CD6.22

Carr Road, Deepcar

Appeal Reference: APP/J4423/W/21/3267168

FLOOD RISK & DRAINAGE

EVIDENCE

Produced on behalf of

Hallam Land Management

May 2021

P19-535

19535-RLL-21-XX-RP-C-002

Document History

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DECLARATION

'The evidence which I have prepared and provided for this appeal is true and has been prepared and is given in accordance with guidance of my professional institution and I confirm that the opinions expressed are my true and professional opinions.'

1 Introduction

1.1 Planning Appeal

1.1.1 An outline Planning application reference 17/04673/OUT was submitted on behalf of the appellant to the Local Planning Authority (LPA) Sheffield City Council (SCC) on 14th November 2017.

1.1.2 The amended description of the development on the committee report is 'Outline application for up to 85 residential dwellings including open space, Land At Junction With Carr Road Hollin Busk Lane Sheffield S36 1GH'. The site has an overall area of approximately 6.5 hectares.

1.1.3 Whilst the officer recommendation was to 'grant conditionally subject to legal agreement', the application was refused by the Council's Planning Committee on the 20th July 2020.

1.1.4 The planning application (reference 17/04673/OUT) was refused for reasons related to impacts on landscape and heritage. Matters relating to flood risk and/or drainage are not reasons for refusal.

1.1.5 The applicant, Hallam Land Management Ltd, has exercised their right to appeal the decision.

1.1.6 The evidence I provide on behalf of Hallam Land Management is in relation to this appeal reference APP/J4423/W/21/3267168 and is in respect of Flood Risk, Surface Water Drainage (including SuDS) and Foul Water Drainage.

1.1.7 No objections to the development proposals were raised by the Lead Local Flood Authority (SCC Flood and Water Management Service) or Yorkshire Water Services Ltd (incumbent Water Company).

1.1.8 It is however noted within the committee report (CD1.7) that local people have raised concerns about flood risk and drainage matters. There have also been further concerns raised by locals since the appeal notice has been submitted. The issues raised in the 'third party representations' can be summarised as follows:

i) Reference to the site being regularly waterlogged and at risk of flooding;

ii) Clough Dike, Fox Glen and Manchester Road are already at risk of flooding and the development proposals would exacerbate this;

iii) The development would pose a pollution risk to Clough Dike and Fox Glen;

iv) The impact of the proposed drainage outfall into Clough Dike on the local wildlife in Fox Glen.

v) The rate of surface water runoff post development into Clough Dike and the risk that it will destabilise land at Glen Works;

vi) Existing flooding issues associated with Hollin Busk Lane, Carr Road, Cockshot Lane and Wood Royd Road;

vii) Hollin Busk would cease its current benefit as a natural soakaway for runoff from the surrounding fields;

viii) Underground mine workings have not been fully explored;

ix) Future maintenance of SuDS elements;

x) Concerns relating to the lack of capacity within the Yorkshire Water network.

xi) Issues with sewer flooding on and around Carr Road.

1.1.9 It should also be noted that since the production of the original Flood Risk Assessment and Drainage Strategy (CD1.19) for the proposed development site, there have been updates to the published Environment Agency (EA) climate change guidance relating to 'peak rainfall intensity'.

1.1.10 I have considered all of the above points and address them in my evidence. I conclude that all of these matters (to the extent that any such issues are valid or relevant) are capable of being addressed by the appeal scheme, with appropriate measures secured by condition.

1.1.11 The evidence is set out as follows:

- In Section 2, I have provided an overview of the site location, its associated watercourses and drainage infrastructure.
- In Section 3, I outline the legislation which stipulates how flood risk and surface water drainage should be considered in the determination of a planning application.
- In Section 4, I consider the site-specific flood risk issues and demonstrate that the proposed development would not be at flood risk, nor would it increase the risk of flooding to the adjacent area. I also address the concerns raised by locals relating to flood risk and surface water drainage (which are summarised at 1.1.9 (i) to (ix) above) in this section.
- In Section 5, I address foul water drainage including the concern raised by locals noted in 1.1.9 (x) to (xi) above.

- In Section 6, I conclude that this site is not at risk of flooding and can be provided with adequate surface water (including SuDS) and foul water solutions.

1.1.12 I conclude that the proposed development, from a flood risk and drainage perspective, accords with the NPPF and the relevant statutory and regulatory requirements.

1.2 Credentials

1.2.1 My name is Kriston Harvey, I have an honours bachelor's degree (B Eng (Hons)) in Civil Engineering from the University of Wales, Swansea and am employed as a Director with Rodgers Leask Limited based in Derby.

1.2.2 I have day to day responsibility for the whole of the Civil Engineering side of the company, working nationally.

1.2.3 I have over 20 years' experience in a consultancy role in dealing with Civil Engineering including Flood Risk, Surface Water Drainage (including SuDS) and Foul Water Drainage.

1.2.4 I have worked on a wide range of development projects including residential developments, mixed use schemes, large SUE developments, employment and business park sites, industrial and logistics developments, education and leisure.

1.2.5 A copy of my CV is included within Appendix A of this proof of evidence.

1.2.6 I confirm that I have inspected the site and locality and am familiar with the application site area.

2 Site Overview

2.1 Existing site and surrounding area

2.1.1 The appeal site is located to the north of the junction of Carr Road and Hollin Busk Lane in Deepcar, Sheffield. The site is located adjoining the edge of the built-up area of Deepcar and Stocksbridge.

2.1.2 The site covers an area of some 6.5ha of private agricultural land.

2.1.3 Agricultural fields are located to the west of the application site and along part of the north western boundary. Fox Glenn wood, an Area of Natural History Interest (ANHI) and Local Wildlife Site (LWS) runs along the remainder of the north western boundary, this contains the watercourse 'Clough Dike' (a tributary to the Little Don River) and has a housing area directly behind.

2.1.4 Clough Dike, where it passes the site, is 'ordinary watercourse' and the Lead Local Flood Authority (LLFA) has jurisdictional responsibility. To the north east of the site, approximately 260m from the proposed development boundary and just prior to where it is culverted beneath Wood Royd Road, Clough Dike becomes a 'main river' and from that point falls within the jurisdictional responsibility of the EA.

2.1.5 To the north, the site adjoins dwellings and the rear gardens of properties. Carr road with dwellings and a housing area beyond is located to the south east of the site.

2.1.6 A cluster of properties and a small field are also located along the eastern boundary between the site and Carr Road.

2.1.7 To the south of the site is Hollin Busk Lane with green belt beyond. The site itself is not in the green belt. The south eastern corner of the site adjoins the junction of Hollin Busk Lane, Carr Road, Royd Lane and Cockshot Lane.

2.1.8 The site is located at Deepcar, within Stocksbridge parish. Deepcar is approximately 9.9 miles from Sheffield City Centre.

2.1.9 The site is made up of private agricultural fields used for grazing. There is a shallow gradient across the site, and it generally falls from the high point at the south to the north of the site.

2.1.10 Sewer records obtained from Yorkshire Water (YW) indicate that public foul sewers are located within Carr Road.

2.2 Illustrative Masterplan

2.2.1 The original appeal submission contained the Illustrative Masterplan dated December 2019 (CD1.3).

2.2.2 As a result of ongoing work, in particular to address further objections, a Revised Illustrative Masterplan (CD1.3a) dated April 2021 (and associated parameters) was developed and submitted to show how a reduction in built form, i.e. houses, could be achieved around the Listed Buildings.

2.2.3 The undeveloped land is shown to be able to accommodate a second SuDS basin. The overall SuDS capacity is not diminished, and the revised scheme provides an opportunity for an additional stage of water treatment which albeit unnecessary is clearly of benefit.

2.2.4 Indeed, the Lead Local Flood Authority has encouraged the exploration of providing a further stage of water treatment as noted at paragraph 2.29 of the 'Flood Risk & Drainage' SoCG (CD6.12).

2.2.5 Furthermore, the introduction of the second SuDS basin in the revised scheme provides the potential for enhanced amenity and habitat.

2.2.6 It is worth noting that the Revised Illustrative Masterplan (April 2021) delivers a slightly reduced net developable area and consequently a slightly reduced impermeable area.

2.2.7 As a result of this, the overall volume of attenuation required for the revised scheme is slightly lower than for the December 2019 scheme and as such the volume of the two basins when added together is slightly less than for the single basin scheme.

3 Planning Policy and Technical Guidance

3.1 National Planning Policy

3.1.1 The National Planning Policy Framework (NPPF) (CD4.1) was first published in March 2012, updated in July 2018 and most recently in February 2019.

3.1.2 The NPPF sets out the government's planning policies for England and how these should be applied, guiding LPAs in determining planning applications.

3.1.3 Within the section 'Planning and flood risk' (paragraphs 155 to 165), NPPF includes policies to ensure that flood risk is considered at all stages of the planning process, to ensure appropriate development takes place when considering the risk of flooding.

3.1.4 At Paragraph 155, the NPPF states that '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'.

3.1.5 Further at Paragraph 163, NPPF states that 'When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment'. It goes on to state that 'development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception test, 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;

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.

3.1.6 Site specific flood risk assessments are required for all proposed developments in Flood Zones 2 and 3, and for all sites of 1ha or greater, in accordance with footnote 50 of the NPPF.

3.1.7 At Paragraph 165, NPPF requires that 'Major developments should incorporate sustainable drainage systems' and that these systems should 'take account of advice from the lead local flood authority; have appropriate proposed minimum operational standards; have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and where possible, provide multifunctional benefits'.

3.1.8 The National Planning Practice Guidance 'Flood Risk and Coastal Change' was published in March 2014 (and thereafter updated).

3.1.9 Guidance notes at paragraph 30 that a 'site-specific' flood risk assessment should be 'carried out by (or on behalf of) a developer to assess the flood risk to and from a development site.

3.1.10 It states the 'objectives of a site-specific flood risk assessment are to establish':

- Whether a proposed development is likely to be affected by current or future flooding from any source;
- Whether it will increase flood risk elsewhere;
- Whether the measures proposed to deal with these effects and risks are appropriate;
- The evidence for the local planning authority to apply (if necessary) the Sequential Test, and;
- Whether the development will be safe and pass the Exception Test, if applicable.

3.1.11 The guidance further notes at paragraph 31 that a site-specific flood risk assessment should be 'credible and fit for purpose', 'proportionate to the degree of flood risk' and 'appropriate to the scale, nature and location of the development'.

3.1.12 NPPG states at paragraph 50 that developers 'should seek opportunities to reduce the overall level of flood risk in the area and beyond' and notes that this can be achieved by measures including 'green infrastructure and the appropriate application of sustainable drainage systems'.

3.1.13 There is reference to the benefits which SuDS systems can offer at paragraph 52:

- Reduce the causes and impacts of flooding;
- Remove pollutants from urban run-off at source;
- Combine water management with green space with benefits for amenity, recreation and wildlife.

3.1.14 At paragraph 81, guidance states that when considering a development that includes a SuDS system, the local planning authority 'will want to be satisfied that the proposed minimum standards of operation are appropriate and that there are clear arrangements in place for ongoing maintenance'. It further notes that 'information sought by the local planning authority should be no more than necessary'.

3.1.15 Paragraph 83 refers to The Department for Environment, Food and Rural Affairs (Defra) 'Non-statutory technical standards for sustainable drainage systems' and states that 'in terms of the overall viability of a development, expecting compliance with the technical standards is unlikely to be reasonably practicable if more expensive than complying with building regulations', it further states that 'a particular discharge route would not normally be reasonably practicable when an alternative would cost less to design and construct'.

3.1.16 At paragraph 84 further clarification is provided as to what is relevant to design and construction costs in that it 'can include the opportunity cost of providing land for a drainage system above ground where the land utilised for the drainage system is not also utilised for another land use' and 'the resulting maintenance and operation requirements arising from the design'.

3.1.17 NPPG goes on to state at paragraph 85 that 'developers need to ensure that their design takes account of the construction, operation and maintenance requirements of both surface and subsurface components' and that 'whether maintenance and operation requirements are economically proportionate should be considered by reference to the costs that would be incurred by consumers for the use of an effective drainage system connecting directly to a public sewer'.

3.1.18 Paragraph 68 provides a checklist for 'site-specific flood risk assessment' reports.

3.1.19 I have produced a technical note (19535-RLL-21-XX-TN-S-004 'Site-Specific Flood Risk Assessment: Checklist') which is included at Appendix B of this proof and which demonstrates that the Flood Risk Assessment and Drainage Strategy prepared by ARP Associates (Report 1265/10r1 dated 19/04/2017) complies with the checklist requirements and that these requirements can still be accommodated within the proposed illustrative masterplan.

3.2 Local Planning Policy

3.2.1 The Sheffield City Council Core Strategy (CD3.1) was adopted on 4 March 2009 and contains the principal policies for determining the application.

3.2.2 Policy CS67 'Flood Risk Management' states that the extent and impact of flooding will be reduced by:

a) Requiring that all developments significantly limit surface water runoff;

b) Requiring the use of Sustainable Drainage Systems or sustainable drainage techniques on all sites where feasible and practicable;

c) Promoting sustainable drainage management, particularly in rural areas;

d) Not culverting and not building over watercourses wherever practicable;

e) Encouraging the removal of existing culverting.

f) Not increasing and, where possible, reducing the building footprint in areas of developed functional floodplain;

g) Not locating or subdividing properties that would be used for more vulnerable uses in areas of developed functional floodplain;

h) Developing only water-compatible uses in functional floodplain;

i) Designating areas of the city with high probability of flooding for open space uses where there is no overriding case for development;

j) Developing only water-compatible uses in functional floodplain;

k) Ensuring any highly vulnerable uses are not located in areas at risk of flooding;

l) Ensuring safe access to and from an area with a low probability of flooding.

3.2.3 Policy CS67 'Flood Risk Management', is complemented by the Sheffield Development Framework 'Climate Change and Design – Supplementary Planning Document and Practice Guidance' (SPD) (CD3.9) adopted March 2011.

3.2.4 It should be noted that whilst references to the Construction Industry Research and Information Association (CIRIA) 'The SuDS Manual' 2007 publication were relevant at the time the SPD was published, the CIRIA guidance has since been updated with the November 2015 'The SuDS Manual (C753).

3.2.5 Sheffield City Council published a Level 1 Strategic Flood Risk Assessment (produced by Jacobs) in July 2008 (CD3.10). The report provides an overview of flood risk in the District and is intended to be used by the Council to inform the application of the sequential test.

3.2.6 The Level 1 SFRA does not provide any information specific to this application site within the main body of the report, however the following principles are noted within the document, along with relevant mapping:

- Section 3.2.3 makes reference to 'reducing flood risk to and from development through location, layout and design, incorporating sustainable drainage systems (SuDS);
- At 5.4 it notes that developers should 'consider the possible change in flood risk over the lifetime of the development as a result of climate change';
- Overland flow maps are included within the SFRA which indicates the potential for overland flow toward the site from the south (refer to Appendix C of this proof for the map which includes the area surrounding the site), however Section 5.5 of the SFRA notes that the flows paths shown are 'indicative' and do not take into account 'roads, buildings, walls and fences, which would influence flow greatly at a local level'.
- Section 6.4 notes that 'issues of a localised nature can generally be addressed safely and sustainably through the design process, and will typically not restrict development' and that 'SuDS should be an integral part of all drainage systems within the district';
- It is noted in Section 6.5 that 'there are no known incidents of groundwater flooding in Sheffield, and it is considered reasonable to assume that the potential risk of groundwater flooding is extremely low';
- There is reference to the 'positive reduction in flood risk to Sheffield' which can be delivered by developers including through the 'integration of SuDS to reduce the runoff rate from the site';
- At Section 7.5.1 it notes that 'all sites situated within Zone 2 or Zone 3, and sites greater than 1ha within Zone 1, require a detailed Flood Risk Assessment';
- Section 7.6.1 provides the scope of requirements for a Flood Risk Assessment to support a 'Proposed Development within Zone 1 Low Probability'.

3.3 Technical Guidance

3.3.1 The Department for Environment, Food and Rural Affairs (Defra) 'Non-statutory technical standards for sustainable drainage systems' (CD7.16) was published in March 2015.

3.3.2 The document provides guidance on runoff control for new drainage systems discharging to any highway drain, sewer or surface water body. This is relevant for the proposed development site as Clough Dike would, in regard to this document, be classed as a surface water body.

3.3.3 The Construction Industry Research and Information Association (CIRIA) published 'The SuDS Manual (C753)' in November 2015.

3.3.4 The latter document provides guidance on the design and maintenance of Sustainable Drainage Systems and elements.

3.3.5 The guidance includes simple pollution hazard indices and mitigation indices for water quality risk management.

3.3.6 The 'Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code")' was published on 10 March 2020.

3.3.7 The 'guidance is for use by developers when planning, designing and constructing foul and surface water drainage systems'.

4 Site Specific Flood Risk

4.1 Introduction

4.1.1 In this section I will summarise the key site characteristics including topography, flood risk and surface water drainage.

4.1.2 I will also detail the work which has been undertaken to date to support the proposed development relating to flood risk and surface water drainage, including the mitigation measures proposed and how these address Planning Policy, Technical Guidance and the concerns raised by locals through the Public Consultation process.

4.2 Site Location

4.2.1 The site is located to the north of the junction of Carr Road and Hollin Busk Lane in Deepcar, Sheffield.

4.2.2 Agricultural fields, Fox Glen and Clough Dike are located to the north west of the site, whilst Hollin Busk Lane and Carr Road wrap around the southern and south eastern site boundary respectively.

4.2.3 To the north of the site are existing dwellings and rear gardens of these properties.

4.2.4 The 6.5ha site comprises private agricultural fields used for grazing.

4.3 Topography

4.3.1 The site generally slopes toward the north east from the highest part in the south at approximately 254mAOD to the lowest part in the north east at approximately 230mAOD.

4.4 Ground Conditions

4.4.1 The site currently comprises agricultural fields.

4.4.2 The British Geological Survey 'Geology of Britain viewer identifies that the site is underlain by bedrock geology of the Pennine Lower Coal measures formation, comprising sandstone.

4.4.3 During a site walkover survey undertaken on Monday 8th March 2021, it was observed that topsoil is present on site overlying the bedrock geology.

4.4.4 The topsoil material is considered to be relatively impermeable, with rainwater likely to collect on the site surface and run-off overland toward Fox Glen and Clough Dike.

4.4.5 Whilst there is a slope across the site, the observed upper ground conditions coupled with localised undulations in the surface would likely result in water 'ponding' at times of heavy rainfall.

4.4.6 This accords with comments noted within the Committee report from local residents that the site is regularly waterlogged.

4.5 Hydrogeology

4.5.1 The underlying solid geology of the Pennine Lower Coal Measures Formation is classified as a Secondary A aquifer by the Environment Agency.

4.5.2 The site is not shown within or within 500m of a Source Protection Zone.

4.6 Hydrology

4.6.1 To the north west of the site, Clough Dike flows in a north easterly direction. It is in a deeply incised channel which flows away from the proposed development site.

4.6.2 Surface water runoff from the site currently flows overland following the topography of the site toward Clough Dike and would disperse through Fox Glen and into Clough Dike.

4.6.3 A large proportion of the site (the western extents) is proposed to be retained as green open space and therefore the surface hydrology would follow the current regime.

4.7 Flood Risk

4.7.1 In April 2017 a site-specific Flood Risk Assessment report (CD1.19) which complies with the requirements of the NPPF was produced by ARP Associates (reference: 1265/10r1). The report covers flood risk both to and from the site, the surface water strategy for the site including SuDS provision and the foul water strategy for the site.

4.7.2 The report documents consultation undertaken with relevant bodies and proposes appropriate mitigation where risks are identified (this is agreed with the LLFA as noted at paragraph 2.5 of the 'Flood Risk & Drainage' Statement of Common Ground' (CD6.12)), considering climate change over the lifetime of the proposed development.

4.7.3 The FRA identifies at Section 6.1 that 'the whole of the site falls within land assessed as having less than a 1 in 1,000 annual probability of river or sea flooding in any year (less than 0.1%). Therefore, in accordance with Table 1 of the PPG, the site falls within Flood Zone 1 "low probability"'.

4.7.4 A copy of the current GOV.UK Flood Map for Planning which confirms that this is still the case is included at Appendix D of this proof of evidence.

4.7.5 The FRA report also notes at Sections 6.9 and 6.10 that 'Clough Dike is in a deeply incised channel, which flows away from the proposed development site. Therefore, any flood flows are likely to be contained within the channel or flow away from the proposed development'.

