



Hydrotec & Engineering Consultants

Develop Design Deliver

Drainage Strategy

JTM Community Project

102 Sherborne St, Manchester

November 2024

CLIENT:

NK Architectural Services

Reference: 24/NK Arch/drainage/JTM/Sherborne St/Manchester

INSTRUCTION:

Hydrotec and Engineering Consultants was commissioned by NK Architectural Services to carry out a drainage strategy for the proposed development on the land at 102 Sherborne Street, Cheetham Hill, Manchester, M8 8LR.

SCHEME:

Construction of a communal building including a sports hall, swimming pool and car parking spaces with associated landscape amenities.

REQUIREMENT:

Surface water drainage strategy for the proposed development to assist the planning application's requirement.

DOCUMENT REVIEW & APPROVAL

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Executive Summary

A flood risk assessment (FRA) and surface water drainage strategy were conducted to assist the planning application for the proposed development on the land at 102 Sherborne Street, Cheetham Hill, Manchester, M8 8ND. The national grid reference number of the development site is SD 84022 00286 (“the Site”). The proposed development is constructing a communal building including a sports hall, swimming pool, and car parking spaces with associated landscape amenities.

The present FRA and surface water drainage strategy of the Site were made with the available information including the latest Environment Agency’s (EA) flood maps, the latest FEH hydrological data, topographical elevation data (LiDAR), soil map data and sewer maps data of United Utilities.

The present investigation suggests that the Site is in flood zone 1, and therefore, the Site is considered to be out of fluvial and coastal flood risk.

The Site is at a low surface water flood risk - according to the EA’s flood map; moreover, the hydrological and topographical elevation data suggest that the impact of the overland flow from the Site's surroundings would be minimal. The Site is not at risk of groundwater or reservoir flows. The Site is also not considered to be a foul water flood risk.

The attenuation storage calculation was performed for the generated surface water runoff within the Site and no external flow was taken into account from the surrounding areas. The investigation was made at 20% AEP, 10% AEP, 3.3% AEP and 1% AEP including climate change allowance to assist the sustainable drainage systems (SuDS) design. The attenuation requirements for the whole site at 3.3% AEP and 1% AEP are 122m³ and 165m³; and with climate change allowance 193m³ and 269m³, respectively.

The proposed development would increase the impervious surface area, however, this increased impervious land of the proposed development would not deteriorate the surface water drainage substantially to the Site itself or its surrounding areas by the excess surface water runoff.

The soil types beneath the ground would not have a good infiltration rate to attenuate excess surface water runoff. There is no watercourse in close proximity to the Site and it would not be feasible to attenuate the excess runoff by a detention pond.

There is no surface water sewer around the Site. Thus, in the proposed surface water drainage strategy - the excess surface water runoff equivalent to the increased impervious area footprint of the proposed development would be attenuated in the underground tank. The discharge from the attenuation tank would be in the existing sewer drainage network of United Utilities with a vortex flow control unit.

Therefore, the on-site surface water attenuation storage for the proposed development would be based on 1% AEP plus a 45% climate change allowance for the proportionate increase of the impervious surface area (i.e. 94m³, taking into account 5.0 litres/sec greenfield runoff rate) without deterioration of the Site itself or surrounding areas. This excess surface water runoff would be stored in the proposed car parking area in an underground attenuation tank. Furthermore, there would be water butts to utilise the roof water for toilet flushing, general washing and irrigation. The discharge from the proposed swimming pool would be maintained during the dry period, assisting the surcharge reduction in sewer drainage drainage systems. The remaining excess runoff would be discharged to the existing sewer drainage network.

In addition, the proposed eco-friendly layout design and landscape amenities would assist in a better drainage system. Therefore, the proposed blue-green SuDS features, such as an underground attenuation tank, vegetated public amenities and plantation, would significantly improve the sustainable drainage systems, local environmental biodiversity and water quality compared to the existing conditions.

The periodic inspection and maintenance of the proposed drainage features including the water quality of the outfalls would be maintained, and the land owner of the Site would be responsible for these services.

The Site is not a risk to surface water drainage and therefore the finished ground floor level of the proposed communal building would be the same as the existing building's floor level which is currently above ground level. The access and egress from the Site during any flooding incident would be at Sherborne Street located in front of the Site.

The generated wastewater flow by the proposed development was estimated to be 0.13 litres/sec. The diameter of the foul water drainage pipes would be 150mm and the gradient of the pipes would be 1 in 80 or more to maintain the gravity flow.

The general observation of the United Utilities' sewer drainage networks in the surrounding area suggests that the proposed development would not make any significant impact on the existing sewer drainage network systems. It should, however, be noted that the Section 106 application will be made to connect the sewer outfalls from the development site to the existing sewer drainage network of United Utilities. A confirmation of consent agreement will be obtained from United Utilities before the construction of the proposed development.

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Abbreviations

AEP	Annual Exceedance Probability
CCA	Climate Change Allowance

DWF	Dry Weather Flow
DTM	Digital Terrain Model
EA	Environment Agency
FEH	Flood Estimation Handbook
FRA	Flood Risk Assessment
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
mAOD	meter Above Ordnance Datum
NGR	National Grid Reference
OS Map	Ordnance Survey Map
SuDS	Sustainable Drainage Systems

1 Introduction

The flood risk and sustainable drainage are important aspects of any new and existing development sites. The flood, which is being enhanced in the recent time due to the global climate change effects, could make vulnerable the properties, communities, and many aspects of human life. Therefore, it is important nowadays to assess the flood risk of any new developments; and the National Planning Policy Framework¹ (NPPF) guidelines have given the authority to the Environment Agency² (EA) and local planning authority (LPA) to make sure that any developments should be considered the flood risk assessment from all possible sources for the planning authorisation. These are not only securing the minimum risk at the proposed development site but also reducing the risk to the other existing developments.

Generally, a new development would provide an improvement with better facilities to the users and the communities, but it should also make a satisfaction that the proposed development would not and should not deteriorate to on-site and/or off-site other existing developments in the surrounding areas during its design life. Therefore, it has been a policy of the NPPF, lead local flood authority (LLFA), LPA, water utility companies and other relevant authorities to assess and manage the sustainable surface water drainage systems of all possible sources for a proposed development before granting the planning permission. Thus, the aim of the present flood risk assessment and drainage strategy is to assist planners and designers with the design of blue-green sustainable drainage systems for the proposed communal development and reduce the flood risk to other existing developments in the surrounding areas.

1.1 Background of the project site

The proposed development (hereafter “the Site”) is constructing a communal building including a sports hall, swimming pool and car parking spaces with associated landscape amenities. According to the NPPF guidelines, the proposed development would therefore be classified as a less vulnerable category in terms of flood risk vulnerability classification³. The Site is located on the land at 102 Sherborne Street, Cheetham Hill, Manchester, M8 8ND. The national grid

¹ [National Planning Policy Framework - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/431119/NPPF_2019.pdf)

² [Flood risk assessments if you're applying for planning permission - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/431119/NPPF_2019.pdf)

³ [National Planning Policy Framework - Annex 3: Flood risk vulnerability classification - Guidance - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/431119/NPPF_2019.pdf)

reference number (NGR) of the Site is SD 84022 00286. The geographical boundary of the project site lies within Manchester City Council’s remit - who is the lead local flood authority (LLFA) - providing advice and guidance for sustainable drainage systems (SuDS) for this development site. The existing conditions of the Site comprise old buildings (not currently in use), a hard and compacted surface and storage containers. There are some overgrown grasses, trees and shrubs around the boundaries. Sherborne Street is located adjacent to the western boundary of the Site, whereas St Davids Ct passes along the northern and eastern boundaries to access the adjacent developments. The land adjacent to the western side is Cheetham Park with dense vegetation with some trees and shrubs.

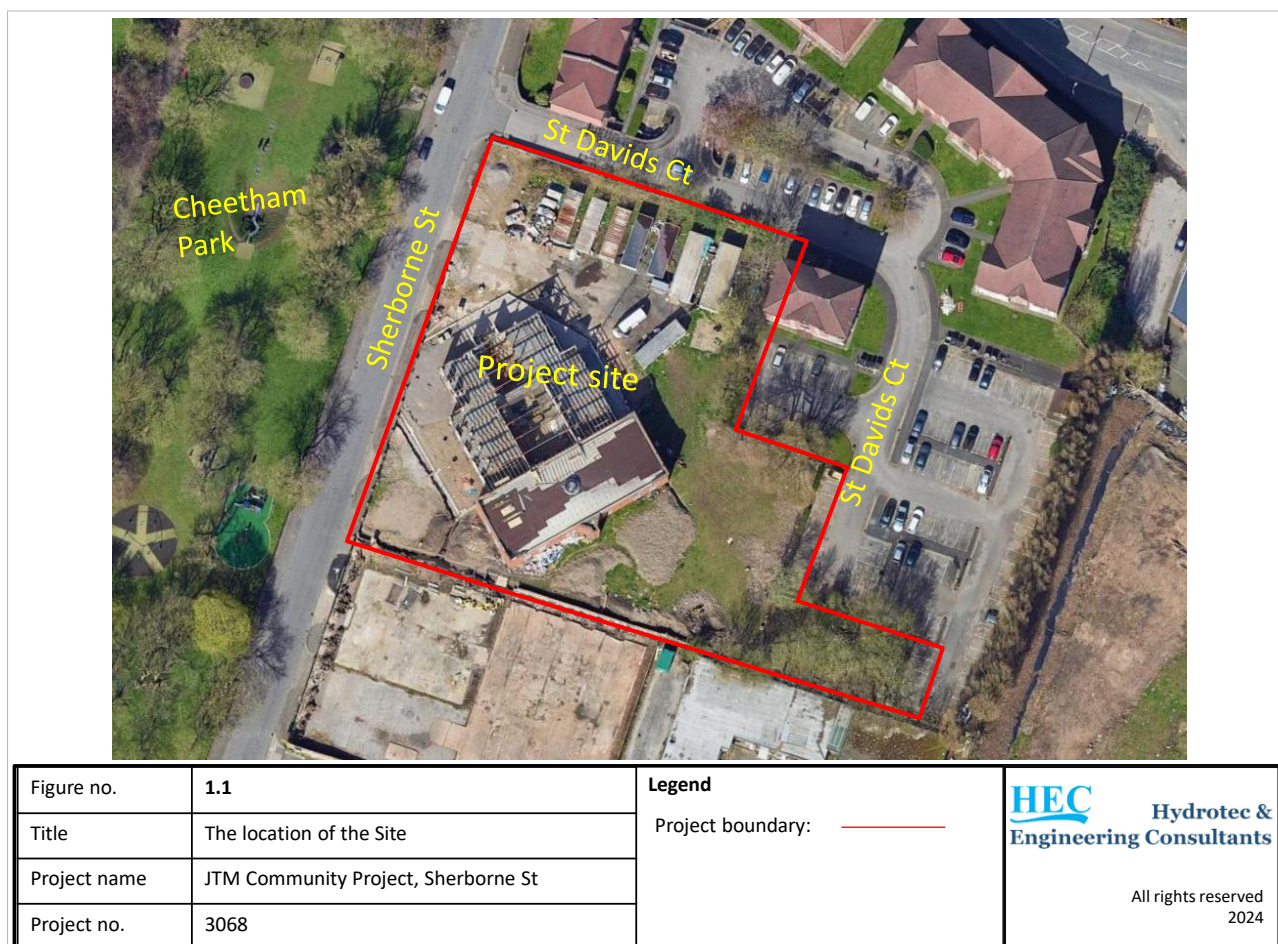


Figure 1.1: The location and existing condition of the proposed development site.

