+44 (0) 161 834 1938

www.edgece.com

3rd Floor, Conavon Court, 12 Blackfriars Street
Manchester M3 5BQ, United Kingdom

Document name: 210701-EDGE-XX-XX-RP-C-0001_FLOOD RISK ASSESSMENT[P03]

FLOOD RISK ASSESSMENT REPORT FOR 210701 – NORTH MANCHESTER GOLF CLUB

Prepared for:
Simon Jones
Duchy Homes
6550 Daresbury Park
Warrington
WA4 4GE

Revision	Date	Description	Prepared by	Checked by	Approved by
P01	24.11.21	FIRST ISSUE	RA	MA	RA
P02	10.07.24	UPDATED DEVELOPMENT PROPOSALS	JC	RA	RA
P03	09.10.25	UPDATED TO LLFA COMMENTS	MA	RA	RA

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY 3
2 INTRODUCTION 4
3 NATIONAL PLANNING POLICY FRAMEWORK (NPPF) 5
4 STRATEGIC FLOOD RISK ASSESSMENT 6
5 FINDINGS OF A FLOOD RISK ASSESSMENT 7
6 RESIDUAL RISKS 12
7 SUDS EVALUATION 13
8 CONCLUSIONS AND RECOMMENDATIONS 15
APPENDICES 16
Appendix A – Extract from chapter 14 of NPPF December 2023 16
Appendix B – Topographic survey 17
Appendix C – Architects layout 18
Appendix D – United Utilities asset search maps 19
Appendix E – Proposed drainage layout 20
Appendix F – Greenfield runoff calculations 21
Appendix G – MicroDrainage calculations 22

1 EXECUTIVE SUMMARY

Alliance Design UK Ltd t/a EDGE Consulting Engineers ("EDGE") has been appointed by Duchy Homes to produce a Flood Risk Assessment to support a planning application seeking permission for the construction of 56 residential dwellings and associated infrastructure.

The site is located off Manchester Old Road in Middleton Greater Manchester and is formally comprised of undeveloped greenfield land fronting North Manchester Golf club, M24 4PE.

The site area extends to 3.017Ha, is an irregular shape and is classified as greenfield land. The southern extent of the site is bounded by Manchester Old Road. Rhodes Lodge fishing lake and River Irk are located beyond Manchester Old Road with an access track to the West of the site beyond which is woodland and existing residential dwellings. North Manchester Golf course and club house is to the north of the site and existing residential dwellings are located to the East.

The site falls from North to South and East to West with levels recorded in the northern extents at 76.0mAOD and 71.0m AOD in the Southwestern extents.

The purpose of this report is to assess the risk of flooding to the site from fluvial, tidal, pluvial (overland) surface water and ground water sources as well as from reservoirs, canals and adjacent sewers.

The site is located wholly within flood zone 1.

Surface water must discharge from the site in the most sustainable manor and drainage proposals should adhere to the SUDs hierarchy.

New drainage proposals consist of traditional gravity sewers for both foul and surface water.

The surface water discharge rate is proposed to mimic the greenfield run off rate, in accordance with Rochdale Borough Council guidelines. Attenuation storage is required within the on-site drainage network to store the 1 in 100 year + climate change (45%) storm events.

Infiltration of surface water to the ground via soakaways will not be viable due to the underlying strata and constraints associated with construction and long-term effectiveness/ stability of soakaways on the site. There is an existing watercourse running from north to south outside the eastern extents of the site and a direct connection to this watercourse is the preferred means of surface water discharge and the highest up the SUDs hierarchy that is possible.

A pressurised sludge main is present within the site and an existing public combined sewer is present in Manchester Old Road. Connection to the combined sewer for foul flows is proposed and both foul and surface water connections have been discussed with United Utilities via a Pre-development enquiry. A proposed drainage strategy is shown in Appendix E.

2 INTRODUCTION

EDGE Consulting Engineers have undertaken a Flood Risk Assessment in line with National Planning Policy framework and the main aims of this report are:

- To determine whether the proposed development is likely to be affected by current or future flooding from any source.
- To determine whether it will increase flood risk elsewhere.
- To determine whether the measures proposed to deal with these effects and risks are appropriate.
- To assess under SUDS Guidance the best way of reducing the flow rates from site to an acceptable rate of discharge.

The site and surrounding boundary conditions are shown on the Aerial Image in Figure 2.1.

FIGURE 2.1 – SITE LOCATION

3 NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

The National Planning Policy Framework (NPPF) clearly identifies flood risk as a specific material consideration in the Planning Process and in the allocation and release of sites for development or re-development.

NPPF seeks to further strengthen the co-ordination between land use planning and development planning and the operational delivery of flood and coastal defence strategy. NPPF encourages local planning authorities to use their existing powers to guide, regulate and control development in relation to flooding and flood risk. The framework expects local authorities to adopt a risk-based approach at all levels of planning, through the application of the Sequential Test detailed in Table 1 and 2, of the Technical Guidance to NPPF document, a copy of which is attached in Appendix A.

The aim of the sequential test is to steer new development to areas with the lowest probability of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. The Strategic Flood Risk Assessment (SFRA) will provide the basis for applying this test. A sequential approach should be used in areas known to be at risk from any form of flooding.

The Water Resources Act 1991 [Section 105] also requires the Environment Agency to exercise a general supervision over all flood defence matters, including flood plains and wash lands which accommodate waters during periods of flood. In discharging their functions, the Agency from time to time carries out comprehensive surveys and flood studies, largely of 'main rivers' within its jurisdiction.

A Section 105 Study involves the Agency topographically surveying the subject watercourse (or parts of it) and obtaining details of the flow mechanics within the watercourse. This data then enables them to generate a comprehensive hydraulic computer model for the watercourse.

From this hydraulic model the EA can define the approximate extent of fluvial flood-plain associated with the 1 in 100-year (1% annual probability) flooding event or the extent of tidal floodplain associated with the 1 in 200-year (0.5% annual probability) flooding event.

The extents of the modelled floodplain are then provided to Local Planning Authorities, to enable them to make more informed decisions when considering proposed development in flood susceptible areas. If development is proposed in a flood susceptible area, or in an area where there is a history of flooding, the EA, as a statutory consultee in the Planning Process, will generally recommend that the risk of flooding be formally assessed, in accordance with the NPPF, and that a Flood Risk Assessment report be produced to support the Planning Application.

The broader modelled flood extents are also indicated on the EA's Flood Zone Maps, available through their website (Figure 5.1).

4 STRATEGIC FLOOD RISK ASSESSMENT

Local planning authorities are required to produce local development frameworks, which are a portfolio of local development documents [LDDs] that collectively deliver the spatial planning strategy for the authority area. The LDD's undergo a sustainability appraisal which assists planning authorities in ensuring their policies fulfil the principles of sustainability.

Strategic Flood Risk Assessments [SFRA] are one of the documents to be used as the evidence base for planning decisions and are a component of the Sustainability Appraisal process. Therefore, SFRAs should be used in the review or production of LDD's.

To assist Local Planning Authorities in their strategic land-use planning, SFRA's should present enough information to enable Local Authorities to apply the Sequential Test to their proposed development sites:

"Decision makers should use the SFRA to inform their knowledge of flooding, refine the information on the Flood Map and determine the variations in flood risk from all sources of flooding across and from their area. These should form the basis for preparing appropriate policies for flood risk management for these areas."

In November 2009 in collaboration with JBA Consulting, Bury, Oldham and Rochdale Borough council produced a 2 Strategic Flood Risk Assessment.

The SFRA along with the EA flood risk maps indicate that the proposed development site lies predominantly within Flood Zone 1 (less than 1 in 1000 probability of flooding from river or sea) and therefore is unlikely to be at risk of fluvial flooding.

The SFRA shows that there is no sewer, fluvial or historical flooding to the site.

The SFRA has been developed with the assistance of the Environment Agency, United Utilities and key landowners to provide a robust assessment of current and future levels of flood risk, ensuring that future development takes full account of flood risk and sustainability at the outset.

In the application of the sequential test the strategic flood risk assessment has identified flood risk zones within the boroughs (1, 2 and 3) and has assessed the potential of the various possible development sites which have been identified by the councils. This has created a hierarchy of preferred development sites in line with the sequential approach required by the NPPF.

A copy of the SFRA is available from Rochdale, Bury and Oldham Councils websites.

5 FINDINGS OF A FLOOD RISK ASSESSMENT

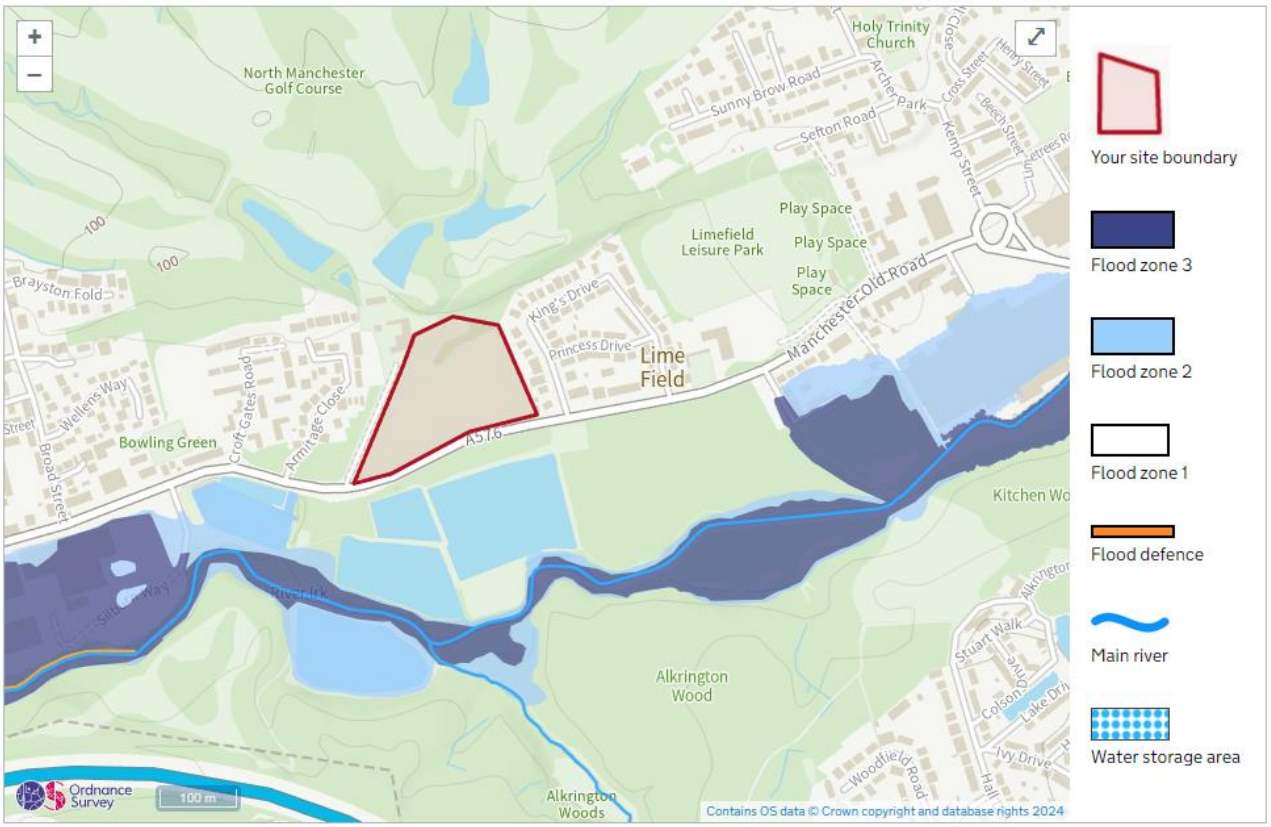
EDGE Consulting Engineers have carried out a flood risk assessment in line with National Planning Policy Framework.

The Environment Agency's flood zone maps, now available on the GOV.uk website, indicate that the site is located within Flood Zone 1 (Ref Figure 5.1).

Flood Zone 1 indicates that there is a low risk of flooding from fluvial or tidal sources and current EA guidance indicates that all proposed developments in zone 1, larger than 1 hectare, should be accompanied by a flood risk assessment. The flood risk assessment should contain:

- Information about the surface water disposal measures already in place and their state of maintenance.
- An assessment of the volume of surface water run-off likely to be generated from the proposed development.
- Information on how that surface water run-off will be disposed of (from the new development).
- Estimates of how climate change could affect the probability and intensity of flooding events in the future.