4.7.6 At Section 6.13, the report acknowledges that whilst at predominantly a 'very low risk of surface water flooding' (from surface water runoff), 'surface water flow paths are present through the site which emanate from third party land to the south of Hollins Busk Lane and Cockshot Lane'.

4.7.7 Given the topography of the local area and the site, should overland runoff enter the site boundary, it would flow from south to north (perpendicular to the site contours) toward Fox Glen and Clough Dike.

4.7.8 The report goes on to recommend that 'whilst the risk of surface water flooding on site is deemed to be very low, the natural surface water flow path should be incorporated into the proposed development layout'. This is agreed with the LLFA as per paragraph 2.21 of the 'Flood Risk & Drainage' SoCG (CD6.12).

4.7.9 I consider that, as indicated within the FRA report, this could be delivered relatively simply by providing a 'cut-off' drain at the southern boundary of the site (sized appropriately for the anticipated catchment area), and with the flow routed through an open drainage feature to discharge at the northern boundary of the site (and on into Fox Glen and Clough Dike) at the location identified on the 'Overland Flow Map' at Appendix C of this proof. This would route the overland flow in a controlled manner to the area of Fox Glen and Clough Dike to which mapping indicates it would currently drain.

4.7.10 As the open drainage feature would be vegetated and would follow the topography of the existing site, the overland flow would pass through this feature at no greater rate than it would across the surface of the site.

4.7.11 A copy of the current GOV.UK Flood Risk from Surface Water map is included at Appendix E of this proof of evidence, which confirms that the site is generally at 'very low risk' of flooding from surface water. There is only a small section of the site shown to be at 'low' risk along the eastern boundary, and a further very small, isolated area within the site.

4.7.12 It is my opinion that post development, this 'low' flood risk would be mitigated with the provision of a positive drainage system.

4.7.13 Based upon the site boundary, there are no flow paths through the site identified on the current Flood Risk from Surface Water map. The dominant overland flow path identified on the 'Flood Risk from Surface Water' map is shown to originate close to Cockshot Hill to the south west of the site and to flow in a northerly direction.

4.7.14 At Section 6.16, the FRA references the statement within the Sheffield City Council SFRA which states 'There are no known incidents of groundwater flooding in Sheffield, and it is considered reasonable to assume that the potential risk of groundwater flooding is extremely low'.

4.7.15 It is noted at Section 6.20 of the FRA that the 'proposed development site is shown to be outside the maximum extent of reservoir flooding' and that 'there are no other artificial sources within the vicinity of the proposed development site, therefore the risk of flooding from this source is deemed to be low'.

4.7.16 A copy of the current GOV.UK Flood Risk from Reservoirs map is included at Appendix F of this proof of evidence which confirms that the site is not at risk of flooding from a reservoir failure.

4.7.17 In terms of mitigation, the FRA proposes the following measures at Section 6.25:

- The finished floor levels to the properties should be raised above external levels by a minimum of 150mm wherever possible;
- The surface water flows paths….should be incorporated into the development masterplan and site drainage strategy;
- Properties shall be designed without any basements and ground floors shall comprise solid concrete slabs or beam and block with screed construction to mitigate against future groundwater risk sources;
- Incoming electricity supplies shall be raised above ground floor level and ground floor sockets shall be served by loops from the first floor to create further flood resilience;
- In the unlikely event of flooding on the site, it would be appropriate to design external levels with falls to non-critical areas, such as landscaping or the northern boundary, where the water can pond or run-off into Clough Dike without causing flooding to buildings;
- It will be necessary to ensure there is a route for overland run-off from third party land through the site without causing flooding to buildings. To

achieve this boundary, cut-off drains may be required to direct water through to the watercourse on the boundary.

4.7.18 Whilst current 'Flood Risk from Surface Water' mapping would suggest that the risk of overland flow to the site identified on the SFRA 'Overland Flow Map' is not present, I consider it is still appropriate to provide a boundary cut-off drain at the southern site boundary to deal with any localised overland runoff.

4.7.19 I consider that the mitigation proposals contained within the FRA report are appropriate.

4.7.20 Draft planning conditions have been provided by Sheffield City Council within the committee report (CD1.7).

4.7.21 Draft conditions require the development to becarried out in accordance with the Flood Mitigation measures identified in section 6.25 within the submitted Flood Risk Assessment and Drainage Strategy prepared by ARP Associates (Report 1265/10r1 dated 19/04/2017).

4.7.22 The wording of the draft planning condition would ensure that the requirements set out at S9 of the DEFRA 'Non-statutory technical standards for sustainable drainage systems' are met.

4.7.23 S9 requires that 'the design of the site must ensure that, so far as is reasonably practicable, flows in excess of a 1 in 100-year rainfall event are managed in exceedance routes that minimise the risk to people and property'.

4.7.24 The penultimate point on the FRA mitigation proposals, which draft conditions require the development complies with, would deliver against this requirement.

4.7.25 I consider that all of the mitigation proposals noted above are deliverable within the proposed residential development and that appropriate measures can be provided to ensure that the proposed development site is not at risk of flooding.

4.7.26 The FRA report concludes at Section 7.8 that 'the proposed development can satisfy the requirements of the National Planning Policy Framework and the Planning Practice Guidance in relation to flood risk'.

4.7.27 The LLFA provided a consultation response on 5th January 2018 (CD2.3).

4.7.28 Whilst the LLFA recommended that further consideration be given to impacts on ecology and opportunities to introduce further SuDS features, the LLFA did not object to the application proposals submitted, raised no issues relating to flood risk and recommended standard drainage planning conditions.

4.7.29 As a statutory consultee, Yorkshire Water responded to the Sheffield City Council Planning Service on 9th January 2018 (CD2.5) and confirmed that the 'Flood Risk

Assessment and Drainage Strategy (CD1.19) (prepared by ARP Associates – Report 1265/10r1) is acceptable'.

4.7.30 The Yorkshire Water letter acknowledged that 'foul water will discharge to public foul sewer in Carr Lane' and also noted that should infiltration drainage at the site not be feasible for disposal of surface water, that 'Clough Dike exists near the site'.

4.7.31 At pages 79 - 81 of the Planning Committee Report (CD1.7) within the section headed 'FLOOD RISK AND DRAINAGE', the case officer notes the following:

- The application site lies within flood zone 1 where there is a low probability of flooding;
- The applicant's Flood Risk Assessment and Drainage Strategy incorporates a sustainable urban drainage system (SuDS);
- Foul water drainage would discharge to the public foul sewer in Carr Road.
- Yorkshire Water has raised no objections to the proposed development and requested conditions to ensure the development is carried out in accordance with the submitted flood risk assessment and drainage strategy.
- Yorkshire Water has stated that the submitted Flood Risk Assessment and Drainage Strategy is acceptable.
- The Council's Flood and Water Management Service as local drainage authority has raised no objections to the principle of the proposed surface water drainage arrangements subject to conditions to secure satisfactory details of the sustainable drainage system.
- The applicant's Flood Risk Assessment and Drainage Strategy includes a screening assessment of the impact of the drainage proposals on the ecological status of the water environment (Water Framework Directive Assessment). The WFDA (CD1.17c Appendix 4) concludes that the proposals are, with mitigation measures, compliant with the water framework directive and no further assessment is required.
- The Council's Ecology Unit has advised that the Water Framework Directive Assessment document submitted by the applicant is thorough and well set out.
- The drainage proposals, as indicated in the application, are considered to be an appropriate solution to dealing with the foul and surface water run-off from the site in a sustainable manner.

4.7.32 The case officer concludes that 'the proposal complies with Core Strategy Policy CS67, which carries weight in the decision making process, and the Government's planning policy guidance on flood risk in the paragraphs 155 and 165 of the NPPF'. This is agreed by the LLFA to be the case, as per paragraph 2.10 of the 'Flood Risk & Drainage SoCG (CD6.12).

4.7.33 I consider that the relevant flood mechanisms which could put the site at risk of flooding have been considered, and where issues have been identified, appropriate mitigation measures have been proposed which can be readily achieved within the proposed development.

4.7.34 It is my opinion therefore that the site is not at flood risk.

4.8 Surface Water Drainage

4.8.1 The April 2017 site specific Flood Risk Assessment report (CD1.19) produced by ARP Associates (reference: 1265/10r1) covers the surface water strategy for the site including SuDS provision.

4.8.2 The report identifies at Section 6.28 that the 'site is greenfield and, therefore, in accordance with the current guidelines and regulations, indicative surface water calculations have been undertaken using the IH124 Method of calculating greenfield run-off rates'.

4.8.3 Restricting the rate of runoff from the proposed development site complies with part (a) of Core Strategy Policy CS67.

4.8.4 The report further notes that the 'existing greenfield rate for the proposed development site has been assessed to be 51.9l/s' and confirms that 'calculations are presented in Appendix E' of the ARP FRA report.

4.8.5 At Section 6.31 of the FRA, it is noted that 'a direct connection to watercourse is considered the most suitable method of discharging surface water based on site layout and topography'.

4.8.6 In developing the illustrative masterplan, the surface water strategy was identified as a constraint, with the layout being developed to take account of the surface water attenuation volume requirements and location.

4.8.7 Through an iterative process, the drainage strategy was then refined to manage the surface water runoff generated by the impermeable areas within the proposed development site.

4.8.8 It is noted in the FRA at Section 6.32 that the 'drainage system will need to accommodate the 1 in 100-year storm plus 30% climate change event without causing flooding of property of third party land' with the calculations included in Appendix E of the FRA.

4.8.9 The consideration of climate change over the lifetime of the development follows the principle outlined at Section 5.4 of the SCC SFRA.

4.8.10 The LLFA provided a consultation response on 5th January 2018 (CD2.3).

4.8.11 The LLFA provided discussion comments relating to the SuDS scheme proposed for the site and recommended standard planning conditions.

4.8.12 The key points for discussion with the LLFA relating to surface water drainage following the outline application were water quality (and the form of treatment to be provided through the SuDS proposals) along with the proposed outfall through Fox Glen to Clough Dike and management arrangements for drainage.

4.8.13 During May 2018, discussions were held with representatives from the LLFA and it was confirmed that SCC had a mechanism for and would be willing to maintain the proposed SuDS features.

4.8.14 The importance of maintenance arrangements over the lifetime of the development is highlighted in Paragraph 165 of NPPF and part (c) of Core Strategy Policy CS67.

4.8.15 A meeting was held on 21st May 2018 with representatives from the LLFA in attendance. It was raised at this meeting by SCC that their preferred solution for the surface water outfall was a rock cascade through Fox Glen to Clough Dike.

4.8.16 It should be noted that whilst the term 'cascade' can often be used to describe water flowing in large quantities its use in the description of the proposed outfall is simply to describe the rock feature which would be formed through Fox Glen. The flow of water along this outfall will, as previously noted, be controlled to a low (greenfield) runoff rate.

4.8.17 The need for a survey along the route of the outfall was discussed and the need to assess how the solution would be delivered when considering existing footpaths and trees.

4.8.18 From an ecological perspective, it was agreed to advise on the ecological enhancement associated with the drainage solution and for a Water Framework Directive Screening to be undertaken.

4.8.19 The LLFA also indicated that it would be the intention that SCC fund the maintenance of the SuDS scheme through a direct charge to the residents of the proposed development.

4.8.20 In my experience, this is a common mechanism used to secure funding for such features.

4.8.21 Initial design proposals for the SuDS basin were submitted to the LLFA on 1st June 2018 and feedback was received on 14th June 2018 which largely focused on the bank gradients of the proposed basin as well as typical details for the inlet and outlet structures.

4.8.22 The LLFA requested gentler side slopes to the SuDS basin than the 1 in 3 slopes originally proposed. Subsequent design revisions incorporated gentler 1 in 4.5 slopes.

4.8.23 A sketch proposal for the rock cascade outfall route incorporating a 6m standoff easement and including culverted sections beneath footpaths was issued to the LLFA on 27th June 2018, and feedback was received to confirm that the principle was acceptable. Further guidance was provided by the LLFA relating to the piped sections, noting that these should be constructed in ductile iron to eliminate the risk of root penetration.

4.8.24 A further conversation on 6th July 2018 with the LLFA refined the proposed route of the cascade outfall through Fox Glen, following input from SCC Parks and Countryside department.

4.8.25 Following these negotiations with the LLFA to refine the route of the cascade outfall, a Water Framework Directive Assessment (WFDA) report (CD1.17c Appendix 4) was produced by FPCR (dated October 2018), to consider the potential impacts of the proposed drainage strategy on the receiving watercourse, as had been agreed during the meeting of 21st May 2018.

4.8.26 The WFDA report encompassed a desk study review to ensure that all aspects of the proposed works that should be screened for assessment were given due consideration.

4.8.27 This was followed by field survey work for the receptor (Fox Glen and Clough Dike) and finally an impact assessment whereby the results of the design study review and field survey were used to assess the type and magnitude of potential impacts and to identify mitigation measures required to ensure compliance with the Water Framework Directive.

4.8.28 The indicative SuDS basin and rock cascade outfall route are identified in Figure 2 of the FPCR WFDA report. This figure is included at Appendix G of this proof.

4.8.29 The 'impact assessment' at Section 6.0 of the WFDA report included comments and proposals relating to mitigation which included:

- Implementation of a Sustainable Drainage Scheme with attenuation features and flow controls in accordance with Sheffield City Council's local guidance.

- The working method statement for construction of the discharge channel and outfall should make provision for ensuring that displaced soil during construction is not able to enter the brook.

- The adoption of standard pollution methods which will form part of the various working method statements for the construction work will mitigate any potential pollution issues.

- The proposed drainage scheme will comply with Sheffield City Council's SuDS guidance to adequately remove contaminants prior to discharge into a watercourse. For example, the scheme will include oil traps as part of the design. The cascade design of the proposed outfall to the brook will increase oxygen levels in the discharge before it enters the brook.

4.8.30 I consider that all of the above mitigation measures are deliverable and would be secured by the draft planning conditions.

4.8.31 The report concludes at Section 7.0 that 'the proposals are, with the identified measures in place, compliant with the WFD'.

4.8.32 At Page 80 of the Committee Report (CD1.7), the case officer notes that the 'Council's Ecology Unit has advised that the Water Framework Directive Assessment document submitted by the applicant is thorough and well set out'

4.8.33 In addition to the WFDA, the applicant also provided a 'Fox Glen Survey of Proposed Drainage Route' report (CD1.17c Appendix 5) by FPCR dated October 2018.

4.8.34 The FPCR report notes in the introduction at Section 1.0 that Fox Glen 'has been designated as a Local Wildlife Site' and outlines the need for 'an assessment of the potential impact on the woodland ground flora along a proposed route for the drainage system within the woodland'.

4.8.35 The report concludes at Section 5.0 that 'the proposed work to construct and maintain a drainage system through Fox Glen Wood to discharge into Clough Dike would have no more than a negligible adverse impact on features for which the woodland has been afforded the non-statutory designation as a Local Wildlife Site'.

4.8.36 It further notes that whilst 'the proposals would potentially have an impact on the small population of bluebell within the proposed area of works where the drainage channel would be located', this impact could be mitigated 'by re-planting any uprooted bulbs into undisturbed areas adjacent to working areas'.

4.8.37 It is considered that the drainage solution will provide ecological enhancements, including the creation of wetland features within the proposed SuDS basin and

the creation of a new open water channel (the rock cascade outfall) from the SuDS basin to Clough Dike.

4.8.38 In addition, the SuDS basin will be designed to hold some water throughout the year to allow the development of species rich grassland and marginal planting.

4.8.39 Draft planning conditions have been provided by SCC in the committee report, a number of which are relevant to the surface water drainage proposals.

4.8.40 Draft conditions would require no development to commence until details for appropriately addressing potential impacts of the proposed drainage outfall from the balancing facility to the Clough Dike during the construction phase have been submitted to the Local Planning Authority and approved.

4.8.41 It is my opinion that a planning condition such as this would adequately ensure that surface water is managed from commencement of any construction works on site and the identified mitigation within Fox Glen is delivered to an agreed timetable.

4.8.42 The condition will allow the LPA to agree the sequence in which drainage works are undertaken to ensure that appropriate components will be in place such as measures to deal with the quantity (the construction of the control chamber upstream of the rock cascade outfall) and quality (the construction of the SuDS basin and provision of temporary treatment measures within construction phase drainage) of water leaving the site prior to the commencement of general construction activities.

4.8.43 Draft conditions further require that no piped discharge of water from the application site shall take place until the surface water drainage works including off-site works have been completed in accordance with details which are to be submitted and approved in writing by the Local Planning Authority.

4.8.44 Such a condition would prevent discharge of surface water from the site until the design proposals have been delivered.

4.8.45 A draft Construction Environmental Management Plan (CEMP), document reference 19535-RLL-21-XX-RP-C-003 dated April 2021, has been produced for this site by Rodgers Leask Ltd.

4.8.46 It should be noted that this draft CEMP is intended to demonstrate the likely content of such a document and as such is not intended to be the finished article. For the production of the final document, relevant departments at the local authority (LA) would be consulted and it would be submitted to the LA for approval.

4.8.47 The draft CEMP sets out general requirements for the site including standards and guidance to be adhered to, community liaison responsibility, hours of working, planning of construction activities and vehicular movements.

4.8.48 There is also consideration of biodiversity and ecological management along with an assessment of the need for an Ecological Clerk of Works (ECoW).

4.8.49 The report includes recommended environmental management measures including those to deal with pollution prevention, dust mitigation and biodiversity protection zones.

4.8.50 Finally, the report sets out construction procedures and methodology associated with excavation works such as that for infrastructure drainage associated with the SuDS basin, earthworks required for the construction of the SuDS basin and drainage including control of surface water runoff quantity and quality through Fox Glen to Clough Dike and the construction of the rock cascade outfall.

4.8.51 It is concluded within the draft CEMP report that the proposed rock cascade outfall can be delivered in such a manner to ensure that it sequentially addresses potential impacts to Fox Glen and Clough Dike during the construction phase. A copy of the draft CEMP is included at Appendix H of this proof.

4.8.52 Draft conditions require that no development commences until detailed proposals for surface water disposal, including calculations, have been submitted to and approved in writing by the Local Planning Authority. They further require that surface water discharge from the completed development is restricted to a maximum flow rate of QBar based on the area of the development, with a suitable allowance for climate change..

4.8.53 The condition is worded such that the discharge rate and resulting attenuation requirements (including allowances for climate change) are to be calculated based upon the detailed layout proposals, which would allow the LLFA to ensure that the figures appropriately reflect any changes from the illustrative masterplan.

4.8.54 I consider that such a condition to limit surface water flows would ensure that flood risk is not increased elsewhere as a result of the development and therefore accords with the principles of NPPF Paragraph 163, Core Strategy Policy CS67 (a) are met, and Section 5.4 of the SCC SFRA.

4.8.55 This condition would also ensure that the surface water drainage scheme complies with the recommendations contained within the DEFRA 'Non-statuatory technical standards for sustainable drainage systems'.

4.8.56 With regard to peak flow control, limiting the discharge rate from the site to QBar would comply with part S2 of the DEFRA document and would also address volume control at part S6.

4.8.57 The requirement for storage to be provided for the 30 year return period and the 100 year return period storm plus climate change retained on site would ensure compliance with S7 and S8 of the DEFRA document.

4.8.58 Since the production of the original FRA report for the site, climate change guidance has been updated (in February 2019) such that residential developments should now consider a 40% increase in peak rainfall intensity (as noted at Table 2 of the EA guidance document 'Flood risk assessments: climate change allowances' published 19th February 2016 and thereafter updated) compared to 30% at the time of writing of the FRA report.

4.8.59 I have considered the uplift in climate change guidance to 40% and coupled with a more detailed appraisal of the net developable area of the site, and resultant impermeable areas, have demonstrated that the appropriate volume of surface water attenuation can still be accommodated within the proposed illustrative masterplan.

4.8.60 I have appended a Technical Note at Appendix I of this proof which sets out the calculations and design proposals relating to 40% climate change allowance.

4.8.61 Draft Conditions require that no development commences until full details of the proposed surface water drainage design, including a phasing plan calculations and appropriate model results, have been submitted to and approved by the Local Planning Authority. The condition further requires details for surface water infrastructure management for the life time of the development.

4.8.62 Such a condition would ensure that the proposed drainage scheme is delivered with an identified management and maintenance regime which shall be in place for the lifetime of the development which accords with the requirements of NPPF Paragraph 165 and part (c) of Core Strategy Policy CS67.