Generally, the surrounding area in the south consists of predominantly commercial facilities, whereas the northern and western sites are residential built-up areas. There is no watercourse in close proximity to the Site, whereas River Irk is situated to the east, approximately 1.1km away

from the Site; and River Irwell is situated to the south, approximately 1.10km away from the Site.

A satellite photograph of the existing condition of the project site is shown in Figure 1.1, and the layout of the proposed development is given in Figure 1.2 in addition to the detailed layouts of the proposed development in Appendix I. The total land surface of the proposed development is approximately 5,330m².

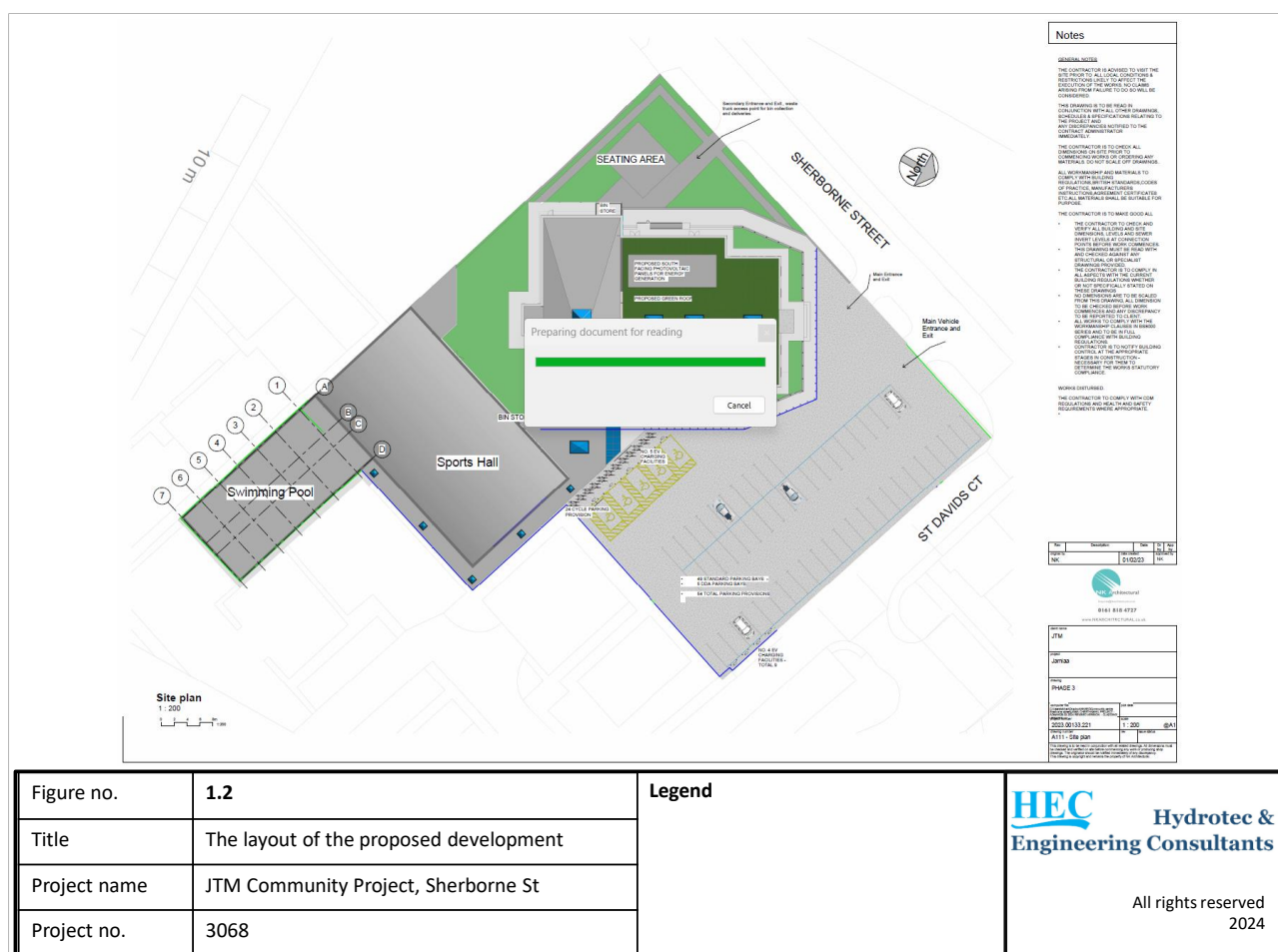


Figure 1.2: The layout of the proposed development.

2 Potential sources of the flood risk

The proposed development is constructing a communal building including a sports hall, swimming pool and car parking spaces with associated landscape amenities; thus, it is a requirement by LLFA to ensure the provision of appropriate flood risk assessment and

sustainable drainage of the surface water within the development, to promote safe and resilient communities, assisting by Environment Agency⁴ (EA) and LLFA.

2.1 Fluvial and coastal flood risk

The Environment Agency’s flood map⁵ indicates that the Site is located in flood zone 1, a risk of flooding less than 0.1% AEP (Annual Exceedance Probability), i.e. less than 1 in 1000-year flood event for the fluvial or coastal flows (Figure 2.1).

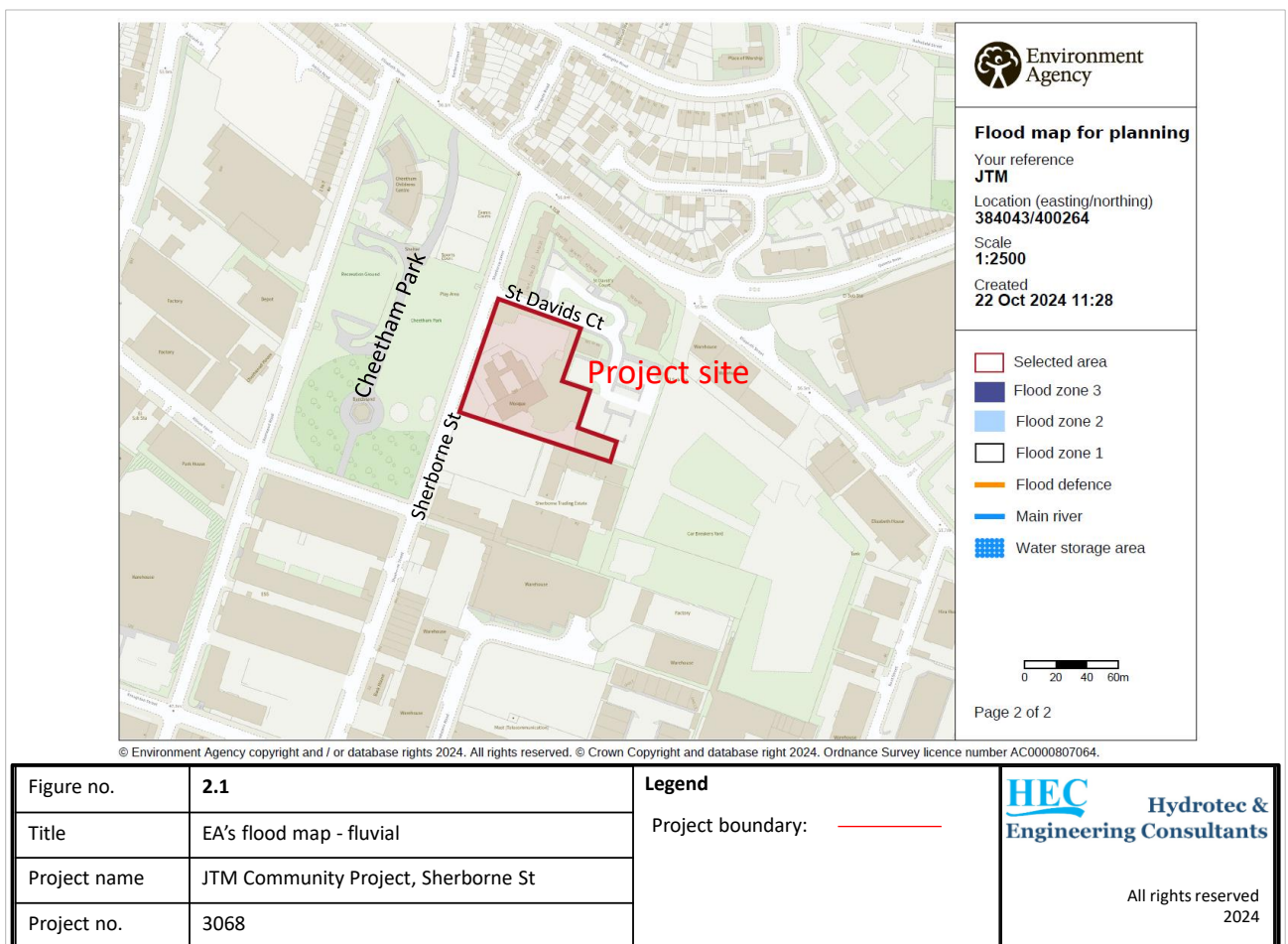


Figure 2.1: The fluvial and coastal flood risk at the Site - flood zone 1, the land having flood risk less than 0.1% AEP fluvial or coastal flows (reference – EA’s flood map⁶).

⁴ [Flood risk assessments if you're applying for planning permission - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/flood-risk-assessments-if-youre-applying-for-planning-permission)

⁵ [Flood map for planning - GOV.UK \(flood-map-for-planning.service.gov.uk\)](https://www.gov.uk/government/publications/flood-map-for-planning)

⁶ [Flood map for planning - GOV.UK \(flood-map-for-planning.service.gov.uk\)](https://www.gov.uk/government/publications/flood-map-for-planning)

Therefore, the proposed development site is considered to be out of either fluvial or coastal flows. In addition, the EA's flood map⁷ suggests that the Site is not at flood risk from the reservoir or groundwater flows (Figure 2.2).

