Langtree PP and Panattoni

Six 56 Warrington

Amendment to Environmental Statement

Part 2 –Flood Risk & Drainage Technical Paper 3

Revision ~~E~~ F ~~09 October 2020~~ 14 October 2020

Revision Record

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1. Introduction

1.1. This document now constitutes part of an addendum to the Environmental Statement originally submitted to Warrington Borough Council (WBC) in March 2019 to accompany the outline planning application for warehouse development (Use Class B8 with ancillary B1(a) offices) and associated infrastructure at the Application Site referred to as Six 56 Warrington.

1.2. Since the submission of the planning application, consultation responses have been received from key consultees and further discussions have taken place with the Council and their key consultees (namely WBC Highway Officers, Highways England (HE) and their consultants Atkins, WBC Environmental Protection Officers, Historic England and WBC Conservation Officer and Ramboll landscape designers acting on behalf of WBC).

1.3. Further clarification and information has been provided in line with requests by HE and WBC Highway's Officer relating to the design of the mitigation and the WMMTM traffic model.

1.4. Environmental Protection have concerns with exposure to high noise levels that will be experienced at existing properties on Cartridge Lane and sensitive receptors within the site comprising Bradley Hall Cottages and Bradley View to potentially unacceptably high noise levels, even with mitigation in place, based on the worst case estimates of the proposals as illustrated on submitted masterplan and parameters plans.

1.5. Landscape Consultants Ramboll's acting on behalf of the Council have also recommended further supplementary information, including an assessment of potential effects on the visual amenity of properties in the vicinity, in order to provide greater transparency to the LVIA and its findings and to aid WBC in its determination of the application.

1.6. Consequently, the indicative masterplan and parameters plans have evolved to address comments raised by these key consultees and reduce the noise impacts on sensitive receptors within the site with realignment of estate roads. Further assessments have also been undertaken in respect of noise and vibration and landscape and visual impacts and cultural heritage. This addendum therefore includes additional and updated information to address the comments raised by key consultees. Part 2 of this addendum includes addendums to the following technical papers:

- Traffic and Transportation

- Water Quality and Drainage
- Landscape and Visual Impact
- Ecology and Nature Conservation
- Socio-Economic
- Noise and Vibration
- Cultural Heritage

1.7. This addendum should however be read in conjunction with the original ES submitted to WBC in April 2019 as the other technical papers (Ground Conditions and Contamination; Socio-Economic, Air Quality, Utilities, Energy, Waste and Agricultural Land and Soils) have not been amended or subject to change and as such are not included within this addendum, but still remain valid and still form part of the ES for the planning application. See Appendix 18 of the ES Part 1 Addendum which provides Consultants confirmation that there are no changes to the significance of impacts in the Ground Conditions and Contamination; Air Quality, Utilities, Energy, Waste and Agricultural Land and Soils Technical Papers arising from the updated project description presented in this ES Addendum.

1.8. In order to make the addendum more understandable and to avoid extensive cross referencing, changes have been integrated within the original text of this technical paper to form a single addendum to the ES. Wherever changes or additions have been made to the text of the original technical paper, the text has been underlined and anything that is no longer relevant or valid has been struck through but retained within the text. A log is also included within Appendix 3.3 of this technical paper addendum so that the text to be removed (i.e. the text struck through within the paper) is identified and a reason for its removal provided.

1.9. Cundall have prepared this Addendum Technical Paper on Flood Risk and Drainage on behalf of Langtree PP and Panattoni.

1.10. The Addendum Technical Paper identifies how the proposed Development may impact local water resources, the surface water regime and flood risk.

1.11. An updated Flood Risk Assessment and Drainage Strategy (FRA) have also been prepared and this can be found within Appendix 3.1. The findings of this report form the basis of the environmental assessment.

1.12. From the identified baseline, the potential impact has been identified and the effects that may occur as a result of the proposed Development have been assessed. The detailed assessment

has, where required, recommended mitigation measures to reduce any adverse effects of the Development.

1.13. Impacts from and to the proposed Development have been considered. These include the capacity of receiving waters or infrastructure, water quality, fluvial impact, pluvial impact and groundwater impact.