4.8.63 The draft S106 makes provision at Schedule 2 for SCC to adopt and maintain the off-site sustainable drainage features. This relates to the works to facilitate the discharge of surface water to Clough Dike via the proposed rock cascade outfall. This has been agreed by SCC.

4.8.64 It is considered that the below ground (piped) surface water infrastructure would most likely be offered for adoption by the developer via Section 104 (S104) of the Water Industry Act 1991. Yorkshire Water is the incumbent Sewerage Undertaker in the area, but the infrastructure could be adopted via S104 of the Water Industry Act by an alternative Sewerage Undertaker. Once adopted, the infrastructure would be maintained by the Sewerage Undertaker in perpetuity.

4.8.65 There are a number of options for the SuDS basin. This could be offered for adoption via S104 of the Water Industry Act along with the below ground

infrastructure. In this case the basin would also be maintained by the Sewerage Undertaker in perpetuity.

4.8.66 Alternatively, the basin could be maintained by either a private management company appointed by the Developer, or by the Local Authority. This position is agreed with the LLFA and detailed in paragraphs 2.19 and 2.20 of the 'Flood Risk and Drainage SoCG (CD6.12).

4.8.67 Should a private management company be appointed, funding for maintenance over the lifetime of the development would usually be secured via a management charge to residents. In the event that the Local Authority are appointed to maintain the basin, funding for maintenance over the lifetime of the development would usually be secured either via a commuted sum or again via a management charge to residents.

4.8.68 Draft Conditions also seek to secure a sustainable (SuDS) drainage scheme, which accords with NPPF Paragraph 165, part (b) of Core Strategy Policy CS67 and Section 3.2.3 of the SCC SFRA.

4.8.69 The SuDS basin proposed at the site would be designed in accordance with the recommendations set out in CIRIA C753 'The SuDS Manual', including Section 4 'Designing for water quality' and Section 26 which relates to 'Water quality management: design methods'.

4.8.70 Section 4 (Table 4.3) identifies that for the proposed land use, a 'simple index approach' is appropriate to ensure minimum water quality management is achieved.

4.8.71 Section 26 indicates the pollution hazard indices for different land use classifications (Table 26.2) and identifies that for a residential development site, the anticipated levels of Total Suspended Solids, Metals and Hydrocarbons can be mitigated by a SuDS Detention Basin (Table 26.3) as proposed at this site. Tables 4.3, 26.2 and 26.3 are included at Appendix J of this proof.

4.8.72 As noted at section 22.5 of CIRIA 'The SuDS Manual (C753)', 'vegetated detention basins can help to retain runoff from small events on site, helping to reduce the contaminant load' and 'some filtration will occur through the vegetation on the basin base and underlying soils together with biodegradation and photolytic breakdown of hydrocarbons during the drying processes between runoff events'.

4.8.73 Small (frequent) events are recognised as delivering a peak flush of sediment from urban surfaces and also pollutants which are predominantly attached to the sediments. Retaining these small events on site therefore within a vegetated basin will help to prevent sediment and contaminants from entering the downstream watercourse by exposing the sediment to UV light, enabling evapotranspiration and treatment by vegetation.

4.8.74 As further noted at Box 26.1 of 'The SuDS Manual (C753)', 'sediment removal tends to improve as residence time increases' and 'this can be increased in.....basins by increasing flow path lengths'.

4.8.75 The proposed SuDS basin for the development would deliver inflow to the eastern end of the basin, with the outfall being located at the western end, thus maximising the flow path length through the basin which will lead to increased removal of sediment (Total Suspended Solids).

4.8.76 A range of additional SuDS features, which are captured in the SPD, will be considered at detailed design stage for the site including:

- Permeable paving;
- Rain gardens;
- Bio-retention areas;
- Swales;
- Filter Drains;
- Channels and rills; and
- Filter strips.

4.8.77 The ability to include additional SuDS features in the final site design will be dependent upon a number of factors and constraints such as available space, topography and adoption criteria.

4.8.78 The Lead Local Flood Authority has confirmed that the proposed SuDS scheme is acceptable and will manage surface water runoff to an acceptable rate so as not to increase flood risk elsewhere. This position is agreed with the LLFA as noted at paragraph 2.31 of the 'Flood Risk & Drainage SoCG (CD6.12).

4.8.79 Yorkshire Water has confirmed that the Flood Risk Assessment and Drainage Strategy submitted in support of the Outline Application is acceptable.

4.8.80 The case officer confirmed at page 81 of the Committee Report (CD1.7) that the proposals comply with Core Strategy CS67 and NPPF Section 14 (paragraphs 155 and 165).

4.8.81 It is my opinion that the surface water drainage strategy for the site addresses water quantity such that the development would not lead to an increase of flood risk elsewhere, over the lifetime of the development and considering climate change.

4.8.82 Furthermore, it promotes a sustainable approach to drainage and water quality which will ensure that the scheme adequately removes contaminants prior to discharge, and has made provision for appropriate management over the lifetime of the development.

4.9 Third Party Representations

The site is regularly waterlogged and at risk of flooding

4.9.1 As identified in Section 4.7, a site specific Flood Risk Assessment report has been produced which considers the relevant flood mechanisms which could put the site at risk of flooding and where issues have been identified, appropriate mitigation measures have been proposed which can be readily achieved within the proposed development to ensure that the site will not be at risk of flooding.

4.9.2 As noted at Section 4.4, ground conditions were observed during the March 2021 walkover survey to be relatively impermeable and therefore rainwater would be likely to collect in localised undulations which would give the appearance of being waterlogged.

4.9.3 Post development, the site would have a positive drainage system which would take runoff away from the surface and therefore significantly reduce the risk of water collecting on the ground.

Clough Dike, Fox Glen and Manchester Road are already at risk of flooding and the development proposals would exacerbate this

4.9.4 As noted at Section 4.8.2, an assessment of the existing greenfield runoff rate from the site has been undertaken. To achieve the restricted flow rate from the developed site, a flow control device would be provided at the outfall from the proposed surface water drainage network. This would ensure that the rate of runoff from the site post development does not exceed that which is currently generated by the greenfield site and as such would not lead to an increase in flood risk elsewhere. This position is agreed with the LLFA and detailed at paragraph 2.31 of the 'Flood Risk & Drainage SoCG' (CD6.12).

4.9.5 Within the same surface water network, a SuDS detention basin is proposed which would attenuate the additional flows generated by the proposed development site and temporarily store this additional volume on site (taking account of climate change over the lifetime of the development) such that it can be released in a controlled manner into Clough Dike at a rate not exceeding that of the current greenfield site.

4.9.6 As noted at section 6.5 of the Sheffield Development Framework 'Climate Change and Design – Supplementary Planning Document and Practice Guidance' (SPD) (CD3.9), SuDS provide 'robust facilities for water volume management through

storage in on or near-surface features for everyday rainfall events and large storm events' and 'can contribute to catchment level flood risk management through flow control'.

4.9.7 A 'Section 19 Statutory Report' into the flooding events in Sheffield on 7th and 8th November 2019 was produced by Sheffield City Council on 9th January 2020. The report notes at section 2.2 that the storm is estimated to have been a 1:100 to 1:150 annual exceedance probability event (i.e. a higher category storm event).

4.9.8 It outlines at section 6.0 that the causes of flooding were a combination of upland areas being saturated due to very wet conditions in early autumn, local drainage systems being overwhelmed by the intensity of the rainfall and in some cases blocked by debris.

4.9.9 It noted at 7.6 that Amey (the Council's first response contractor) had to carry out clearance works to the Clough Dike culvert to release flood water within parkland adjacent to Wood Royd Road. Table 1 identifies that 9 residential properties were flooded as a result of the November 2019 event.

4.9.10 A telephone conversation with Mr James Wilson from Sheffield City Council on 10th May 2021 confirmed that the November 2019 flooding of dwellings on Wood Royd Road was a result of the Clough Dike culvert beneath Wood Royd Road collapsing. This significantly impeded the flow of water leading to it building up in the parkland behind the play area off Wood Royd Road.

4.9.11 This water eventually overtopped and due to the topography ultimately led to the flooding of residential dwellings as noted in the SCC 'Section 19 Statutory Report'.

4.9.12 Mr Wilson confirmed that the works required to reinstate the Clough Dike culvert are now in the current Environment Agency 'Medium Term Plan' and that both SCC and the EA are keen to resolve this issue.

4.9.13 Until the permanent works can commence, SCC and the EA are providing measures to help alleviate flood risk by pumping water from the parkland at the head of the Clough Dike culvert. A number of pumps are available to deal with varying storm events.

4.9.14 It was confirmed by Mr Wilson that once reinstated, the Clough Dike culvert would be adequate to deal with the flows passing along this watercourse.

4.9.15 It was also confirmed that if the appeal site is delivered in a sustainable measure, whereby runoff rates are restricted to equivalent greenfield rates (as is proposed), this would not lead to any increase in flood risk either during the interim pumped situation or once the Clough Dike culvert is reinstated.

4.9.16 A summary of the telephone conversation was confirmed via e-mail with Mr Wilson on 13th May 2021, a copy of which is provided at Appendix K of this proof.

4.9.17 It should be noted that the rate of surface water runoff leaving the site post development would not increase, and during higher category storm events would in fact be lower than the existing greenfield runoff rate. This reduction in the rate of runoff from the site post development would assist in reducing flood risk within Fox Glen and Clough Dike, and at Manchester Road during higher category storm events by allowing runoff from elsewhere within the catchment to disperse from this area whilst runoff from the site is discharged over a longer period of time at a low controlled rate.

<u>The development would pose a pollution risk to Clough Dike and Fox Glen & The impact of the proposed drainage outfall into Clough Dike on the local wildlife in Fox Glen</u>

4.9.18 A SuDS detention basin is proposed within the surface water drainage network which would be designed to nationally recognised standards such as CIRIA C753 'The SuDS Manual' and would provide sufficient water quality treatment to mitigate the potential pollutants associated with a residential development. This is agreed with the LLFA as per paragraph 2.31 of the 'Flood Risk & Drainage SoCG (CD6.12).

4.9.19 As noted above at Section 4.8.71, the proposed SuDS basin would mitigate the anticipated levels of Total Suspended Solids, Metals and Hydrocarbons contained within runoff from the proposed residential site.

4.9.20 Furthermore, a Water Framework Directive Assessment (CD1.17c Appendix 4) has been provided by the applicant and endorsed by the Council, which concludes that the proposals are compliant with the WFD and the Fox Glen Survey report concluded that potential impacts to the Local Wildlife Site could be mitigated.

4.9.21 As noted at section 6.6 of the SPD, 'SuDS features are able to remove sediments and breakdown pollutants that have originated from urban surfaces, promoting improved water quality within developments and contributing to wider river quality'.

<u>The rate of surface water runoff post development into Clough Dike and the risk that it will destabilise land at Glen Works</u>

4.9.22 As described earlier in this proof, the outfall from the site is proposed to discharge via a rock cascade, the route and form of which has been discussed with the LLFA and agreed in principle.

4.9.23 This rock cascade outfall would help to still the flow to ensure that it does not cause destabilisation downstream.

4.9.24 Furthermore, the rate of runoff leaving the site post development would not increase, and during higher category storm events would be lower than the

existing greenfield runoff rate, therefore the risk to land at Glen Works post development due to the rate of surface water runoff would be reduced.

The existing flooding issues associated with Hollin Busk Lane, Carr Road, Cockshot Lane and Wood Royd Road & Hollin Busk would cease its current benefit as a natural soakaway for runoff from the surrounding fields

4.9.25 Both of these points relate to overland runoff from the surrounding area, how it is currently accommodated and the potential impact that development of the site would have on this regime.

4.9.26 It is worth noting that the FRA (CD1.19) acknowledges at Section 6.13 that whilst at predominantly a 'very low risk of surface water flooding' (from surface water runoff), 'surface water flow paths are present through the site which emanate from third party land to the south of Hollins Busk Lane and Cockshot Lane'.

4.9.27 The current Flood Risk from Surface Water map confirms that the site is generally at 'very low risk' of flooding from surface water. There is only a small section of the site shown to be at 'low' risk along the eastern boundary, where rainwater would collect on the surface.

4.9.28 Post development, the site would have a positive drainage system which would take runoff away from the surface and therefore significantly reduce the risk of water collecting on the ground.

4.9.29 The proposed development would not result in additional surface water runoff on the existing public highway and therefore the issue raised relating to existing flooding on public highway is not relevant to the application.

4.9.30 Furthermore, given the topography of the local area, flooding on the existing public highway at the site access would flow away from the site and would therefore not impede residents at the proposed development from using the public highway.

4.9.31 Notwithstanding this however, the FRA proposes that a route will be provided for overland runoff entering the site from third party land in the form of boundary cut-off drains.

4.9.32 These cut-off drains would be sized to accommodate runoff from the relevant catchment area and direct the runoff to the existing watercourse on the northern boundary (the natural outfall for this runoff).

4.9.33 This mitigation measure would be designed to suit the final site layout and would ensure that overland runoff entering the site from the surrounding area is re-routed in an appropriate manner.

4.9.34 With regard to the benefits of the site as a natural soakaway, as noted in Section 4.4 above the overlying material observed on site during the March 2021 site walkover survey was considered to be relatively impermeable, with rainwater likely to collect on the site surface, rather than 'soaking away' and run-off overland toward Fox Glen and Clough Dike.

4.9.35 This would also be the case for any runoff entering the site from the surrounding area, which would also flow overland to Fox Glen and Clough Dike.

Underground mine workings have not been fully explored

4.9.36 A Stage 1 Geo-Environmental Desk Study Report was prepared by ARP Geotechnical Engineers Ltd in June 2016 (CD1.26).

4.9.37 The Coal Authority as a statutory consultee through planning reviewed this report and confirmed to the Local Planning Authority via a letter dated 29 September 2017 (CD2.4) that 'The Coal Authority concurs with the recommendations of the Stage 1 Geo-Environmental Report; that intrusive site investigation works should be undertaken prior to development in order to establish the exact situation regarding coal mining legacy issues on the site.

4.9.38 The Coal Authority confirmed in this letter that it had no objection to the proposed development subject to the imposition of a suitably worded planning condition.

4.9.39 It is not uncommon for residential development to take place on sites where former mine workings are present. The Standard approach is to undertake intrusive site investigation works to investigate and determine the need for any remedial works.

4.9.40 A remediation strategy would then be prepared which may recommend remedial measures such as drilling and grouting which would ensure the site is stable for ongoing development.

4.9.41 It is usual for this work to be undertaken post Outline Approval. This is agreed with the LLFA as outlined at paragraphs 2.22 to 2.25 of the 'Flood Risk & Drainage SoCG (CD6.12).

4.9.42 Draft Planning Conditions require no development to commence unless the intrusive site investigation works described in the Coal Mining Risk Assessment (Title Stage 1 Geo-Environmental Desk Study Report (Report No. HLT/09r1)) dated June 2016 prepared by ARP Geotechnical Engineers Ltd have been carried out as recommended and a report of the findings arising from the intrusive site investigations is submitted to and approved in writing by the Local Planning Authority. Where the investigations indicate that remedial works are required, a scheme of remedial works is to be submitted to and approved by the Local

Planning Authority before the development commences and thereafter the remedial works are to be carried out in accordance with the approved details.

4.9.43 I consider that the proposed condition clearly sets out a mechanism to ensure that the former mine workings are investigated prior to any development commencing and also provides a mechanism to ensure that any identified remedial works are approved and undertaken prior to any development commencing. The proposed condition is also in line with the recommendations from the Coal Authority.

4.9.44 As noted at page 52 of the Committee Report (CD1.7) and at Section 4.9.22 of this proof, the Coal Authority has no objections to the proposed development and concurred that any Outline Approval should be conditioned such that intrusive site investigation and any resultant remedial works deemed necessary should be undertaken prior to development.

4.9.45 As the proposed development would be positively drained to a new surface water drainage network, with the outfall being to Clough Dyke, it is my opinion that any remedial works required would not impact upon the proposed drainage of the site.

Future maintenance of SuDS elements

4.9.46 As noted at 4.8.63 – 4.8.66 above, there are a number of options relating to future maintenance of the SuDS elements. The surface water drainage pipe network would be offered for adoption to Yorkshire Water (or another Sewerage Undertaker), who would then be responsible for the maintenance of the system in perpetuity.

4.9.47 With regard to the detention basin, this is intended to be adopted by Sheffield City Council. It should be noted that Sheffield City Council has already confirmed that it would be willing to adopt the SuDS components, as noted at 4.8.13 above and as agreed with the LLFA (see paragraph 2.19 of the 'Flood Risk & Drainage SoCG' (CD6.12)). There would however be other options for maintenance of the SuDS basin such as a private management company or through adoption by a Sewerage Undertaker.

4.9.48 Following completion of the development, Sheffield City Council would be responsible for the maintenance of the SuDS components. The provides a clear mechanism for the future maintenance of the entire surface water drainage system associated with the proposed development.

4.9.49 As noted at 4.8.61, Planning Conditions proposed within the committee report would ensure that no development could commence until a satisfactory maintenance regime has been approved by the Local Planning Authority.

4.10 Conclusion

4.10.1 Based upon the above, I believe that the implementation of the measures noted would appropriately mitigate flood risk from all sources.

4.10.2 It is my opinion that the proposed development would not be at risk of flooding, nor would it increase the flood risk to the local area for the lifetime of the development and accords with both national and local planning policy.

5 Foul Water Drainage

5.1.1 The April 2017 site specific Flood Risk Assessment report (CD1.19) produced by ARP Associates (reference: 1265/10r1) includes a section on 'Foul Water Drainage' at 6.33.

5.1.2 Sewer records provided by Yorkshire Water indicate that public foul sewers are located within Carr Road. A copy of the records can be found in Appendix E of the FRA.

5.1.3 The FRA report states that 'Yorkshire Water have confirmed foul water domestic waste should discharge to the 225mm diameter public foul sewer recorded on Carr Road, at a point to the north east of the site'.

5.1.4 The original 'Pre-Planning Sewerage Enquiry' response received from YW dated 13th May 2016 is included at Appendix C of the FRA report, and confirms the above statement.

5.1.5 The YW letter also indicated that the local Waste Water Treatment Works 'may only have limited spare capacity, if any, available'. It went on to note that they had 'contacted the respective treatment team for more information regarding the impact of the proposed development'.

5.1.6 A further e-mail exchange was undertaken with YW on 31st August 2016 to clarify the feedback from the treatment team. The response from YW confirmed that 'the anticipated domestic foul flows can be accommodated at the Stocksbridge WWTW'.

5.1.7 As a statutory consultee, Yorkshire Water responded to the Sheffield City Council Planning Service on 9th January 2018 (CD2.5) and confirmed that the 'Flood Risk Assessment and Drainage Strategy (prepared by ARP Associates – Report 1265/10r1) is acceptable'.

5.1.8 Based upon the existing site levels and as noted at Section 6.33 of the FRA report, a gravity connection into the foul sewer in Carr Lane to the north east of the site is proposed to drain foul flows.

5.1.9 It is proposed that the onsite foul drainage network would be offered for adoption with Yorkshire Water via a Section 104 Agreement.

5.1.10 An updated Pre-Planning Sewerage Enquiry response dated 27th December 2020 has been received from Yorkshire Water (included at Appendix L of this proof) which re-confirms that a foul connection for the development could be accommodated in the sewer.

5.1.11 The Yorkshire Water Pre-Planning service uses details relating to development proposals to determine if the public sewer network is capable of accepting the domestic flows.

5.2 Third Party Representation

Concerns relating to the lack of capacity within the Yorkshire Water network

5.2.1 As has been confirmed at Sections 5.1.3 to 5.1.10, Yorkshire Water has assessed the development proposals and provided confirmation that a connection can be made to the public foul sewer on the basis that the public sewer network is capable of accepting the anticipated domestic foul flows.

Issues with sewer flooding on and around Carr Road

5.2.2 The sewer records provided by Yorkshire Water (included at Appendix M of this proof) indicate that whilst the public sewers within Carr Road are classed as foul sewers, the private networks feeding into the public foul sewer contain a significant amount of combined pipework (draining both foul and surface water flows from dwellings).

5.2.3 During higher category storm events, the surface water element feeding into the foul sewer will become the dominant factor and could lead to the system surcharging.

5.2.4 If there are blockages present within the Yorkshire Water foul sewer network coincident with such a storm event (as is alluded to in some of the third-party representations), this can lead to flooding from manhole covers or covers 'lifting'.

5.2.5 During these situations, the domestic foul flows become a small proportion of the overall flow in the network and it is the surface water element which would lead to the flood event.