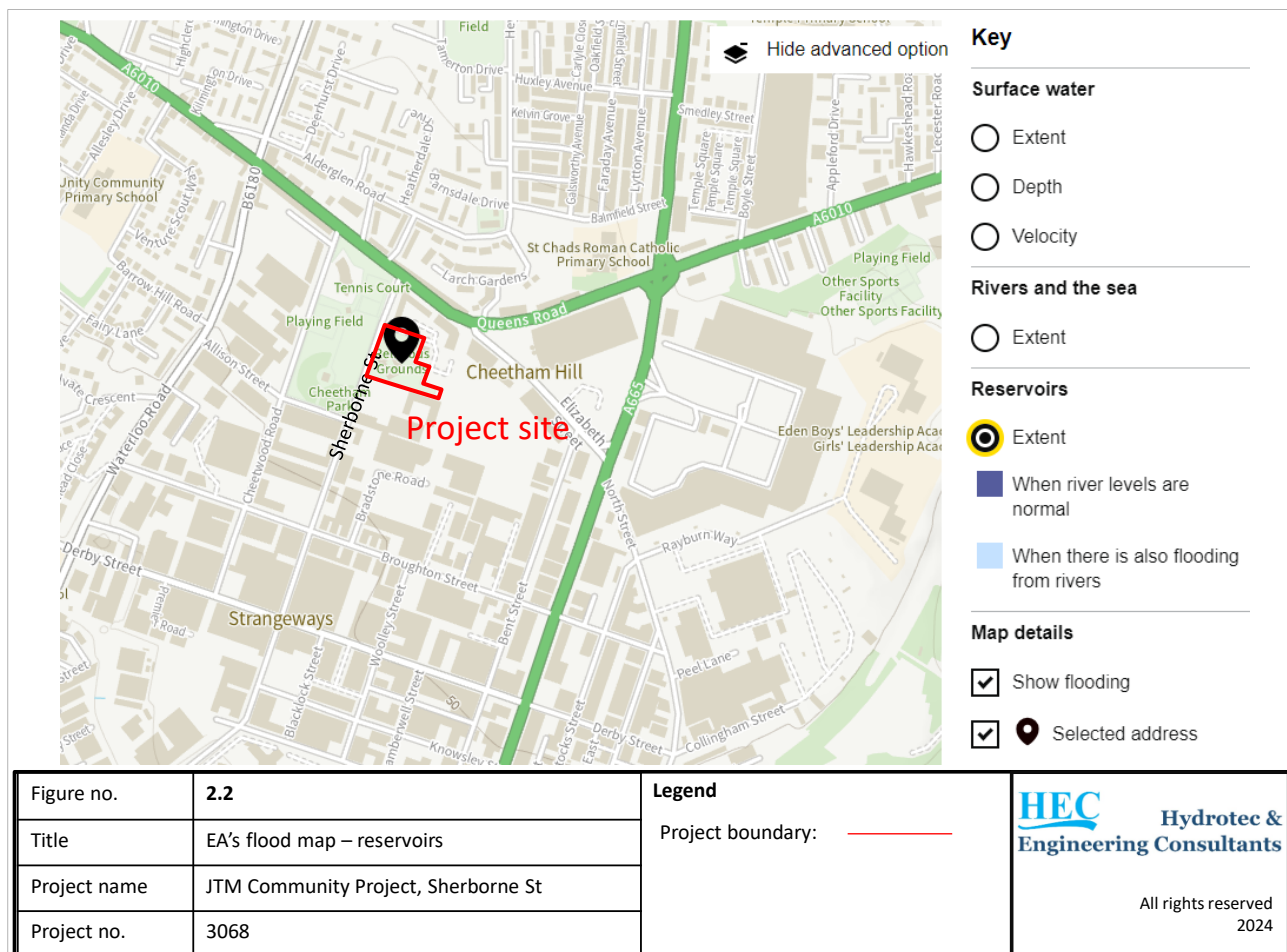


Figure 2.2: Groundwater/reservoir flow at the Site – a very low flood risk against the groundwater or reservoir flows (reference – EA's flood map⁸).

2.2 Surface water drainage

The guidance of the Environment Agency and LLFA based on the national planning policy framework⁹ (NPPF) recommends avoiding the increase in surface water flooding through requirements for sustainable drainage systems (SuDS) and minimising the impervious surface

⁷ [Check the long term flood risk for an area in England - GOV.UK \(flood-warning-information.service.gov.uk\)](https://www.gov.uk/flood-warning-information.service.gov.uk)

⁸ [Check the long term flood risk for an area in England - GOV.UK \(www.gov.uk\)](https://www.gov.uk)

⁹ Op. cit.

area. Moreover, the NPPF para 167 suggests that “when determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment.” Therefore, the surface water drainage measures should have a neutral or better effect on the risk of flooding both on and off the site, taking into account rain falling on the site and runoff from adjacent areas.

NPPF, LLFA and EA’s guidance takes a presumption against development in a 1 in 30-year hydrological event to the surface water drainage. Development should only be allowed in an area at risk from a 1 in 100-year (with climate change allowance (CCA)) if surface water drainage is manageable without any major risk to the development itself or other surrounding areas. It should be shown that in such cases surface water flows can be contained within the development and any flooding flood volumes do not affect third-party lands, flood the property, or obstruct the key access/egress routes.

Therefore, to achieve the guidance’s requirements for the surface water drainage at the Site, the surface water flooding mechanism at the on-site and off-site was assessed with appropriate consideration.

The EA’s surface water flood map¹⁰ (Figure 2.3) indicates that the Site would stay at a low flood risk to surface water drainage (i.e. a low risk means that each year this area has a chance of flooding of between 0.1% AEP and 1% AEP). Therefore, the Site would be considered a low hazard to surface water drainage.

Generally, the surface water overland flow is highly affected by the topographical features which define hydrological sub-catchments. For a better understanding of the surface water runoff around the Site, the hydrological sub-catchments were obtained from the Flood Estimation Handbook¹¹ (FEH22) and the data are presented in Figure 2.4.

¹⁰ [Your long term flood risk assessment - GOV.UK \(check-long-term-flood-risk.service.gov.uk\)](https://www.gov.uk/check-long-term-flood-risk)

¹¹ [Map - FEH Web Service \(ceh.ac.uk\)](https://www.ceh.ac.uk/map)

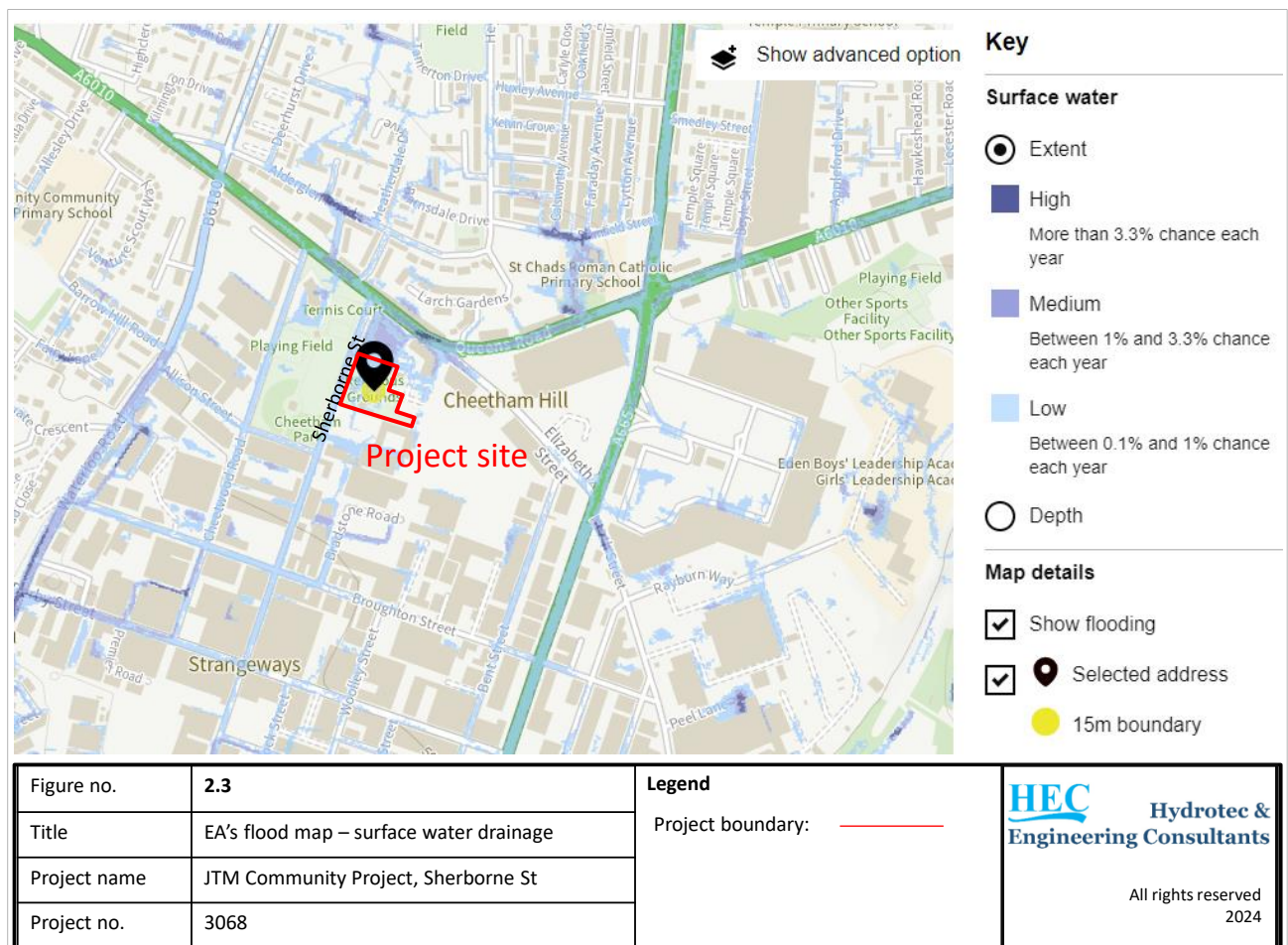


Figure 2.3: Surface water drainage at the Site – a low flood risk against the surface water flow (reference – EA's flood map¹²).

