificial flood sources include raised channels such as canals or storage features such as ponds and reservoirs.

The Environment Agency dataset 'risk of flooding from reservoirs' shows that the proposed site is not affected by reservoir flooding.

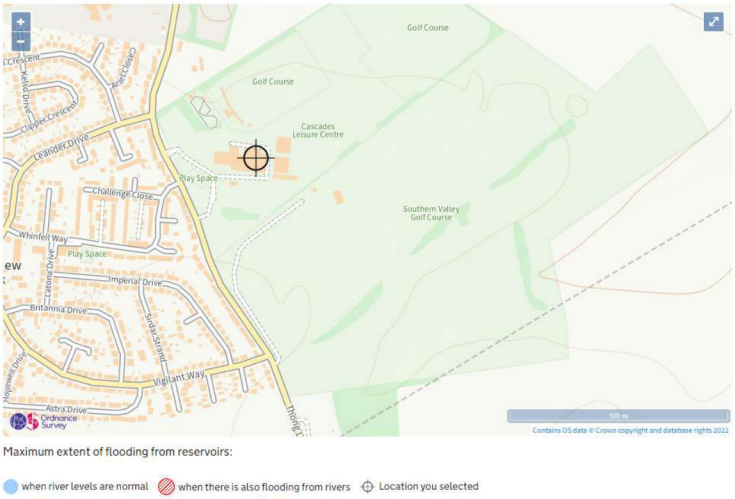


Figure 6 Flooding from reservoirs

4.3 Groundwater Flooding

The British Geological Survey (BGS) online mapping, indicates that the site lies within a medium-high groundwater vulnerability area. The Phase 2 site investigation indicates that no groundwater was encountered within the maximum depth of the investigation of 20m bgl, and there has been no recorded occurrence of groundwater flooding within or in the vicinity of the site area at the time of writing this report.

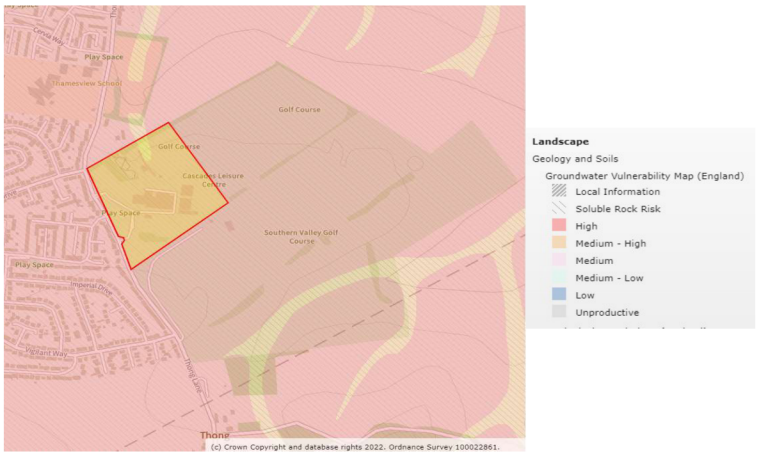


Figure 7 Groundwater vulnerability

4.4 Sewer Flooding

No records of sewer flooding in the vicinity of the site has been identified at the time of writing this report.

4.5 Overland Flooding

Overland flooding is caused when water does not penetrate into the ground due to the surface being impermeable (not porous). It also occurs when the ground is already saturated or because drains are not functional or overwhelmed. This leaves the water with nowhere to go to and as a result, it will remain or flow on the surface.

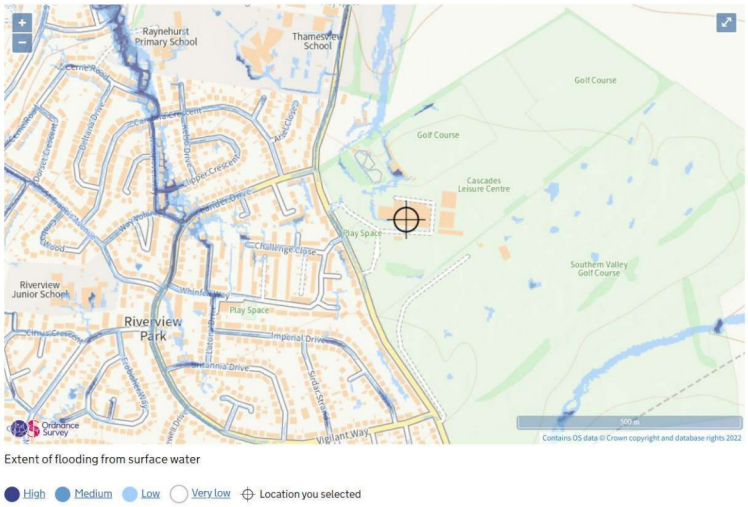


Figure 8 Flooding from surface water

The EA has provided the Flood map for surface water for the application site and surrounding area, as shown in Figure 8 above, which indicates that the site lies in a low-risk area of surface water flooding, and hence, overland flooding.