5.2.6 It is not proposed to drain any surface water from the site to the public foul sewer network.

5.2.7 It should also be noted that Yorkshire Water is the Statutory Undertaker responsible for maintaining the public foul sewers in Carr Road and that will remain the case should this development go ahead.

5.3 Conclusion

5.3.1 It is my opinion that appropriate consultation has been undertaken with Yorkshire Water to outline the development proposals and establish that there is sufficient capacity within the public sewer network to accept domestic foul flows from the proposed dwellings.

5.3.2 An appropriate outfall in Carr Road has been identified, to which a piped connection for foul water discharge from the site can be made.

5.3.3 I consider therefore that it has been demonstrated and agreed with the relevant consultee that an appropriate solution is available for foul water drainage.

6 Summary and Conclusions

6.1.1 An outline Planning application reference 17/04673/OUT was submitted on behalf of the appellant to the Local Planning Authority (LPA) Sheffield City Council (SCC) on 14th November 2017.

6.1.2 A site-specific Flood Risk Assessment (FRA) report produced by ARP Associates (reference: 1265/10r1) accompanied the planning application. The report covers flood risk both to and from the site, the surface water strategy for the site including SuDS provision and the foul water strategy for the site.

6.1.3 The planning application (reference 17/04673/OUT) was refused for reasons related to impacts on landscape and heritage. Matters relating to flood risk and/or drainage are not reasons for refusal.

6.1.4 No objections to the development proposals were raised by the Lead Local Flood Authority (SCC Flood and Water Management Service) or Yorkshire Water Services Ltd (incumbent Water Company).

6.1.5 In producing this proof of evidence, I have reviewed the above FRA document alongside national and local policy and relevant technical guidance and have revisited published mapping data relating to flood risk.

6.1.6 I consider that the relevant flood mechanisms which could put the site at risk of flooding have been considered, and where issues have been identified, appropriate mitigation measures have been proposed which can be readily achieved within the proposed development.

6.1.7 I have considered changes in guidance relating to climate change since the original planning application was submitted and have demonstrated that the surface water drainage strategy proposed for the development can accommodate these changes for both the December 2019 Illustrative Masterplan and the April 2021 Revised Illustrative Masterplan.

6.1.8 It is my opinion therefore that the surface water drainage strategy for the site addresses water quantity such that the development would not lead to an increase of flood risk elsewhere, over the lifetime of the development and considering climate change.

6.1.9 Furthermore, it promotes a sustainable approach to drainage and water quality which will ensure that the scheme adequately removes contaminants prior to discharge, and has made provision for appropriate management over the lifetime of the development.

6.1.10 With regard to foul water discharge, I consider that appropriate consultation has been undertaken with Yorkshire Water to outline the development proposals and

established that there is sufficient capacity within the public sewer network to accept domestic foul flows from the proposed dwellings.

6.1.11 I have also reviewed consultation responses to the planning application provided by the relevant statutory consultees, the case officer's committee report, the Statement of Case, the Statement of Common Ground and representations from third parties relating to flood risk and drainage.

6.1.12 I note that no statutory consultees objected to the proposals on grounds of flood risk or drainage (subject to appropriate planning conditions being imposed) and that the case officer, as set out in the committee report, agrees that the proposal fully accords with national and local policy in respect of flood risk and drainage.

6.1.13 With regard to third party representations, I consider that measures are already proposed to address the concerns raised in an appropriate manner.

6.1.14 It is my opinion that the application accords with the NPPF and the relevant statutory and regulatory requirements relating to flood risk and drainage and there is no reason why the application should not be approved as a result of flood risk or drainage matters.

CD6.22

Carr Road, Deepcar

Appeal Reference: APP/J4423/W/21/3267168

FLOOD RISK & DRAINAGE

EVIDENCE APPENDICES

Produced on behalf of

Hallam Land Management

May 2021

P19-535

19535-RLL-21-XX-RP-C-002

Appendix A – CV Kriston Harvey

Kriston Harvey

Director

Kriston oversees a dedicated team of Engineers and CAD Technicians undertaking the infrastructure design and detailing on residential, industrial and commercial projects.

He has extensive experience in dealing with projects ranging from small residential developments in sensitive rural locations through to large SUEs, education facilities, nuclear licensed facilities, large industrial and commercial developments, and healthcare facilities.

Kriston is also heavily involved with feasibility and planning stage projects, providing engineering advice to Developers and assisting with land bids and planning applications.

Qualifications

BEng (Hons) Civil Civil Engineering

FCIHT Fellow of the Chartered Institution of Highways and Transportation

Key Skills

- Undertaking due diligence and planning application stage work including flood risk assessments and drainage strategies including SuDS.
- Specific Civil and structural design experience of working on existing and new build nuclear licensed facilities
- Leading design teams of Engineers & Technicians on projects to a successful conclusion, from conceptual highway and drainage design strategies, planning approval, detailed design to technical approval and completion
- Use of engineering computer aided design software for drainage network analysis and simulation modelling, highway modelling/design, and AutoCAD drafting
- Design of large infrastructure residential / commercial projects with complex technical content
- Design of large storm and foul water drainage schemes, pumping stations, flow control structures, balancing facilities for major residential and commercial developments
- Ability to integrate design with other Design Team disciplines.

Key Project Experience

New Lubbesthorpe, Leicestershire

Appointed to undertake the infrastructure design for a large scale development in Leicestershire, covering approximately 394 hectares, to comprise around 4,250 new residential dwellings plus associated schools and local centres.

Involvement began at feasibility stage, providing drainage strategy input into masterplanning and the over-arching design code for the development. This progressed through to the design of extensive highway and drainage infrastructure including pumping stations, rising mains and significant SuDS infrastructure.

Wragley Fields, Sinfin

Residential development of a 5.9ha greenfield site for 130 dwellings.

Flood Risk Assessment and Drainage Strategy produced to support the Reserved Matters planning application, building on the FRA report submitted with the Outline application.

Involved detailed liaison with the Lead Local Flood Authority to agree minimum finished floor levels for the site and to agree appropriate rates for surface water discharge and resultant attenuation volumes.

The drainage strategy included SuDS detention basins with permanent wetland areas and conveyance swales.

The Landmark, Derby

Proposed 17 storey residential development adjacent to the River Derwent.

Located in close proximity to the River Derwent, the Flood Risk Assessment took account of both the existing flood risk posed to the site and also post completion of the 'Our City Our River' (OCOR) flood defence scheme, to ensure the site could be delivered irrespective of the delivery programme for the OCOR scheme.

Assessment work included consideration of safe access and egress for the pre OCOR scenario and provision of an appropriate SuDS scheme working within the constraints of the site.

Becketwell, Derby

Major city centre regeneration scheme to create a new Urban Quarter in the heart of the city, the development features multi-storey apartment and commercial buildings, a hotel, multi-storey car park and retail spaces. A feature public square will be the focal point of the area.

The Flood Risk Assessment accounts for the complex flooding mechanisms resulting from the River Derwent and three nearby culverted brooks. Consideration was given to ensuring safe access and egress for residents for a breach scenario of the existing flood defences in the city.

The drainage strategy work delivered an appropriate SuDS scheme for this constrained city centre development.

Appendix B – Site-Specific FRA: Checklist

Project:	P19-535 Carr Road, Deepcar		
Subject:	Site-specific flood risk assessment: Checklist		
Prepared by:	Kriston Harvey – Director	**Date:**	05 May 2021
Authorised by:	Lawrence Pacey – Director	**Status:**	S2 - Information
Document Ref:	19535-RLL-21-XX-TN-S-004	**Revision:**	P01

1 Introduction

1.1 An outline Planning application reference 17/04673/OUT was submitted to the Local Planning Authority (LPA) Sheffield City Council (SCC) on 14th November 2017.

1.2 A site-specific Flood Risk Assessment (FRA) report produced by ARP Associates (reference: 1265/10r1) dated April 2017 was submitted in support of the Planning application (CD1.19).

1.3 The report covers flood risk both to and from the site, the surface water strategy for the site including SuDS provision and the foul water strategy for the site.

1.4 Planning Practice Guidance 'Flood Risk and Coastal Change' published in March 2014 and thereafter updated, includes a checklist at paragraph 68 for site-specific flood risk assessments.

1.5 The purpose of this technical note is to demonstrate that the ARP FRA report achieves the requirements set out within the PPG checklist, and that these requirements can still be accommodated within the illustrative masterplan.

2 Development Site and Location

2.1 Part 1 of the checklist notes that this section of the FRA should be used to describe the site proposed for development including:

- Where the site is located;
- The current use of the site;
- Which Flood Zone the site falls in.

2.2 At section 2.1 of the ARP FRA report (CD1.19), the location and a general description of the site is provided, and the current use is described at section 2.3.

2.3 The Flood Zone for the site (being Flood Zone 1 'low probability') is detailed at section 6.1 of the FRA report (CD1.19).

3 Development Proposals

3.1 Part 2 of the checklist notes that this section of the FRA should be used to provide a general summary of the development proposals including:

- What the development proposals entail;
- The vulnerability classification of the proposed development;
- The estimated lifetime of the development (to feed into the consideration of climate change allowance).

3.2 Section 6.2 of the ARP FRA (CD1.19) confirms that the proposed end use for the site is for the construction of residential dwellings and provides an illustrative masterplan at Appendix D of the report.

3.3 The flood risk vulnerability classification is confirmed at section 6.3 as being 'more vulnerable' based upon the proposed residential end use.

3.4 Whilst the FRA (CD1.19) does not specifically identify an estimated lifetime for the development, it does confirm at section 6.24 that a 30% allowance for climate change should be applied to rainfall intensities which at the time of writing of the report was appropriate for a residential end use site in accordance with Environment Agency guidance document 'Flood risk assessments: climate change allowances' (published February 2016 and thereafter updated).

3.5 Since the production of the ARP FRA (CD1.19), there have been amendments to the illustrative masterplan proposals.

3.6 A December 2019 Illustrative Masterplan (CD1.3) was submitted with the planning appeal and following further assessment work relating to Listed Buildings a Revised Illustrative Masterplan dated April 2021 (CD1.3a) was submitted.

3.7 A separate technical note 'Drainage Strategy Update for Climate Change' (reference 19535-RLL-21-XX-TN-S-003) has been produced which confirms that for both the December 2019 Illustrative Masterplan (CD1.3) and the April 2021 Revised Illustrative Masterplan (CD1.3a), the required volumes of attenuation can be accommodated within the site to account for the 1 in 100 year plus 40% climate change event, in line with current Environment Agency guidance.

4 Sequential Test

4.1 Part 3 of the checklist details requirements for the Sequential Test to be applied to proposed development sites.

4.2 It notes however that this is only relevant to proposed developments within Flood Zones 2 or 3, and where the development is proposed wholly within Flood Zone 1 this section can be omitted.

4.3 As noted within section 6.1 of the ARP FRA report (CD1.19), the site lies wholly within Flood Zone 1 and therefore the FRA does not consider the Sequential Test.

5 Climate Change

5.1 The checklist notes at Part 4 that the site-specific FRA should consider how flood risk at the site is likely to be affected by climate change.

5.2 The ARP FRA (CD1.19) contains a section on climate change and notes at section 6.24 that in accordance with guidance, an allowance of 30% should be applied to rainfall intensities which at the time of writing of the report was appropriate for a residential end use site in accordance with Environment Agency guidance document 'Flood risk assessments: climate change allowances' (published February 2016 and thereafter updated).

5.3 Since the production of the ARP FRA (CD1.19), climate change guidance has been updated, to require an allowance of 40% to be applied to rainfall intensities.

5.4 A separate technical note 'Drainage Strategy Update for Climate Change' (reference 19535-RLL-21-XX-TN-S-003) has been produced which confirms that for both the December 2019 Illustrative Masterplan (CD1.3) and the April 2021 Revised Illustrative Masterplan (CD1.3a), the required volumes of attenuation can be accommodated within the site to account for the 1 in 100 year plus 40% climate change event, in line with current Environment Agency guidance.

6 Site specific flood risk

6.1 Part 5 of the checklist indicates that the FRA should describe the risk of flooding both to and from the proposed development, with appropriate allowances for climate change, including.

- What the main sources of flood risk are;
- The probability of the site flooding;
- Other sources of flood risk;
- The expected depth and level of the design flood;
- Whether properties are expected to flood internally;
- How the development will be made safe from flooding and the impacts of climate change;
- Whether the development offers opportunities to reduce the causes and impacts of flooding.

6.2 Section 6.0 of the ARP FRA (CD1.19) addresses the various sources of flood risk to the site, considering flooding from rivers, local watercourses, the sea, land, groundwater, sewer, reservoirs, canals and artificial sources.

6.3 Flood risk from the site (surface water drainage) is addressed within the FRA (CD1.19) at 6.27 to 6.32.

6.4 The probability of the site flooding is detailed at section 6.1 of the FRA (CD1.19) and is assessed as having less than a 1 in 1,000 annual probability of river or sea flooding in any year.

6.5 As the site is not at risk of fluvial flooding with a 1% annual probability (a 1 in 100 chance each year), the design flood event is not relevant to the site.

6.6 Flood mitigation measures are proposed at section 6.25 of the FRA (CD1.19) and to reduce the risk of properties flooding internally and to ensure that the development will be made safe.

6.7 The FRA does not specifically identify opportunities to reduce the causes and impacts of flooding

7 Surface Water Management

7.1 Part 6 of the checklist outlines information which should be provided relating to surface water management at the site, using sustainable drainage systems (SuDS) where appropriate, to ensure there is no increase in flood risk to others off-site.

7.2 The checklist suggests the following items are considered:

- Details of the existing surface water drainage arrangements for the site;
- If known, the approximate rates and volumes of surface water runoff generated by the site;
- Proposals for managing and discharging surface water from the site, including measures for restricting discharge rates and (for developments of 10 or more dwellings or major commercial developments) details of proposed SuDS;
- How the scheme will prevent runoff causing an impact post development;
- Plans for the ongoing operation and / or maintenance of the surface water drainage system.

7.3 The existing surface water arrangements, including an assessment of the greenfield runoff rate, are detailed at section 6.28 of the ARP FRA report (CD1.19).

7.4 The proposals for managing and discharging surface water are detailed at sections 6.29 to 6.32 of the FRA report (CD1.19) and whilst there are no specific details of the proposed SuDS arrangements (although section 6.26 acknowledges a need for sustainable drainage techniques for the development), it is noted at section 5.1 of the FRA that Sheffield City Council (SCC) had not engaged in dialogue at the time of writing of the report.

7.5 Subsequent to the submission of the planning application, and upon receipt of Statutory Consultee comments from SCC as Lead Local Flood Authority (LLFA) and further dialogue, SuDS proposals were developed and agreed with the LLFA.

7.6 At section 7.4 of the FRA (CD1.19) it is noted that the rate of discharge from the site shall be restricted to no greater than the existing greenfield rate, which would prevent this causing an impact post development.

7.7 No specific details relating to the ongoing operation or maintenance of the drainage system are included in the FRA, but again at the time of writing the LLFA had not engaged in dialogue.

7.8 Along with the SuDS details being developed post submission, there was also dialogue with the LLFA relating to future maintenance and an agreed position was reached.

8 Occupants and users of the development

8.1 At Part 7 of the checklist it is suggested that the FRA should consider the number of future occupants at the site and proposed measures for protecting more vulnerable people from flooding.

8.2 Within Appendix D of the ARP FRA (CD1.19), the illustrative masterplan identifies the site is likely to accommodate between 80 and 93 dwellings.

8.3 The FRA concludes that the site is not at risk of flooding and therefore does not include specific details relating to more vulnerable people.

9 Exception Test

9.1 Part 8 of the checklist details the requirements for applying the Exception Test to development proposals and notes that this is required to support certain developments in Flood Zones 2 or 3.

9.2 As the site has been identified to lie wholly within Flood Zone 1, as noted at section 6.1 of the ARP FRA (CD1.19), the Exception Test is not applicable and is not discussed within the FRA report.

10 Residual Risk

10.1 At Part 9 of the checklist, suggestions are made for considering residual risks which might remain after flood risk management and mitigation measures are implemented.

10.2 Sections 6.25 and 7.0 of the ARP FRA (CD1.19) provide recommendations for incorporating measures into the development to deal with potential residual risks.

10.3 These measures include:

- Finished floor levels of properties being raised above external levels by a minimum of 150mm;
- Incorporating overland flow paths into the development masterplan;
- Providing exceedance routing with falls to non-critical areas (i.e. away from residential dwellings).

11 Flood risk assessment credentials

11.1 Part 10 of the checklist suggests details which should be provided within the FRA relating to the author and the date the assessment was undertaken.

11.2 A revision table is included inside the front cover of the ARP FRA report (CD1.19).

11.3 This table includes details of the author of the report, who it was checked and reviewed by and also the date it was issued.

11.4 At section 1.4 of the FRA (CD1.19), details are provided relating to when consultations and walkover surveys were carried out.

12 Conclusions

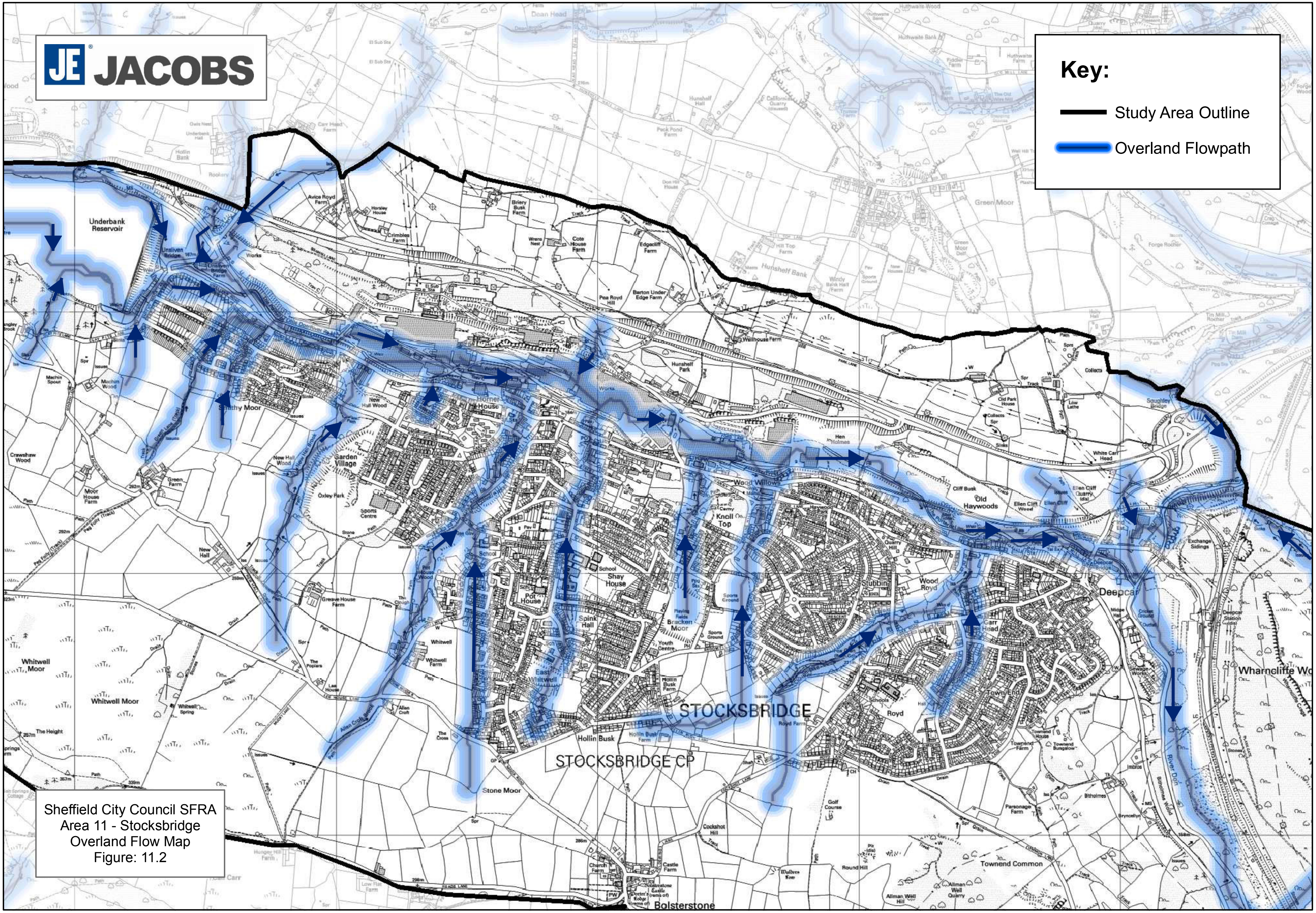
12.1 An outline Planning application reference 17/04673/OUT was submitted to the Local Planning Authority (LPA) Sheffield City Council (SCC) on 14th November 2017.