FIGURE 5.1 – FLOOD ZONE MAP (RIVERS AND SEAS)



CLIMATE CHANGE

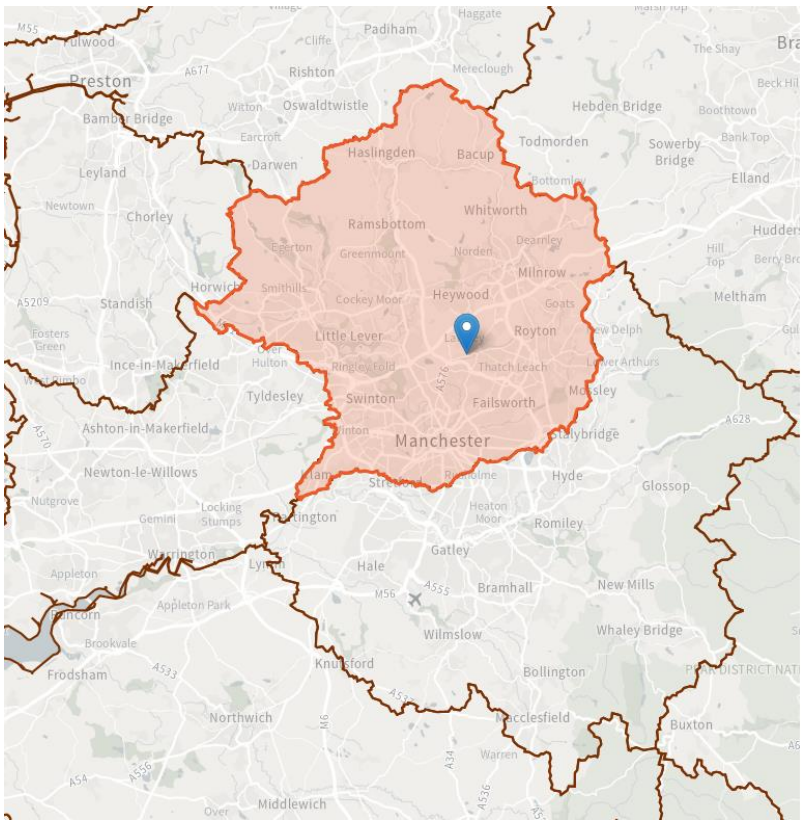
Climate change requires careful consideration in all aspects of development, including the construction of new residential areas and it is crucial to analyse the potential impact of climate change on proposed developments. One significant aspect to consider is the increase in rainfall events. With climate change, there is a growing trend of more intense and frequent rainfall, leading to an increased risk of flooding.

Incorporating climate change allowances into the development proposals will mitigate flood risk and ensure the long-term sustainability and resilience of the development. By implementing measures such as effective drainage systems, green infrastructure, and flood-resistant construction techniques, developments can better withstand the potential impacts of climate change, safeguarding residents and properties.

Taking proactive steps within development proposals will not only protect the investment in the development but also contribute to a more sustainable and climate-resilient future.

An increase to peak rainfall allowances should be accommodated in drainage proposals and the Environment Agency/DEFRA website provides online mapping services indicating central and upper end allowances for climate change in specific management catchments. The development lifetime (100 years) means a requirement to assess the upper end allowance should be considered.

The Irwell management catchment (extracted below) indicates an additional, upper end, allowance for the 1 in 100-year (1% annual exceedance rainfall) event is 45% so this has been considered within the development's drainage calculations.



Irwell Management Catchment peak rainfall allowances

3.3% annual exceedance rainfall event

Epoch

	Central allowance	Upper end allowance
2050s	25%	35%
2070s	30%	40%

1% annual exceedance rainfall event

Epoch

	Central allowance	Upper end allowance
2050s	25%	40%
2070s	30%	45%

*Use '2050s' for development with a lifetime up 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

DRAINAGE STRATEGY

Existing Foul Drainage

There is a large 1200mm diameter existing public combined sewer running below Manchester Old Road from East to West and there is a (approx.) 225mm diameter pressurised sludge main within the site.

Proposed Foul Drainage

It is proposed that the foul flows generated from the development will utilise a traditional gravity system and connect to the existing combined sewer below Manchester Old Road. New connections will be subject to Section 106 approval by United Utilities. During liaison with United Utilities under a pre-development enquiry, confirmation that the connection point shown (in appendix E) is acceptable and foul flows can discharge to the public sewer at an unrestricted rate. The correspondence with UU is shown in appendix D.

Foul water sewers are proposed to be offered to Icosa for adoption under a section 104 agreement and all maintenance and inspection responsibilities will be with Icosa.

A drainage strategy is shown in Appendix E.

Existing Storm Water Drainage

There is an existing ordinary watercourse running North to South, in 3rd party land, on the opposite side of the western Golf course access track. It then heads south below Manchester Old Road. Connection of surface water flows, at a greenfield rate, to the watercourse is proposed and is the preferred method of discharge.

If connection is made in the 3rd party land, then landowners' permission will be needed. If this is not available then a connection to the culverted section of the watercourse, below Manchester Old Road is proposed.

The greenfield runoff rate for the site has been calculated using greenfield runoff tool from HR Wallingfords UKSUDs website. The output generated from the tool shows that the QBAR greenfield run off rate is 18.08 litres per second. A pdf of the output can be found in Appendix F Drainage calculations.

Proposed Strom Water Drainage

Due to the nature of the underlying strata, discharging surface water flows via infiltration is not proposed and will not be a viable option for this site.

Discharge of surface water to the watercourse is proposed at 18.08 litres per second and connection will be under a land drainage consent to be reviewed and approved by Rochdale borough Council as LLFA. A gravity connection will be possible.

The restriction of surface water run off will result in an increase is surface water discharge and a corresponding increase in storage being required. Oversized pipes and large diameter chambers along with online polypipe attenuation tanks offer the best option for storage. The storage is proposed to hold surface water within the site for all volumes required up to the 100-year plus climate change (45%) storm events.

The drainage network has been built and simulated in micro-drainage software for 2-year, 30-year and 100-year + 45% climate change storms. The output from micro-drainage is shown in appendix G. The proposed sewers up to the outfall point will be offered to Icosa for adoption under a section 104 agreement and will be designed in accordance with the Design Construction Guidance (DCG), United Utilities guidelines and Icosa standard details.

A preliminary drainage layout outlining the drainage proposals are shown within Appendix E.

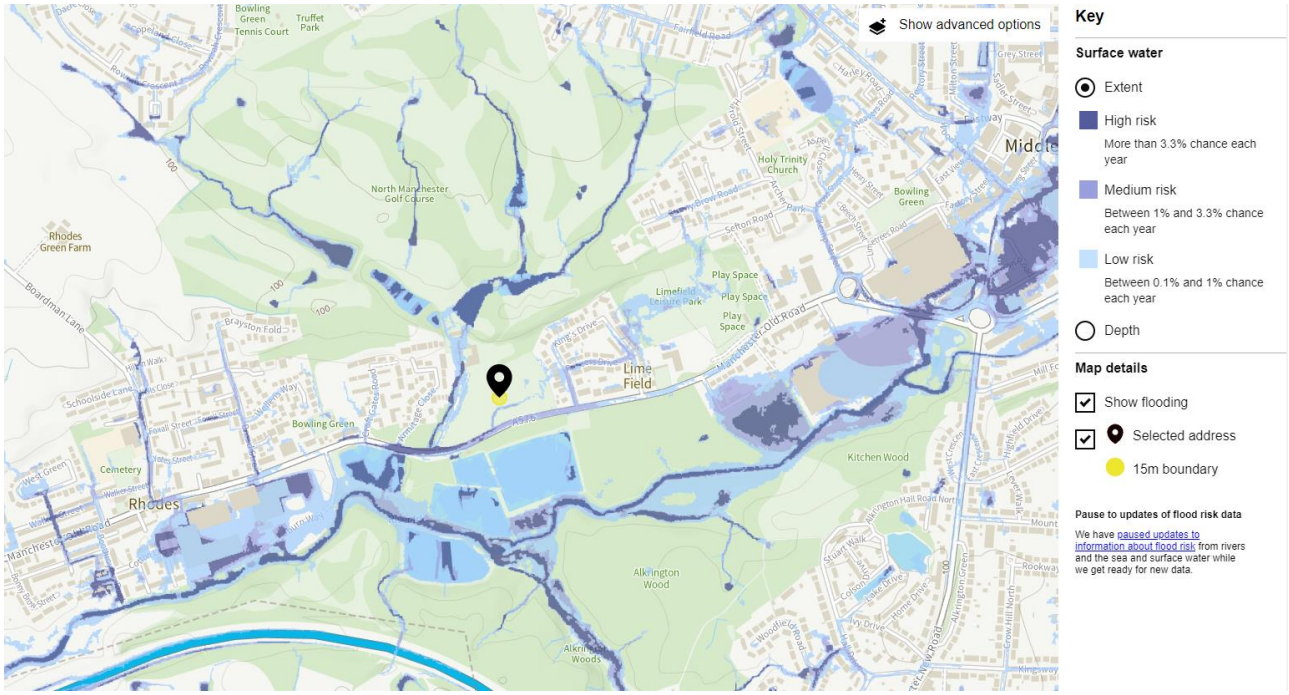
Flood Risk

- Fluvial – As mentioned in previous sections of this report the site is located within flood zone 1 and as such has a low probability of flooding from fluvial sources. An ordinary watercourse runs North to South outside the Western extent of the site and then is culverted below Manchester Old Road. There is no historical data of flooding of this watercourse, and it is not thought to pose a flood risk.

- Tidal – The site is located far enough inland to be considered at very low risk of flooding from the sea. Climate change is not thought to provide an increased risk to the site from tidal flooding during the lifetime of the development and so tidal flood risk is deemed to be low.

- Surface Water – Surface water flooding may occur when intense rainfall causes the ground to be saturated and its capacity is exceeded. The flood risk associated with surface water is shown in figure 5.2 below. The site is predominantly at a very low risk of surface water flooding with a low risk identified through the lower central portion of the site. The development of the site and introduction of impermeable areas (roofs, drives and roads etc) will further mitigate any low-risk overland flows away from dwellings to soft landscaped areas and to drainage infrastructure. Finished floor levels of proposed dwellings should be set a minimum of 150mm above surrounding ground levels to further minimise the risk of flooding from this source.

FIGURE 5.2 – FLOOD MAP (SURFACE WATER)

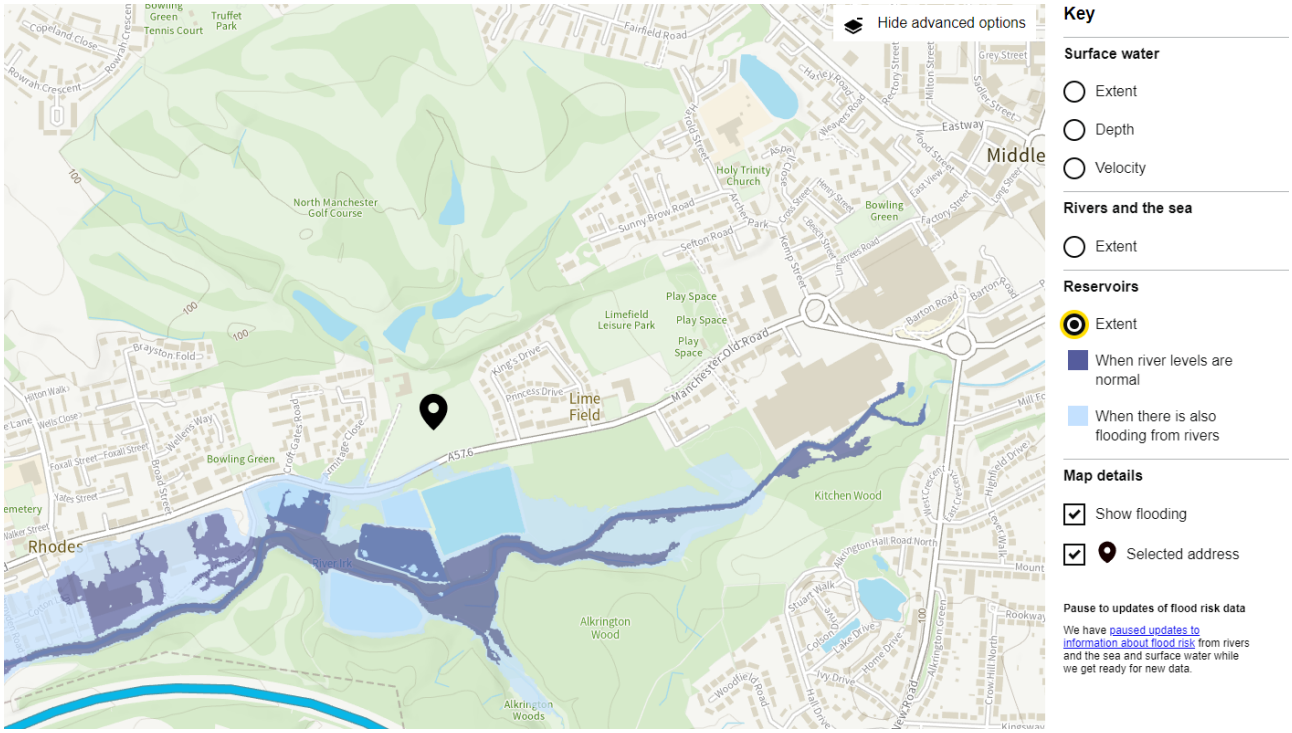


- Ground water – groundwater flooding is caused by the emergence of water from beneath the ground. The occurrence of groundwater flooding is usually local and unlike flooding from rivers and the sea, does not generally pose a significant risk to life due to the slow rate at which the water level rises.
  In July 2021 e3p conducted a phase I and II geo-environmental site assessment, report reference 14-807-R1-1 which concluded that Groundwater was encountered as strikes at depths between 0.50m and 1.80mbgl. It is understood that the site is not affected by flooding from this source with waters heading south (to the low point) away from the site toward the lakes and River Irk. Finished floor

levels of proposed dwellings should be set a minimum of 150mm above surrounding ground levels to further minimise the risk of water ingress from this source.

- Reservoirs, canals – Flooding can occur from the release of large volumes of water from reservoirs and canals. The image below (Figure 5.3) is taken from the governments flood risk section of the website indicating the extent of flooding from reservoirs. The risk is very low. There are no canals in the vicinity of the site and so flooding from this source is also considered to be very low.

FIGURE 5.3 – FLOOD MAP (RESERVOIRS)



- Adjacent sewers – There is an existing combined sewer beyond the low point of the site in Manchester Old Road to the south. The only risk of flooding from this source would be failure or surcharge during periods of high flow. Assuming the existing public sewer has sufficient capacity for the catchment it is serving and is regularly maintained and inspected the risk of flooding from sewers is low.