5 Surface Water Management and SuDS

5.1 Existing Surface Water Drainage

The site is brownfield. The site is served by a foul water network, which is owned and maintained by Southern Water. Review of existing asset records confirms that there are no public surface water sewers in the immediate vicinity. However, the utility map shows several soakaways within the site boundary, which currently collects surface water runoff from existing carpark and leisure centre. The utility survey map can be found in Appendix F.

5.2 Evaluation of Sustainable Drainage Systems

In accordance with best practice and requirements set out in the NPPF, and guidance from the Environment Agency, SuDS should be utilised where possible, within the planned development. It is proposed to utilise SuDS as is deemed feasible, following the hierarchy for disposal and treatment as outlined below in Table 3. A summary of comments has been provided for each method with regards to this specific development:

SuDS Hierarchy (most to least preferred)	
METHOD	**COMMENTS**
Discharge into the ground	Although made ground and cohesive soils seem to be present, infiltration/percolation is feasible into the deeper layers of sand and chalk formation.
Discharge into a surface water body	Not feasible. There does not exist any known surface water body within or near the site boundary.
Discharge into a surface water sewer	Not feasible due to lack of public surface water sewers in the vicinity of the site.
Discharge into a combined sewer	Not feasible. There are no combined sewers in the vicinity of the site.

Table 3 SuDS Hierarchy Summary

5.3 Proposed Surface Water Drainage / SuDS Strategy

The site is a brownfield development with an area of approximately 4.5 hectares, currently draining via infiltration. In line with the existing drainage strategy and in accordance with the Non-Statutory Technical Standards for Sustainable Drainage Systems (SuDS), surface water from the redeveloped site will also be managed through infiltration.

The drainage strategy applies only to the areas subject to redevelopment; all other areas within the site will remain unchanged, continuing to discharge surface water as existing. The site is divided into two catchments:

- Catchment 1 – Proposed Car Park (existing leisure centre footprint): Surface water will be managed through lined permeable paving to collect and filter water from the new carpark, then it will discharge to a new soakaway located to the top right of the carpark.

- Catchment 2 – Proposed Leisure Centre (existing car park footprint): Surface water will be collected using conventional methods (rainwater pipes, catchpit manholes, and gullies) before discharging to a soakaway located in the western soft landscaped area.

Infiltration testing has been undertaken in accordance with BRE 365, with full results provided in the Site Investigation Report (Appendix D). Infiltration rates across the site ranged from 1.17×10^{-4} m/s to 1.20×10^{-5} m/s. For design purposes, the lowest recorded rate of 1.20×10^{-5} m/s (equivalent to 0.0432 m/hr) has been adopted to ensure a robust and conservative drainage design. Further testing is required at the proposed location of the soakaway to determine the exact infiltration rate, the size of the tank may be adjusted once those results are available.

This has been modelled in InfoDrainage using the positively drained area of 1.54ha. The model considers all storm durations up to the 1 in 100-year plus 20% climate change design storm.

The proposed drainage strategy & Catchment Area Plan has been included in Appendix H & Appendix I, and the InfoDrainage soakaway and permeable paving sizing estimates can be found in Appendix J. It should be noted that the drainage proposals in this report are outline only and the final drainage design will be concluded at detailed design stage.

5.3.1 Proposed Development Impact on Flood Risk / Exceedance Flows

Through the use of SuDS compliant design philosophies, with regards to runoff and stormwater treatment for adequate water quality, the proposed development adequately maintains and slightly reduces the flood risk to the receiving ground and also to the surrounding areas. The permeable pavement mimics greenfield processes by slowing down the runoff infiltrating in to the ground while also providing a filtration and sedimentation process to better the water quality discharging into the groundwater. Therefore, it is expected that the proposed drainage strategy will not negatively affect the flood risk to the site.

In case of exceedance flows, it is expected that any surface flooding that occurs for heavier rainfall than the 1 in 100 year plus 20% critical storm, will simply follow the natural topography of the site and fall in a north/north-easterly direction towards the car park. Any exceedance flooding would then be bounded by the upstand kerbs proposed around the perimeter of parking, and slowly infiltrate into the ground once space becomes available within the soakaways.

5.3.2 Stormwater Treatment Management Train and Runoff Quality

The Surface Water treatment provided by the SuDS features will ensure that the runoff is of sufficient quality so as not to impact the receiving system.

In keeping with the CIRIA SuDS Manual philosophy, the drainage strategy proposed aims to reduce any potential pollution risk to the receiving surface water sewers and water bodies. In terms of designing for amenity and biodiversity, due to the nature of the site, there is little opportunity or value in proposing any methods to enhance either criterion, and hence, they will not be considered further.