12.2 A site-specific Flood Risk Assessment (FRA) report (CD1.19) produced by ARP Associates (reference: 1265/10r1) dated April 2017 was submitted in support of the Planning application.

12.3 This technical note confirms that the FRA report addresses the Planning Practice Guidance 'Flood Risk and Coastal Change' checklist at paragraph 68 for site-specific flood risk assessments.

12.4 It also confirms that both the December 2019 Illustrative Masterplan (CD1.3) and April 2021 Revised Illustrative Masterplan (CD1.3a) submitted with the appeal can accommodate the required volumes of attenuation within the site to account for the 1 in 100 year plus 40% climate change event, in line with current Environment Agency guidance.

Appendix C – Overland Flow Map


JACOBS
Key:
Study Area Outline
Overland Flowpath
Sheffield City Council SFRA
Area 11 - Stocksbridge
Overland Flow Map
Figure: 11.2
STOCKSBRIDGE
STOCKSBRIDGE CP
Deepcar
Bolsterstone
Underbank Reservoir
Wharncliffe Wo
River Don
Stone Moor
Whitwell Moor
Garden Village
Royd
Hollin Busk

Appendix D – Flood Map for Planning

Flood map for planning

Your reference	Location (easting/northing)	Created
Deepcar	**427735/397464**	**7 Jan 2021 15:51**

Your selected location is in flood zone 1, an area with a low probability of flooding.

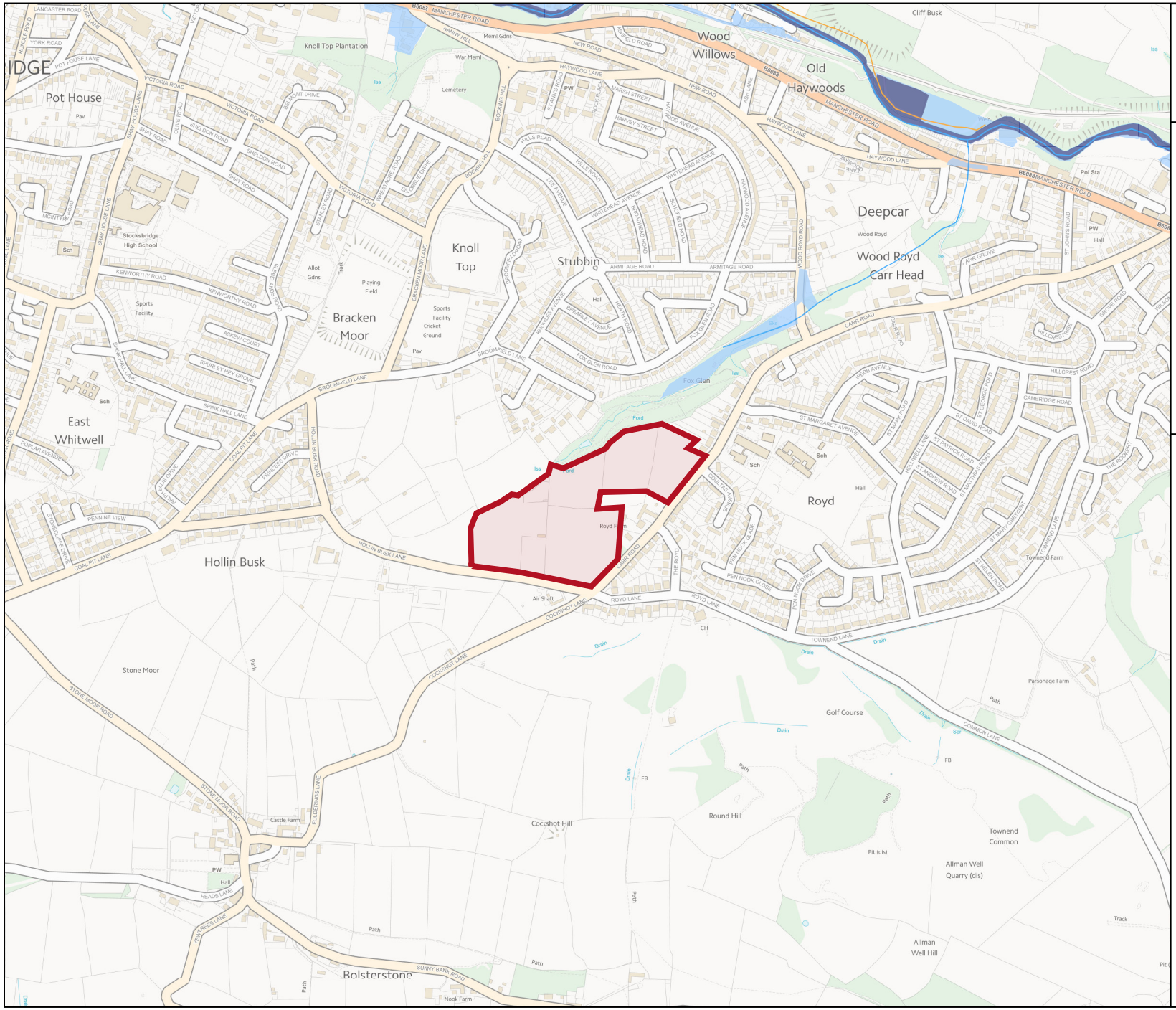
This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
Deepcar

Location (easting/northing)
427735/397464

Scale
1:10000

Created
7 Jan 2021 15:51

- Selected area
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 100 200 300m

Appendix E – Flood Risk from Surface Water Map

Flood risk

Extent of flooding

Location

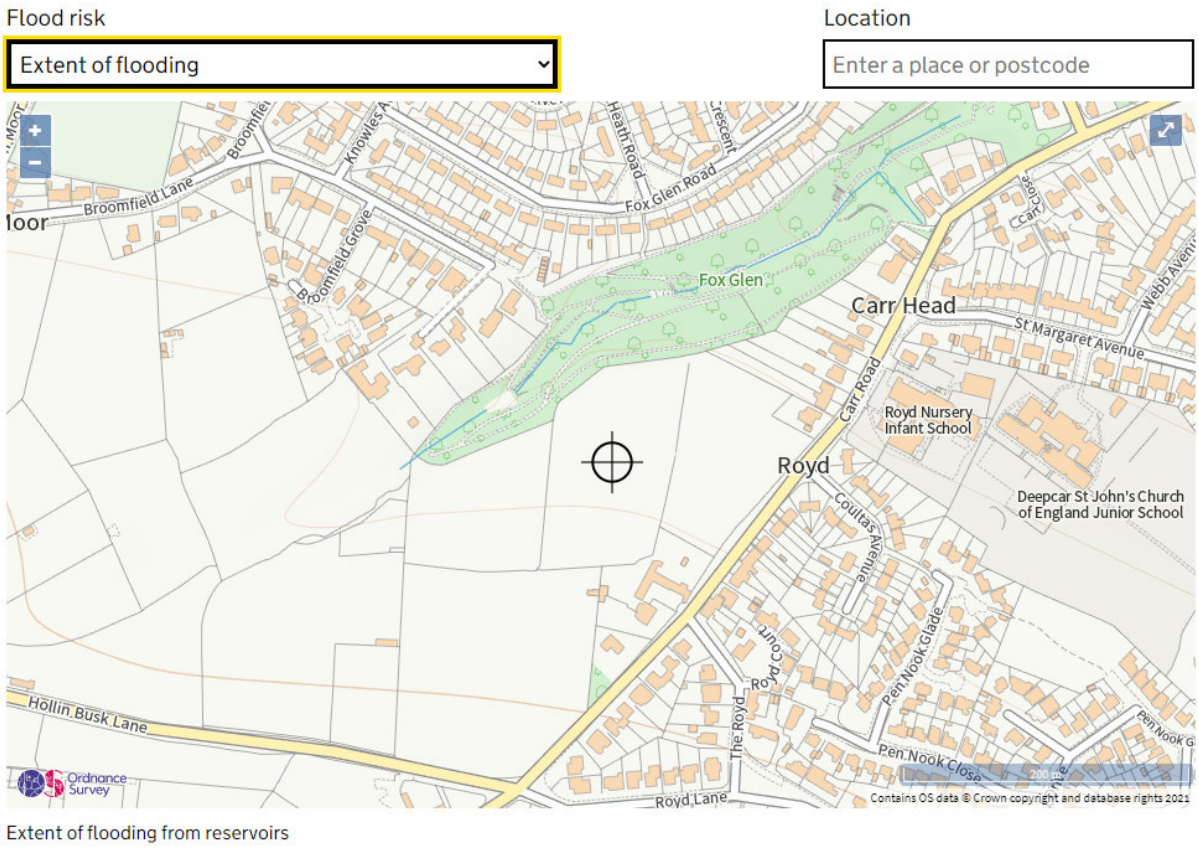
Enter a place or postcode

Extent of flooding from surface water

High Medium Low Very low Location you selected

Flood Risk from Surface Water Map

Appendix F – Flood Risk from Reservoirs Map



Flood Risk from Reservoirs Map

Appendix G – WFDA Figure 2

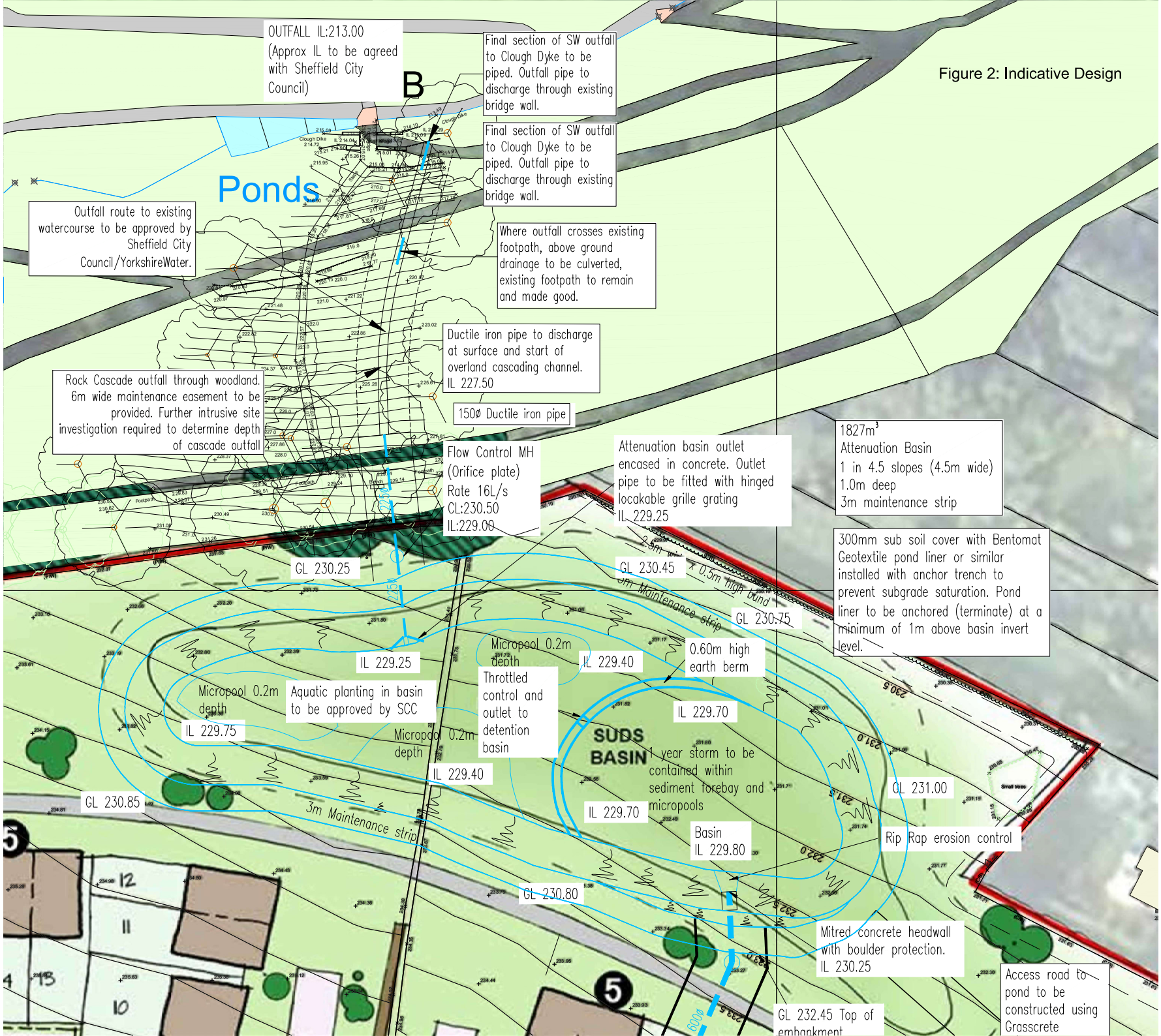


Figure 2: Indicative Design

Appendix H – Draft CEMP

RLRE Consulting Engineers

Carr Road, Deepcar

Carr Road, Deepcar

DRAFT CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

For

Hallam Land Management

May 2021

REV: -

P19-535

19535-RLL-21-XX-RP-C-003

Document History

Prepared by	:	Kriston Harvey
Position	:	Director
Date	:	May 2021
Authorised by	:	Lawrence Pacey
Position	:	Director
Date	:	May 2021
Document Status	:	Draft
Revision	:	-

Revision	Date	Comment	Editor

Contents

Appendices

1.0 INTRODUCTION

1.1. Terms of Reference

Rodgers Leask Ltd has been commissioned by Hallam Land Management Ltd to produce a Construction Environmental Management Plan for the site referred to as Carr Road, Deepcar.

With reference to draft planning conditions contained within the Planning Committee report dated 14th July 2020, the purpose of this document is to outline the specific engineering requirements to demonstrate that the proposed rock cascade surface water outfall can be delivered in such a manner to ensure that it appropriately addresses potential impacts to Fox Glen and Clough Dike during the construction phase.

It shall also cover proposed initiatives associated with a number of typical construction related activities to ensure that these are planned and managed in such a way as to comply with relevant best practice and guidance.

It should be noted that this document is in draft form and is subject to further work in advance of construction, which would consider other specific activities which sit later in the construction programme.

This document includes input from the ecology consultant (FPCR) and should be read in conjunction with the FPCR 'Water Framework Directive Assessment' dated October 2018 and the FPCR 'Fox Glen Survey of Proposed Drainage Route' dated October 2018 (CD1.17c: Appendices 4 & 5).

The aim of the Construction Environmental Management Plan (CEMP) is to set out responsibilities and details with regards to management measures and responsibilities to minimise environmental impact from the construction phase of development.

This document is pre-construction stage and for planning purposes.

At construction stage, the document will be updated following liaison with appropriate departments within the Local Planning Authority and pursuant to planning conditions and formal approval. The CEMP should remain a live document to be updated at regular intervals throughout the life of the project.

1.2. Overview of Works

The works covered by this draft document include the construction of the new SuDS detention basin extents within the site boundary along with a rock cascade outfall through Fox Glen to its outfall to Clough Dike. The content of this document is relevant to both the December 2019 Illustrative Masterplan (single SuDS basin scheme) and the April 2021 Revised Illustrative Masterplan (dual SuDS basin scheme).

The works will also include the installation of strategic site infrastructure to support development of the site area (surface water drainage).

2.0 THE SITE

2.1. Site Location

The site is located to the north of the junction of Carr Road and Hollin Busk Lane in Deepcar, Sheffield. The site is located on the southern edge of the built-up area of Deepcar and Stocksbridge.

The site covers an area of some 6.5ha of private agricultural land. Refer to Figure 1 for site location plan, with the boundary shown in red.

2.2. Site Access and Surrounding Area

It is anticipated that construction traffic will use a construction access off Carr Road, which will be provided at the location of the proposed site acces. Existing roads, footpaths and all existing accesses will be kept clear of debris and free of mud at all times. Traffic management will be in operation for the site access and site compound, as required by and to be agreed with the highway authority, to control site access and egress.

Initially there will be HGV movement to and from site during construction set up phases due to the nature of the work which should reduce once plant and materials are retained on site. HGV movement will be kept to a minimum in the interests of highway safety and local amenity. This will also help to ensure that the site is delivered in a cost effective manner and will therefore be in the interest of the developer. Every effort will be made to ensure that HGV access and egress will be timed to be outside peak congestion hours wherever possible.

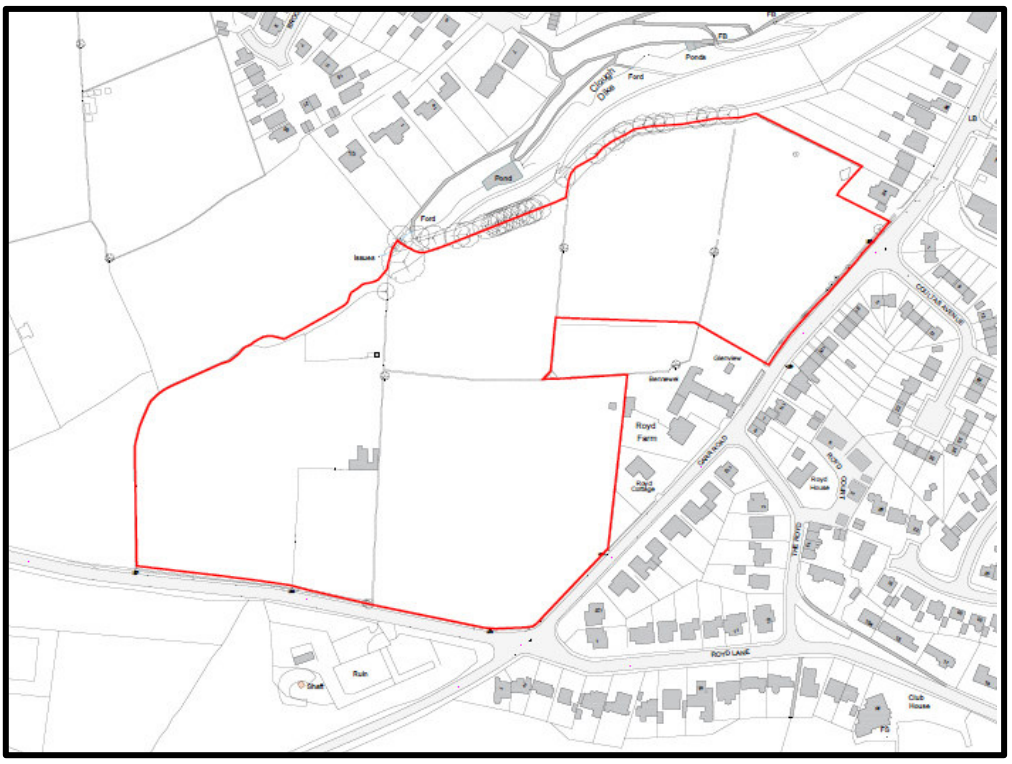


Figure 1: Site Location Plan

Agricultural fields are located to the west of the application site and along part of the north western boundary. Fox Glen an Area of Natural History Interest (ANHI) and Local Wildlife Site (LWS) runs along the remainder of the north western boundary, this contains the watercourse 'Clough Dike' (a tributary to the Little Don River) and has a housing area directly behind.