- Proposed sewers – Drainage infrastructure is designed to ensure that rainwater drains off site at a restricted rate. Storage pipes and tanks will hold all volumes up to and including the 1 in 100 year + 45% climate change storm events and the drainage network will be modelled and simulated to ensure the risk of flooding is minimised. The risk of flooding form proposed sewer sources is low.

6 RESIDUAL RISKS

The table below outlines the initial qualitative assessment of risk posed by each potential source of flooding, the mechanisms for flooding and the likely consequences. The Table also includes a review of possible mitigation measures and what effect, if any, the mitigation measures are likely to have on the residual risk posed by each potential flood source. Categories of risk have been qualitatively defined as:

- High Risk: Flooding is likely to result in damage to property and pose a significant risk to life.
- Medium Risk: Flooding is likely to result in possible minor damage to property, but flood progress would allow adequate time for residents to be warned and safely evacuated to higher ground or appropriate places of safety.
- Low' Risk: Flooding is unlikely to result in any damage to property and pose little or no risk to life.

Source	Flood Mechanism & Consequences	Assessment of Risk	Recommended Mitigation Measures	Residual Risk
Fluvial flooding	Risk of fluvial flooding at the site from adjacent Watercourses, Drains and other Water Bodies.	Very Low	• Fluvial flooding of the site is not expected during the 1 in 100-year event + climate change.	Very Low
Pluvial flooding	Risk of flooding from overland flows in extreme events. Ponding of surface water due to ground being saturated and capacity being exceeded.	Low	• FFLs to be set 150mm above surrounding levels. • Positive drainage systems discharging runoff away from dwellings	Low
Surcharging of artificial drainage systems	Drainage systems operating above design capacity, resulting in: • surcharging of manholes / drainage systems. • over-land flow through development. • ponding in low-lying areas of site. • no over-land flow route for flood waters accumulating in low-lying areas.	Low	• Appropriate design of SW drainage system to provide sufficient storage. • Provision of overland flood flow routes through proposed development.	Low
Infrastructure failure	Water main burst resulting in: • Possible over-land flows through / adjacent to the site and possible inundation of property. • Possible ponding in low-lying areas.	Low	• Safe access/egress available to adjacent highway. • Flood flow route through development.	Low

7 SUDS EVALUATION

Development of the site will result in an increase of impermeable areas and therefore a corresponding increase in run-off volumes. The use of SUDs techniques to discharge the additional surface water will be evaluated in this section of the report.

The storm water drainage system for the proposed development will be designed in accordance with the DCG, which requires that any surface water drainage system, should not surcharge during the 1 in 2-year storm event, and should not flood during a 1 in 30-year storm event (i.e., all run-off contained wholly within the sewerage system during the 1 in 30-year event).

Whilst the DCG requires there be no surface flooding during the 1 in 30-year storm event. It is generally accepted that a degree of surface flooding can be permitted during extreme storm events i.e., 1 in 100 year + climate change. This will be subject to specific areas being designated as flood susceptible and subject to flooding of these areas posing little or no risk to human life and damage to property. Examples of surface areas which might be permitted to flood in such events are:

- Agricultural land
- Recreational land (playing fields etc.)
- Landscaped areas
- Highways
- Car parks
- Other non-inhabited, designated areas

In all cases where surface flooding might be permitted or designed into a scheme, due diligence needs to be given to the NPPF and the need to make potential users of such areas aware of their functionality and purpose, and the requirement to maintain safe egress and access at all times.

The Building Regulations Approved Document H (2002) outlines a hierarchy of potential methods of disposing surface water from a site:

- A soakaway: or where that is not practicable.
- A watercourse or river; or where that is not practicable,
- A sewer.

The viability of each has been assessed below:

- Soakaway: Regarding the consideration of soakaway methods for the disposal of surface water, infiltration will not be viable based on the nature of the underlying strata. The e3p Phase II report section on soakaways noted:

  "The site is predominantly underlain by circa 1.00—5.00 m of high permeability gravelly SANDS. Three BRE365 Permeability Tests have been undertaken where a good infiltration rate has been calculated.

  However a high water table was observed during the ground investigation with saturated SANDs present and therefore the use of soakaway drainage may be limited. The granular drift deposits are likely to offer a certain amount of soakage potential; however the construction of sustainable drainage is likely to be difficult due to the stability of the natural granular material, especially after periods of heavy rain.

  Additionally, consideration must be given to the construction of the soakaways due to the site being elevated above the adopted highway to the south of the site by circa 1.00m. However, the application

of soakaway drainage will ultimately be dependent on the specific requirements of the development. All soakaways should be designed in accordance with BRE Special Digest 365 – Soakaway Design."

EDGE have concluded that given the high water table, saturated sands, potential ground instability and other constraints of the site, soakaways should not be considered as the primary means of surface water discharge. This conclusion is outlined below.

Soakaways need to be sited a minimum of 1m above the ground water level (in accordance with BRE 365 guidance). As the water table is noted to be 0.5-1.8m below ground level (0.5m below ground in the south of the site) this would result in significant reprofiling/ lifting of levels across the site to make this work (which would make the site unfeasible). The ideal location for a soakaway would be the low point in the south of the site (where the water table is 0.5m bgl) in an area already elevated in comparison to the existing Manchester Old Road. So significant retaining walls and level lifting would be required here.

Furthermore, the Phase II Site investigation notes the site is underlain by up to 5.0m deep permeable gravelly sands and due to the high water table the saturated sands would offer limited soakage potential. There is also a concern regarding the construction of soakaways due to the potential instability of the saturated ground material. This, coupled with the location of existing and proposed infrastructure on the site means said infrastructure would be put at risk of damage/ displacement if located near to a single point of infiltration like a soakaway.

- Watercourse's waterbodies: An ordinary watercourse, runs outside the site boundary to the West and heads south where it is culverted below Manchester Old Road. Connection to the watercourse is the preferred method of discharge. Runoff rates will be restricted to mimic the greenfield run off rate in accordance with Rochdale County Councils guidelines.

- Sewers: A United Utilities combined public sewer is located to the south along Manchester Old Road. A connection of surface water to this sewer is discounted as a more sustainable option is available further up the hierarchy.

8 CONCLUSIONS AND RECOMMENDATIONS

- EDGE have been instructed by Duchy Homes to prepare a Flood Risk Assessment which will support a planning application seeking permission for the construction of 56 residential dwellings and associated infrastructure.
- The site is located off Manchester Old Road in Rochdale Greater Manchester and fronts North Manchester Gold Club.
- The site area is 3.017 hectares, is irregular in shape and is greenfield undeveloped land.
- There is an existing watercourse running South to the West of the site.
- There is an existing public sewer to the south of the site In Manchester Old Road.
- EDGE Consulting Engineers have been instructed to formally assess the risk of flooding through a flood risk assessment.
- The site lies within Flood Zone 1 and is therefore unlikely to be affected by fluvial flooding.
- Surface water flows will be restricted to a greenfield run off rate calculated as 18.08 litres per second.
- Surface water volumes will be stored within below ground pipes and storage tanks.
- Climate change has been factored into the drainage calculations.
- Construction of the proposed development will not increase flood risk on or off the site.
- No mitigation measures are considered necessary to mitigate the risk from infrastructure failure.
- A drainage strategy (Appendix E) has been submitted in support of this flood risk assessment.
- Development of the site will not increase the flood risk to any other property.
- Based on the information provided to EDGE Consulting Engineers in support of this flood risk assessment, the development of the site would be considered sustainable in terms of flood risk, subject to the various recommendations in line with National and Local Planning Policy.

+44 (0) 161 834 1938

www.edgece.com

3rd Floor, Conavon Court, 12 Blackfriars Street
Manchester M3 5BQ, United Kingdom

APPENDICES

Appendix A – Extract from chapter 14 of NPPF December 2023

GOV.UK

Home

National Planning Policy Framework

From: **Department for Levelling Up, Housing and Communities (/government/organisations/department-for-levelling-up-housing-and-communities)**

Published 27 March 2012

Updated: 27 March 2012 - **See all updates**

Contents

14. Meeting the challenge of climate change, flooding and coastal change

Paragraphs 157 to 179

157. The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.

Planning for climate change

158. Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures [56]. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

159. New development should be planned for in ways that:

(a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and

(b) can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the government's policy for national technical standards.

160. To help increase the use and supply of renewable and low carbon energy and heat, plans should:

(a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, and their future re-powering and life extension, while ensuring that adverse impacts are addressed appropriately (including cumulative landscape and visual impacts);

(b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting

infrastructure, where this would help secure their development; and

(c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

161. Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.

162. In determining planning applications, local planning authorities should expect new development to:

(a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and

(b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

163. When determining planning applications [57] for renewable and low carbon development, local planning authorities should:

(a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to significant cutting greenhouse gas emissions;

(b) approve the application if its impacts are (or can be made) acceptable [58] . Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the

proposed location meets the criteria used in identifying suitable areas; and

(c) in the case of applications for the repowering and life-extension of existing renewable sites, give significant weight to the benefits of utilising an established site, and approve the proposal if its impacts are or can be made acceptable.

164. In determining planning applications, local planning authorities should give significant weight to the need to support energy efficiency and low carbon heating improvements to existing buildings, both domestic and non-domestic (including through installation of heat pumps and solar panels where these do not already benefit from permitted development rights). Where the proposals would affect conservation areas, listed buildings or other relevant designated heritage assets, local planning authorities should also apply the policies set out in chapter 16 of this Framework.

Planning and flood risk

165. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

166. Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards.

167. All plans should apply a sequential, risk-based approach to the location of development – taking into account all sources of flood risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property.

They should do this, and manage any residual risk, by:

(a) applying the sequential test and then, if necessary, the exception test as set out below;

(b) safeguarding land from development that is required, or likely to be required, for current or future flood management;

(c) using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management); and

(d) where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations.

168. The aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding.

169. If it is not possible for development to be located in areas with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in Annex 3.

170. The application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied

during plan production or at the application stage. To pass the exception test it should be demonstrated that:

(a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and

(b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

171. Both elements of the exception test should be satisfied for development to be allocated or permitted.

172. Where planning applications come forward on sites allocated in the development plan through the sequential test, applicants need not apply the sequential test again. However, the exception test may need to be reapplied if relevant aspects of the proposal had not been considered when the test was applied at the plan-making stage, or if more recent information about existing or potential flood risk should be taken into account.

173. 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 [59]. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

(a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;

(b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;

(c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;

(d) any residual risk can be safely managed; and

(e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

174. Applications for some minor development and changes of use [60] should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 59.

175. Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

(a) take account of advice from the lead local flood authority;

(b) have appropriate proposed minimum operational standards;

(c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and

(d) where possible, provide multifunctional benefits.

Coastal change

176. In coastal areas, planning policies and decisions should take account of the UK Marine Policy Statement (https://www.gov.uk/government/publications/uk-marine-policy-statement) and marine plans (https://www.gov.uk/topic/planning-development/marine-planning). Integrated Coastal Zone Management should be pursued across local authority and land/sea boundaries, to ensure effective alignment of the terrestrial and marine planning regimes.

177. Plans should reduce risk from coastal change by avoiding inappropriate development in vulnerable areas and not exacerbating the impacts of physical changes to the coast. They should identify as a Coastal Change Management Area any area likely to be affected by physical changes to the coast, and:

(a) be clear as to what development will be appropriate in such areas and in what circumstances; and

(b) make provision for development and infrastructure that needs to be relocated away from Coastal Change Management Areas.

178. Development in a Coastal Change Management Area will be appropriate only where it is demonstrated that:

(a) it will be safe over its planned lifetime and not have an unacceptable impact on coastal change;

(b) the character of the coast including designations is not compromised;

(c) the development provides wider sustainability benefits; and

(d) the development does not hinder the creation and maintenance of a continuous signed and managed route around the coast [57] .

179. Local planning authorities should limit the planned lifetime of development in a Coastal Change Management Area through temporary permission and restoration conditions, where this is necessary to reduce a potentially unacceptable level of future risk to people and the development.