1.14. The assessments are in accordance with National Planning policy (the Framework) and the Local Authorities Local plan and Core Strategy. Reference will also be made to the local Strategic Flood Risk Assessment (SFRA) and other local drainage and flood guidance documents of Warrington Borough Council (WBC) to identify any wider risks.

1.15. The Lead Local Flood Authority (LLFA), the Environment Agency (EA) and United Utilities (UU) have been consulted as part of the scoping and assessment process for this Environmental Statement (ES).

1.16. The Addendum Drainage & Flood Risk Paper links closely with Technical Paper 1: Ground Conditions and Contamination with regard to water resources and quality through the ground and provides more detail on geology and make up and should be consulted for further information and detail.

1.17. The Addendum Ecology and Nature Conservation Paper 5 should also be read in conjunction with this Paper with regard to hydrogeological and water body items.

2. Documents Consulted

2.1. The following documents were consulted as part of the assessment;

- National Planning Policy Framework (The Framework), 2018
- Flood risk and coastal change Planning Policy Guidance, published 6 March 2014
- Climate Change Planning Policy Guidance, published 12 June 2014
- Water supply, wastewater and water quality Planning Policy Guidance, published 23 March 2015
- Sustainable drainage systems: non-statutory technical standards Guidance by Department for Environment, Food and Rural Affairs (DEFRA), Revision date: 23 March 2015
- Water Framework Directive, 23 October 2000
- Flood & Water Management Act (FWMA), 2010
- North West river basin district River Basin Management Plan (RBMP) by DEFRA, 2009, updated 18 February 2016
- Living on the edge, the Environment Agency (EA), 2016
- Building Regulations Approved Document H: drainage and waste disposal published 2015
- BS EN 752 (2017): Drain and sewer systems outside buildings
- Sewers for Adoption 6th and 7th Edition
- C753: The SuDS manual
- Warrington Borough Council SFRA – January 2008, (JBA Consulting, 2011)
- Warrington Borough Council SFRA, Volume 1 – SFRA Guidance Report – September 2011, (JBA Consulting, 2011)
- Warrington Borough Council SFRA, Volume 2 – SFRA Technical Report – September 2011, (JBA Consulting, 2011)
- Warrington Borough Council, Environment & Regeneration Surface Water Flooding Evidence Base – May 2012, (JBA Consulting, 2011)
- WBC Economic Regeneration, Growth & Environment, Warrington Preliminary Flood Risk Assessment 2017-2023 – May 2017, (JBA Consulting, 2011)

- Cheshire East Council SFRA. Final Report – August 2013, (JBA Consulting, 2011)

- Mid Mersey Water Cycle Study (Outline Phase). Final Report – April 2011, (JBA Consulting, 2011)

3. Consultations

3.1. The following table identifies all consultations and engagements that have been undertaken in preparation of the Technical Paper.

Theme / Issue	Date	Consultee	Method	Summary of Discussion	Outcome / Output
Storm Water Strategy	04-08-17	Lead Local Flood Authority (LLFA)	Following enquiries by Cundall (01-04-17), this was an email from Colin Ludden within the LLFA on 04.11.17.	After Cundall's outline of storm water strategy, the LLFA confirmed that if discharging to the river that greenfield runoff rates would apply at 5 l/s/ha and that the storm system would need to be designed to cope with the storm events outlined in the EA guidance and that all elements should be designed to relevant policies and other official guidance.	Outcome is that the Development should be designed in accordance with current national policies for storm water discharge, treatment and attenuation, including climate change and storm allowances. The impact of these requirements is addressed in the ES in terms of the impact to Site and from the Site.
Flood Levels	11-08-17	Environment Agency (EA)	Following formal applications by Cundall (01-08-17 & 03-08-17), this was an email from Claire Cooke of the EA on 11-08-17.	Flood levels attached. Confirmation that there are no records of flooding affecting the Site.	Confirmation that the river network does not flood the Site. This will not impact design proposals but will be covered in the ES as part of the overall flood risk analysis.
Sewer Plans	18-08-17	United Utilities (UU)	Following formal application for plans on the 11-08-17, plans were available to download on the 18-08-17 from the UU website.	Receipt of record plans that confirm there are no appropriate sewer assets in the immediate surroundings of the Site.	Option for foul discharge will have to be to the brook or pumped through an offsite sewer to a connection point to be agreed. Further liaison with UU and the EA on the option for foul discharge required with eventual option being included in the ES assessment.