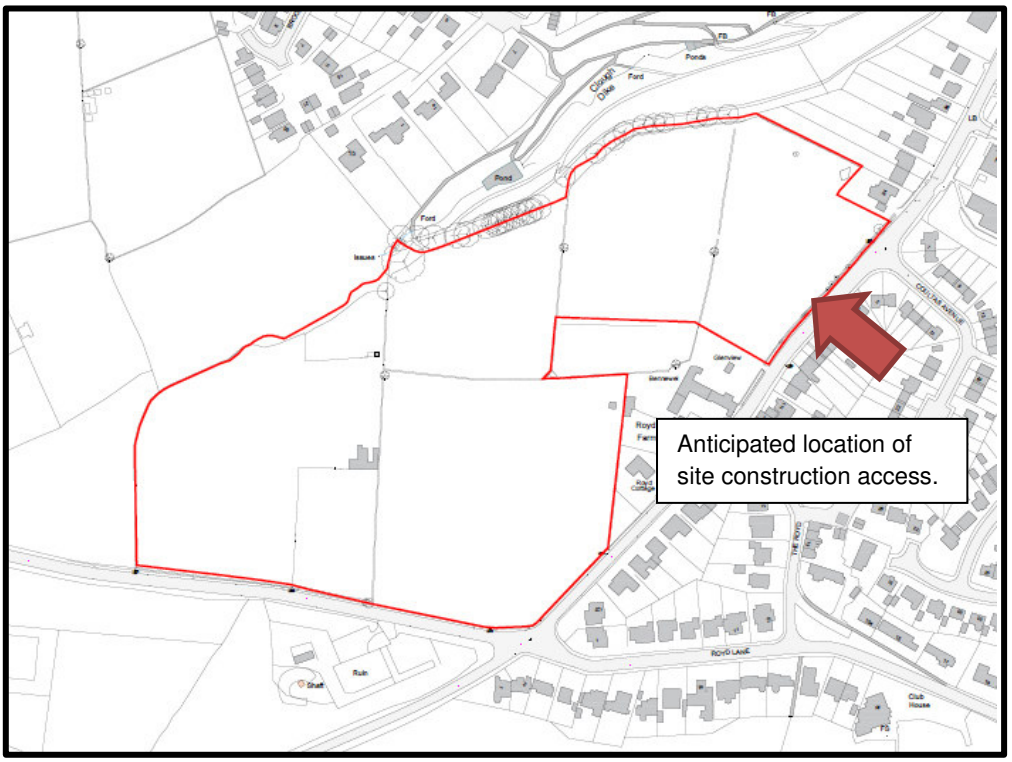


Figure 2: Site Access Location

2.3. Site History

The Site has had a predominantly greenfield and agricultural history.

Urban and industrial activity is noted surrounding the Site throughout the period covered by historical mapping, mostly to the north, comprising large residential areas with old pits/collieries and quarries and Stocksbridge Steelworks ~1.5km northwest.

3.0 GENERAL REQUIREMENTS

3.1. Standards and Guidance

Drainage works will generally be undertaken in accordance with the Construction Industry Research and Information Association (CIRIA) document C753 'The SuDS Manual', Water UK Design and Construction Guidance (the Code) and Part H of the Building Regulations.

The construction work should be undertaken in accordance with the latest editions of all relevant regulations and guidance, which is generally outlined in this document, however the list is not exhaustive.

3.2. Community Liaison Responsibility

The main Contractor is to make the public aware of the onsite activities and maintain suitable lines of communication through the project. Typical requirements will be;

- Contractor to appoint a Community Liaison Officer (CLO) throughout the duration of the contract and a Community Liaison Group (CLG);
- The CLO and CLG will meet on a regular basis and certain construction activities with higher levels of noise, for example, will be communicated to relevant stakeholders within the community;
- Encouraging positive engagement with the public with regards to environmental concerns;
- There will be a means of reporting issues, complaints and comments from the general public and local stakeholders;
- The site will be registered with the Considerate Constructors Scheme with local businesses and neighbours updated regularly with on site activities and progress.

3.3. Site Set-Up

Welfare and First Aid arrangements will be in accordance with the CDM Regulations (2015) Approved Code of Practice and the Health and Safety (First Aid) Regulations Approved Code of Practice and Guidance (L74).

A site compound area will be established, with parking provision for site workers and visitors. The facilities must be sized appropriate for the type of work and site occupancy. A typical site layout for the compound area will be provided by the appointed Contractor prior to commencement.

3.4. Hours of Working

General hours of working will be as follows:

- 07:30-18:00 Monday-Friday
- 08:30-13:00 Saturday
- No site work will be undertaken on Sundays or on Bank Holidays

Works should be undertaken during daylight hours only and vegetation clearance and ground preparation works should be outside of the breeding bird season (March to August inclusive), where possible. If lighting is required the following best practice guidance should be followed in order to avoid impact upon nocturnal species such as bats which, although not considered to be present permanently on site, may possibly be present intermittently:

- Keep lighting downward facing;
- Make sure lighting is generally of low wattage, so as to minimise the amount of unnecessary 'bleed' of light beyond the area of requirement. This should include rebounded lighting from the ground or other adjacent surfaces;
- Take measures to ensure that the trees within Fox Glen are not illuminated;
- To avoid using bulbs that produce a blue-light or other light that has a high UV content; and
- Ensuring lighting is proportionate to use, and be kept to a minimum, illuminating the desired areas only.

3.5. Site Security

The appointed Contractor shall introduce any necessary security measures, including fencing and signage as appropriate.

3.6. Planning of Construction Procedures, Processes and Activities

The Contractor will consider the following when planning any works procedures, processes and activities:

- Impact on adjacent properties and infrastructure including maintaining access, noise, vibration and dust;
- Existing services/utilities; including rights of access and the protection of apparatus;
- Control of surface water runoff from the development through Fox Glen and into Clough Dike during construction stages;
- Control of dust, noise and vibration during the works;
- Minimising waste and management of materials;
- Protecting the general public including, motorists, cyclists and pedestrians.

3.7. Existing Utilities and Statutory Authorities

Access to assets and apparatus should not be impeded and all works should be carried out in accordance with the requirements of the relevant Statutory Undertaker.

The Contractor should identify the exact positions of sewers and utilities and if necessary ensure that they are protected throughout the works, whilst maintaining access and easements.

As a general note the Contractor must identify all services within the site and provide necessary protection, disconnection or diversion works as required, in line with the recommendation of the relevant Statutory Undertaker and the appointed Mechanical & Electrical specialist.

3.8. Vehicle Movements and Highway Safety

The following will be implemented by the Contractor to ensure safe vehicle movements and to minimise environmental impact:

- The access/entrance to the site will be kept clean and well managed at all times with a wheel wash facility being provided. A road sweeper will visit site as necessary.
- All deliveries to the site will be pre-booked using an online system to monitor and mitigate the flow and quantity of construction traffic and deliveries to eliminate any congestion or build-up of site traffic outside the footprint of the site boundary.
- A detailed traffic management plan will be implemented prior to the works commencing on site and monitored throughout the works on a daily basis. This plan will be communicated to all subcontractors.
- Vehicles will be prevented from leaving engines running unless strictly necessary.
- The use of diesel or petrol-powered generators will be avoided, and mains electricity or battery powered equipment will be used where practicable.
- A Maximum speed limit of 15mph on surfaced and 10mph on un-surfaced haul roads and work areas will be imposed and signposted.

3.9. Biodiversity and Ecological Management

The CEMP helps to ensure that environmental impact from the site works are mitigated. A risk assessment is provided in Appendix A which lists activities with the potential to affect ecology and biodiversity, with means of mitigation provided. Specialist input from an ecologist has been used to compile the CEMP document and to define the risk assessment.

At each stage of design and construction the documents should be updated pending any review by the ecologist.

Prior to commencement of works within the site, an experienced ecologist will complete a walk over survey of the site to confirm works can proceed, and if required provided Contractors with relevant information to avoid particular ecological constraints, if recorded.

Works will avoid the breeding bird season in relation to vegetation clearance and ground preparation, however the resulting effect in both areas could provide suitable habitat for ground nesting birds. Therefore, clearance works occurring during the breeding bird season should be overseen by an ECoW in order to ensure no ground nesting birds are present. There will be no requirement for ecological supervision unless works are undertaken during the breeding bird season.

3.10. Ecological Clerk of Works (ECoW)

Prior to commencing works, the contractors or developer will employ a suitably qualified ecologist (ECoW) to supervise works, where required.

During the works where an ECoW is required, the role of the ECoW will be to ensure no detrimental impacts occur upon ecological receptors on the site as a result of construction or other activities associated with the proposed development. The ECoW will undertake watching briefs during sensitive works at the relevant times. The ECoW will also be responsible for ensuring all contractors are aware of the potential ecological receptors relating to the site and

to help them understand their own responsibilities. The ECoW will also remain the focal point of contact for any queries or issues that may arise during the phased construction processes.

For issues regarding ecology on the site the main point of contact will be the ECoW appointed by the Contractor or Developer.

3.11. Archaeology

Although there have been no significant archaeological features identified on the site through desk top analysis, the Contractor shall report to the Developer any archaeology found on site accordingly and protective measures shall be implemented prior to the recommencement of works, as necessary.

3.12. Site Clearance

- Any vegetation clearance should commence between September and February (inclusive), to avoid the nesting bird season. If this is not possible, the habitat to be disturbed should be checked for the presence of an active nest by a suitably experienced ecologist immediately prior to works commencing;
- If an active nest is discovered, it will need to be left undisturbed (including the habitat around the nest) until the young birds have fully fledged; and
- If nesting birds are discovered during works in any area of the site, work in that area should cease immediately and a suitably qualified ecologist should be contacted for advice, including confirmation on exclusion zones.

4.0 ENVIRONMENTAL MANAGEMENT MEASURES

4.1. Pollution provention

The Contractor shall acquaint himself with, and abide by, the guidelines contained within, all relevant Pollution Prevention Guidelines (PPGs) or Guidance For Pollution Prevention (GPPs) produced by the Environment Agency including, in particular:

- PPG1 Understanding your environmental responsibilities – good environmental practice;
- GPP2 Above ground oil storage tanks;
- GPP5 Works and maintenance in or near water;
- GPG6 Working at construction and demolition Sites;
- GPP8 Storage and disposal of used oils;
- GPP13Wheel washing and cleaning;
- PPG21 Pollution incident response planning;
- GPP22 Dealing with spills.

Compliance with the requirements of this CEMP shall not relieve the Contractor of any obligations or liabilities under the Control of Pollution Act 1974 and the Environmental Protection Act 1990.

4.2. Dust Mitigation Measures

- The site layout will be planned so that machinery and dust-causing activities are located away from receptors, as far as is possible;
- Solid screens or barriers will be erected around dusty activities;
- Stockpiles will be covered, seeded or fenced to prevent wind whipping;
- Materials that have a potential to produce dust will be removed from site as soon as possible, unless being re-used on site.; and
- Site fencing, barriers and scaffolding shall be kept clean using wet methods.
- Cutting, grinding or sawing equipment will only be used where fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- An adequate water supply on the site for effective dust/particulate matter suppression/mitigation will be ensured, using non-potable water where possible and appropriate;
- Enclosed chutes, conveyors and covered skips will be used;
- Drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment will be minimised and fine water sprays will be used on such equipment wherever appropriate; and
- Equipment shall be readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
- Scabbling (roughening of concrete surfaces) will be avoided;

- The site management team will conduct regular checks for the potential generation of dust on site. During windy conditions, work will be halted if dust is affecting adjacent roads or dwellings and the Contractor will liaise with the Local Highway Authority.

4.3. Ground Gas and Vapours

The Contractor must use measures to monitor and mitigate against the risks from ground gas and vapours associated with the site ground conditions. The contractor shall undertake appropriate risk assessments and confined space working procedures and the need for specialist training should be considered. Gas and vapour levels may need to be monitored, subject to the contactor's RAMS.

4.4. Noise Mitigation Measures

Noise monitoring will be carried out and recorded throughout the project to check sound levels and the effect on neighbouring sites. It is not anticipated that there will be significant vibration created during the construction works.

It is anticipated that no piling will be undertaken on the site associated with building foundations due to the presence of shallow bedrock. It is anticipated that the building foundation solution will be achieved using strip footings.

The following noise control measures will be implemented:

- All plant and vehicles will be shut down when not in use;
- Construction activities will be limited to the working hours in section 3.4;
- Unnecessary noise from shouting or playing music will be avoided;
- Site generator plant will be low noise type;
- On-site and off-site traffic movements will be planned such to minimise vehicles sitting in traffic and contributing to background traffic noise;
- Barriers and enclosures will be erected around plant or activities that are particularly noisy.

4.5. Biosecurity

All plant and machinery will be thoroughly cleaned prior to arriving on site to ensure no invasive species or pathogens are accidentally inroduced to the site and surrounding areas.

All plant when it first arrives at the site, will be thoroughly inspected by the site supervisor who will have the authority to refuse entry to the site if they are not satisfied with the cleanliness of plant or machinery. Any new machinery or plant that arrives at the site following the commencement of works will also be thoroughly checked.

4.6. Biodiversity Protection Zones

The ecological sensetive receptor identified within and adjacent to the Site are:

- The veteran ash trees located to the north west of the site; and

- Fox Glen LWS siutated adjacent to the northern boudary of the site.

The FPCR Tree Retention Plans are contained within Appendix 2 Annex E of the Proof of Evidence provided by Mr Kurt Goodman.

Prior to commencement of development, the Root Protection Areas (RPA's) of the Veteran trees and Fox Glen will be re-assessed and standard tree protection measures / signage will be provided. Following implementation of tree protection measures, these measures will be maintained until completion of the development.

If works are required in the RPA's of the trees on the edge of Fox Glen, these works will be undertaken in accordance with an Arboricultural Method Statement (AMS) which is likely to include measures requiring hand digging and/or the use of other methods considered necessary to avoid root damage. Where necessary these works would be overseen by an experience arborculturalist.

Necessary works within Fox Glen have been limited to the implementation of a drainage outfall. Further details on completing these works are outline at Section 6 below.

No particular sensetive ecological receptors have been recorded on land effected by the proposed development. Nontheless the south western field compartment is retained uneffected by the proposals and no construction works or storage of construction material will be allowed in this compartment.

5.0 MATERIALS MANAGEMENT

5.1. Management of Arisings and Documentation

Material stockpiles will be sited away from Fox Glen, with temporary stockpiles always sited at least 25m from the site boundary.

Materials will be delivered directly to their point of use where possible to reduce additional movements on-site. The site layout will ensure that material use and movement is undertaken efficiently and that sub-contractors are fully briefed.

During the early construction stages, the Contractor will collate all delivery needs from the supply chain and develop a contractor specific delivery strategy for each element of the works. A dedicated full-time compound gateman will be engaged to direct site traffic and deliveries alike to the necessary unloading points.

Signage - Adequate signage will be erected on the lead up to the entrance to site to enable safe traffic movements on the public highway. All signage is to be identified on the traffic management plan and will be agreed with the appropriate authority during the application procurement stage of the scheme. Company branded signage will be erected around the site and the compound advising all safety obligations of the company their workforce and visitors, signage will be subject to weekly inspection and daily monitoring.

5.2. Waste and Recycling

The Contractor will make every effort to recycle materials generated by the works in line with the Waste & Resources Action Programme (WRAP) protocol. Reuse of material will be undertaken in accordance with best practice outlined in CL:AIRE Protocol (2011):

- Ensuring that an adequate Materials Management Plan (MMP) is in place, covering the use of materials on a specific site;
- Ensuring that the MMP is based on an appropriate risk assessment
- Ensuring that materials are treated and used as set out in the MMP and that this subsequently demonstrated in a Verification Report.

Waste will be carefully managed on site and contained so that it isn't driven across the site by wind and rain, to prevent waste entering neighbouring areas and watercourses.

6.0 CONSTRUCTION PROCEDURES AND METHODOLOGY

6.1. General Construction Activities

The main construction processes will generally comprise;

- Any residual site investigation;
- Setting up temporary site infrastructure such as site compound, welfare etc;
- Construction of rock cascade outfall through Fox Glen to Clough Dike;
- Vegetation clearance;
- Earthworks associated with the SuDS detention basin;
- Laying of drainage including temporary surface water drainage for the construction phase.

6.2. Sequencing of Works

To ensure the connection to Clough Dike is delivered in an appropriate manner, the following sequence of works is proposed:

1. Construction of rock cascade outfall through Fox Glen to Clough Dike.
2. Construction of SuDS detention basin.
3. Construct connecting surface water drainage between the SuDS basin and the rock cascade outfall.

6.3. Excavation Works

Main excavation works will be to install drainage associated with the SuDS detention basin and temporary surface water drainage for the construction phase.

Drainage will be installed as shallow as possible to minimise the extents of excavation and depth of trenches. The following procedures will be considered during the works:

- Bunding and careful movement of material to prevent material entering the Fox Glen;
- Any man-made excavations, trenches or pits relating to the development will either be securely fenced off or covered up overnight to avoid entrapment or, if left open, an egress point (e.g. mammal ladders or a roughened plank) will be placed within the excavation to form a ramp to allow wildlife to escape;
- Any temporarily exposed open pipe systems will be capped in such a way as to prevent wildlife gaining access as may happen when contractors are off site; and
- Any excavations will be inspected each morning to ensure no mammals have become trapped overnight. Contractors will be made aware that trapped animals may dig a temporary sett into the side of a trench. If any mammal is found within any excavations, an ecologist must be contacted immediately for further advice.

6.4. Earthworks asociated with the SuDS Detention Basin

Best practice methods will be followed to ensure that dust generated by earthworks activities is controlled to minimise the deposition of dust into surrounding habitats.

The SuDS detention basin will be formed and the control chamber constructed ahead of other construction activities, to ensure that surface water runoff from the site is restricted to the agreed rate from commencement of the development.

6.5. Drainage

Prior to commencing works on site the Appointed Contractor will be required to obtain any necessary approvals and/or temporary works consents from the Lead Local Flood Authority and the adopting Water Company. There will also be a requirement for approval to be obtained from Sheffield City Council prior to any works commencing in Fox Glen.

The following measures will be put in place as a minimum with regards to drainage and control of surface water runoff through Fox Glen to Clough Dike;

- All fuels will be stored in a double bunded container with a capacity of 110% and kept padlocked when not in use. Drip trays will be used underneath containers to capture any drips. A designated fuel storage area will be set up on the project a minimum of 20m away from surface water drainage. A spill kit will be made available in the event of a spillage.
- Refuelling will only take place at least 20m from the surface water drainage on specially prepared ground.
- Surface water drainage features including the detention basin and control chamber will be installed as early as possible and any construction phase surface water drainage should be routed via the detention basin to ensure that the rate of runoff from the site is controlled.
- Where temporary construction phase surface water drainage is introduced at the site, silt fences will be used to prevent ingress of silt to the temporary drainage feature. In addition to this, sumps will be provided within the temporary drainage network to provide additional protection relating to sediment control.
- Straw bales should be introduced within temporary drainage prior to outfalls to aid the removal of suspended solids.
- Unnecessary vegetation clearance should be avoided and should be undertaken in a phased manner to reduce surface water runoff and the associated risk of sediment pollution.
- Haul routes should be drained to temporary drainage ditches.

The following specific measures will be undertaken when constructing the rock cascade outfall through Fox Glen to Clough Dike:

- The construction of the drainage outfall will be timed to avoid the main bird breeding season and periods of prolonged rainfall.
- Prior to commencing works within Fox Glen, the working corridor will be marked with high visibility fencing and no works will be undertaken outside of this area.
- There shall be no discharge of surface water runoff from the site until the rock cascade outfall has been constructed.

- Where the rock cascade is to be installed near to existing trees, careful hand dig techniques should be utilised to avoid damage to existing tree roots. Where necessary, these works will be overseen by an experienced arboricultural consultant.
- Silt fences should be installed on the existing slope of Fox Glen to help avoid disturbed soils from migrating to Clough Dike.
- No dig excavation work should be undertaken in short sections, with excavated material removed from the area as soon as possible.
- Prior to the localised outfall construction works into Clough Dike, a barrier should be installed to exclude water from the working area.
- A silt barrier should be installed at the proposed outfall to Clough Dike until the rock cascade works are complete.
- Any uprooted bluebell bulbs or other sensitive vegetation should be re-planted into undisturbed areas adjacent to the rock cascade outfall.
- On completion of the works, all soils will be levelled, and the ground flora allowed to naturally regenerate.

7.0 CONCLUSION

This CEMP identifies construction activities which have the potential to affect ecology and proposes appropriate measures to mitigate the risk.

Consideration has been given to vehicle movements, pollution prevention, dust, ground gas and vapours and noise.

Proposals have also been put forward to ensure that any work to be undertaken within biodiversity protection zones is carried out in accordance with appropriate method statements and where applicable overseen by specialist.

In conclusion this document demonstrates that sufficient measures have been considered to ensure that the sequencing and construction of the proposed rock cascade surface water outfall can be delivered in such a manner to ensure that it appropriately addresses potential impacts to Fox Glen and Clough Dike during the construction phase.