Footnotes

(56) In line with the objectives and provisions of the Climate Change Act 2008 (http://www.legislation.gov.uk/ukpga/2008/27/contents). ↩

(57) Wind energy development involving one or more turbines can also be permitted through Local Development Orders, Neighbourhood Development Orders and Community Right to Build Orders. In the case of Local Development Orders, it should be demonstrated that the planning impacts identified by the affected local community have been appropriately addressed and the proposal has community support. ↩

(58) Except for applications for the repowering and life-extension of existing wind turbines, a planning application for wind energy development involving one or more turbines should not be considered acceptable unless it is in an area identified as suitable for wind energy development in the development plan or a supplementary planning document; and, following consultation, it can be demonstrated that the planning impacts identified by the affected local community have been appropriately addressed and the proposal has community support. ↩

(59) A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use. ↩

(60) This includes householder development, small non-residential extensions (with a footprint of less than 250m2) and changes of use; except for changes of use to a caravan, camping or chalet site, or to a mobile home or park home site, where the sequential and exception tests should be applied as appropriate.↩

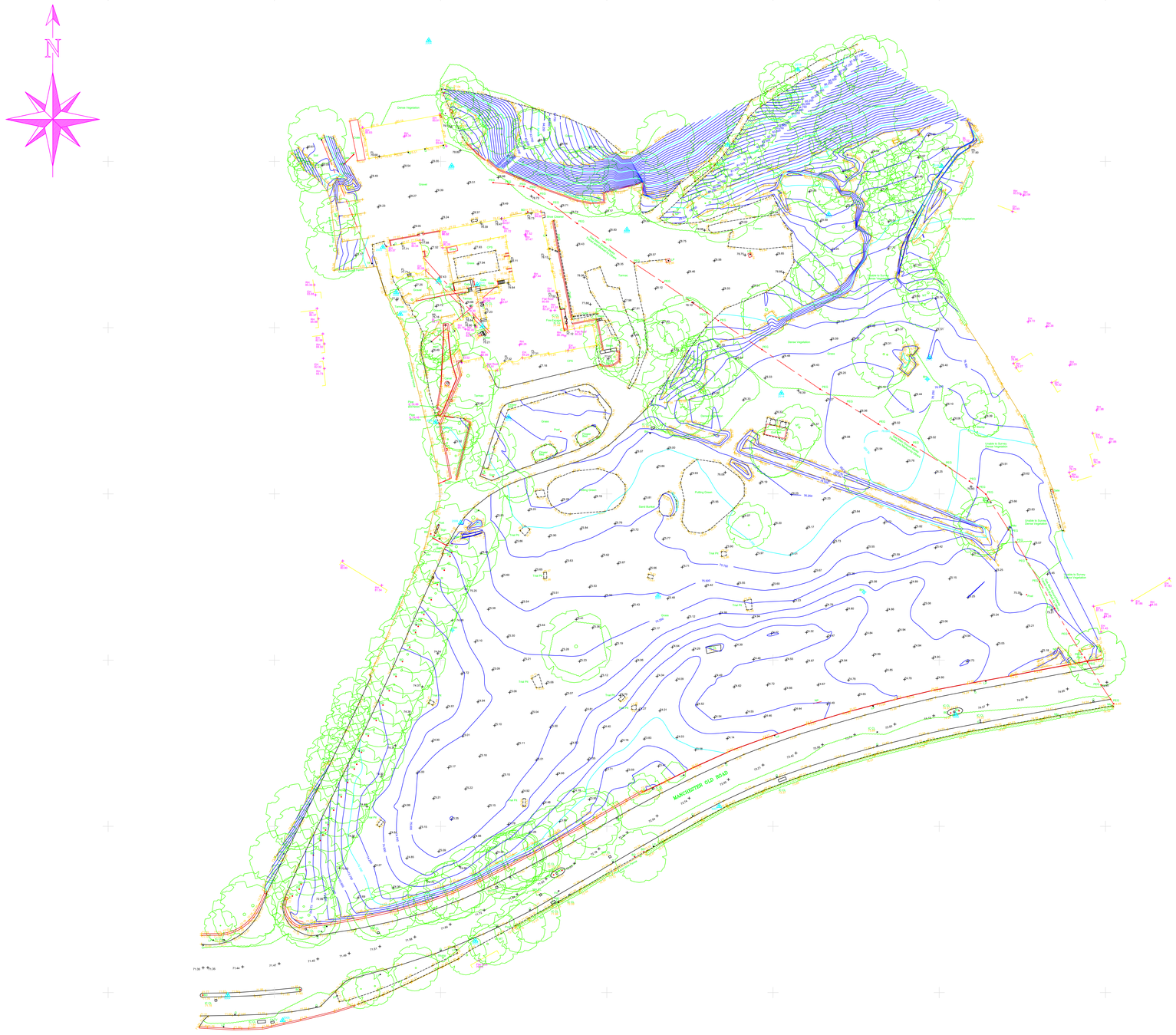
(61) As required by the Marine and Coastal Access Act 2009

(https://www.legislation.gov.uk/ukpga/2009/23/contents). ↩

OGL

All content is available under the Open Government Licence v3.0, except where otherwise stated © Crown copyright

Appendix B – Topographic survey



SURVEY CONTROL STATIONS			
STN	EASTING	NORTHING	HEIGHT
2001	385865.426	405469.470	75.478
2002	385856.050	405579.560	78.972
2003	385803.329	405598.729	78.628
2004	385796.430	405636.459	83.511
2005	385782.643	405574.241	77.712
2006	385787.888	405564.347	77.423
2007	385787.888	405554.116	76.961
2008	385798.455	405521.573	76.112
2009	385806.089	405491.363	75.549
2010	385799.467	405564.347	77.423
2011	385811.024	405562.915	77.944
2012	385812.611	405550.342	76.695
2013	385820.438	405523.127	76.494
2014	385902.507	405530.352	76.423
2015	385947.081	405541.190	76.319
2016	385916.331	405603.035	80.829
2017	385916.338	405605.032	81.809
2018	385921.450	405627.645	87.814
2019	385950.740	405598.570	78.389
5001	385883.799	405406.097	72.914
5003	385810.468	405365.624	71.829
5004	385735.952	405349.878	71.940
5005	385752.511	405341.674	71.854

LEGEND

CONTROL STATIONS
MANHOLE — MH 05.11.20
BUSH
TREE
DROP KERB
EMBANKMENT — TOP BANK / BOTTOM BANK
OVERHEAD ELECTRICITY LINE
OVERHEAD TELEPHONE LINE
FOOTPATH
FENCE
HEDGE
FOLIAGE
DITCH
VERGE
EXISTING BUILDING
MAIN CONTOUR — 50.00
CONTOUR — 49.50
SW SEWER
FW SEWER

AV	Air Valve
BH	Borehole
BD	Bollard
BM	Bench Mark
BS	Bus Stop
BT	BT Inspection Chamber
BL	Bed Level
CATV	Cable TV Cover
CL	Cover Level
C/L	Chain Link Fence
CP	Catch Pit
CPS	Concrete Paving Slab
ECB	Electricity Control Box
EH	Building Eaves Level
ER	Earthing Rod
FB	Flower Bed
FH	Fire Hydrant
FL	Floor Level
GH	Greenhouse
GP	Gate Post
GR	Grate
GV	Gas Valve
G	Gully
IC	Inspection Chamber
IL	Invert Level
KO	Kerb Outlet
JB	Junction Box
LP	Lamp Post
MH	Man Hole
MK	Marker Post
MS	Mile Stone Marker
NP	Street Name Plate
O/H	Overhead
P	Post
PB	Post Box
PI	Pipe
PM	Parking Meter
P/R	Post & Rail Fence
P/W	Post & Wire Fence
PYL	Electricity Pylon
RE	Rodding Eye
RL	Building Ridge Level
RSJ	Rolled Steel Joist
R/W	Retaining Wall
RWP	Rainwater Pipe
SPS	Stone Paving Slabs
SL	Soffit Level
SP	Sign Post
ST	Stop Tap
SV	Stop Valve
SY	Stay Wire
TC	Tactile Crossing
TOW	Top Of Wall Level
TH	Trial Hole
TL	Traffic Light
TP	Telegraph Pole
UTL	Unable To Lift
WM	Water Meter
WL	Water Level
VH	Building Valley Level

Disclaimer

Man Entry to sewers has not been undertaken. Depths, Pipesizes etc are measured from the ground. All sewers and inverts to be checked prior to any works commencing on site. Geomatic Surveys Limited are not responsible for manholes, services, information not surveyed which may have an impact on site development.

Boundaries shown are physical and may not represent legally conveyed ownership

Tree species have only been identified using basic identification techniques. For precise tree species identification, it is recommended that a qualified aborocuiturist is used prior to tree removal.

REV	DATE	DESCRIPTION	BY	APP.

Sheet Layout

Sheet 1

Survey Information

The Survey has been orientated to Ordnance Survey National Grid and datum using one central control station. No Scale Factor has been applied to the coordinates meaning that the survey is arbitrary and not true Ordnance Survey Coordinates.

Geomatic Surveys Ltd

LAND SURVEYORS AND CONSULTING ENGINEERS
Bank House, The Paddock
Wilmslow Road
Handforth
Cheshire
SK9 3HQ
Tel/Fax:– 01625 521405
Email: info@geomaticsurveys.co.uk
Web: www.geomaticsurveys.co.uk

Client

DUCHY HOMES LTD

Project Title

NORTH MANCHESTER
GOLF CLUB
MANCHESTER OLD ROAD
MIDDLETON

Drawing Title

TOPOGRAPHICAL SURVEY

Drawn	Checked	Surveyed Date
SD	IRH	19/03/2021
Date	**Scale**	**Sheet No.**
24/03/2021	1:500 @ A0	SHEET 1 OF 1
Drg. No.		**Rev**
02591/Topo		

Copyright © Geomatic Surveys Limited 2021

Appendix C – Architects layout

The copyright of this drawing is held by Duchy Homes Limited and no reproduction is allowed without prior permission.

NORTH MANCHESTER GOLF CLUB, MIDDLETON

NOTES:

Duchy Homes

Version: P46

Date - 05.11.24

ACCOMMODATION SCHEDULE

HOUSE TYPE	LAYOUT REF	HOUSE TYPE REFERENCE	NUMBER OF BEDS	FLOOR AREA SQ.FT	NUMBER OF UNITS	TOTAL FLOOR AREA	PERCENTAGE
OPEN MARKET UNITS							
Wentworth	WEN	T3H0929	3	929	3	2787	5.4%
Thornbury	THO	T2H0982	3	982	10	9820	17.9%
Alderley	ALD	T2H1062	3	1062	4	4248	7.1%
Willington	WIL	T3H1265	3	1265	7	8855	12.8%
Harewood	HAR	T4H1266	4	1266	5	6330	8.9%
Dunsmore	DUN	T4H1325	4	1325	3	3975	5.4%
Hartfoth	HAF	T4H1525	4	1525	2	3050	3.6%
Buckingham	BUK	T4H1648	4	1648	5	8240	8.9%
Oakmere	OAM	T5H1850	5	1850	2	3700	3.6%
Wavendon	WAV	T5H1977	5	1977	7	13839	12.8%
TOTALS					48	64844	85%
AFFORDABLE UNITS UNITS							
Windsor	WIN	T3H1060	3	1060	8	8480	15.0%
TOTALS					8	8480	15.0%
TOTALS					56	73324	
				GROSS SITE AREA		9.178	
				NET DEVELOPABLE SITE AREA		4.56	
				GROSS SQ FT/ACRE		7989	
				NET SQ FT/ACRE		16080	

Rev	Date	Amendment	By
P52	06.06.25	Plots 22&23 swapped with 24&25. Accommodation schedule corrected.	SJ
P51	05.06.25	Plot substitutions to Plots 9, 10, 20,21, 31, 32, 55 & 56.	SJ
P50	25.02.25	Materials,Boundary Treatments, Hard Landscaping & EV Charging points added.	SJ
P49	06.01.25	Rear garden to Plot 28 adjusted.	SJ
P48	02.01.25	Flagging and gates added. Plots 2, 4 & 50 handed.	SJ
P47	06.11.24	Layout amended following LPA comments.	SJ
P46	05.11.24	Layout amended following LPA comments.	SJ
P45	01.11.24	Layout amended following internal comments.	SJ
P44	01.11.24	Layout amended following comments from the LPA.	SJ
P43	21.10.24	Road extended past Plot 35 to Plot 33.	SJ
P42	18.10.24	Layout redesigned following comments from the LPA.	SJ
P41	01.10.24	Layout redesigned following comments from the LPA.	SJ
P40	06.06.24	Layout amended following internal comments.	SJ
P39	29.05.24	Timeless 2.1 House Type Range Added.	SJ
P38	22.02.24	Plots 1 and 2 positions moved eastwards, so that Plot 3 sales garage can be separated; Parking of plot 56 revised; Shared driveway for plots 14 & 17-20 updated & Plots 36 & 46 garage positions updated.	AC
P37	16.02.24	Golf club access reverted back to existing access.	AC
P36	09.02.24	Plots 6 - 9 & 21 - 24 units swapped with plots 30 - 36 & 3No. Linnet House types omitted and replaced with 3No. Fieldfare house types.	AC
P35	25.01.24	Plots 1 - 11, 20 - 28 & 46 - 51 names clarified; Plot 6 updated to a Starling, Plot 7 & 49 updated to Brambling's and Plot 50 updated to a Fieldfare and Plot 55 parking arrangement updated.	AC
P34	24.01.24	Plots 4, 6 - 30, 46 - 52 & 56 updated as per layout meeting 23.01.24 and Sales Garage added to plot 22.	AC
P33	22.01.24	Plots 6, 8, 12 & 26 changed to Birch's; Plots 42 - 45 changed to the P3.3.1 & Plots 46 - 50 positions updated to suit.	AC
P32	30.11.23	Gas and Sludge main easements shown.	AC
P31	24.11.23	21 - 26 Plots replanned.	AC
P30	27.09.23	11 - 20 Plots replanned.	AC
P29	09.03.23	Plots 45-49 replanned.	SJ
P28	06.02.23	Plots 39-45 replanned.	SJ
P27	27.01.23	Latest Golf Club Car Parking layout added.	SJ
P26	26.01.23	Amended following comments from the LPA & Golf Club.	SJ
P25	18.01.23	A pair Bodnants replaces 1no. Oakfield on Plot 39.	SJ
P24	25.11.22	Plots 39-48 adjusted. Units reduced to 53.	SJ
P23	18.11.22	Single sided road infront of plots 20-24 changed to shared drive.	SJ
P22	18.11.22	HA removed and House type mix amended.	SJ
P21	15.11.22	Amended following layout review comments.	SJ
P20	14.11.22	Layout redrawn.	SJ
P19	22.09.22	Plots 12-16 replaced with 1no. Wentworth and 8 Affordable Units.	SJ
P18	13.05.22	Plots subs to 27, 45 & 47. Adoptable road reduced in front of Plot 46.	SJ
P17	10.05.22	Site re-planned following comments from LPA and UU.	SJ
P16	04.01.22	Updated to included latest house type footprints.	SJ
P15	24.11.21	Turning Head sizes increased following comments back from Transport consultant.	SJ
P14	06.08.21	Minor amends following comments Group Design.	SJ
P13	27.07.21	3no. Harewood replaced with Buckinghams, 2no. Ripleys replaced with Cranbournes, 1no Calverley replaced with a Warwick.	SJ
P12	29.06.21	Flagging indicated, handings corrected and Plot 14 changed to a Warwick	SJ
P11	14.04.21	Layout amended following sludge main diversion.	SJ
P10	28.01.21	Plot 56 changed to a Calverley & Plot 17 garage removed.	SJ
P9	22.01.21	Plots 2, 4, 10, 22, 24, 26, 27, 31 changed to Ripleys.	SJ
P8	17.12.20	Layout re-planned following comment from the LPA.	SJ
P7	08.11.20	Layout re-planned.	SJ
P6	19.08.20	House type mix amended following comments.	SJ
P5	05.06.20	Plot 50 changed from an Alderley to a Cranbury	SJ
P4	05.06.20	Plot 50 added.	SJ
P3	15.05.20	Plots 1-8 adjusted following comments and red edge amended adjacent to Plot 6.	SJ
P2	11.05.20	Amended to accommodate the HP gas main constraints.	SJ
P1	21.04.20	Amended following internal comments.	SJ