As per Section 26 of the SuDS Manual:

'*The risk posed by surface water runoff to the receiving environment is a function of:*

- *The pollution hazard at a particular site (i.e., the pollutant source)*
- *The effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels, and/or the effectiveness of underlying soil layers in protecting the receiving groundwater (i.e., the pollutant pathway)*
- *The sensitivity of the receiving environment (i.e., the environmental receptor).'*

To ensure the design complies with the required pollution mitigation, adequate treatment of the contributing areas will need to be provided.

The following equation needs to be complied with, for each SuDS type used:

Total SuDS mitigation index ≥ Pollution hazard index

To ensure the stormwater quality is as high as possible prior to infiltrating the soil, we propose to utilise gullies and channel drains with appropriate sump units that will collect/manage any debris or silt falling into the system. Following this, the stormwater will be temporary stored in the proposed soakaway, which will then allow the stormwater to discharge into the ground.

The Simple Index Approach has been used to assess the pollution risk for this site's SuDS strategy. According to Table 26.2 'Pollution hazard indices for different land use classifications' of the SuDS Manual, the site can be classified within the following categories:

Land use		Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
1	Residential roofs	Very low	0.2	0.2	0.05
2	Other roofs	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from roof)	0.05
3	Individual property driveways, residential car parks, low traffic roads, and non-residential car parking with infrequent change i.e., < 300 traffic movements/day	Low	0.5	0.4	0.4
4	Commercial yard and delivery areas, non-residential car parking with frequent change, all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
5	Sites with heavy pollution, sites where chemicals and fuels are to be delivered, handled, stored, used or manufactured, industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

Table 4 Pollution Hazard Indices

The roofs of the site would fall under category 2 - 'other roofs', and the site parking and access roads would fall under category 4. Category 4 figures will be used for this check as it encompasses a higher level of pollution risk.

The following data will be used for surface water discharge to the ground:

	Mitigation indices		
Type of SuDS component	***TSS***	***Metals***	***Hydrocarbons***
Proprietary treatment – SPEL ESR Bypass Treatment System	0.8	0.6	0.9
Permeable pavement	0.7	0.6	0.7

Table 5 Pollution Mitigation indices

Therefore, for the proposed drainage strategy for the leisure centre and surrounding hardstanding including access road, the following mitigation indices will apply:

SPEL Stormceptor > Soakaway > Ground

	Pollution hazard indices	Total SuDS Mitigation indices	Mitigation ≥ Pollution hazard?
TSS	0.7	0.8	Yes
Metals	0.6	0.6	Yes
Hydrocarbons	0.7	0.9	Yes

Table 6 SPEL Stormceptor Treatment Train

For the proposed drainage strategy for the main car park area only, the following mitigation indices will apply:

Permeable paving > Soakaway > Ground

	Pollution hazard indices	Total SuDS Mitigation indices	Mitigation ≥ Pollution hazard?
TSS	0.7	0.7	Yes
Metals	0.6	0.6	Yes
Hydrocarbons	0.7	0.7	Yes

Table 7 Permeable Pavement Treatment Train

Therefore, the proposed treatment train for both catchment areas is considered acceptable.

5.3.3 Drainage / SuDS Maintenance and Management Schedule

The maintenance and management schedule required for the proposed SuDS on site should follow the below guidelines, to ensure the risk of flooding i.e., failure of the system, is reduced and even eliminated for the lifetime of the system.

Maintenance will be in accordance with Sewerage Sector Guidance Appendix C document (May 2021), the guidance of CIRIA SuDS Manual C753 and other established best practices.

The SuDS and drainage infrastructure on site will be maintained by the developer for the maintenance period after completion and handover. Long term, the owner or a site management company will be responsible for the ongoing maintenance of the SuDS infrastructure. Table 8 outlines the maintenance schedule required for the site; however, it should be noted that for the first 3 months post practical completion and handover, maintenance should be carried out every month at a minimum. Regular maintenance schedule reviewing may be required to keep up with best practice and ensure the SuDS are remaining effective.

The developer is responsible for providing the SuDS Maintenance Plan and O&M Manual to the site Management team. The O&M manual shall be handed over to each subsequent owner of the site, and within that pack should be included any relevant engineering drawings for ease.

Drainage Infrastructure Item	General maintenance	Responsibility
Drainage pipework	Jet and clean as necessary	Site owner/Management Company
Manholes/silt traps/catchpits/gullies/ channel drains	Remove cover annually to check for any sign of blockage and (jet) clean as necessary. Empty sumps as required.	Site owner/Management Company
SPEL ESR Bypass Treatment System	Bi-annual visual inspection, remove any significant debris/litter. Servicing as per manufacturers requirements.	Site owner/Management Company
Permeable Pavement	Monthly brushing and vacuuming (standard cosmetic sweep over whole surface).	Site owner/Management Company
Cellular Soakaway	Bi-annual inspection for sediment and debris in pre-treatment components and floor of inspection chamber. Servicing as per manufacturers requirements.	Site owner/Management Company

Table 8 Maintenance Schedule

6 Foul Water Strategy

The CCTV survey map indicates that the existing foul water drainage network collects flows from the current leisure centre building and conveys them northwest across the site, before continuing beyond the site boundary towards Thong Lane. Based on the asset plan, it is anticipated that the foul water from the site discharges into the existing Southern Water sewer (Ref. 8807) located on Thong Lane.