The hydrological sub-catchments that could have a possible impact on the Site are presented in Figure 2.4, and the indicative flow paths of the surface water runoff are shown in the blue arrow lines. The Site is located in a hydrological sub-catchment which drains the overland flow southerly into River Irwell located in the south, approximately 1.1km away from the Site. The surface area of this sub-catchment that could have a possible impact on the Site is relatively small, i.e. approximately 0.10km². Moreover, the existing infrastructures and drainage networks would intercept most of the overland flow in the upstream of the sub-catchment. Thus, a very limited overland flow would reach the Site from the upstream; consequently, the Site would not be impacted by the off-site surface water runoff. The adjacent sub-catchment located on the west side would convey the overland flow southerly and would not have any contribution to the

¹² [Check the long term flood risk for an area in England - GOV.UK \(www.gov.uk\)](https://www.gov.uk)

overland flow towards the Site. Another adjacent sub-catchment located on the north side would drain the overland flow through local drains into River Irk and would stay away from any overland contribution to the Site. The sub-catchment located adjacent to the southside would flow the overland flow laterally into the River Irwell and would not have an impact on the Site. Finally, the sub-catchment on the far east side would convey the overland flow laterally into River Irwell and would stay out of the Site. Thus, the effective overland flow contribution to the Site from the adjacent areas would be minimal.

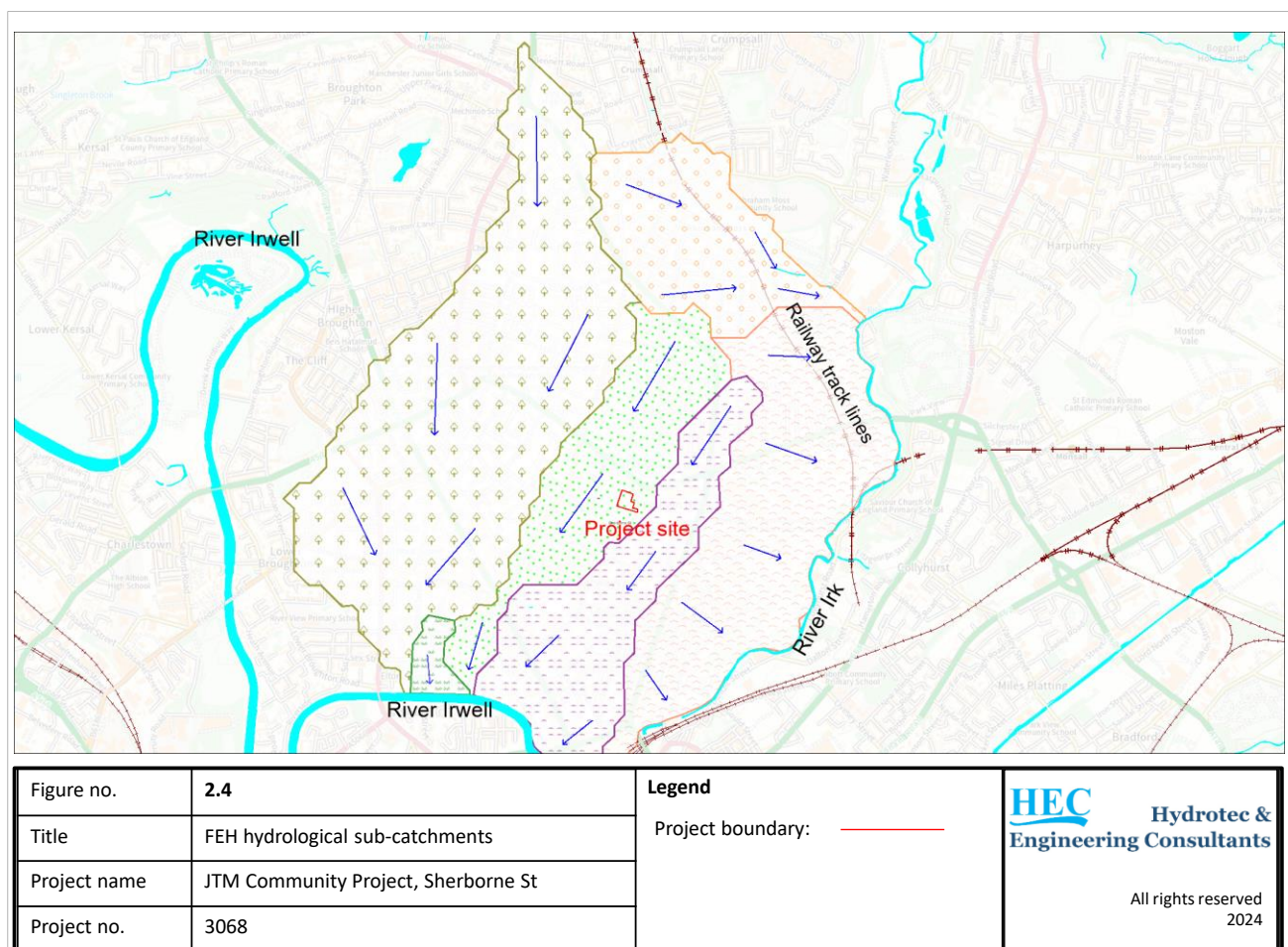


Figure 2.4: The hydrological sub-catchments around the Site (indicative overland flow paths in blue arrow lines); reference of the FEH22¹³.

¹³ op. cit.

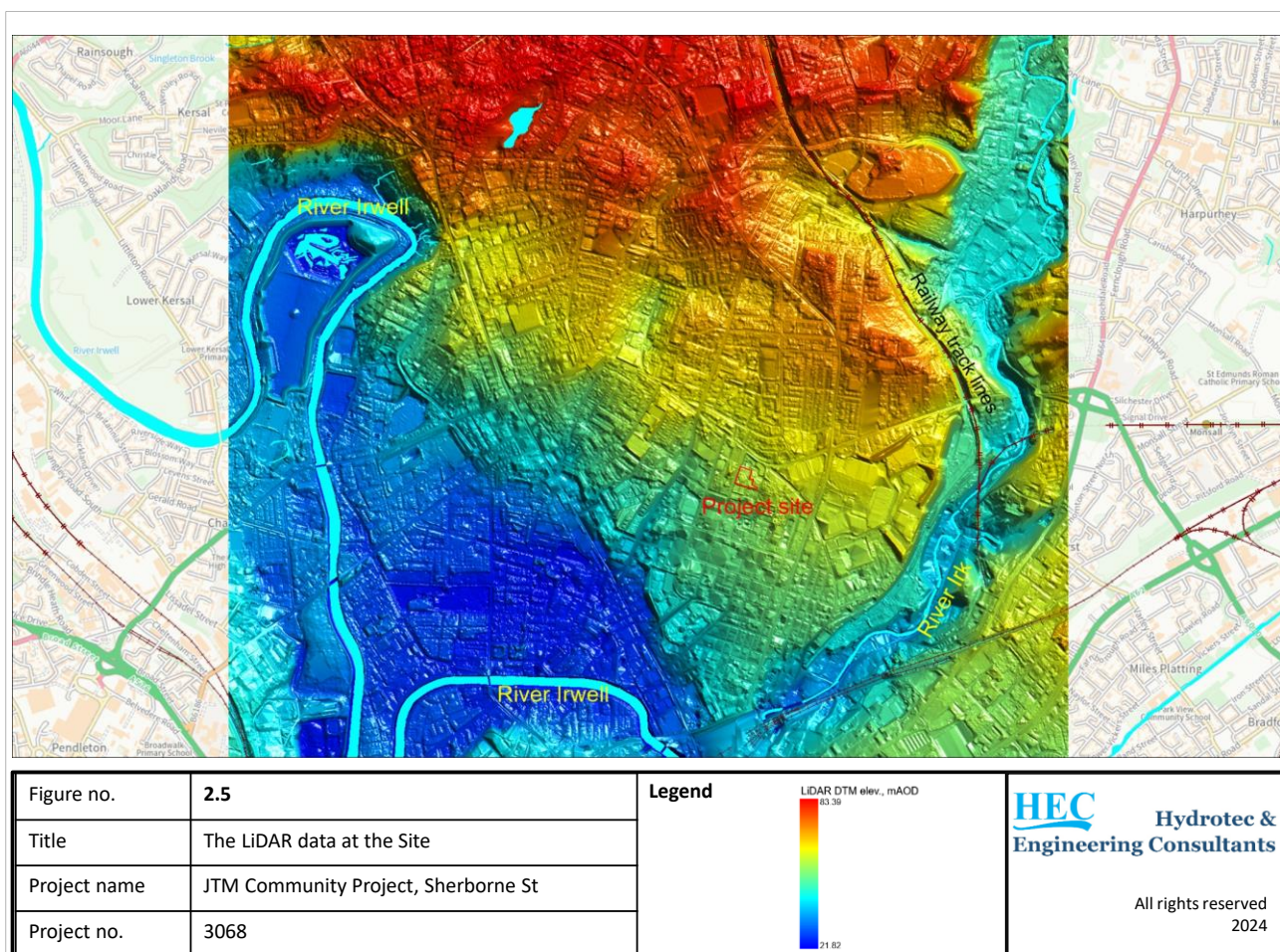


Figure 2.5: The LiDAR topographical elevation at the Site.

The intensity and magnitude of the overland flow and path on the ground surface would have a significant effect due to the ground elevation. Therefore, for an understanding of the complexity of the overland flow mechanisms, the topographical elevation at the Site was assessed based on the recent LiDAR¹⁴ (Light Detection and Ranging) DTM (Digital Terrain Model) data (Figure 2.5).

The LiDAR elevation data suggest that the ground level in the far northern area is relatively higher and declines to the south. However, most of the overland flow from the northern area would be channelised through the local drains and discharged to River Irwell and River Irk. Therefore, only part of this area, particularly the adjacent to the northern side, would contribute to surface water runoff towards the south. However, as mentioned earlier, the existing

¹⁴ [Defra Data Services Platform](#)

infrastructures and drainage networks would intercept most of the overland flow in upstream; subsequently, there would be a very minimal impact on the Site from the upstream runoff.

Therefore, the contributing surface water runoff from the off-site to the Site would be relatively low. Subsequently, the Site would not be considered any off-site surface water flood risk. Thus, the surface water runoff generated at the proposed development site would mainly be from the rainfall on the Site. Subsequently, a drainage strategy for this excess-generated surface water runoff would be required and managed by sustainable drainage systems (SuDS), according to the LLFA guidance.

2.3 Sewer flood risk

The proposed development is the construction of a communal building including a sports hall, swimming pool and car parking spaces. Therefore, the users and visitors of the proposed development would generate foul water flow.