KEY:

- 1.8m high Brick screen wall to match house with Close Boarded Panels *(to detail DH-SD-726)*
- 1.8m high timber close boarded fence *(to detail DH-SD-754)*
- 2.4 m high timber acoustic fence
- 2.4m high Brick screen wall
- 1200mm metail estate railings *(to detauk DH-SD-733)*
- 1.8m high timber close boarded gate *(to detail DH-SD-753)*
- EV Charging Point
- Tree Planting (refer to Landscape Architects designs for full details)
- Easements
- Managed Area Lane
- Turf
- Rear Garden Topsoil/Turf

MATERIALS:

Main Facing Brick & Below DPC
Mere Blend as indicated
With Slate Grey Roof Tile TBC

Main Facing Brick & Below DPC
Mottram Multi as indicated
With Slate Grey Roof Tile TBC

Adoptable Highways
Tarmac

Private / Shared Drives
Tarmac

Private Paths and Patios
Marshalls Saxon Flag
450x450 Grey

Artstone - See working drawings
Forticrete Buff Artstone

Contrasting Brick - See working drawings
Smooth Red

Mortar - To all Plots
Natural - Bucket handle joint profile

Plain Tiles (small areas & dormers) - See working drawings
To Match Main Roof

Barge & Fascia Board - To all Plots
Black PVCu with additonal feature board to Front Gables

Soffit - To all Plots
Black PVCu

Front & Garages Doors - To all Plots
White

External Door Frames - To all Plots
White

Rear Doors - See working drawings
White

Windows & French Doors - To all Plots
White

Rainwater Systems - To all Plots
Black PVCu half round with Rise & Fall Gutter brackets

Duchy Homes

Duchy Homes Ltd.
3125 Century Way, Thorpe Park, Leeds, LS15 8ZB.

DEVELOPMENT:
NORTH MANCHESTER GOLF CLUB, MIDDLETON

TITLE:
PLANNING LAYOUT

DATE:	SCALE:	DRAWN:
20.04.20	1:500 @ A1	SJ

DRAWING NO:	REV:
NMGCMPL/001	P52

Appendix D – United Utilities asset search maps

Ryan Atherton

From: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Sent: 11 August 2021 14:20
To: Ryan Atherton; Wastewater Developer Services
Cc: 'lorna.carlisle@duchyhomes.co.uk'; 'simon.jones@duchyhomes.co.uk'; James Cann
Subject: PDE 4200041214 North Manchester Golf Club Middleton M24 4PE

Follow Up Flag: Follow up
Flag Status: Flagged

Good afternoon Ryan,

Firstly we must apologise the WeTransfer you have provided was not downloaded in time and has now expired, so we would appreciate it if you could resend the link in order for us to assess this information.

That being said United Utilities holds no objection to the proposals to drain to the watercourse as the primary drainage solution, we would suggest trying to incorporate infiltration based SuDS where possible and recommend that the proposals are discussed in detail with the Lead Local Flood Authority as they have the authority on surface water drainage solutions for new developments.

With regard to the proposals relating to the diversion of the MVSP, I feel further discussion with those within United Utilities who deal with the critical asset would be prudent. I have sent them an email about the potential for a meeting next week. Perhaps you could provide some dates and times next week and we will see whether any of these suit?

Kind regards,

United Utilities
Water for the North West

Robert Brenton
Developer Engineer
Developer Services & Metering
Customer Services
M: 07880299827
unitedutilities.com

If you have received a great service today why not tell us?
Visit: unitedutilities.com/wow

Did you know we now have a live chat facility available to you Mon to Friday 8 -5pm. You just click on the orange live chat box on our webpage and one of our advisors will be ready to chat to you and help you with your enquiry https://www.unitedutilities.com/builders-developers/ or you can email us at developerserviceswater@uuplc.co.uk

Coronavirus | Prevent the spread

Wash your hands

Disinfect common surfaces

Practise social distancing

FEVER + COUGH

Stay home if you have symptoms

Click for our message to customers

From: Ryan Atherton [mailto:ratherton@edgece.com]
Sent: 30 July 2021 14:04
To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Cc: 'lorna.carlisle@duchyhomes.co.uk' <lorna.carlisle@duchyhomes.co.uk>; 'simon.jones@duchyhomes.co.uk' <simon.jones@duchyhomes.co.uk>; James Cann <jcann@edgece.com>
Subject: RE: PDE 4200041214 North Manchester Golf Club Middleton M24 4PE

Robert

Firstly thank you for your detailed response on this enquiry. We understand the extent of difficulties and constraints associated with this site so we have tried to respond as comprehensively as we can on each of the points below.

We have reviewed the drainage proposals and I have attached the latest schematic for you to review along with further information explained below.

Whilst we have provided a lot of information we do think that a meeting, via TEAMs, would be of benefit given the challenges with this site. Are you able to confirm when you and/ or your team would be available for such a meeting to bottom out any remaining issues/ requirements?

The following we transfer link will expire in 7 days and contains, CCTV survey of the foul sewer in Manchester Old road and the site investigation report.

https://we.tl/t-aQmbEO1ovo

My notes on the elements below explain where we are with the site and the proposals going forward.

Foul Water

Thank you for confirming we can connect here. With regard to the mapping inconsistency, Duchy Homes (our client) have had the sewer surveyed and the information can be downloaded form the above wetransfer link for review.

Surface Water

The above wetransfer link includes the site investigation by e3p which contains information on infiltration and soakaway testing. While the results of the testing are favourable for infiltration we believe given the high water table, saturated sands, potential ground instability and other constraints of the site, soakaways should not be considered as the primary means of surface water discharge. This conclusion is outlined below.

Soakaways need to be sited a minimum of 1m above the ground water level (in accordance with BRE 365 guidance). As the water table is noted to be 0.5-1.8m below ground level (0.5m below ground in the south of the site) this would mean fairly significant reprofiling/ lifting of levels across the site to make this work (which would make the site unfeasible). The ideal location for a soakaway would be the low point in the south of the site (where the water table is 0.5m bgl) however this is within close proximity to the proposed route of the diverted sludge main (as described below) and in an area already elevated in comparison to the existing Manchester Old road. So significant retaining walls and level lifting would be required here (again not feasible).

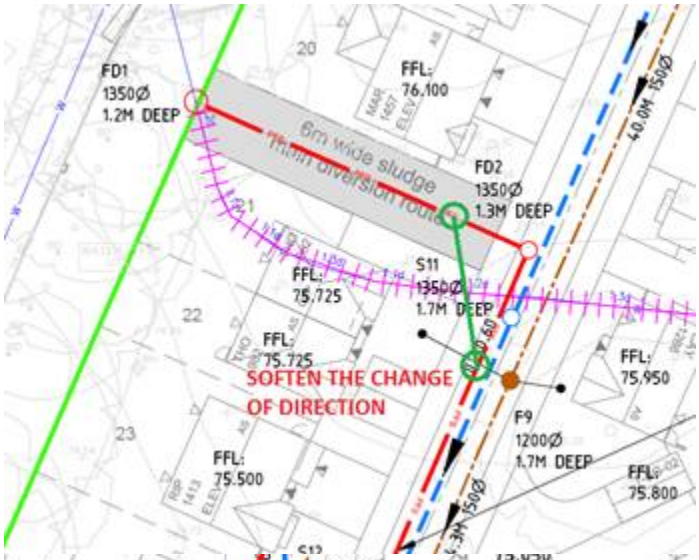
Furthermore, the SI notes the site is underlain by up to 5.0m deep permeable gravelly sands and due to the high water table the saturated sands would offer limited soakage potential. There is also a concern regarding the construction of soakaways due to the potential instability of the saturated ground material. This, coupled with the location of existing and proposed infrastructure on the site means said infrastructure would be put at risk of damage/ displacement if located near to a single point of infiltration like a soakaway.

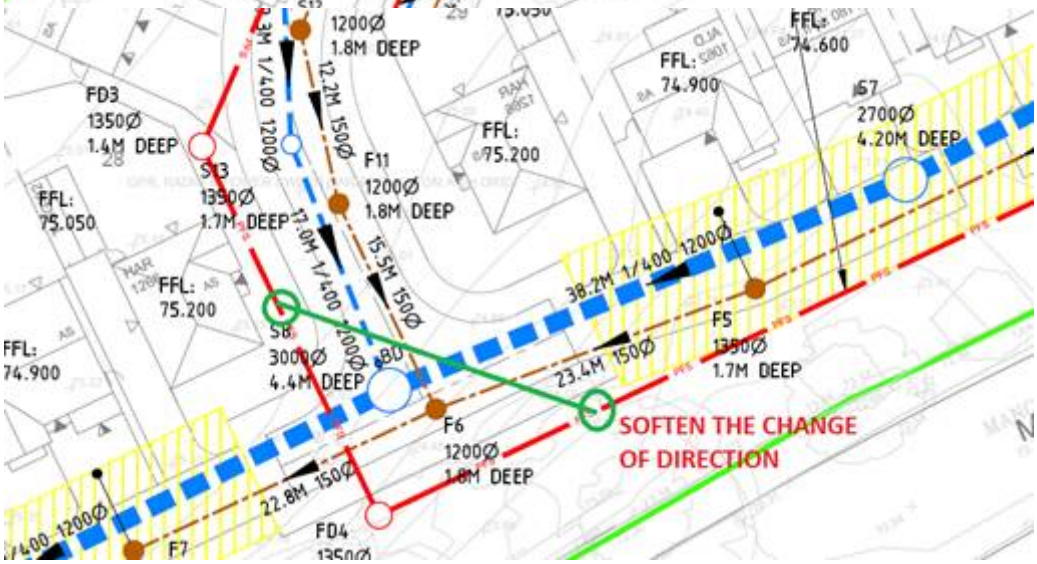
We would therefore propose a direct connection to the watercourse immediately West of the site. This would remove the need for reprofiling of ground levels, reduces the risk of ground instability (that would be associated with soakaways) in turn providing more comfort to the existing and proposed infrastructure on the site.

Existing Wastewater Assets Crossing the Site

The layout of the site has already taken into consideration the Cadent Gas main to the East and so accommodates the easement associated with that. As initial correspondence with UU suggests (attached) that a diversion of the sludge main under a S185 agreement would be possible, and the pre-development enquiry response below shows UU are open to this, the layout has been developed around a diversion being possible.

An easement to the West (beside plots 20-21) has been included and allows the diversion of the sludge main to take the most direct route through the site. We appreciate that head loss and changes of direction appear to be the main concern and we would be open to “softening” some of the changes in direction in the attached schematic by including additional chambers (examples below in green).





The area to the front of plot 28 shows a possible route for the diversion, it can't be routed in the road due to the congestion of pipes here. While this is not ideal it is not in enclosed private land and is still accessible for inspection and maintenance. We could reconfigure and have the proposed foul sewer located here and route the sludge main in the road, however, this would increase the changes of direction of the sludge main.

We would like to confirm that UU are willing to accept the diversion proposals as shown or if you have further preferences/ concerns for this asset. The layout has been developed to accommodate the sites constraints however further reconfiguration to work around the sludge main in its current location aren't feasible and further changes would make the site commercially unviable, affecting the land valuation.

I trust the above is clear and we are able to discuss further in a meeting. Please let us know your availability over the coming weeks and if you need anything further that we can provide ahead of us discussing the next step and way forward for this site.

FYI I am unavailable on the morning of the 3rd August and on annual leave on the 5th and 6th of August, free otherwise.

Should you need anything further or wish to discuss please let me know.

Many thanks

Kind regards

Ryan Atherton
Team Leader - Civil

EDGE Consulting Engineers
3rd Floor, Conavon Court, 12 Blackfriars Street,
Manchester, M3 5BQ, United Kingdom
T +44 (0) 161 834 1938 | M +44 (0) 755 221 6876
Follow us on Twitter: @EDGEConsultEng

www.edgece.com | ratherton@edgece.com | map

Alliance Design UK Ltd t/a EDGE Consulting Engineers
Registered in England and Wales: 05586079
Registered Office: 1 City Road East, Manchester, M15 4PN, United Kingdom
Confidentiality Note: This email may contain confidential and/or private information. If you received this email in error, please delete and notify sender.