All existing foul drains serving the leisure centre will be decommissioned, with a new foul drainage system provided for the proposed building. Foul water flows from the new facility will be collected via a gravity drainage system designed to accommodate WCs, showers, washbasins, and kitchen waste. These flows will then discharge to a new private manhole positioned to the north-west of the proposed building.

The swimming pool will require a backwash tank, proposed to be located south of the building near the plant room. A provisional tank volume of 5 m^3 has been assumed, based on backwash water from the pools being discharged to the sewer at a rate of approximately 1 L/s. The final tank capacity and discharge rate will be confirmed by the pool specialist in accordance with the existing trade effluent agreement.

All foul drainage will be designed to Building Regulations Part H, and BS 752 standards.

7 Conclusions

The redevelopment proposes to demolish the existing leisure centre building and construct a new one at the location of the existing parking area; the car park will be moved to the location of the existing leisure centre.

The proposed development is classified as 'Less Vulnerable' according to the NPPF. The site is located within Flood Zone 1, i.e. a low probability of sea and river flooding, and has a low risk of flooding from all other flood sources including fluvial, tidal, surface water, groundwater and artificial sources, and so, the development is considered 'appropriate development' under the NPPF. The proposed development, therefore, satisfies the Sequential Test.

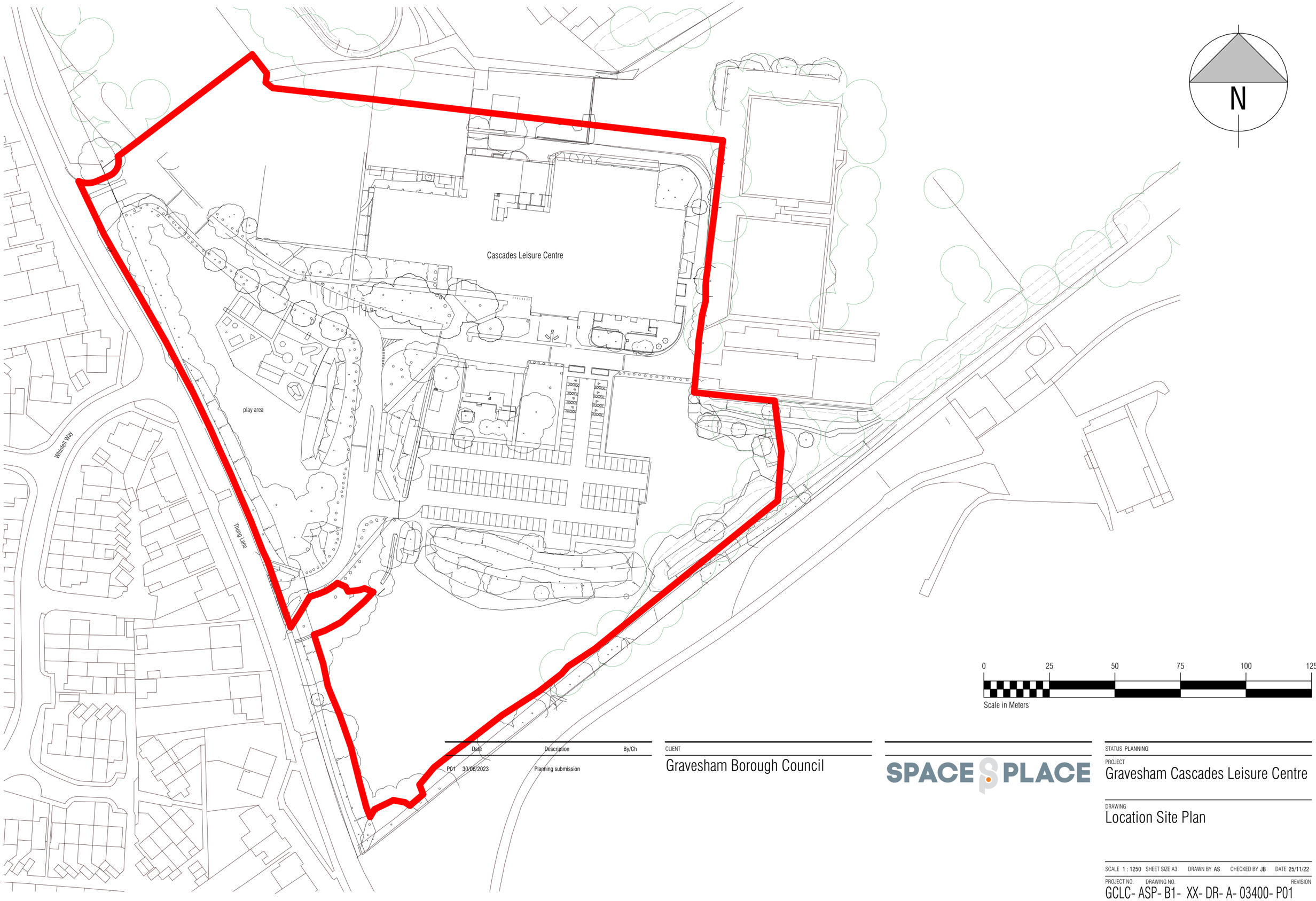
For the drainage strategy, the site has been divided into two principal catchments: the proposed leisure centre building and the new main car park to the north. The total positively drained area amounts to 1.54 hectares. Surface water from the proposed leisure centre roof will be collected via a conventional below-ground drainage system and discharged to a soakaway located within the existing soft landscape to the south of the building. Surface water from the new car park will be managed through permeable paving, allowing direct infiltration into the ground.