The sewer drainage network data (see also Appendix II) obtained from United Utilities indicate that the existing sewer drainage network systems around the Site are combined, i.e. conveying surface and foul water flow through the same pipe in gravity flow. There is an existing 750mm in diameter sewer in front of the Site and under Sherborne Street conveying flow southerly and then upgraded to 640mmx950mm along Sherborne Street.

There are two manholes located in close proximity to the Site and therefore it would be suitable to discharge the excess flow by the proposed development into them. There are no details of the cover and invert levels of the manholes in the United Utilities' sewer drainage network. Moreover, there are no details of the private drainage network in the United Utilities' sewer drainage network system. Therefore, a CCTV sewer drainage survey would be carried out in order to get information on the existing condition of sewer pipes at the Site including the cover and invert levels of the manholes on Sherborne Street.

The proposed drainage networks would be separate, i.e. separate surface water and foul water drainage pipes. Subsequently, there would be less wastewater flow into the United Utilities' drainage networks, benefiting from less wastewater treatment by the sewage treatment works.

Thus, it would be suitable for discharging the generated foul water flow from the proposed development into the existing United Utilities' sewer drainage network.

For the estimation of the generated foul water by the proposed development, the standard guidelines of foul water design were followed. The foul water generation would be highly variable during the days or nights and throughout the year. Considering the standard guidelines from the Sewer for Adoption¹⁵, the typical wastewater flow for this type of catchment for commercial facilities is considered to be 0.6 litres per sec per hectare. The proposed communal building and sports hall would generate only domestic wastewater flow by the staff and visitors at the Site, and the total floor area of the proposed building is approximately 2,200m². Subsequently, the generated wastewater flow by the proposed facilities would become 0.13 litres/sec.

The general observation of the sewer drainage networks in the surrounding areas suggests that the proposed development would not significantly impact the existing sewer drainage network systems. It should, however, be noted that the Section 106 application will be made to connect the foul water outfalls from the development site to the existing sewer drainage network of United Utilities, and a confirmation of consent agreement will be obtained from United Utilities before the construction of the proposed development.

3 Drainage strategy and attenuation storage requirement

The proposed development is the construction of a communal building including a sports hall, swimming pool and car parking spaces with associated landscape amenities. The proposed development is therefore classified as a less vulnerable category - according to the NPPF flood risk vulnerability classification¹⁶.

At present, most of the existing ground surfaces on the Site are impervious areas, see also recent photographs of the front side, rear side and southwest side in Figure 3.1, 3.2 and 3.3, respectively.

¹⁵ [Sewerage Sector Guidance-approved documents | Water UK](#)

¹⁶ [National Planning Policy Framework - Annex 3: Flood risk vulnerability classification - Guidance - GOV.UK \(www.gov.uk\)](#)

The total surface area of the proposed development site is approximately 5,330m². Thus, most of the existing ground surfaces around the site would generate surface water runoff, flow around the Site and drain off to the existing sewer drainage network.



Figure 3.1: The photograph of the existing ground surface condition at the front side.



Figure 3.2: The photograph of the existing ground surface condition at the rear side.

The permeable and impermeable surface area of the existing and proposed developments are presented in Table 3.1. It suggests that the proposed development would increase the impervious surface area by approximately 1,840m², or 35% with respect to the total area.

Table 3.1: The surface area of the pre-development and post-development at the Site.

Development	Permeable area, m ²	Impermeable area, m ²
Existing	2,400	2,930
Proposed	560	4,770

Therefore, the proposed development would modify the existing ground surface; however, the proposed development would not have any detrimental impact on the Site itself or the surrounding area by the excess surface water runoff compared to the existing conditions.

At present, all the on-site surface water runoff is discharged either in the existing drainage network and/or nearby overground. The proposed development would have some increase in impermeable land. Therefore, to comply with the NPPF's local plan policy and LLFA guidelines and to improve the sustainability of the wider drainage systems, environmental impact and local biodiversity in the surrounding areas – the development proposal should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. Subsequently, some measures of the generated surface water runoff would be taken to be managed on-site.

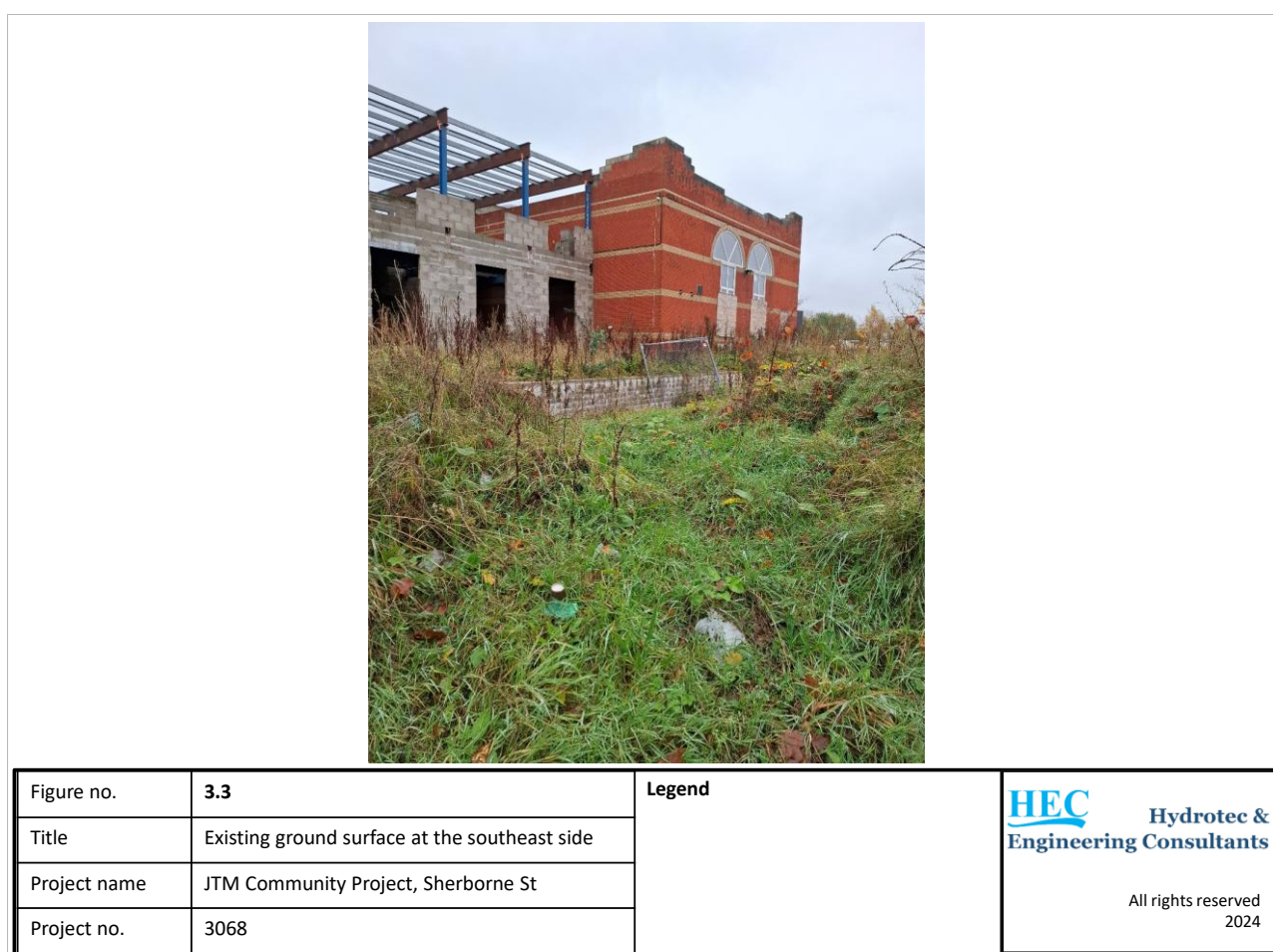


Figure 3.3: The photograph of the existing ground surface condition at the southwest side.

In order to calculate the generated surface water runoff at the Site, the hydrological data were obtained from the Flood Estimation Handbook¹⁷ (FEH22). The cumulative rainfall depths were

¹⁷ [Map - FEH Web Service \(ceh.ac.uk\)](http://map-feh.web-service.ceh.ac.uk).

calculated and the values at 1 in 5-year (20% AEP), 1 in 10-year (10% AEP), 1 in 30-year (3.3% AEP) and 1 in 100-year (1% AEP) are provided in Table 3.2 up to 600mins (i.e. 10.0 hrs).

Table 3.2: The cumulative depth-duration rainfall at 20% AEP, 10% AEP, 3.3% AEP and 1% AEP at the Site.

Duration, mins	Rainfall depths, mm			
	20% AEP	10% AEP	3.3% AEP	1% AEP
15	11.23	13.98	18.33	23.17
30	14.61	18.36	24.21	30.98
45	16.83	21.08	27.98	36.05
60	18.44	23.18	30.75	39.68
90	21.20	26.27	34.29	43.80
120	23.41	28.58	36.84	46.68
180	26.71	32.09	40.91	51.54
240	29.20	34.79	44.09	55.48
300	31.19	37.04	46.74	58.92
360	32.88	38.98	49.07	61.99
420	34.37	40.66	51.18	64.86
480	35.70	42.16	53.12	67.51
540	36.92	43.53	54.91	69.98
600	38.03	44.80	56.58	72.30

The proposed development is for communal use and therefore the design life of the development would be 100 years. Thus, the NPPF's guidance suggests the upper-end allowance for peak rainfall when considering climate change. The upper-end peak rainfall allowances at the Site in the 2070s epochs are 40% and 45% at 3.3% AEP and 1% AEP, respectively - according to the Environment Agency's climate change allowance guidelines¹⁸. Subsequently, for the climate change allowance (CCA), the peak rainfall was increased by 25%, 25%, 40% and 45% at 20% AEP, 10% AEP, 3.3% AEP and 1% AEP, respectively.

¹⁸ [Flood risk assessments: climate change allowances - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/flood-risk-assessments-climate-change-allowances)

One of the main objectives of the surface water attenuation storage is that during the storm event, the generated surface water runoff within the Site would be retained on-site for some time. Therefore, the peak flow in the watercourses and/or drainage networks would not be increased substantially to ease the flood risk in the downstream. However, it is an acceptable policy of the LLFA with regard to the greenfield runoff rate to allow some discharge from the development site into the nearby watercourses and/or drainage network systems to reduce the cost and land space for the attenuation storage within the development site.

In the present calculation, the greenfield runoff rates were considered based on the HR Wallingford tools¹⁹. The estimated greenfield runoff rates at 1 in 30-year and 1 in 100-year are 5.99 litres/sec and 7.33 litres/sec, respectively (see Appendix III).