From: Wastewater Developer Services
Sent: 07 July 2021 16:24
To: Ryan Atherton ; Wastewater Developer Services
Subject: PDE 4200041214 North Manchester Golf Club Middleton M24 4PE

Good afternoon Ryan,

Pre Development Enquiry for: North Manchester Golf Club Middleton M24 4PE UU Reference Number : 4200041214

For future reference we now have a new wastewater pre-development enquiry form designed to be easier and more user friendly which is available on our website via the following link:

https://www.unitedutilities.com/builders-developers/larger-developments/pre-development/wastewater-pre-dev/

We have carried out an assessment of your application which is based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your drainage strategy will need to be reviewed by other competent authorities as part of the planning process, and we advise that you carry out the necessary site investigations to confirm the viability of your proposals.

Please note the highlighted **BOLD AND UNDERLINED** section below as this relates directly to the Mersey Valley Sludge Pipeline which is a strategic asset of a critical nature and therefore significant care should be taken in relation to this asset.

If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 3723223 or refer to the link below:

https://www.unitedutilities.com/builders-developers/working-near-our-assets/

Foul Water

Foul flow from this site will be allowed to drain into the public foul water/combined sewer system.

You have indicated that your preferred point of connection is to the public combined network located in Manchester Old Road to the south of the site at an unrestricted rate which we hold no objection to at this stage. It does appear as though the receiving network is an oversized tank sewer with throttles; however, when speaking to our network colleagues it is thought to be a 1200mm diameter combined sewer all the way through so may in fact be a mapping inconsistency. It is recommended that this is confirmed on-site.

If you are able to identify an alternative, more suitable point of discharge, we request that you contact us at your earliest convenience so that we can assess suitability.

In accordance with our infrastructure plans we may ask you to change your point of connection. Therefore please contact us when you are ready to formalise your drainage proposals, we would suggest before you submit for Full Planning.

Surface Water

All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, (Reference ID: 7-080-20150323), of the National Planning Practice Guidance. We also recommend you prioritise the use of multi-functional sustainable drainage systems for the management of surface water in accordance with national planning policy.

Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.

This is outlined as follows, in order of priority:

1. **into the ground (infiltration);**
2. **to a surface waterbody;**
3. **to a surface water sewer or highway drain;**
4. **to a combined sewer.**

For guidance, The North West SuDS Pro-Forma provides information on the appropriate evidence required at each stage of the hierarchy, to demonstrate how each level has been discounted.

The Lead Local Flood Authority has responsibility for all surface water drainage concerns and their input to your proposal is critical. You should also consider whether it is necessary to discuss your proposal with the Environment Agency, or Internal Drainage Board (if operating in your area).

The Local Planning Authority are the determining authority for any application for planning permission and the appropriate authority for determining cost viability of a proposed drainage scheme, such assessments are outside of the jurisdiction of United Utilities.

Infiltration

Surface water runoff generated from this development should discharge to the ground via infiltration system where feasible.

A detailed evidence based feasibility assessment must be carried out in line with Chapter 25 of the CIRIA SuDS Manual 2015 to determine whether infiltration is a suitable method of surface water disposal.

Particular attention must be paid to Ground Water Source Protection Zones to ensure that the risk of pollution to these valuable resources is not compromised. Details can be obtained from the government website:

https://www.gov.uk/guidance/groundwater-source-protection-zones-spzs#find-groundwater-spzs

If your site is in a Groundwater Source Protection Zone, you should have regard to the Environment Agency's approach to Groundwater Protection. Information on this is available via the link below:

https://www.gov.uk/government/publications/groundwater-protection-position-statements

Please note that such a location could have implications for the principle of your development and the need for additional mitigating measures to protect the groundwater environment and public water supply in the detailed design of your site.

With the original planning application you have sent in, infiltration testing had been undertaken and resulted in results which appear largely feasible and therefore further consideration of the utilisation of infiltration as the primary surface water drainage solution for the site.

Waterbody

We understand there are third party land issues with discharging to the watercourse. We recommend discussing these further as this represents a more sustainable solution than draining to a public sewer.

Highway Drainage

If an evidence based assessment has been carried out and confirms that infiltration is not feasible, we recommend that you investigate the possibility of draining surface water to the highway drain where this ultimately discharges to a watercourse, by contacting the relevant Highway Authority.

Public Sewer

In accordance with the hierarchy of drainage options within the National Planning Practice Guidance, both discharge to ground via infiltration and discharge to a waterbody should be discounted prior to consideration of discharging surface water to the public sewer system. Evidence should be provided to demonstrate how these have been discounted, as outlined in the North West SuDS pro-forma.

Once evidence is provided as outlined above, United Utilities will consider a connection to the 670mm x 1800mm diameter public surface water sewer within Manchester Old Road, which we note that this may be a continuation of the watercourse and therefore we recommend speaking to the Lead Local Flood Authority about the connection and a pass forward flow rate. United Utilities request that any agreed rate does not exceed 15l/s.

As a Water Company, we have no obligation to accept highway drainage into our public sewer network. However, should your proposals include runoff from highways, we would request that consideration is given to SuDS components that deliver source control are incorporated within the design of the scheme to reduce the volume and frequency of discharges of these flows to the public sewer.

Levels

For low-lying sites, (where the ground level of the site or the level of a basement is below the ground level at the point where the drainage connects to the public sewer), care should be taken to ensure that the property is not at increased risk of flooding. If these circumstances exist, we recommend that you contact us to discuss further. It could affect the detailed design of your site and result in the need to incorporate appropriate mitigating measures in your drainage scheme.

Land drainage / Overland flows / track drainage

United Utilities have no obligation, and furthermore we do not accept land drainage, overland flows or track drainage into the pubic sewerage network under any circumstances.

Sewer Adoptions

You have not indicated if you intend to put the sewers forward for adoption (including any SuDS components that can come within the meaning of a sewer). As a result, we have included the below information for your consideration if this is the case.

United Utilities assess adoption applications based on the current Design & Construction Guidance and local practices which have now replaced 'Sewers For Adoption 6th Edition'.

We recommend that you submit a pre design assessment to the sewer adoption mailbox (SewerAdoptions@uuplc.co.uk) stating pre design assessment in the title

Please refer to links below to obtain further guidance:

https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-adoptions/

Site drainage must be designed in accordance with Building Regulations, National Planning Policy, and local flood authority guidelines, we would recommend that you speak and make suitable agreements with the relevant statutory bodies.

If you intend to put forward your wastewater assets for adoption by United Utilities, the proposed detail design will be subject to a technical appraisal by an Adoption Engineer as we need to be sure that the proposals meets the requirements set out in the Design & Construction Guidance. The proposed design should give consideration to long term operability and give United Utilities a safe and cost effective proposal for the lifetime of the assets. In these cases, we strongly recommend that no construction commences until the detailed drainage design, submitted as part of the Section 104 application, has been assessed and accepted in writing by United Utilities. Any work carried out prior to the technical assessment being approved is done entirely at the developer's own risk and could be subject to change.

Codes For Adoption

The new Codes for Adoption are outlined on the Water UK Website. The link below takes you to their webpage:

https://www.water.org.uk/technical-guidance/developers-services/codes-for-adoption/

A free copy of the new Design & Construction Guidance can be downloaded via the link below which identifies that SuDS should be design in accordance with the CIRIA SuDS manual (C753):

Design and Construction Guidance

Sustainable Drainage Systems (SuDS)

If you need advice on any site proposals which incorporate open SuDS features either that are to be offered for adoption or that interact with a traditional adoptable piped network you can complete the form below and we will be in touch within 2 weeks to discuss the proposals further.

Pre Design Enquiry

Existing Wastewater Assets Crossing the Site

We have a strategic asset called the Mersey Valley Sludge Pipeline crossing this site that cannot easily be diverted, this is a critical asset for the business. We would ask that you obtain a copy of our asset data records from your provider and plan your development around them ensuring that all legal easements are observed where possible. Please refer to the attached MVSP pipeline contractor work requirements as this is a high pressured system which represents a significant risk to those working near this asset. We understand that you intend to divert the asset but advice has been sought and the proposed diversion of this asset is not acceptable, multiple additional changes of direction will result in the a detriment to the performance of the system. Whilst it is preferable that the proposed site should work around the existing pipeline, should the feasibility of this not be acceptable and a diversion is required, United Utilities would be open to discussions relating to the most feasible solution for all parties but we would not accept any head loss in the system which would occur based on the currently proposed diversion route.

No works, be it investigative or main construction works shall be commenced prior to consultation and approval from United Utilities.

You have also mentioned that there are gas mains crossing the site and where interaction with the proposed network is encountered, if these assets are to be put forward for adoption, they should comply with the guidelines relating to working near existing pipelines. As a result, please refer to section 5.3 of the attached Standard Conditions for Works Adjacent to Pipelines document. Where utilities are required to cross a public sewer, it should be at a 90 degree angle and ducted, whilst when running parallel, a minimum 1m offset from the outside of the pipe would be required.

Existing Water Assets Crossing the Site

It is the developer responsibility to identify utilities on-site. Where clean water assets are shown on our records, we recommend that you contact our Water Pre-Development Team, via the following email address: DeveloperServicesWater@uuplc.co.uk. Further information for this service can be found on our website via the link below:

https://www.unitedutilities.com/builders-developers/larger-developments/pre-development/water-pre-dev/

Connection Application

Although we may discuss and agree discharge points and rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below:

https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-connections/

We recommend that the detailed design should confirm the locations of all utilities in the area and ensure that any proposed drainage solution considers routing and clash checks where required.

If we can be of any further assistance please don’t hesitate to contact us further.

Kind regards,

Robert Brenton
Developer Engineer
Developer Services & Metering
Customer Services
M: 07880299827
unitedutilities.com

If you have received a great service today why not tell us?
Visit: unitedutilities.com/wow

Did you know we now have a live chat facility available to you Mon to Friday 8 -5pm. You just click on the orange live chat box on our webpage and one of our advisors will be ready to chat to you and help you with your enquiry https://www.unitedutilities.com/builders-developers/ or you can email us at developerserviceswater@uuplc.co.uk

---

From: Ryan Atherton [mailto:ratherton@edgece.com]
Sent: 25 June 2021 14:39
To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: North Manchester Golf Club - Drainage strategy and diversion proposals

---

Good afternoon

Please find attached application form and drainage schematic showing the preliminary proposals to drain a site at North Manchester Golf Club, Middleton. A link to the planning portal (and specifically the FRA) is provided below:

http://documents.rochdale.gov.uk/pav/planapp.aspx?MyQueryID=108&OBKey__705_1=16/01123/FUL

We would like your input on the SW and FW connection points and rates (note the SW outfalls to what records show is a UU SW sewer, however this is a continuation of a watercourse which discharges to the River Irk / lakes to the south). A direct connection to the watercourse is not possible due to 3rd party land issues so a connection within the public road is proposed.

Also there is a sludge main which runs through the site and the development proposals include the diversion of this main. Can you review and confirm if this is acceptable and offer any guidance we need to adhere to in this regard.

Finally there is a trunk Gas Main that is crossing the site which is being left in situ. The easement for this has been shown in grey and our remit is to avoid entering the easement with new sewers except at right angles. Can you also provide and guidance/ comments on the proposals here where relevant to UU.

Should you need anything further or have any questions please let me know.

Kind regards

Ryan Atherton
Team Leader - Civil

EDGE Consulting Engineers
3rd Floor, Conavon Court, 12 Blackfriars Street,
Manchester, M3 5BQ, United Kingdom
T +44 (0) 161 834 1938 | M +44 (0) 755 221 6876
Follow us on Twitter: @EDGEConsultEng

www.edgece.com | ratherton@edgece.com | map

Alliance Design UK Ltd t/a EDGE Consulting Engineers
Registered in England and Wales: 05586079
Registered Office: 1 City Road East, Manchester, M15 4PN, United Kingdom
Confidentiality Note: This email may contain confidential and/or private information. If you received this email in error, please delete and notify sender.