Theme / Issue	Date	Consultee	Method	Summary of Discussion	Outcome / Output
EA Pre-Development enquiry	21-08-17	EA	Following formal applications by Cundall (01-08-17 & 03-08-17), this was an email from Steve Sayce of the EA on 21-08-17.	Formal pre-development response from the EA stating that the brook network to the south was a main river, the EA has discretionary powers to carry out works and that the proposed Development needs to ensure that access is provided to and along the banks. Permit will be required for any works within 8m of the top of the bank but that a permit would be unlikely for anything within the 8m strip that would affect access. Statement that the LLFA will be able to advise on discharge of storm water. Additional note on preference that foul should be to mains and it should be discussed further with Neil Finch for any watercourse option.	Development proposals to ensure adequate access to banks and that no proposals impede on the 8m strip and this will be addressed in the ES confirming no work zone. The LLFA need to be contacted with regard to storm water disposal. Neil Finch (Bradley Brook Officer) to be contacted to discuss alternative waste disposal.
UU Pre-Development enquiry	05-09-17	UU	Following formal application by Cundall for pre-dev enquiry (22-08-19), this was an email from John Lunt of UU on the 05-09-17.	Foul flows can be discharged to the 300 sewer in Old Cherry Lane (across the M6) and storm should go to soakaway or the adjacent watercourse.	Further investigation into available options and then liaison with both UU and the EA to come to a final solution.
Foul Discharge to Brook	12-09-17	EA	Telephone call between Lee French (Cundall) and Neil Finch (EA).	Discussed foul discharge option to Brook and Neil confirmed the EA have thresholds for when discharge can be made rather than look at an offsite connection. Lee confirmed that it was only optioneering at this stage and the reason for looking at the brook was that the only option on the table from UU was an M6 crossing which was not feasible.	Agreed that the EA would look at option if Cundall supplied scheme details and population numbers. Eventual discharge option will impact development proposals and the ES. Any scheme other than a brook connection will need to include a pumping station.
Foul Discharge to UU	14-09-17	UU	Email from Andrew French to UU on 14-09-17.	Outlining the complications and impractical solution that is the M6 crossing and enquiring whether there are any other more feasible options. Confirmation that storm would be going to the brook.	Awaiting UU's direction on the options. Eventual option to be addressed in the ES.

Theme / Issue	Date	Consultee	Method	Summary of Discussion	Outcome / Output
Foul Discharge to Brook	19-09-17	EA	Email from Neil Finch (EA).	Following submission of the scheme details by Cundall on email (18-09-17), EA confirmed that they would only consider an application for an Environmental Permit (and this discharge to the brook) if United Utilities categorically refused connection and even then, they could still decline. The EA expect UU to accommodate foul flows and will work with them if necessary. The EA also identified the potential sewer 1km to the south west as a feasible option and summarized they would support a permit to discharge to watercourse.	Places the emphasis wholly on a sewer connection with UU which requires approval from UU and would require a pumping station. The final option will be addressed in the ES.
Foul Discharge to UU	19-09-17	UU	Email from John Lunt (UU).	UU stating that the Client is to ascertain if another system exists as an option or agree with the EA to go to the brook.	Ongoing liaison.
Foul Discharge to UU	27-09-17	UU	Email from Andrew French (Cundall) to John Lunt (UU).	Request for UU to look further afield due to the impractical M6 crossing and the EA's confirmation that a permit would not be supported and that UU should identify an option.	Ongoing liaison.
Foul Discharge to UU	05-10-17	UU	Email from John Lunt (UU).	Confirmation that the 450mm public sewer in Grappenhall Lane would be most feasible point of connection for consideration.	Ongoing liaison.
Foul Discharge to UU	06-10-17	UU	Email from Andrew French (Cundall) to John Lunt (UU).	Request for additional record drawings and also outlining the new Warrington local plan to UU should they wish to consider this in the response for more strategic foul discharge options.	Ongoing liaison.
Foul Discharge to UU	12 & 18-10-17	UU	Email from John Lunt (UU).	Confirming that the point of discharge (alternative) would be to the 450 sewer in Grappenhall Lane, no connection to a rising main would be considered and that a formal application for plans through the formal process needed to be followed.	Ongoing liaison. Final solution will be included and addressed in the ES.