The proposed drainage strategy is considered to slightly improve the flood risk of the site, through the use of the permeable pavement and soakaway, which will ensure stormwater is slowly discharged into the ground, mimicking natural processes.

Maintenance and management schedule has been provided for the site, SuDS.

New foul drainage is proposed for the leisure centre building, which includes a pool water backwash tank, which will need to be discharged at the rate subject to trade effluent agreement with Southern Water. The final point of connection from the site needs to be determined during later design stages.

APPENDIX A – Existing Site Plan



Date	Description	By/Ch
P01 30/06/2023	Planning submission	

CLIENT
Gravesham Borough Council

SPACE PLACE

+44 800 909 8008 answers@space-place.com www.space-place.com

STATUS PLANNING

PROJECT
Gravesham Cascades Leisure Centre

DRAWING
Location Site Plan

SCALE 1 : 1250 SHEET SIZE A3 DRAWN BY AS CHECKED BY JB DATE 25/11/22

PROJECT NO. DRAWING NO. REVISION
GCLC- ASP- B1- XX- DR- A- 03400- P01

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APPENDIX B – Proposed Site Plan



N

NOTE

KEY LEGEND

- Property Line

Site Area Total - 45028.93 m²

- Parking spaces
- Green/Vegetation spaces
- Car access road
- Pavement
- Retaining Wall

(A) Gravesend Airfield Memorial

(B) Sub-Station

(C) Bin Store

(D) Gas

(E) Car access only for Legend Sports users and Leisure Centre Service Road

- Proposed Tree
- Existing Tree
- Tree to be replanted/demolished

Car Park numbers

203 car spaces
15 disabled car spaces
14 car spaces (services)
Total: 232 spaces

25 existing car spaces

13 motorcycle spaces

35 bike stands (15 covered ones)

Revision	Date	Description	By/Ch

0 25 50 75 100 125
Scale in Meters

STATUS

Gravesham Borough Council

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STATUS PLANNING

PROJECT

Family Sports & Leisure Centre Gravesham

DRAWING

Site Plan

SCALE 1 : 500 SHEET SIZE A1 DRAWN BY AS CHECKED BY JB DATE 10/21/22

PROJECT NO. DRAWING NO. REVISION

3929 - ASP - B1 - XX - DR - A - 0803 -

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APPENDIX C – Topographic Survey Map

NOTES:

Drainage:
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Survey notes:
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Survey detail obtained and shown is relative to the plotting scale.

Copyright:
This survey information is Copyright Encompass Surveys Ltd (2009). All rights reserved.

LEGEND

TREE SPECIES INFORMATION

ALDER	ALD	LOCUST	LOC
ASH	ASH	LONDON PLANE	LPN
ASPEN	ASP	MAGNOLIA	MAG
BEECH	BCH	MAPLE	MPL
CEDAR	CED	OAK	OAK
CHERRY	CHY	PINE	PNE
CYPRESS	CYP	POPLAR	POP
ELM	ELM	PRUNUS	PRS
FIR	FIR	RHODODENDRONS	RDN
FRUIT	FRT	ROWAN	RWN
HAWTHORN	HAW	SILVER BIRCH	SBI
HAZEL	HAZ	SORBUS	SOR
HOLLY	HLY	SWEET CHESTNUT	SCH
HORSE CHESTNUT	HCH	SYCAMORE	SYC
HORNBEAM	HBM	WALNUT	WNT
LABURNUM	LBM	WILLOW	WLW
LARCH	LAR	YEW	YEW
LIME	LIM	SPECIES UNKNOWN	SPU
		COPPICED	COP

TREE ANNOTATIONS: Tree Species / Tree Bol Size / No of Bolls
Tree Height / Tree Canopy Spread