Appendices

Appendix A

Construction Activity Risk Assessment

Construction Activity Environmental Risk Assessment	
Activity	**Mitigation**
Vegetation clearance	• Any vegetation clearance should commence between September and February (inclusive), to avoid the nesting bird season. If this is not possible, the habitat to be disturbed should be checked for the presence of an active nest by a suitably experienced ecologist immediately prior to works commencing; • If an active nest is discovered, it will need to be left undisturbed (including the habitat around the nest) until the young birds have fully fledged; and • If nesting birds are discovered during works in any area of the site, work in that area should cease immediately and a suitably qualified ecologist should be contacted for advice, including for confirmation on exclusion zones.
Excavations	• Any man-made excavations, trenches or pits relating to the development will either be securely fenced off or covered up overnight to avoid entrapment or, if left open, an egress point (e.g. mammal ladders or a roughened plank) will be placed within the excavation to form a ramp to allow badgers to escape; • Any temporarily exposed open pipe systems will be capped in such a way as to prevent badgers gaining access as may happen when contractors are off site; and • Any excavations will be inspected each morning to ensure no mammals have become trapped overnight. Contractors will be made aware that trapped animals such badgers may dig a temporary sett into the side of a trench. If any mammal is found within any excavations, an ecologist must be contacted immediately for further advice.
Ground works	• Ensure best practice methods are followed to ensure that dust generated by ground works / construction activities is controlled in order minimise deposition of dust into surrounding habitats.

Refuelling and materials storage	• Ensure designated, bunded refuelling areas are identified and that any fuels and . or chemicals are stored appropriately in order to avoid accidental pollution incidents.
Biosecurity	• All plant and machinery will be thoroughly cleaned prior to arriving on site to ensure no invasive species or pathogens are accidentally introduced to the site and surrounding areas. • All plant when it first arrives at the site, will be thoroughly inspected by the site supervisor who will have the authority to refuse entry to the site if they are not satisfied with the cleanliness of plant or machinery. Any new machinery or plant that arrives at the site following the commencement of works will also be thoroughly checked.
Timing of works	• Works should be undertaken during daylight hours only. If lighting is required the following best practice guidance should be followed in order to avoid an impact upon nocturnal species such as bats and otters which, although considered to be present permanently on site, may possibly be present intermittently: • Keeping lighting downward facing; • Make sure lighting is generally of low wattage, so as to minimise the amount of unnecessary 'bleed' of light beyond the area of requirement. This should include rebounded lighting from the ground or other adjacent surfaces; • Take measures to ensure that the trees along Fox Glen are not illuminated; • Ensuring lighting is a warm / neutral colour temperature (<4,200 kelvin), as opposed to using bulbs that produce a blue-light or other light that has a high UV content; and • Ensuring lighting is proportionate to use, and be kept to a minimum, illuminating the desired areas only.

Carr Road, Deepcar

Construction Environmental Management Plan

Rodgers Leask Limited & Rodgers Leask Environmental Limited
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Appendix I – Drainage Strategy Update for Climate Change

Project:	P19-535 Carr Road, Deepcar		
Subject:	Drainage Strategy Update for Climate Change		
Prepared by:	Kriston Harvey – Director	**Date:**	May 2021
Authorised by:	Lawrence Pacey – Director	**Status:**	S2 - Information
Document Ref:	19535-RLL-21-XX-TN-S-003	**Revision:**	P01

1 Introduction

1.1 An outline Planning application reference 17/04673/OUT was submitted to the Local Planning Authority (LPA) Sheffield City Council (SCC) on 14th November 2017.

1.2 A site-specific Flood Risk Assessment (FRA) report (CD1.19) produced by ARP Associates (reference: 1265/10r1) dated April 2017 was submitted in support of the Planning application.

1.3 The report covers flood risk both to and from the site, the surface water strategy for the site including SuDS provision and the foul water strategy for the site.

1.4 At the time of writing of the FRA report, Environment Agency (EA) guidance required that residential development sites consider a 30% increase in peak rainfall intensity to allow for climate change over the lifetime of the development.

1.5 Guidance has since been updated (in February 2019) to require that a 40% increase in peak rainfall intensity is considered, as noted at Table 2 of the EA guidance document 'Flood risk assessments: climate change allowances' published 19th February 2016 and thereafter updated.

1.6 The purpose of this technical note is to demonstrate that the attenuation requirements within the proposed surface water drainage system to serve the site can be accommodated within the illustrative masterplan for the proposed development when considering a 40% increase in peak rainfall intensity.

1.7 It should be noted that the proposed outfall arrangement from the site would remain unchanged and would still be via a rock cascade outfall through Fox Glen to Clough Dike.

2 Greenfield Runoff Rate

2.1 A review of the existing greenfield runoff rate from the site has been undertaken to establish the baseline scenario for the drainage strategy update.

2.2 Flood Estimation Handbook (FEH) catchment data has been purchased for the site which indicates that the Standard Percentage Runoff (SPR) rate to be used in calculating the existing greenfield runoff rate is 34.31%.

2.3 Therefore whilst the principle of the runoff calculation undertaken by ARP for the FRA report is considered appropriate, a soil parameter of 0.34 has been used in this drainage strategy update to reflect the FEH SPR data.

Illustrative Masterplan (dated December 2019)

2.4 Whilst the total site area for the proposed development is 6.5ha, there are large areas which will remain as 'greenfield'.

2.5 These areas will continue to discharge surface water runoff overland to Clough Dike and therefore for the purposes of calculating the existing greenfield runoff rate to which the development surface water drainage system should be restricted, it is considered that these areas should be discounted.

2.6 The resultant 'net developable' area which is measured at 2.63ha has therefore been used to calculate the greenfield (QBar) rate using the ICP SuDS method in MicroDrainage, but manually amending the 'soil' parameter to 0.34 to reflect the FEH SPR data for the catchment.

2.7 The calculations, which are contained within Appendix 1 of this Technical Note, indicate that based upon a net developable area of 2.63ha, the QBar discharge rate is 10.7l/s.

Revised Illustrative Masterplan (dated April 2021)

2.8 As per the December 2019 illustrative masterplan, there are large areas of the proposed 6.5ha development site which will remain as 'greenfield' and continue to discharge overland to Clough Dike.

2.9 The resultant 'net developable' area which is measured at 2.43ha for this layout has therefore been used to calculate the greenfield (QBar) rate using the ICP SuDS method in MicroDrainage, but again manually amending the 'soil' parameter to 0.34 to reflect the FEH SPR data for the catchment.

2.10 The calculations, which are contained within Appendix 2 of this Technical Note, indicate that based upon a net developable area of 2.43ha, the QBar discharge rate is 9.9l/s.

3 Attenuation Requirements

Illustrative Masterplan (dated December 2019)

3.1 Based upon a 2.63ha net developable area, and considering 60% of this (1.58ha) to be impermeable areas such as roof, driveway, roads and footpaths, an assessment of the volume of attenuation required to achieve a maximum discharge rate of 10.7l/s (as calculated at 2.7 above) and accommodate the 1 in 100 year plus 40% climate change storm event has been undertaken.

3.2 Past experience of delivering detailed design schemes for residential developments would indicate that typically the final impermeable area on a site will be around 45-50% of the net developable area. As such, representing 60% of the net developable area in calculations makes suitable provision for up to 10% urban creep.

3.3 It is proposed to attenuate the required volume within a SuDS detention basin located in the northern part of the site, with the final outfall being to Clough Dike as indicated in the original FRA report.

3.4 Calculations have been undertaken using the Source Control module within MicroDrainage and are included at Appendix 3 of this Technical Note.

3.5 The calculations indicate that an attenuation volume of 1,172m^3 would be required for the critical storm event.

3.6 To demonstrate that options are available with regard to the design parameters for the SuDS basin, 2nr scenarios have been considered.

3.7 The first scenario utilises maximum side slope gradients to the basin of 1 in 4.25, which are considered suitable for the basin to be adopted and maintained by SCC.

3.8 The second scenario utilises a maximum side slope gradient to the basin of 1 in 3, which would comply with the requirements set out in the Construction Industry Research and Information Association (CIRIA) technical guide 'The SuDS Manual (C753) published in November 2015. This would be suitable for the basin to be adopted by a statutory undertaker such as Yorkshire Water.

3.9 Design proposals for each scenario are included at Appendix 4 of this Technical Note (drawings 19535-RLL-21-XX-DR-C-201 'December 2019 Illustrative Masterplan SuDS Detention Basin Option 1' and 19535-RLL-21-XX-DR-C-202 'December 2019 Illustrative Masterplan SuDS Detention Basin Option 2' respectively).

3.10 The proposals confirm that appropriate solutions are available for the SuDS basin to accommodate a 40% increase in peak rainfall intensity for the 1 in 100 year storm event, within the Illustrative Masterplan.

Revised Illustrative Masterplan (dated April 2021)

3.11 Based upon a 2.43ha net developable area, and again considering 60% of this (1.46ha) to be impermeable area, an assessment of the volume of attenuation required to achieve a maximum discharge rate of 9.9l/s (as calculated at 2.10 above) and accommodate the 1 in 100 year plus 40% climate change storm event has been undertaken.

3.12 It is proposed to attenuate the required volume within 2nr SuDS detention basins, with one located in the southern part of the site and the other located in the northern part of the site.

3.13 The basins would be linked such that there remains only a single final outfall from the site which would again be to Clough Dike as indicated in the original FRA report.

3.14 To demonstrate how these basins would interact, calculations have been undertaken using InfoDrainage and are included at Appendix 5 of this Technical Note.

3.15 The controlled discharge rate from the southern basin has been set to of 5l/s, as this is considered an appropriate minimum rate to allow the network to be adopted by a statutory undertaker such as Yorkshire Water.

3.16 The selection of a rate of 5l/s is to ensure that the orifice size within the control structure is sufficient to minimise the risk of blockage.

3.17 The catchment (net developable) area of the southern basin is calculated to be 0.75ha, with an impermeable area of 0.45ha (based upon 60% of the net developable area).

3.18 Runoff from the southern basin would be routed (at the controlled rate of discharge) through the subsequent surface water drainage network to the northern basin via pipes under the estate roads. This is shown schematically on the drawings included at Appendix 6 of this Technical Note.

3.19 The northern basin would also receive runoff from the remaining 1.01ha of impermeable area (taken as 60% of the remaining 1.68ha net developable area).

3.20 The calculations indicate that an attenuation volume of 275m^3 would be required for the critical storm event for the southern pond and 846m^3 for the northern pond

3.21 Again, to demonstrate that options are available with regard to the design parameters for the SuDS basins, 2nr scenarios have been considered.

3.22 The first scenario utilises maximum side slope gradients to the basin of 1 in 4.5, which are considered suitable for the basin to be adopted and maintained by SCC.

3.23 The second scenario again utilises a maximum side slope gradient to the basin of 1 in 3. This would be suitable for the basin to be adopted by a statutory undertaker such as Yorkshire Water.

3.24 Design proposals for each scenario are included at Appendix 6 of this Technical Note (drawings 19535-RLL-21-XX-DR-C-203 'April 2021 Revised Illustrative Masterplan SuDS Detention Basin Option 1' and 19535-RLL-21-XX-DR-C-204 'April 2021 Revised Illustrative Masterplan SuDS Detention Basin Option 2' respectively).

3.25 The proposals confirm that appropriate solutions are available for the SuDS basin to accommodate a 40% increase in peak rainfall intensity for the 1 in 100 year storm event, within the Revised Illustrative Masterplan.

4 Conclusions

4.1 Greenfield runoff rates have been reviewed based upon net developable areas and FEH data relating to runoff parameters.

4.2 Both the December 2019 and April 2021 Illustrative Masterplan's have been considered and calculations undertaken to determine attenuation volumes required to accommodate the 1 in 100 year plus 40% climate change event.

4.3 Designs have been produced which give flexibility over adoption and maintenance, and demonstrate that the required volumes of attenuation can be accommodated within the site.

4.4 It is therefore considered that an appropriate surface water drainage scheme which considers current climate change requirements can be delivered at the site.

APPENDIX 1

December 2019 'Illustrative Masterplan' QBar Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.340
Area (ha)	2.630	Urban	0.000
SAAR (mm)	1106	Region Number	Region 4

Results l/s

QBAR Rural	10.7
QBAR Urban	10.7
Q100 years	27.6
Q1 year	8.9
Q30 years	21.0
Q100 years	27.6

APPENDIX 2

April 2021 'Revised Illustrative Masterplan' QBar Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 1106 Urban 0.000
Area (ha) 2.430 Soil 0.340 Region Number Region 4

Results l/s

QBAR Rural 9.9
QBAR Urban 9.9

Q100 years 25.5

Q1 year 8.2
Q30 years 19.4
Q100 years 25.5

APPENDIX 3

December 2019 'Illustrative Masterplan' Attenuation Calculations

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	229.794	0.294	10.7	353.1	O K
30 min Summer	229.902	0.402	10.7	482.6	O K
60 min Summer	230.022	0.522	10.7	626.2	O K
120 min Summer	230.145	0.645	10.7	773.9	O K
180 min Summer	230.212	0.712	10.7	853.9	O K
240 min Summer	230.253	0.753	10.7	903.1	O K
360 min Summer	230.305	0.805	10.7	965.8	O K
480 min Summer	230.333	0.833	10.7	999.1	O K
600 min Summer	230.346	0.846	10.7	1015.7	O K
720 min Summer	230.351	0.851	10.7	1021.3	O K
960 min Summer	230.349	0.849	10.7	1019.2	O K
1440 min Summer	230.333	0.833	10.7	999.9	O K
2160 min Summer	230.294	0.794	10.7	953.3	O K
2880 min Summer	230.248	0.748	10.7	897.6	O K
4320 min Summer	230.141	0.641	10.7	768.8	O K
5760 min Summer	230.040	0.540	10.7	648.0	O K
7200 min Summer	229.954	0.454	10.7	544.4	O K
8640 min Summer	229.880	0.380	10.7	456.3	O K
10080 min Summer	229.820	0.320	10.7	384.5	O K
15 min Winter	229.830	0.330	10.7	396.3	O K
30 min Winter	229.952	0.452	10.7	542.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	122.486	0.0	334.6	26
30 min Summer	84.172	0.0	464.4	41
60 min Summer	55.250	0.0	638.9	70
120 min Summer	34.920	0.0	809.2	128
180 min Summer	26.218	0.0	911.4	188
240 min Summer	21.255	0.0	984.8	248
360 min Summer	15.823	0.0	1098.2	366
480 min Summer	12.808	0.0	1183.3	484
600 min Summer	10.860	0.0	1251.5	602
720 min Summer	9.484	0.0	1308.0	720
960 min Summer	7.650	0.0	1396.2	834
1440 min Summer	5.638	0.0	1489.9	1086
2160 min Summer	4.143	0.0	1754.5	1496
2880 min Summer	3.324	0.0	1875.4	1912
4320 min Summer	2.434	0.0	2053.6	2728
5760 min Summer	1.953	0.0	2216.6	3464
7200 min Summer	1.647	0.0	2335.4	4184
8640 min Summer	1.434	0.0	2436.3	4928
10080 min Summer	1.275	0.0	2521.4	5552
15 min Winter	122.486	0.0	376.5	26
30 min Winter	84.172	0.0	520.8	40

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	230.087	0.587	10.7	704.3	O K
120 min Winter	230.228	0.728	10.7	873.3	O K
180 min Winter	230.303	0.803	10.7	963.4	O K
240 min Winter	230.350	0.850	10.7	1020.0	O K
360 min Winter	230.412	0.912	10.7	1094.3	O K
480 min Winter	230.447	0.947	10.7	1136.1	O K
600 min Winter	230.466	0.966	10.7	1159.5	O K
720 min Winter	230.476	0.976	10.7	1170.9	O K
960 min Winter	230.477	0.977	10.7	1171.9	O K
1440 min Winter	230.451	0.951	10.7	1141.3	O K
2160 min Winter	230.397	0.897	10.7	1076.1	O K
2880 min Winter	230.329	0.829	10.7	994.6	O K
4320 min Winter	230.172	0.672	10.7	806.4	O K
5760 min Winter	230.008	0.508	10.7	609.6	O K
7200 min Winter	229.880	0.380	10.7	455.6	O K
8640 min Winter	229.783	0.283	10.7	339.6	O K
10080 min Winter	229.717	0.217	10.5	259.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	55.250	0.0	716.5	70
120 min Winter	34.920	0.0	906.5	126
180 min Winter	26.218	0.0	1020.5	184
240 min Winter	21.255	0.0	1102.2	242
360 min Winter	15.823	0.0	1228.1	358
480 min Winter	12.808	0.0	1321.7	472
600 min Winter	10.860	0.0	1395.7	586
720 min Winter	9.484	0.0	1455.7	696
960 min Winter	7.650	0.0	1542.2	910
1440 min Winter	5.638	0.0	1563.7	1142
2160 min Winter	4.143	0.0	1965.3	1608
2880 min Winter	3.324	0.0	2100.2	2076
4320 min Winter	2.434	0.0	2297.9	2984
5760 min Winter	1.953	0.0	2483.3	3696
7200 min Winter	1.647	0.0	2616.6	4392
8640 min Winter	1.434	0.0	2730.2	5016
10080 min Winter	1.275	0.0	2827.0	5648

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.500	Shortest Storm (mins)	15
Ratio R	0.307	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.580

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.527	4	8	0.527	8	12	0.527

Model Details

Storage is Online Cover Level (m) 230.800

Tank or Pond Structure

Invert Level (m) 229.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1200.0	0.700	1200.0	1.400	0.0	2.100	0.0
0.100	1200.0	0.800	1200.0	1.500	0.0	2.200	0.0
0.200	1200.0	0.900	1200.0	1.600	0.0	2.300	0.0
0.300	1200.0	1.000	1200.0	1.700	0.0	2.400	0.0
0.400	1200.0	1.001	0.0	1.800	0.0	2.500	0.0
0.500	1200.0	1.200	0.0	1.900	0.0		
0.600	1200.0	1.201	0.0	2.000	0.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0150-1070-1000-1070
Design Head (m)	1.000
Design Flow (l/s)	10.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	150
Invert Level (m)	229.500
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	10.7
Flush-Flo™	0.306	10.7
Kick-Flo®	0.679	8.9
Mean Flow over Head Range	-	9.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.4	1.200	11.7	3.000	18.0	7.000	27.1
0.200	10.4	1.400	12.5	3.500	19.4	7.500	28.0
0.300	10.7	1.600	13.4	4.000	20.7	8.000	28.9
0.400	10.6	1.800	14.1	4.500	21.9	8.500	29.7
0.500	10.3	2.000	14.9	5.000	23.0	9.000	30.5
0.600	9.8	2.200	15.5	5.500	24.1	9.500	31.4
0.800	9.6	2.400	16.2	6.000	25.1		
1.000	10.7	2.600	16.8	6.500	26.1		

APPENDIX 4

December 2019 'Illustrative Masterplan' SuDS Detention Basin Option 1 & Option 2

APPENDIX 5

April 2021 'Revised Illustrative Masterplan' Attenuation Calculations

P19 - 535 - Carr Road, Deepcar: Proposed SuDS Detention Basin Hallam Land Management Limited	Date: 04/05/2021			RLRE Consulting Engineers
	Designed by: LH	Checked by:	Approved By:	
Report Details: Type: Stormwater Controls Storm Phase: Phase	Rodgers Leask Limited: St James House St Mary's Wharf Mansfield Road Derby DE1 3TQ			

Pond 1

Type : Pond

Dimensions

Exceedence Level (m)	243.10
Depth (m)	1.30
Base Level (m)	241.80
Freeboard (mm)	300
Initial Depth (m)	0.00
Porosity (%)	100
Average Slope (1:x)	7.076
Total Volume (m³)	280.035

Depth (m)	Area (m²)	Volume (m³)
0.00	94.58	0.000
1.00	523.09	280.035
1.30	677.57	459.636

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	0.45ha
Bypass Destination	(None)
Capacity Type	No Restriction

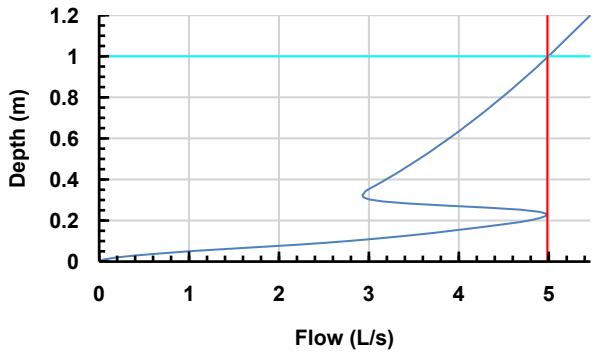
Outlets

Outlet

Outgoing Connection	No Delay
Outlet Type	Hydro-Brake®

Invert Level (m)	241.80
Design Depth (m)	1.00
Design Flow (L/s)	5.0
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☐