The Concrete Society Awards 2020 Outright Winner

The Institution of Structural Engineers The North West Structural Awards 2018 WINNER MOST INNOVATIVE PROJECT Welsh International Convention Centre

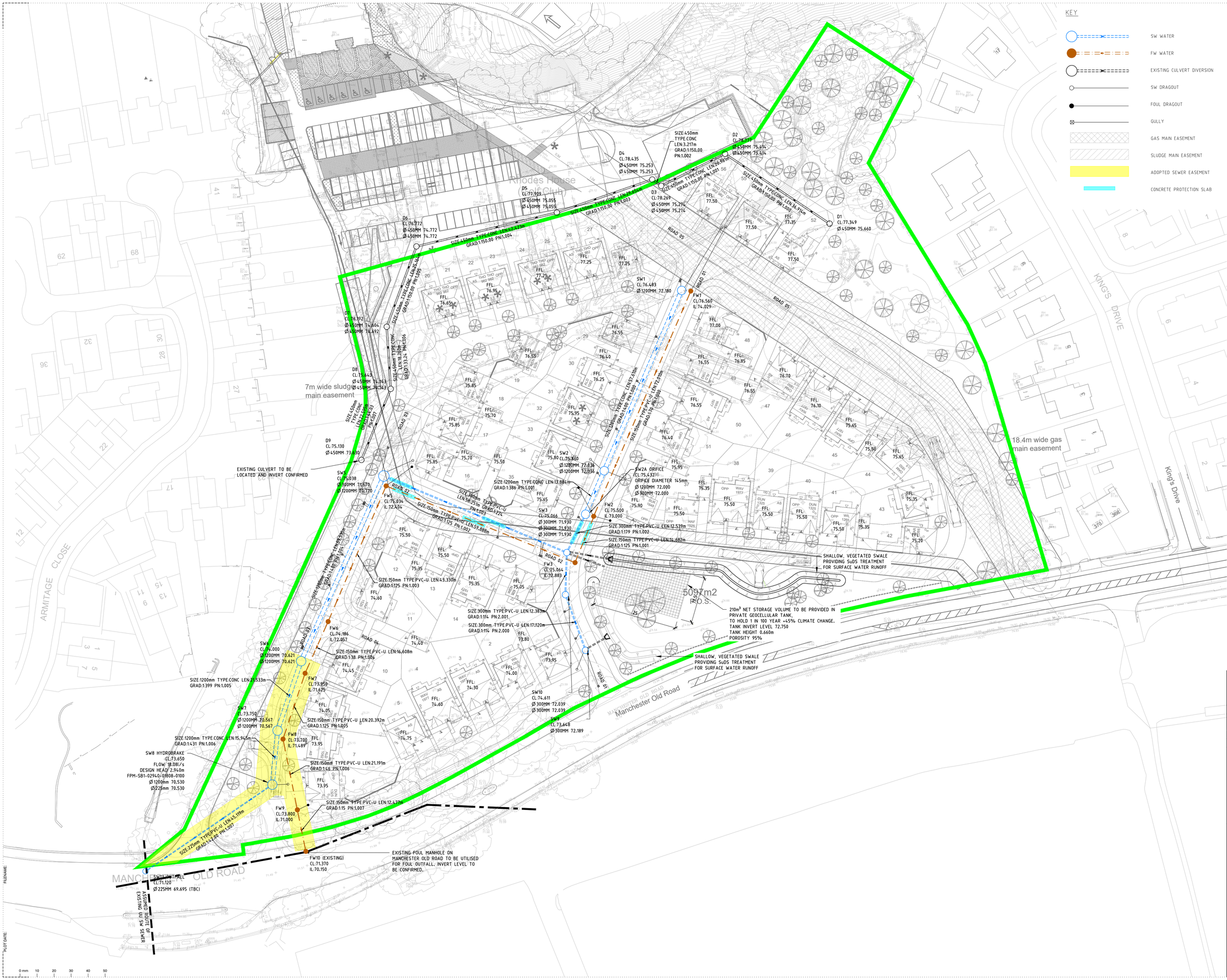
The information contained in this e-mail is intended only for the individual to whom it is addressed. It may contain legally privileged or confidential information or otherwise be exempt from disclosure. If you have received this Message in error or there are any problems, please notify the sender immediately and delete the message from your computer. You must not use, disclose, copy or alter this message for any unauthorised purpose. Neither United Utilities Group PLC nor any of its subsidiaries will be liable for any direct, special, indirect or consequential damages as a result of any virus being passed on, or arising from the alteration of the contents of this message by a third party.

United Utilities Group PLC, Haweswater House, Lingley Mere Business Park, Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP

Registered in England and Wales. Registered No 6559020

www.unitedutilities.com
www.unitedutilities.com/subsidiaries

Appendix E – Proposed drainage layout



KEY

- SW WATER
- FW WATER
- EXISTING CULVERT DIVERSION
- SW DRAGOUT
- FOUL DRAGOUT
- GULLY
- GAS MAIN EASEMENT
- SLUDGE MAIN EASEMENT
- ADOPTED SEWER EASEMENT
- CONCRETE PROTECTION SLAB

NOTES:

1. ALL SEWERS ARE DESIGNED IN ACCORDANCE WITH DESIGN AND CONSTRUCTION GUIDANCE FOR FOUL AND SURFACE WATER SEWERS OFFERED FOR ADOPTION 2.1 VERSION AND ICOSA GUIDELINES AND STANDARD DETAILS.
2. DRAWING IS SUBJECT TO APPROVAL BY ICOSA UNDER A SECTION 104 AGREEMENT AND CONSTRUCTION WORKS UNDERTAKEN PRIOR TO TECHNICAL APPROVAL ARE AT THE DEVELOPERS RISK.
3. ALL CO-ORDINATES AND LEVELS SHOWN ARE RELATIVE TO THE TOPOGRAPHIC SURVEY DRAWING '02591/TOPO' BY GEOMATIC SURVEYS LTD.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INVESTIGATING AND VERIFYING ALL THE EXISTING DRAINAGE CRITICAL TO THE PROPOSED SCHEME PRIOR TO COMMENCING ANY WORK AS FOLLOWS:
   - MANHOLE OUTFALL LOCATIONS
   - OUTFALL INVERT LEVELS
   - OUTFALL PIPE DIAMETERS
   - INTER-CONNECTION OF SEWERS

   ANY INACCURACIES OR INCONSISTENCIES ON THE DRAWING RESULTING FROM THE FINDINGS SHALL BE REPORTED TO THE ENGINEER.
5. PRIOR TO THE COMMENCEMENT OF ANY ON SITE WORKS THE CONTRACTOR MUST CONTACT THE STATUTORY UNDERTAKER AND BE IN POSSESSION OF THE LATEST DRAWINGS SHOWING THEIR APPARATUS.
6. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ALLOW FOR THE SUPERVISION OF THE CONSTRUCTION WORKS BY ICOSA. THE CONTRACTOR WILL NOTIFY THE SUPERVISING OFFICER GIVING NOTICE WHICH WILL BE IN ACCORDANCE WITH THE AUTHORITIES REQUIREMENTS.
7. THE PROPOSED SEWERS WILL BE CLAY PIPE WORK AND SHALL BE EXTRA STRENGTH TO BS EN 295:1991 PART 1.
8. ANY PCC PIPE WORK WILL BE IN ACCORDANCE WITH BS EN 1916:2002.
9. THE CONTRACTOR MAY ELECT TO USE REINFORCED PVC PIPES COVERED BY BS EN 13476-2, B.S 4660,200 & B.S EN 1401-1. STRUCTURED WALL UPVC PIPES TO COMPLY WITH WIS 4-35-01 UP TO AND INCLUDING 300MM. MAX PIPE LENGTH TO BE 3.0M.
10. ALL MANHOLES AND CHAMBERS SHALL BE IN ACCORDANCE WITH BS EN 1917:2002
11. ADOPTABLE SEWERS WITH COVER TO SOFFIT GREATER THAN 1.2m IN ROADS AND 0.9m IN FIELDS SHALL HAVE CLASS S GRANULAR BED AND SURROUND
12. ANY SEWER FOR ADOPTION WITH A COVER OF LESS THAN 1.2M TO PIPE SOFFIT IN ROADS OR 0.9m TO PIPE SOFFIT IN FIELDS WILL HAVE A REINFORCED CONCRETE SLAB PROTECTION AS PER DCG FIG B27.
13. ALL PIPES BUILT INTO THE MANHOLE INVERTS SHALL BE INSTALLED WITH SOFFITS LEVEL. UNLESS SHOWN OTHERWISE.
14. THE CONNECTION TO THE ADOPTABLE SEWER SHALL BE MANUFACTURED JUNCTION PIPES. A SADDLE CONNECTION IS NOT PERMITTED UNLESS IT IS CLEARLY SPECIFIED.
15. CONNECTIONS TO THE EXISTING PUBLIC SEWER WILL BE IN ACCORDANCE WITH APPROVAL GRANTED BY THE STATUTORY UNDERTAKER.
16. PRIVATE DRAINAGE CONNECTIONS TO THE SEWER WILL BE 150MM DIAMETER AND LAID TO THE SPECIFIED INVERT.
17. THE INVERT LEVELS SPECIFIED AT THE DRAG OUT CHAMBER ARE INCOMING LEVELS.
18. A PROTECTIVE GEOTEXTILE/PLASTIC MEMBRANE IS TO BE APPLIED TO ALL FOUL SEWERS LAID ABOVE STORM SEWERS WITH LESS THAN 500MM OF COVER
19. CENTRE OF MANHOLES MAY NOT BE AT THE SAME LOCATION AS PIPE INTERSECTION OR AS SHOWN IN THE LAYOUT. THE MANHOLE RINGS SHALL BE ADJUSTED OVER THE MANHOLE BASE TO SATISFY THE FOLLOWING REQUIREMENTS:
   - CLEARANCE FROM THE ADJACENT PIPE WORK
   - CLEARANCE FROM THE KERB LINE (THE BISCUIT OF THE MANHOLE SHALL NOT PROJECT UNDER THE ROAD CHANNEL LINE).
   - TO PROVIDE THE MINIMUM STANDING SPACE ON THE BENCHING AND THEREBY LOCATE THE MANHOLE COVER AND ENTRY ACCESS.
   - TO PROVIDE THE MINIMUM 250MM OF BEARING FOR THE MANHOLE RING OVER THE CAST IN STUB PIPES.
20. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO LIAISE WITH THE HIGHWAY AND SEWERAGE AUTHORITIES FOR APPROVALS, INTERIM INSPECTION, SNAGGING AND FINAL INSPECTIONS OF THEIR WORK TO ADOPTABLE STANDARDS.
21. AT THE CONCLUSION OF THE WORKS THE CONTRACTOR SHALL PROVIDE A MARKED UP DRAWING TO RECORD ANY AS BUILT VARIATIONS NOT SHOWN ON THE DRAWINGS.
22. ALL WORK BEFORE TECHNICAL APPROVAL IS AT DEVELOPERS RISK. INSPECTIONS CAN BE ARRANGED AS SOON AS THE CONTRACT WITH ICOSA/LAST MILE IS SIGNED.

Rev	Date	Description	By	Chk
P17	09.10.25	Updated to LLFA comments	M.A.	R.A.

EDGE CONSULTING ENGINEERS
www.edgece.com

Manchester . UK
3rd Floor, Conavon Court,
12 Blackfriars Street,
Manchester, M3 5BQ,
United Kingdom

T: +44 (0) 161 834 1938
E: manchester@edgece.com

The concepts + information contained in this document are the copyright of EDGE Consulting Engineers. Use or copying of this document in whole or in part without the written permission of EDGE Consulting Engineers constitutes an infringement of copyright.

DO NOT SCALE DRAWINGS. IF IN DOUBT, ASK!

Project Name
NORTH MANCHESTER GOLF CLUB

Client
DUCHY HOMES

Designed	Drawn	Checked	Scale @ A1
R.A	H.S	R.A	1:500

Drawing Title
DRAINAGE LAYOUT

Project No.
210701

PRELIMINARY
NOT FOR CONSTRUCTION

Drawing No.
210701-EDGE-P1-XX-DR-C-2001

Revision
P17

FILENAME:
PLOT DATE:

Appendix F – Greenfield runoff calculations

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

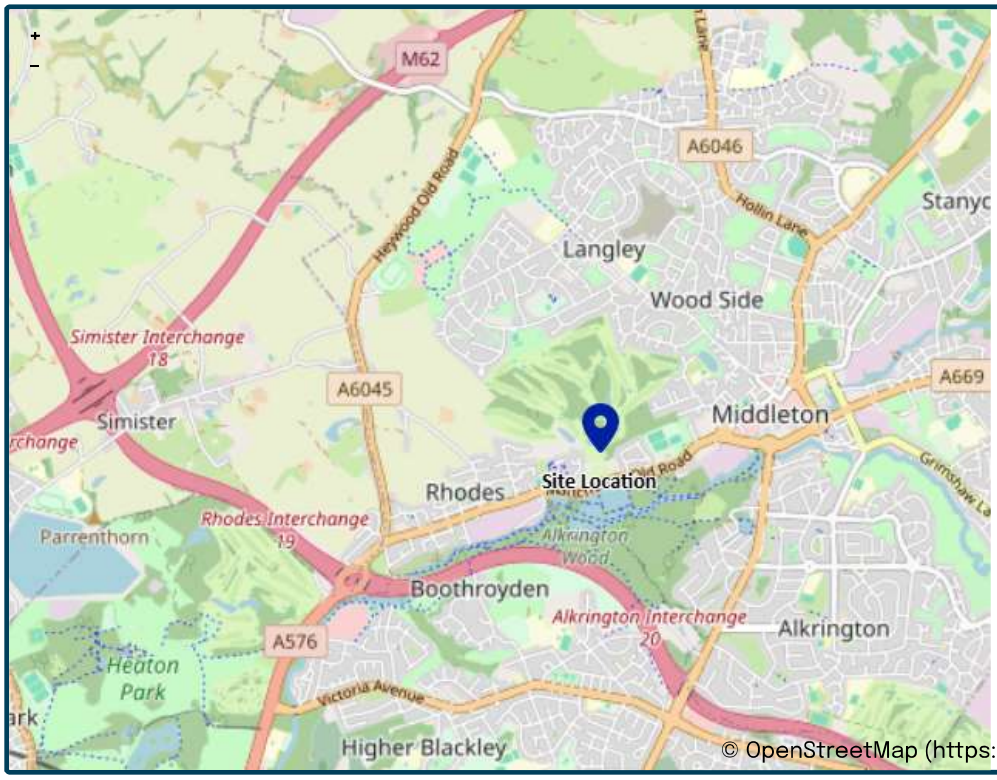
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

Project details

Date	09/10/2025
Calculated by	
Reference	
Model version	2.1.2

Location

Site name	NORTH MANCHESTER GOLF CLUB
Site location	



© OpenStreetMap (https://www.openstreetmap.org/copyright) contributors.