FENCE INFORMATION

BARBED WIRE FENCE	BWF	BASEMENT LEVEL	BTL
CORRUGATED IRON FENCE	CIF	BED LEVEL	BL
CLOSE BOARD FENCE	CBF	COVER LEVEL	CL
CHAIN LINK FENCE	CLF	DAMP PROOF COURSE	DPC
CHESTNUT PALING	CPF	FLOOR LEVEL	FL
CRASH BARRIER	CBR	INVERT LEVEL	IL
HANDRAIL	HDL	OUTFALL LEVEL	OL
IRON RAILINGS	IRF	THRESHOLD LEVEL	THL
LANCH LAP FENCE	LLF	POOL WATER	PW
MISCELLANEOUS FENCE	MSF	SURFACE WATER	SW
PALISADE FENCE	PSF	UNABLE TO LIFT	UTL
PICKET FENCE	PKF	WATER LEVEL	WL
POST AND CHAIN FENCE	PCF		
POST AND RAIL FENCE	PRF		
POST AND WIRE FENCE	PWF		
STOCK WIRE FENCE	SWF		
TRELLIS FENCING	TLF		

LEVEL INFORMATION

BASEMENT LEVEL	BTL
BED LEVEL	BL
COVER LEVEL	CL
DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
POOL WATER	PW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
BROCK PAVIERS	BP
FLOWERBED	FB
PAVING SLABS	PS
RETAINING WALL	RtWall
TACTILE PAVING	Tac

FEATURE INFORMATION

BOLLARD	BO	NOTICE BOARD	NB
BRITISH TELECOM BOX	BTB	POST	P
BRITISH TELECOM IC	BTIC	RAIN WATER PIPE	RWP
BUS STOP	BS	RAISED FLOWERBED	RFB
CABLE TELEVISION BOX	CATB	ROAD SIGN	RS
CABLE TELEVISION IC	CATV	RODDING EYE	RE
EARTHING ROD	ER	SERVICE MARKER POST	SMP
ELECTRICITY CABLE PIT	ELCP	SOIL VENT PIPE	SVP
ELECTRICITY CONTROL BOX	ECB	STOP COCK	SC
ELECTRICITY POLE	EP	STOP VALVE	SV
FIRE HYDRANT	FH	TELEGRAPH POLE	TP
INSPECTION COVER	IC	TELEPHONE CALL BOX	TCB
LAMP POST	LP	TRAFFIC SIGNAL	TS
LITTER BOX	LB	TRAFFIC SIGNALS IC	TSIC
LITTER BIN	BIN	WATER METER	WM
KERB OUTLET	KO	WATER TAP	TAP
NAME PLATE	NP		

Level Datum:
Levels are related to OSGB15 derived from the GPS network

Grid:
Grid is related to OSGB15 derived from the GPS network

Northpoint:

ENCOMPASS SURVEYS

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Duncan Road
Park Gate, Southampton
Hampshire SO31 7GA

Tel: 023 80692002 Email: info@encompass-surveys.co.uk
Fax: 023 80697125 Website: encompass-surveys.co.uk

Client:	Faithful & Gould
Survey Location:	Cascades Leisure Centre Site Thong Lane Gravesend
Survey type:	Topographical
Scale:	1:200@A0
Drawing ref:	ENC/011122/252151
Date:	November 2022
Drawn/QA:	BF/DH
Plot No:	1 of 4



NOTES:

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BEECH	BCH	MAPLE	MPL
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CHERRY	CHY	PINE	PNE
CYPRESS	CYP	POPLAR	POP
ELM	ELM	PRUNUS	PNS
FIR	FIR	RHODODENDRONS	RDN
FRUIT	FRT	ROWAN	RWN
HAWTHORN	HAW	SILVER BIRCH	SIB
HAZEL	HAZ	SORBUS	SOR
HOLLY	HLY	SWEET CHESTNUT	SCH
HORSE CHESTNUT	HCH	SYCAMORE	SYC
HORNBEAM	HRM	WALNUT	WNT
LABURNUM	LRM	WILLOW	WLW
LARCH	LAR	YEW	YEW
LIME	LIM	SPECIES UNKNOWN	SPU
		COPPICED	COP

TREE ANNOTATIONS: Tree Species / Tree Boll Size / No of Bolls
Tree Height / Tree Canopy Spread

FENCE INFORMATION

BARBED WIRE FENCE	BWF
CORRUGATED IRON FENCE	CIF
CLOSE BOARD FENCE	CBF
CHAIN LINK FENCE	CLF
CHESTNUT PALING	CPF
CRASH BARRIER	CBR
HANDRAIL	HDL
IRON RAILINGS	IRF
LARCH LAP FENCE	LLF
MISCELLANEOUS FENCE	MSF
PALISADE FENCE	PSF
PICKET FENCE	PKF
POST AND CHAIN FENCE	PCF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
STOCK WIRE FENCE	SWF
TRELLIS FENCING	TLF

LEVEL INFORMATION

BASEMENT LEVEL	BTL
BED LEVEL	BL
COVER LEVEL	CL
DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
BRICK PAVERS	BP
FLOWERBED	FB
PAVING SLABS	PS
RETAINING WALL	RWall
TACTILE PAVING	Tac