The attenuation storage requirements for the proposed development were calculated at 20% AEP, 10% AEP, 3.3% AEP and 1% AEP including climate change allowance²⁰; and the results are presented in Table 3.3. In Table, the 4th column is the total runoff volume (m³) generated by the Site; the 5th column is the total runoff volume (m³) required for attenuation, considering the greenfield runoff rates and the last column 6th is the total runoff volume (m³) required for attenuation with climate change allowance.

No external off-site runoff was taken into consideration in the present calculation and the attenuation storage requirements for the Site (i.e. surface area 5,330m²) at 3.3% AEP and 1% AEP are 122m³ and 165m³; and with climate change allowance 193m³ and 269m³, respectively

¹⁹ [Online tools for sustainable drainage systems \(SuDS\) \(uksuds.com\)](https://uksuds.com/)

²⁰ [Peak rainfall climate change allowances by management catchment - GOV.UK \(www.gov.uk\)](https://www.gov.uk/)

Table 3.3: Surface water attenuation storage requirement at 20% AEP, 10% AEP 3.3% AEP and 1% AEP including climate change allowance at the Site.

Return periods	Storm duration, mins	Greenfield runoff rate, l/s	Volume of the surface water runoff, m ³		
			Total runoff	Attenuation req.	Attenuation req. with CCA
20% AEP	15	5.00	55	50	65
	30	5.00	68	59	78
	45	5.00	75	61	84
	60	5.00	78	60	85
	90	5.00	83	56	84
	120	5.00	84	48	80
	180	5.00	82	28	63
	240	5.00	75	3	42
	300	5.00	65	-25	17
	360	5.00	54	-54	-10
10% AEP	15	5.00	69	65	84
	30	5.00	88	79	103
	45	5.00	97	84	112
	60	5.00	103	85	116
	90	5.00	110	83	118
	120	5.00	112	76	114
	180	5.00	111	57	99
	240	5.00	105	33	79
	300	5.00	97	7	56
	360	5.00	87	-21	31
3.3% AEP	15	5.99	93	87	126
	30	5.99	119	108	160
	45	5.99	134	118	177
	60	5.99	144	122	188
	90	5.99	153	120	193
	120	5.99	156	113	191
	180	5.99	158	93	180
	240	5.99	154	68	162
	300	5.99	148	41	140
	360	5.99	141	11	116
1% AEP	15	7.33	118	112	167
	30	7.33	155	142	216
	45	7.33	177	157	244
	60	7.33	191	165	260
	90	7.33	203	164	269
	120	7.33	208	156	268
	180	7.33	214	135	259
	240	7.33	215	110	243
	300	7.33	213	81	223
	360	7.33	209	51	200

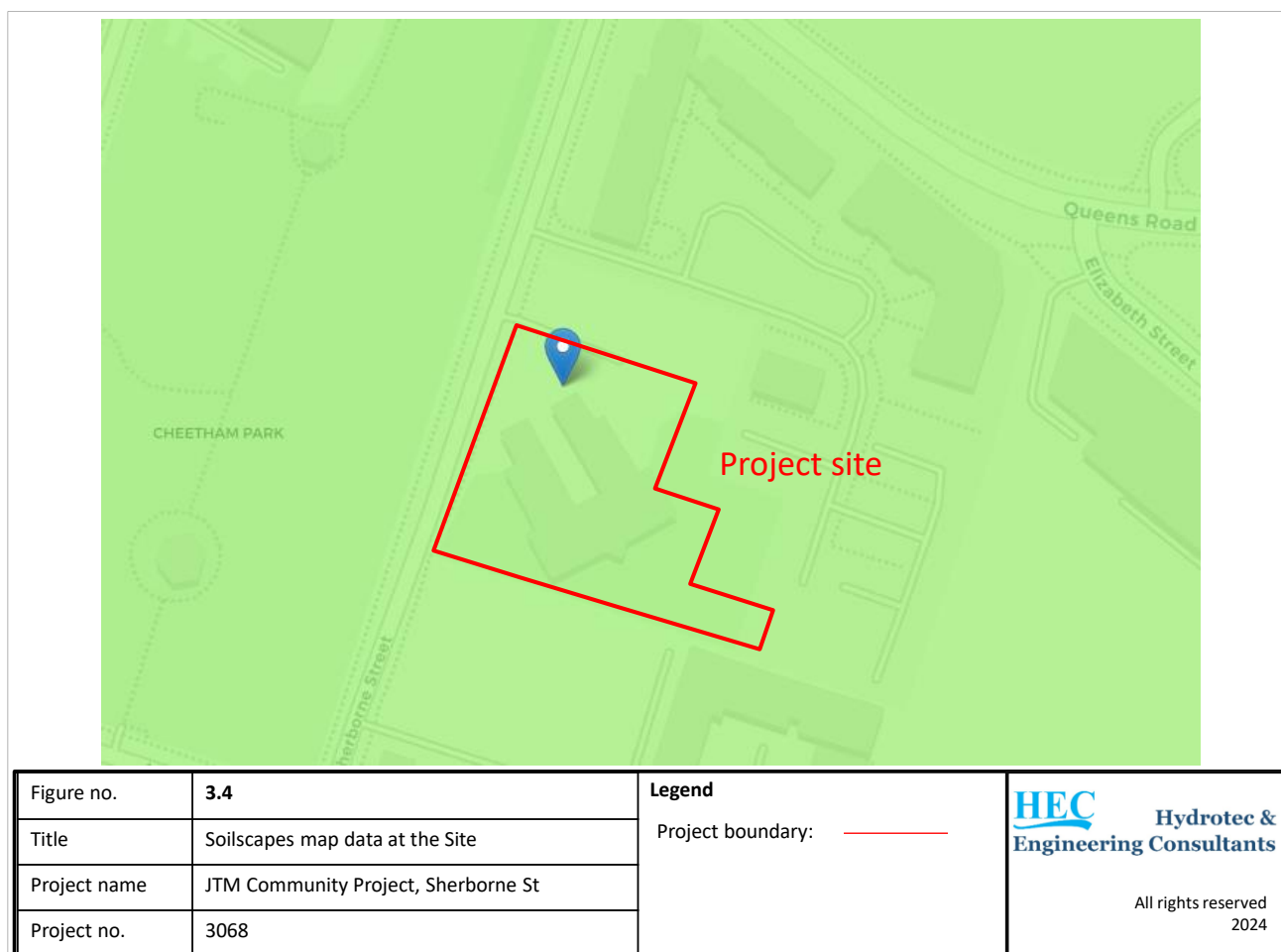


Figure 3.4: The soil types beneath the Site – slowly permeable, seasonally wet acid-loamy and clayey soils (reference - Soilscapes map data of Cranfield University²¹).

To assess the feasibility of the attenuation for the generated surface water runoff through underground infiltration, the soil types beneath the Site were assessed based on the Soilscapes map data of Cranfield University²². Generally, soil types beneath the Site are slowly permeable, seasonally wet acid-loamy and clayey soils (Figure 3.4). Therefore, the infiltration rate of the soils beneath the Site would not be good and it would not be suitable for attenuating excess surface water through infiltration. It should, however, be noted that there is no in-situ soil percolation data available at the project site during the publication of the report.

There is no watercourse in close proximity to the Site and there is no surface water sewer drainage network in close proximity to the Site.

²¹ [Soilscapes soil types viewer - National Soil Resources Institute. Cranfield University \(landis.org.uk\)](https://www.landis.org.uk/)

²² <https://www.landis.org.uk/>

At present, all the on-site surface water runoff is discharged to nearby overground. The proposed development would not substantially deteriorate the excess surface water runoff compared to the existing condition. However, to comply with the NPPF’s local plan policy and LLFA guidelines and to improve the sustainability of the wider drainage systems, environmental impact and local biodiversity in the surrounding areas – in the proposed surface water drainage strategy, the excess surface water runoff equivalent to the increased impervious footprint area of the proposed development at 1 in 100-year plus climate change allowance would be attenuated on-site.

The proposed development would have an impact of approximately a 35% increase in impervious land. Therefore, the on-site surface water attenuation storage requirement would be 94m³ - the equivalent impervious surface area footprint (i.e. 35% of total runoff) at 1% AEP plus a 45% climate change allowance.

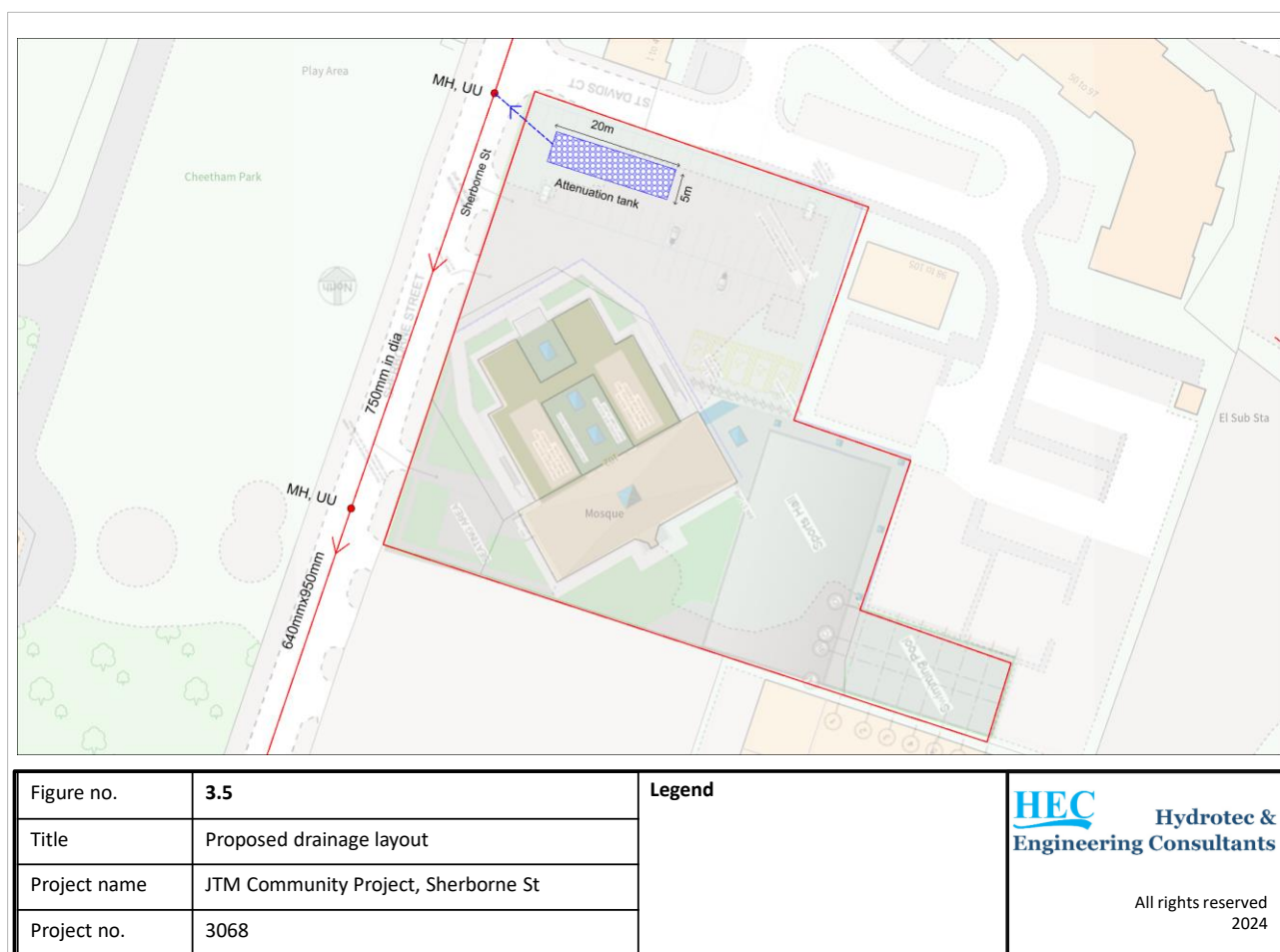


Figure 3.5: The layout of the proposed drainage strategy.