Site easting (British National Grid)	385864
Site northing (British National Grid)	405456

Site details

Total site area (ha)	2.458 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	1003	mm	1003
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		4
SPR	0.47		
QBar (IH124) (l/s)	18.08	l/s	

Growth curve factors

	My value	Map value
Hydrological region	10	10
1 year growth factor	0.87	
2 year growth factor	0.93	
10 year growth factor	1.38	
30 year growth factor	1.7	
100 year growth factor	2.08	
200 year growth factor	2.37	

Results

Method	IH124	
Flow rate 1 year (l/s)	15.7	l/s
Flow rate 2 year (l/s)	16.8	l/s
Flow rate 10 years (l/s)	24.9	l/s
Flow rate 30 years (l/s)	30.7	l/s
Flow rate 100 years (l/s)	37.6	l/s
Flow rate 200 years (l/s)	42.8	l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.1.2) developed by HR Wallingford and available at uksuds.com (https://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 uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate 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, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Appendix G – MicroDrainage calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SW

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	30	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.355	Minimum Backdrop Height (m)	0.600
Maximum Rainfall (mm/hr)	100	Maximum Backdrop Height (m)	3.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.850	Min Slope for Optimisation (1:X)	400

Designed with Level Soffits

Network Design Table for SW

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	57.670	0.144	400.5	0.141	5.00	0.0	0.600	o	1200	Pipe/Conduit	🔒
1.001	13.884	0.036	385.7	0.413	0.00	0.0	0.600	o	1200	Pipe/Conduit	🔒
1.002	12.538	0.070	179.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
2.000	17.119	0.150	114.1	0.031	5.00	0.0	0.600	o	300	Pipe/Conduit	🔒
2.001	12.383	0.089	139.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
1.003	58.251	0.260	224.0	0.060	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
1.004	59.534	0.149	399.6	0.246	0.00	0.0	0.600	o	1200	Pipe/Conduit	🔒
1.005	21.533	0.054	398.8	0.220	0.00	0.0	0.600	o	1200	Pipe/Conduit	🔒
1.006	15.944	0.037	430.9	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	100.00	5.52	72.180	0.141	0.0	0.0	0.0	1.86	2107.3	43.3
1.001	100.00	5.64	72.036	0.554	0.0	0.0	0.0	1.90	2147.7	170.0
1.002	100.00	5.82	72.000	0.554	0.0	0.0	0.0	1.17	82.8«	170.0
2.000	100.00	5.19	72.189	0.031	0.0	0.0	0.0	1.47	104.0	9.5
2.001	100.00	5.35	72.039	0.031	0.0	0.0	0.0	1.33	94.1	9.5
1.003	96.20	6.74	71.930	0.645	0.0	0.0	0.0	1.05	74.0«	190.5
1.004	93.12	7.28	70.770	0.891	0.0	0.0	0.0	1.87	2109.8	254.7
1.005	92.06	7.47	70.621	1.111	0.0	0.0	0.0	1.87	2111.9	313.9
1.006	91.27	7.62	70.567	1.111	0.0	0.0	0.0	1.80	2031.0	313.9

©1982-2020 Innovyze

Network Design Table for SW

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.007	34.849	0.835	41.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.007	89.79	7.90	70.530	1.111	0.0	0.0	0.0	2.03	80.7«	313.9

©1982-2020 Innovyze

Manhole Schedules for SW

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)
SW1	76.483	4.303	Open Manhole	2400	1.000	72.180	1200			
SW2	75.660	3.624	Open Manhole	2400	1.001	72.036	1200	1.000	72.036	1200
SW2A	75.432	3.432	Open Manhole	2400	1.002	72.000	300	1.001	72.000	1200
SW9	73.648	1.459	Open Manhole	1800	2.000	72.189	300			
SW10	74.611	2.572	Open Manhole	1800	2.001	72.039	300	2.000	72.039	300
SW3	75.066	3.136	Open Manhole	1500	1.003	71.930	300	1.002	71.930	300
								2.001	71.950	300
SW5	75.038	4.268	Open Manhole	3000	1.004	70.770	1200	1.003	71.670	300
SW6	74.000	3.379	Open Manhole	3000	1.005	70.621	1200	1.004	70.621	1200
SW7	73.750	3.183	Open Manhole	3000	1.006	70.567	1200	1.005	70.567	1200
SW8	73.650	3.120	Open Manhole	3000	1.007	70.530	225	1.006	70.530	1200
Structure - (12)	72.000	2.305	Open Manhole	1200		OUTFALL		1.007	69.695	225

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW1	385891.694	405532.699	385891.694	405532.699	Required	
SW2	385868.961	405479.764	385868.961	405479.764	Required	
SW2A	385863.496	405467.001	385863.496	405467.001	Required	
SW9	385863.413	405427.284	385863.413	405427.284	Required	
SW10	385857.560	405443.371	385857.560	405443.371	Required	
SW3	385857.967	405455.748	385804.226	405478.222	Required	
SW5	385804.226	405478.222	385804.226	405478.222	Required	
SW6	385779.916	405423.878	385779.916	405423.878	Required	

©1982-2020 Innovyze

Manhole Schedules for SW

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW7	385773.002	405403.485	385773.002	405403.485	Required	
SW8	385771.465	405387.615	385771.465	405387.615	Required	
Structure - (12)	385737.676	405379.087			No Entry	

©1982-2020 Innovyze

PIPELINE SCHEDULES for SW

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	1200	SW1	76.483	72.180	3.103	Open Manhole	2400
1.001	o	1200	SW2	75.660	72.036	2.424	Open Manhole	2400
1.002	o	300	SW2A	75.432	72.000	3.132	Open Manhole	2400
2.000	o	300	SW9	73.648	72.189	1.159	Open Manhole	1800
2.001	o	300	SW10	74.611	72.039	2.272	Open Manhole	1800
1.003	o	300	SW3	75.066	71.930	2.836	Open Manhole	1500
1.004	o	1200	SW5	75.038	70.770	3.068	Open Manhole	3000
1.005	o	1200	SW6	74.000	70.621	2.179	Open Manhole	3000
1.006	o	1200	SW7	73.750	70.567	1.983	Open Manhole	3000
1.007	o	225	SW8	73.650	70.530	2.895	Open Manhole	3000

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	57.670	400.5	SW2	75.660	72.036	2.424	Open Manhole	2400
1.001	13.884	385.7	SW2A	75.432	72.000	2.232	Open Manhole	2400
1.002	12.538	179.1	SW3	75.066	71.930	2.836	Open Manhole	1500
2.000	17.119	114.1	SW10	74.611	72.039	2.272	Open Manhole	1800
2.001	12.383	139.1	SW3	75.066	71.950	2.816	Open Manhole	1500
1.003	58.251	224.0	SW5	75.038	71.670	3.068	Open Manhole	3000
1.004	59.534	399.6	SW6	74.000	70.621	2.179	Open Manhole	3000
1.005	21.533	398.8	SW7	73.750	70.567	1.983	Open Manhole	3000
1.006	15.944	430.9	SW8	73.650	70.530	1.920	Open Manhole	3000
1.007	34.849	41.7	Structure - (12)	72.000	69.695	2.080	Open Manhole	1200

Surcharged Outfall Details for SW

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	Structure - (12)	72.000	69.695	70.000	1200	0

Datum (m) 69.695 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
10	1.000	30	1.000	50	1.000	70	1.000	90	1.000	110	1.000
20	1.000	40	1.000	60	1.000	80	1.000	100	1.000	120	1.000

©1982-2020 Innovyze

Surcharged Outfall Details for SW

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
130	1.000	140	1.000	150	1.000	160	1.000	170	1.000	180	1.000

Simulation Criteria for SW

Volumetric Runoff Coeff	0.850	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.850
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.355		

©1982-2020 Innovyze

Online Controls for SW

Orifice Manhole: SW2A, DS/PN: 1.002, Volume (m³): 28.5

Diameter (m) 0.145 Discharge Coefficient 0.600 Invert Level (m) 72.000

Depth/Flow Relationship Manhole: SW8, DS/PN: 1.007, Volume (m³): 36.7

Invert Level (m) 70.530

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.120	9.3200	1.090	16.8200	2.070	15.8500	3.040	18.2900
0.240	13.8200	1.220	15.7300	2.190	16.2000	3.160	18.5500
0.360	16.5500	1.340	14.1400	2.310	16.5400	3.280	18.7900
0.490	17.8500	1.460	13.7600	2.430	16.8600	3.400	19.0300
0.610	18.0800	1.580	14.2300	2.550	17.1700	3.520	19.2600
0.730	18.0400	1.700	14.6700	2.680	17.4700		
0.850	17.8800	1.820	15.0800	2.800	17.7600		
0.970	17.5100	1.950	15.4700	2.920	18.0300		

©1982-2020 Innovyze

Storage Structures for SW

Cellular Storage Manhole: SW3, DS/PN: 1.003

Invert Level (m) 72.750 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	335.0	0.0	0.670	0.0	0.0
0.660	335.0	0.0			

©1982-2020 Innovyze

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 2 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.356
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	SW1	30 Winter	2	+0%	100/15 Summer				72.536
1.001	SW2	30 Winter	2	+0%	100/15 Summer				72.536
1.002	SW2A	30 Winter	2	+0%	2/15 Summer				72.531
2.000	SW9	15 Winter	2	+0%	30/120 Winter				72.234
2.001	SW10	15 Winter	2	+0%	30/60 Winter				72.095
1.003	SW3	15 Winter	2	+0%	30/60 Winter				72.073
1.004	SW5	120 Winter	2	+0%	30/60 Summer				71.397
1.005	SW6	120 Winter	2	+0%	30/60 Summer				71.388
1.006	SW7	120 Winter	2	+0%	30/30 Winter				71.382
1.007	SW8	120 Winter	2	+0%	2/15 Summer				71.376

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW1	-0.844	0.000	0.01			14.2	OK	
1.001	SW2	-0.700	0.000	0.03			29.5	OK	

©1982-2020 Innovyze

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.002	SW2A	0.231	0.000	0.38			25.1	SURCHARGED	
2.000	SW9	-0.255	0.000	0.05			4.8	OK	
2.001	SW10	-0.244	0.000	0.06			4.6	OK	
1.003	SW3	-0.157	0.000	0.46		20	32.2	OK	
1.004	SW5	-0.573	0.000	0.02			34.6	OK	
1.005	SW6	-0.433	0.000	0.02			28.6	OK	
1.006	SW7	-0.385	0.000	0.02			22.1	OK	
1.007	SW8	0.621	0.000	0.24			18.0	SURCHARGED	

©1982-2020 Innovyze

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 2 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.356
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	SW1	30 Winter	30	+0%	100/15 Summer				72.905
1.001	SW2	30 Winter	30	+0%	100/15 Summer				72.901
1.002	SW2A	30 Winter	30	+0%	2/15 Summer				72.892
2.000	SW9	120 Winter	30	+0%	30/120 Winter				72.704
2.001	SW10	120 Winter	30	+0%	30/60 Winter				72.704
1.003	SW3	120 Winter	30	+0%	30/60 Winter				72.704
1.004	SW5	120 Winter	30	+0%	30/60 Summer				72.689
1.005	SW6	120 Winter	30	+0%	30/60 Summer				72.689
1.006	SW7	120 Winter	30	+0%	30/30 Winter				72.688
1.007	SW8	120 Winter	30	+0%	2/15 Summer				72.688

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW1	-0.475	0.000	0.02			26.8	OK	
1.001	SW2	-0.335	0.000	0.05			48.7	OK	

©1982-2020 Innovyze

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.002	SW2A	0.592	0.000	0.55			36.2	SURCHARGED	
2.000	SW9	0.215	0.000	0.03			3.1	SURCHARGED	
2.001	SW10	0.365	0.000	0.04			3.1	SURCHARGED	
1.003	SW3	0.474	0.000	0.56		75	39.4	SURCHARGED	
1.004	SW5	0.719	0.000	0.03			57.2	SURCHARGED	
1.005	SW6	0.868	0.000	0.04			49.4	SURCHARGED	
1.006	SW7	0.921	0.000	0.04			35.1	SURCHARGED	
1.007	SW8	1.933	0.000	0.24			18.1	SURCHARGED	

©1982-2020 Innovyze

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 2 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.356
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	SW1	60 Winter	100	+45%	100/15 Summer				75.352
1.001	SW2	60 Winter	100	+45%	100/15 Summer				75.352
1.002	SW2A	60 Winter	100	+45%	2/15 Summer				75.350
2.000	SW9	180 Winter	100	+45%	30/120 Winter				73.503
2.001	SW10	180 Winter	100	+45%	30/60 Winter				73.503
1.003	SW3	180 Winter	100	+45%	30/60 Winter				73.503
1.004	SW5	180 Winter	100	+45%	30/60 Summer				73.485
1.005	SW6	180 Winter	100	+45%	30/60 Summer				73.485
1.006	SW7	180 Winter	100	+45%	30/30 Winter				73.485
1.007	SW8	180 Winter	100	+45%	2/15 Summer				73.484

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW1	1.972	0.000	0.02			32.0	SURCHARGED	
1.001	SW2	2.116	0.000	0.08			79.9	SURCHARGED	

©1982-2020 Innovyze

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.002	SW2A	3.050	0.000	1.02			67.4	FLOOD RISK	
2.000	SW9	1.014	0.000	0.05			4.3	FLOOD RISK	
2.001	SW10	1.164	0.000	0.05			3.9	SURCHARGED	
1.003	SW3	1.273	0.000	0.64		143	44.9	SURCHARGED	
1.004	SW5	1.515	0.000	0.04			72.1	SURCHARGED	
1.005	SW6	1.664	0.000	0.05			58.3	SURCHARGED	
1.006	SW7	1.718	0.000	0.04			38.2	FLOOD RISK	
1.007	SW8	2.729	0.000	0.24			18.1	FLOOD RISK	

©1982-2020 Innovyze