FEATURE INFORMATION

BOLLARD	BO	NOTICE BOARD	NB
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BRITISH TELECOM IC	BTIC	RAIN WATER PIPE	RWP
BUS STOP	BS	RAISED FLOWERBED	RFB
CABLE TELEVISION BOX	CATB	ROAD SIGN	RS
CABLE TELEVISION IC	CATV	RODDING EYE	RE
EARTHING ROD	ER	SERVICE MARKER POST	SMP
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ELECTRICITY POLE	EP	STOP VALVE	SV
FIRE HYDRANT	FH	TELEGRAPH POLE	TP
INSPECTION COVER	IC	TELEPHONE CALL BOX	TCB
LAMP POST	LP	TRAFFIC SIGNAL	TS
LETTER BOX	LB	TRAFFIC SIGNALS IC	TSIC
LITTER BIN	BIN	WATER METER	WM
KERB OUTLET	KO	WATER TAP	Tap
NAME PLATE	NP		

Level Datum:
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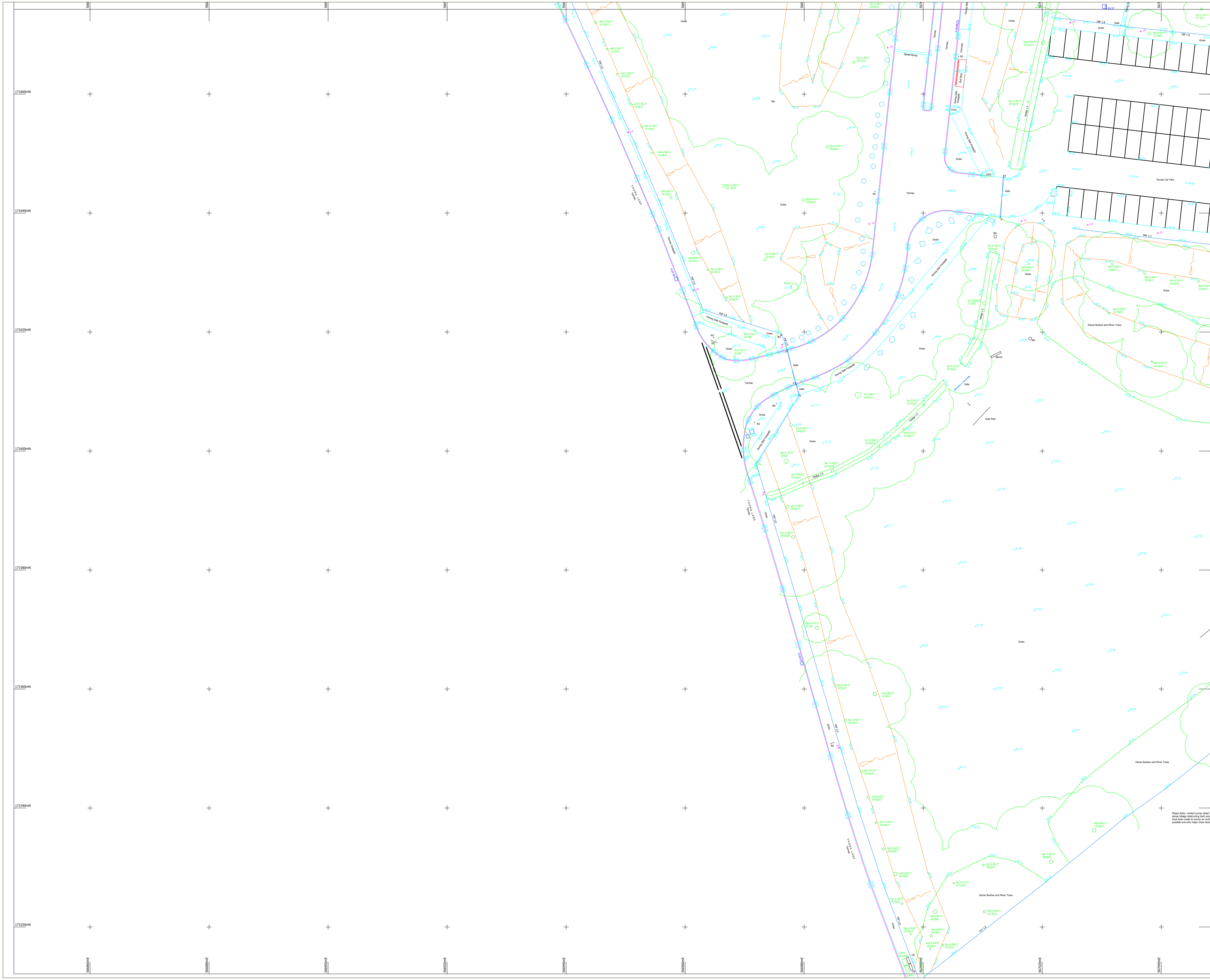
Northpoint:

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Fax: 023 80697125 Website: encompass-surveys.co.uk

Client:	Faithful & Gould		
Survey Location:	Cascades Leisure Centre Site Thong Lane Gravesend		
Survey type:	Topographical	Scale:	1:200@A0
Drawing ref:	ENC/011122/2521S1	Date:	November 2022
Drawn/QA:	BF/DH	Plot No:	2 of 4



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TREE ANNOTATIONS: Tree Species / Tree Boll Size / No of Bolls
Tree Height / Tree Canopy Spread

FENCE INFORMATION

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PALISADE FENCE	PSF
PICKET FENCE	PKF
POST AND CHAIN FENCE	PCF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
STOCK WIRE FENCE	SWF
TRELLIS FENCING	TLF

LEVEL INFORMATION

BASEMENT LEVEL	BTL
BED LEVEL	BL
COVER LEVEL	CL
DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
BRICK PAVERS	BP
FLOWERBED	FB
PAVING SLABS	PS
RETAINING WALL	RWall
TACTILE PAVING	Tac

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FIRE HYDRANT	FH	TELEGRAPH POLE	TP
INSPECTION COVER	IC	TELEPHONE CALL BOX	TCB
LAMP POST	LP	TRAFFIC SIGNAL	TS
LETTER BOX	LB	TRAFFIC SIGNALS IC	TSIC
LITTER BIN	BIN	WATER METER	WM
KERB OUTLET	KO	WATER TAP	Tap
NAME PLATE	NP		

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Survey Location:	Cascades Leisure Centre Site Thong Lane Gravesend		
Survey type:	Topographical	Scale:	1:200@A0
Drawing ref:	ENC/011122/2521S1	Date:	November 2022
Drawn/QA:	BF/DH	Plot No:	3 of 4

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HORSE CHESTNUT	HCH	SYCAMORE	SYC
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LARCH	LAR	YEW	YEW
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		COPPICED	COP

TREE ANNOTATIONS: Tree Species / Tree Boll Size / No of Bolls
Tree Height / Tree Canopy Spread

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CHESTNUT PALING	CPF
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HANDRAIL	HDL
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LARCH LAP FENCE	LLF
MISCELLANEOUS FENCE	MSF
PALISADE FENCE	PSF
PICKET FENCE	PKF
POST AND CHAIN FENCE	PCF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
STOCK WIRE FENCE	SWF
TRELLIS FENCING	TLF

LEVEL INFORMATION

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BED LEVEL	BL
COVER LEVEL	CL
DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
TOAL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
BRICK PAVIERS	BP
FLOWERBED	FB
PAVING SLABS	PS
RETAINING WALL	RtWall
TACTILE PAVING	Tac

FEATURE INFORMATION

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BRITISH TELECOM IC	BTIC	RAIN WATER PIPE	RWP
BUS STOP	BS	RAISED FLOWERBED	RFB
CABLE TELEVISION BOX	CATB	ROAD SIGN	RS
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ELECTRICITY POLE	EP	STOP VALVE	SV
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LAMP POST	LP	TRAFFIC SIGNAL	TS
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KERB OUTLET	KO	WATER TAP	Twp
NAME PLATE	NP		

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Grid:
Grid is related to OSGB15 derived from the GPS network

Northpoint:

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Client:	Faithful & Gould		
Survey Location:	Cascades Leisure Centre Site Thong Lane Gravesend		
Survey type:	Topographical	Scale:	1:200@A0
Drawing ref:	ENC/011122/252151	Date:	November 2022
Drawn/QA:	BF/DH	Plot No:	4 of 4

APPENDIX D – Site Investigation Report



Furness Partnership Limited

Gravesham Leisure Centre

Phase 2 Geo-environmental and Geotechnical Site Investigation

52511-R01(00)

RSK GEOSCIENCES

May 2023

RSK GENERAL NOTES

Project No.: 52511

Title: Phase 2 Geo-environmental and Geotechnical Site Investigation: Gravesham Leisure Centre, Thong Lane, Gravesend DA12 4LG

Client: Furness Partnership Limited

Date: May 2023

Office: RSK Environment Limited, Anerley Court, Half Moon Lane, Hildenborough, Tonbridge, TN11 9HU. Tel 01732 833111

Status: Rev 00

Author Rebecca Drewett **Technical reviewer** Niki Dubber / Ziaul Hoque

Signature [redacted]

Project manager Svetislav Trajkovski **Quality reviewer** Helen Bailey

Signature [redacted]

Revision control sheet				
Revision ref.	**Date**	**Reason for revision**	**Amended by:**	**Approved by:**
Rev 00	24/05/23	First issue	n/a	see above

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Where any data supplied by the client or from other sources have been used, it has been assumed that the information is correct. No responsibility can be accepted by RSK for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

This work has been undertaken in accordance with the quality management system of RSK Environment Ltd. No part of this report may be copied or duplicated without the express permission of RSK and the party for whom it was prepared.

Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.