Unit Reference	CHE-0101-5000-1000-5000



Advanced

Perimeter	Circular
Length (m)	57.20

Pond 2

Type : Pond

Dimensions

Exceedence Level (m)	230.80
Depth (m)	1.30
Base Level (m)	229.50
Freeboard (mm)	300
Initial Depth (m)	0.00
Porosity (%)	100
Average Slope (1:x)	5.482
Total Volume (m³)	870.069

Depth (m)	Area (m²)	Volume (m³)
0.00	596.78	0.000
1.00	1175.77	870.069
1.30	1373.43	1252.065

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	1.01ha
Bypass Destination	(None)
Capacity Type	No Restriction

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	No Delay
Bypass Destination	(None)
Capacity Type	No Restriction

P19 - 535 - Carr Road, Deepcar: Proposed SuDS Detention Basin Hallam Land Management Limited	Date: 04/05/2021			RLRE Consulting Engineers
	Designed by: LH	Checked by:	Approved By:	
Report Details: Type: Stormwater Controls Storm Phase: Phase	Rodgers Leask Limited: St James House St Mary's Wharf Mansfield Road Derby DE1 3TQ			

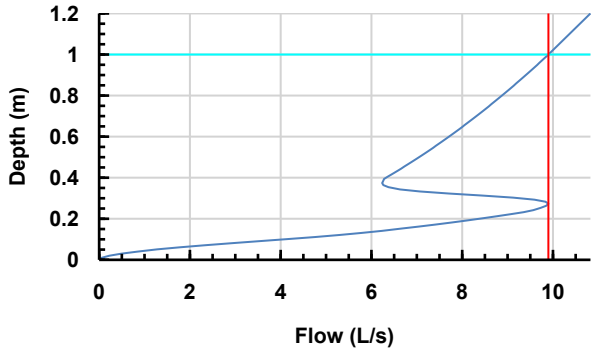
Outlets

Outlet

Outgoing Connection	No Delay (1)
Outlet Type	Hydro-Brake®

Invert Level (m)	229.50
Design Depth (m)	1.00
Design Flow (L/s)	9.9
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☐

Unit Reference	CHE-0138-9900-1000-9900



Advanced

Perimeter	Circular
Length (m)	62.33

P19 - 535 - Carr Road, Deepcar: Proposed SuDS Detention Basin Hallam Land Management Limited	Date: 04/05/2021			RLRE Consulting Engineers
	Designed by: LH	Checked by:	Approved By:	
Report Details: Type: Inflow Summary Storm Phase: Phase	Rodgers Leask Limited: St James House St Mary's Wharf Mansfield Road Derby DE1 3TQ			

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
0.45ha	Pond 1		Time of Concentration	0.45	100	0	100	0.45
1.01ha	Pond 2		Time of Concentration	1.01	100	0	100	1.01
TOTAL		**0.0**		**1.46**				**1.46**

P19 - 535 - Carr Road, Deepcar: Proposed SuDS Detention Basin Hallam Land Management Limited	Date: 04/05/2021			RLRE Consulting Engineers
	Designed by: LH	Checked by:	Approved By:	
Report Title: Analysis Criteria	Rodgers Leask Limited: St James House St Mary's Wharf Mansfield Road Derby DE1 3TQ			

Runoff Type	Dynamic
Output Interval (mins)	1
Time Step	Default
Urban Creep (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FSR

Type: FSR

Region	England and Wales
M5-60 (mm)	19.5
Ratio R	0.307
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
1.0	0
30.0	0
100.0	40

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880

P19 - 535 - Carr Road, Deepcar: Proposed SuDS Detention Basin Hallam Land Management Limited	Date: 04/05/2021			RLRE Consulting Engineers
	Designed by: LH	Checked by:	Approved By:	
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Rodgers Leask Limited: St James House St Mary's Wharf Mansfield Road Derby DE1 3TQ			

Critical Storm

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond 1	FSR: 100 years: Increase Rainfall (%): +40: 480 mins: Winter	242.79	242.79	0.99	0.99	34.0	275.349	0.000	0.000	5.0	246.391	2	OK
Pond 2	FSR: 100 years: Increase Rainfall (%): +40: 960 mins: Winter	230.48	230.48	0.98	0.98	49.8	846.130	0.000	0.000	9.9	944.119	3	OK

P19 - 535 - Carr Road, Deepcar: Proposed SuDS Detention Basin Hallam Land Management Limited	Date: 04/05/2021			RLRE Consulting Engineers
	Designed by: LH	Checked by:	Approved By:	
Report Details: Type: Connections Summary Storm Phase: Phase	Rodgers Leask Limited: St James House St Mary's Wharf Mansfield Road Derby DE1 3TQ			

Critical Storm

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
No Delay	FSR: 1 years: Increase Rainfall (%): +0: 720 mins: Summer	No Delay	Pond 1	Pond 2		242.03	0.02	104.250	11.1		5.0	
No Delay (1)	FSR: 30 years: Increase Rainfall (%): +0: 30 mins: Winter	No Delay	Pond 2	Outfall		229.78	0.06	25.948	2.4		9.9	

APPENDIX 6

April 2021 'Revised Illustrative Masterplan' SuDS Detention Basin Option 1 & Option 2

Appendix J – CIRIA C753 Tables

TABLE 4.3 Minimum water quality management requirements for discharges to receiving surface waters and groundwater

Land use	Pollution hazard level	Requirements for discharge to surface waters, including coasts and estuaries[2]	Requirements for discharge to groundwater
Residential roofs	Very low	Removal of gross solids and sediments only	
Individual property driveways, roofs (excluding residential), residential car parks, low traffic roads (eg cul de sacs, home zones, general access roads), non-residential car parking with infrequent change (eg schools, offices)	Low	Simple index approach[3] *Note: extra measures may be required for discharges to protected resources[1]*	
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	Simple index approach[3] *Note: extra measures may be required for discharges to protected resources[1]*	Simple index approach[3] *Note: extra measures may be required for discharges to protected resources[1]* In England and Wales, Risk Screening[4] must be undertaken first to determine whether consultation with the environmental regulator is required. In Northern Ireland, the need for risk screening should be agreed with the environmental regulator.
Trunk roads and motorways	High	Follow the guidance and risk assessment process set out in HA (2009)	
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured, industrial sites	High	Discharges may require an environmental licence or permit[5]. Obtain pre-permitting advice from the environmental regulator. Risk assessment is likely to be required[5].	

Notes

The minimum water quality management requirements for discharges to receiving surface waters and groundwater are presented here. (For Northern Ireland, this guidance should be considered as interim until such time as Northern Ireland publishes its own legislation/policy/guidance.)

1 These are not required in Scotland and Northern Ireland. For England and Wales, see Step 3 of the simple index approach (Section 26.7.1).

Protected surface water resources will include those designated for drinking water abstraction or for other environmental protection reasons. Protected groundwater resources are represented by SPZ1s in England and Wales.

2 In Scotland, the Water Environment (Controlled Activities) (Scotland) Regulations (CAR) 2011 General Binding Rules, Rule 10 (d) (iv) effectively provides an exemption from requiring SuDS for coastal discharges. However, control of any contaminants likely to be present in surface water runoff is still required, but can be delivered using alternative methods such as proprietary treatment products. As the term 'SuDS' in this manual includes proprietary treatment products, this exemption is not valid in this context.

3 The application of the simple index approach should follow the approach outlined in Section 26.7.1 (or equivalent approved).

4 Risk screening is an assessment to identify high risk scenarios where the Environment Agency or Natural Resources Wales (NRW) would wish to be consulted regarding infiltration of water from surface runoff in order to agree the proposed design approach. The risk screening method is provided in Section 26.7.2.

5 The risk assessment should determine the appropriate design approach to mitigate risk to acceptable levels following the guidance outlined in Section 26.7.3. This assessment should be approved by the environmental regulator.

TABLE 26.2 Pollution hazard indices for different land use classifications

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

Notes

1 Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009).

2 These should only be used if considered appropriate as part of a detailed risk assessment – required for all these land use types (Table 4.3). When dealing with high hazard sites, the environmental regulator should first be consulted for pre-permitting advice. This will help determine the most appropriate approach to the development of a design solution.

Where a site land use falls outside the defined categories, the indices should be adapted (and agreed with the drainage approving body) or else the more detailed risk assessment method should be adopted.

Where nutrient or bacteria and pathogen removal is important for a particular receiving water, equivalent indices should be developed for these pollutants (if acceptable to the drainage approving body) or the risk assessment method adopted.

Where the mitigation index of an individual component is insufficient, two components (or more) in series will be required, where:

$$\text{Total SuDS mitigation index} = \text{mitigation index}_1 + 0.5\ (\text{mitigation index}_2)$$

Where:

$\text{mitigation Index}_n$ = mitigation index for component n

A factor of 0.5 is used to account for the reduced performance of secondary or tertiary components associated with already reduced inflow concentrations.

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Notes

1 SuDS components only deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters.

2 Filter drains can remove coarse sediments, but their use for this purpose will have significant implications with respect to maintenance requirements, and this should be taken into account in the design and Maintenance Plan.

3 Ponds and wetlands can remove coarse sediments, but their use for this purpose will have significant implications with respect to the maintenance requirements and amenity value of the system. Sediment should normally be removed upstream, unless they are specifically designed to retain sediment in a separate part of the component, where it cannot easily migrate to the main body of water.

4 Where a wetland is not specifically designed to provide significantly enhanced treatment, it should be considered as having the same mitigation indices as a pond.

5 See Chapter 14 for approaches to demonstrate product performance. A British Water/Environment Agency assessment code of practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: **http://tinyurl.com/qf7yuj7**

6 SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. SEPA (2014) also provides a flowchart with a summary of checks on suitability of a proprietary system.

Appendix K – E-mail Correspondence with Mr James Wilson

Kriston Harvey

From: James Wilson <James.Wilson2@sheffield.gov.uk>
Sent: 13 May 2021 13:11
To: Kriston Harvey
Subject: RE: P19-535 - Carr Road, Deepcar

Thanks Kriston, I agree with your summary of our conversation. The pumps are set up to pump back to the watercourse beyond the collapsed section.

Kind regards,

James Wilson
Flood & Water Management Team
Strategic Transport Sustainability and Infrastructure
Sheffield City Council

✉ Howden House, 1 Union Street, Sheffield, S1 2SH
www.sheffield.gov.uk
file clough dike

From: Kriston Harvey <kriston.harvey@rodgersleask.co.uk>
Sent: 13 May 2021 11:54
To: James Wilson <James.Wilson2@sheffield.gov.uk>
Subject: P19-535 - Carr Road, Deepcar

Hi James,

Thank you for your time on the phone on 10th May to discuss the proposed mitigation works to the existing Clough Dike culvert beneath Wood Royd Road.

Please find below my notes from our conversation:

- There is an old stone culvert beneath Wood Royd Road of approximately 600mm diameter and up to around 20m deep, which has been in a relatively poor condition for a number of years. Funding has however not previously been available to undertake remedial works on the culvert.
- Ultimately, prior to the November 2019 flood events, the culvert collapsed which significantly impeded the flow of water, leading it to build up within the parkland area behind the play area off Wood Royd Road.
- The water eventually overtopped the depression behind the play area and this ultimately led to the flooding of a number of properties on Wood Royd Road.
- Sheffield City Council is the main riparian owner of the culvert and the Environment Agency is the Flood Risk Manager due to this section having 'Main River' status.

- The November 2019 flood events coincided with the next EA Medium Term Plan (a 6 year programme of funding), and subsequently the Clough Dike culvert works are now in the updated EA Medium Term Plan for funding allocation.
- Both the EA and SCC are keen to resolve this issue and reinstate the culvert.
- Whilst detailed proposals are considered, interim measures are in place to protect the local area from flood risk.
- A pumping scheme is now in operation, with a number of pumps available to deal with varying storm categories – for example when higher category storms are expected, additional pumps are available to deal with the runoff generated.
- As a standby provision, sandbags are also available to provide added protection to nearby dwellings.
- Once reinstated, the Clough Dike culvert beneath Wood Royd Road will be adequate to deal with runoff passing along this watercourse.
- If the proposed scheme at Carr Road is delivered in a sustainable manner, whereby runoff rates are restricted to equivalent greenfield rates (as is proposed), this will not lead to any increase in flood risk either during the interim pumped situation or once the Clough Dike culvert is reinstated.

I think that covers everything we discussed, but please let me know if I have missed anything.

One question I forgot to ask was where the currently installed pumps discharge to – are you able to clarify this please?

Many thanks,

Kriston

Kriston Harvey BEng (Hons) FCIHT
DIRECTOR

kriston.harvey@rodgersleask.co.uk
07808714152

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Civil | **Structural** | **Geo-environmental** | **Traffic & Transport Planning**

Disclaimer

Appendix L – Yorkshire Water Pre-Planning Sewerage Enquiry

YorkshireWater

Kriston Harvey
Rodgers Leask Limited
St James House
St Marys Wharf
Mansfield Road
DE1 3TQ
kriston.harvey@rodgersleask.co.uk

Yorkshire Water Services
Developer Services
Pre-Development Team
PO BOX 52
Bradford
BD3 7AY

Tel: 0345 120 8482
Fax:

Email:
technical.sewerage@yorkshirewater.co.uk

Your Ref:
Our Ref: W017743

For telephone enquiries ring:
Chris Roberts on 0345 120 8482

27th December 2020

Dear Kriston,

Land At Junction With Carr Road, Hollin Busk Lane, Sheffield, S36 1GH - Pre Planning Sewerage Enquiry U072385

Thank you for your recent enquiry and remittance. Our official VAT receipt has been sent to you under separate cover. Please find enclosed a complimentary extract from the Statutory Sewer Map which indicates the recorded position of the public sewers. Please note that as of October 2011 and the private to public sewer transfer, there are many uncharted Yorkshire Water assets currently not shown on our records.

The following comments reflect our view, with regard to the public sewer network only, based on a 'desk top' study of the site and are valid for a maximum period of twelve months:

YorkshireWater

Development of the site should take place with separate systems for foul and surface water drainage. The separate systems should extend to the points of discharge to be agreed.

Foul Water

Foul water domestic waste can discharge to the 225 mm diameter public foul sewer recorded in Carr Road, at a point to the north east of the site.

Surface Water

Please note further restrictions on surface water disposal from the site may be imposed by other parties. You are strongly advised to seek advice/comments from the Environment Agency/Land Drainage Authority/Internal Drainage Board, with regard to surface water disposal from the site.

Other Observations

Any new connection to an existing public sewer will require the prior approval of Yorkshire Water. You may apply on line or obtain an application form from our website (www.yorkshirewater.com) or by telephoning 0345 120 84 82.

An off-site foul and surface water sewer may be required which may be provided by the developer and considered for adoption under Section 104 of the Water Industry Act 1991. Please telephone 0345 120 84 82 for advice on sewer adoptions. Alternatively, the developer may in certain circumstances be able to requisition off-site sewers under Section 98 of the Water Industry Act 1991 for which an application must be made in writing. For further information, please telephone 0345 120 84 82.

Prospectively adoptable sewers and pumping stations must be designed and constructed in accordance with the WRc publication "Sewers for Adoption - a design and construction guide for developers" 6th Edition as supplemented by Yorkshire Water's requirements, pursuant to an agreement under Section 104 of the Water Industry Act 1991.

YorkshireWater

An application to enter into a Section 104 agreement must be made in writing prior to any works commencing on site. Please contact our Developer Services Team (telephone 0345 120 84 82) for further information.

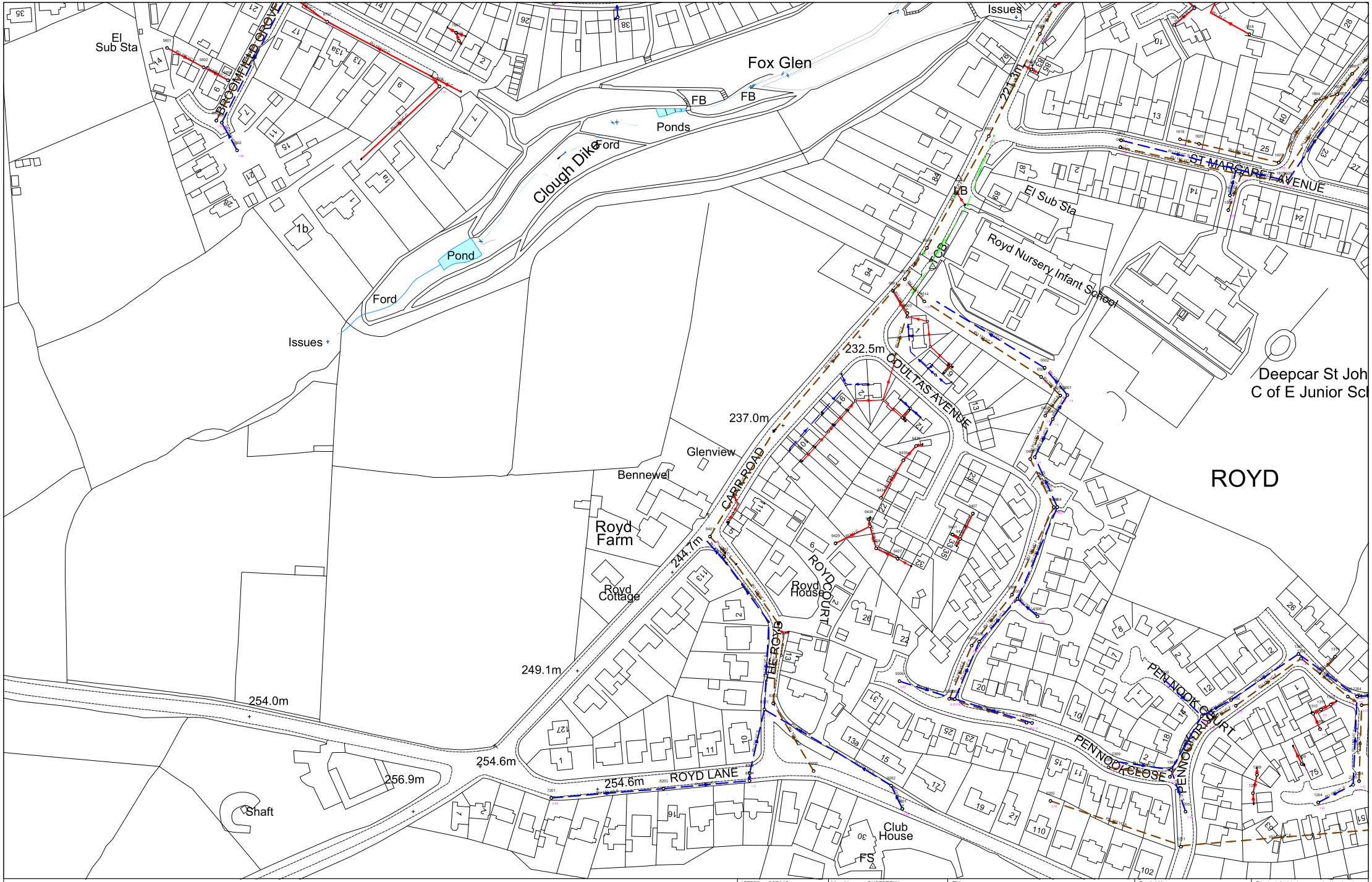
The site is within an area that may be affected by river, coastal or estuarine flooding. We would advise you to contact the Environment Agency for details.

All the above comments are based upon the information and records available at the present time and is subject to formal planning approval agreement. The information contained in this letter together with that shown on any extract from the Statutory Sewer Map that may be enclosed is believed to be correct and is supplied in good faith. Please note that capacity in the public sewer network is not reserved for specific future development. It is used up on a 'first come, first served' basis. You should visit the site and establish the line and level of any public sewers affecting your proposals before the commencement of any design work.

Yours sincerely

Chris Roberts
Development Services Technician

Appendix M – Yorkshire Water Sewer Records



427753 : 397413

Map Name : SK2797SW

Yorkshire Water,
PO Box 500,
Halifax Road,
Bradford BD6 2LZ
Contact Name :
YorMap Advisor C ROBERTS
Contact Tel : 87 2582

Title

Notes

Partial Key

Foul Sewer =3D F
Combined Sewer =3D C
Surface Water Sewer =3D SW
Trade Sewer =3D TD
Partially Separate =3D PS

Date Req : 27/12/2020, 16:08:14

Date Gen : 27/12/2020, 16:11:30

Source : Sewer Network Enquiry

UPN: Undefined

Originator: C ROBERTS, YorMap, 87 2582

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