Due to space limitations on the Site, it would not be feasible to attenuate the excess surface water runoff in a detention pond. Thus, the attenuation for the excess runoff would be managed by an underground storage tank located in the car parking area, taking into account the space restriction and maintenance facilities. The extent and location of the proposed attenuation storage are shown in Figure 3.5, see also in Appendix V.

The discharge from the underground storage tank would be into the existing combined sewer drainage network of United Utilities located under Sherborne Street. The discharge from the underground tank would be maintained by a hydro-valve vortex flow control unit (i.e. 5.0 litres/sec, see also a sample of vortex flow control device in Appendix IV) in a controlled manner including reasonable water quality measures.

There is a proposed swimming pool on the Site and the outfall from the swimming pool due to the change of water would be maintained during the dry period into the underground attenuation tank, and then it would be discharged to the sewer drainage network, reducing the surcharge impact of the excess water during the wet period in the sewer drainage network of the United Utilities.

The size of the underground storage tank would therefore be the equivalent impervious surface area footprint (i.e. 35% of total runoff) of the Site at 1% AEP plus a 45% climate change allowance. (i.e. 94m³).

In addition, in the proposed surface water drainage strategy, runoff from the roof surface would be stored in a water butt (approximately 2,500 litres in size, see also a sample in Appendix VI) and it would be utilised for toilet flushing, general washing and irrigation, e.g. patio plants, attenuating further excess surface water runoff.

Moreover, there would be surface water drainage pipes to facilitate the collection of the excess runoff by gravity flow in addition to ACO drains to intercept the runoff on the Site (see an example of an ACO drain in Appendix VII). Therefore, the proposed surface water drainage strategy would be sustainable during the design life of the development without deteriorating the Site itself or other existing developments in surrounding areas.

It should, however, be noted that the Section 106 will be made to United Utilities to obtain consent for a confirmation agreement to discharge the proposed outfall into the United Utilities' sewer drainage network before the construction of the proposed development facilities.

Furthermore, the layout of the development site is considered well-thought, eco-friendly and sustainable drainage systems including public recreational open space and plenty of shrub and tree plantation with permeable porous trenches, assisting water quality improvement by reducing the suspended solid and silt materials. Subsequently, the proposed surface water drainage strategy would significantly improve the sustainability of surface water drainage at the Site and adjacent area.

4 Finished floor level and access/egress from the Site

The proposed development, which is the construction of a communal building including a sports hall, swimming pool and car parking spaces with associated landscape amenities, is classified as a less vulnerable category, according to the NPPF flood risk vulnerability classification²³.

The Site would not have a flood risk from fluvial flow. Moreover, the surface water drainage would have a very low risk and would have a minimal impact on the Site, taking into account the proposed surface water drainage strategy. The existing ground floor level of the building is already above the ground level. Thus, it would be suitable for the proposed communal building's floor level to stay on the existing building's floor level. The sports hall building could remain the same as the communal building's ground floor level.

There would not be any issues with the access and egress from the proposed development site during evacuation and emergency vehicles' movement. Sherborne Street, which is located in front of the Site, would be used as an access and egress during any unexpected flooding incident.

²³ [National Planning Policy Framework - Annex 3: Flood risk vulnerability classification - Guidance - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/policies/national-planning-policy-framework-annex-3-flood-risk-vulnerability-classification-guidance)

5 Conclusions

A flood risk assessment and surface water drainage strategy were conducted to assist the sustainable drainage systems (SuDS) design for the proposed development on the land at 102 Sherborne Street, Cheetham Hill, Manchester, M8 8ND. The proposed development is the construction of a communal building including a sports hall, swimming pool and car parking spaces with associated landscape amenities. The Site lies within Manchester City Council's remit, who is the LLFA, providing advice and guidance for sustainable drainage systems for this development site.

The present flood risk assessment and drainage strategy to assist the planning application were made with available information including the latest EA's flood maps data, FEH hydrological data, topographical elevation data (LiDAR), soil map data, and sewer network data of United Utilities.

The present investigation suggests that the Site is in flood zone 1 and, therefore, the Site is considered to be out of fluvial and coastal flood risk.

The proposed development site is a low risk from the surface water flow - according to the EA's flood map²⁴. Moreover, the hydrological and topographical elevation data around the Site indicate that the impact of the surface water runoff from the surrounding areas would be minimal. Thus, the surface water attenuation storage requirement for the Site would only be the generated overland flow by the surface area of the proposed development, and the overland flow from the surrounding areas was not considered. In addition, the Site is not at risk to the groundwater or reservoir flows.

The soil types beneath the Site are slowly permeable, seasonally wet, acid-loamy and clayey soils with reference to the Soilsmap data²⁵. Thus, it would not be suitable to attenuate the excess surface water through the infiltration.

²⁴ Op.cit.

²⁵ Op.cit.

There is no watercourse in close proximity to the Site, and due to space limitations, it would not be suitable for attenuating excess runoff by a detention pond.

There is no surface water sewer drainage network around the Site. However, there is a combined sewer drainage network of United Utilities conveying flow under Sherborne Street located in front of the Site. There are existing sewer manholes in front of the proposed development.

Therefore, in the proposed surface water drainage strategy - the excess runoff would be attenuated in an underground storage tank and then discharge to the existing sewer drainage network in a controlled manner by a vortex flow control unit.

The attenuation storage requirements were calculated at 20% AEP, 10% AEP, 3.3% AEP and 1% AEP including climate change allowance²⁶. The cumulative rainfall depths at these events were estimated from the latest FEH22 rainfall-runoff model data²⁷. For the whole site, the attenuation storage requirements at 3.3% AEP and 1% AEP are 122m³ and 165m³; and with climate change allowance 193m³ and 269m³, respectively.

In the proposed surface water drainage strategy, the excess generated surface water runoff by the development would be attenuated on-site up to the equivalent of the increased impervious area footprint of the proposed development (i.e. approximately 35%). On the other hand, approximately 94m³ of surface water based on 1% AEP plus a 45% climate change allowance would be attenuated in the underground storage tank. The storage water would be discharged in a controlled manner by a flow control vortex unit into the existing sewer drainage network of United Utilities.

It should be noted that the Section 106 application will be made to discharge the excess runoff to the existing sewer drainage of United Utilities under Sherborne Street, and a consent agreement will be obtained from United Utilities before the construction of the development.

Moreover, in the proposed surface water drainage strategy, runoff from the roof surface would be stored in water butts and would be utilised for toilet flushing, general washing and irrigation,

²⁶ Op.cit.

²⁷ Op. cit.

e.g. patio plants. Furthermore, the ACO drains and surface water drainage pipes would assist in the excess runoff conveying to the outfalls.

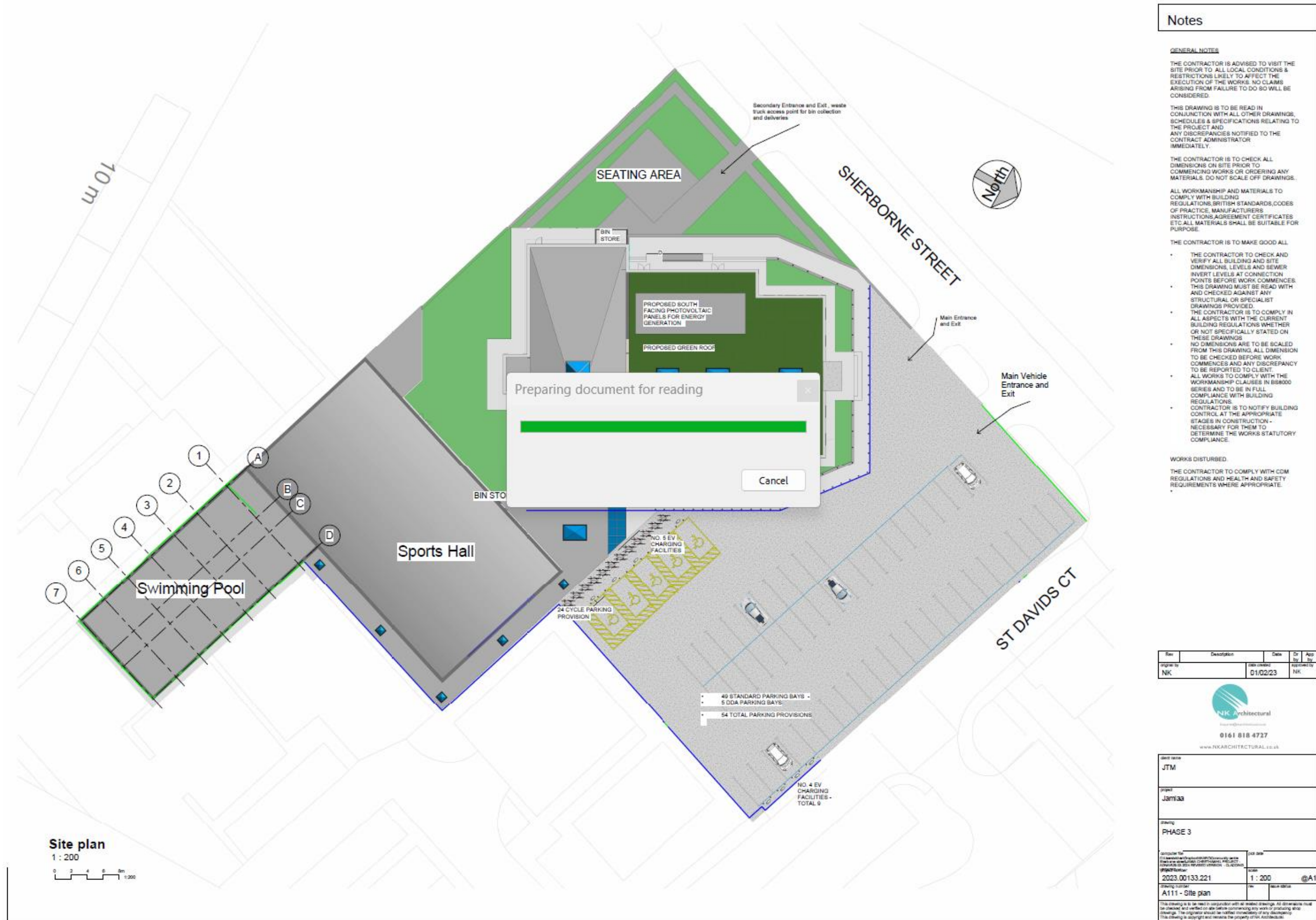
Thus, the proposed development would improve the surface water drainage sustainability during the design life of the development without deterioration of the Site itself or surrounding areas.

The Site is not considered to be a surface water flood risk, taking into account the proposed surface water drainage strategy. Therefore, the finished ground floor level of the proposed communal building and sports hall would be on the existing building's floor level which is currently above the ground level.

The access and egress from the Site during any flooding incident would be at Sherborne Street located in front of the Site.

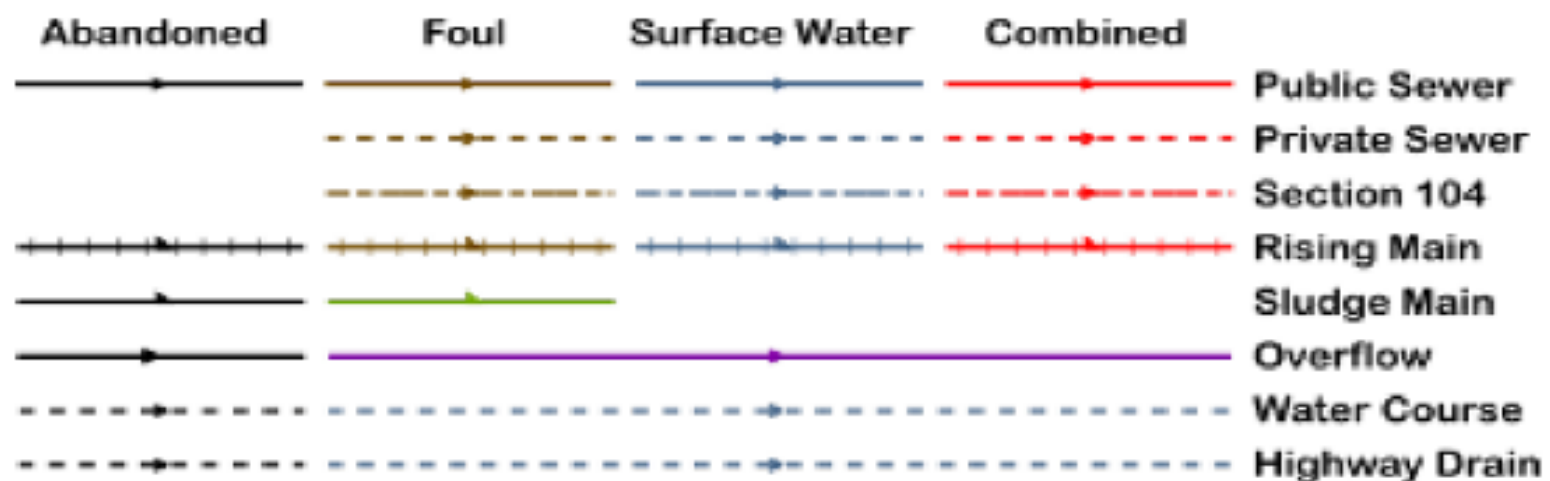
The generated wastewater flow by the proposed development was estimated to be 0.13 litres/sec. The general observation of the United Utilities' sewer drainage networks in the surrounding area suggests that the proposed development would not make any significant impact on the existing sewer drainage network systems. However, a confirmation of consent agreement from United Utilities will be obtained before utilising the proposed development.

Appendix I: The layout of the proposed development.





Wastewater Symbolology



All point assets follow the standard colour convention: **red** – combined **brown** - foul
blue – surface water **purple** - overflow

- | | |
|------------------|------------------------------|
| Manhole | Side Entry Manhole |
| Head of System | Outfall |
| Extent of Survey | Screen Chamber |
| Rodding Eye | Inspection Chamber |
| Inlet | Bifurcation Chamber |
| Discharge Point | Lamp Hole |
| Vortex | T Junction / Saddle |
| Penstock | Catchpit |
| Washout Chamber | Valve Chamber |
| Valve | Vent Column |
| Air Valve | Vortex Chamber |
| Non Return Valve | Penstock Chamber |
| Soakaway | Network Storage Tank |
| Gully | Sewer Overflow |
| Cascade | Ww Treatment Works |
| Flow Meter | Ww Pumping Station |
| Hatch Box | Septic Tank |
| Oil Interceptor | Control Kiosk |
| Summit | DNM Network Monitoring Point |
| Drop Shaft | Change of Characteristic |
| Orifice Plate | |

Appendix III: Greenfield runoff rate at the Site, reference to HR Wallingford



Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Dr Mahmud Ahsan
Site name:	JTM
Site location:	Cheetham Hill

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details	
Latitude:	53.49894° N
Longitude:	2.24237° W
Reference:	334606675
Date:	Nov 08 2024 12:12

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha):	0.533
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Methodology

Q _{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Calculate from dominant HOST
HOST class:	17
BFI / BFIHOST:	0.514
Q _{MED} (l/s):	2.81
Q _{BAR} / Q _{MED} factor:	1.08

Hydrological characteristics

	Default	Edited
SAAR (mm):	916	916
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

Default Edited

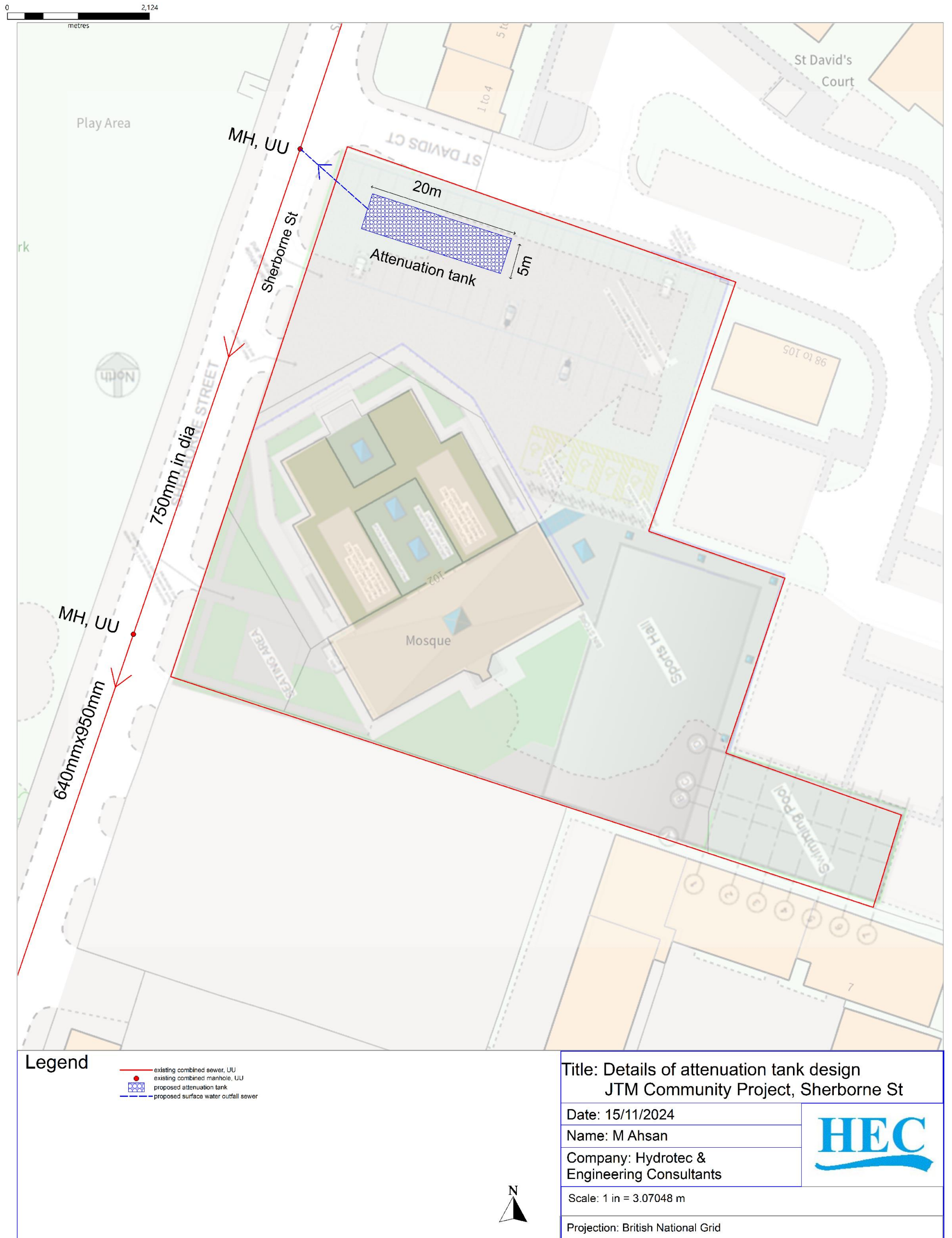
Q_{BAR} (l/s):	3.03	3.03
1 in 1 year (l/s):	2.63	2.63
1 in 30 years (l/s):	5.14	5.14
1 in 100 year (l/s):	6.29	6.29
1 in 200 years (l/s):	7.17	7.17

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Appendix IV: A sample of hydro-valve, a vortex flow control device (1-5 litres/sec).



Appendix V: The layout of the proposed drainage strategy at the Site.



Appendix VI: A typical vertical water tank for rainwater harvesting (capacity 2,500 litres).



Appendix VII: A typical ACO drain (channel drainage).