Theme / Issue	Date	Consultee	Method	Summary of Discussion	Outcome / Output
Foul Discharge to UU	21-11-17	UU	Telephone call with (Lee French – Cundall) and email from John Lunt (UU).	Cundall confirming that the asset plans had been received and that a 2.4km 20m lift would be required and requesting confirmation of approval to connect here and also any UU stipulations on the M6 option. UU confirmed acceptance of foul discharge point and noted that a reception chamber discharging by gravity at connection would be required and they would adopt the pumping station and rising main.	The scheme now has a verified foul connection discharge point approved by UU.
ES Scoping Consultee response	16-03-18	WBC LLFA	Formal EA Scoping Response (2018/32281)	WBC Asset and Flood Risk Team outlined their satisfaction of the Drainage and Flood Risk proposal	The ES Technical Chapter and outline design will be developed in line with comments received.
ES Scoping Consultee response	28-03-18	EA	Formal EA Scoping Response (SO/2018/118062/01-L01)	The Site is in a relatively sensitive location as it has and adjoins watercourse and waterbodies, as well as being sited above a Secondary Aquifer. The presence of agricultural buildings and the existing land uses may pose a low but potential risk of contamination of groundwaters. The Site is sited in Flood Zone 1. There are two Main River at and near the southern boundary of the Site. Any works within 8m of the top of the bank of the river will require a permit application to the EA. The EA have no objections to the outline drainage strategy as far developed. The EA are pleased to see the inclusion of SuDS within the proposal. These can be used to enhance biodiversity and should include options such as retention ponds, reed beds, wetlands and swales. The watercourse should have nothing done to it that would cause deterioration. The watercourse is targeted to reach 'good ecological potential and the Development should not affect the potential to do so, and assess opportunities to improve the watercourse or remove redundant modifications.	The ES Technical Chapter and outline design will be developed in line with comments received.

Theme / Issue	Date	Consultee	Method	Summary of Discussion	Outcome / Output
ES Scoping Opinion	06-04-18	WBC Planning	ES Scoping opinion response from WBC (2018/32281)	WBC Planning re-affirmed the Consultee responses above	The ES Technical Chapter and outline design will be developed in line with comments received.

Table 3.1: Summary of Consultations and Discussions

4. Methodology and Approach

4.1. The ES assessment has been undertaken in accordance with the requirements of the Framework and assesses flood risk to and from the proposed Development in addition to any water quality changes. It also includes mitigation measures provided by the proposed drainage strategy which has been designed and detailed in accordance with the LLFA requirements.

Receptors

4.2. The receptors identified as susceptible to potential impact from the Development are the receiving waters and sewers for the drainage and water quality and adjacent neighbourhoods for flood risk, all within the local area as shown on the Receptor Plans in Appendix 11 of the ES Part 1 Report.

Designation	Receptors
International	None
National	None
Regional	None
County	None
Borough / District	Bedrock Aquifer, Superficial deposits Aquifer,
Local/Neighbourhood	United Utilities sewers, Bradley Brook, Bradley Brook Tributary, existing ponds, groundwater regime, Bradley Gorse, motorways, adjacent roads, Bradley Hall Cottages, Bradley View, scheduled monument (Bradley Moat), construction operatives, site users

Table 3.2: Receptors

Environmental Impacts

4.3. The below table outlines the definition of the magnitude of environmental impact in relation to Flood Risk and Drainage effects.

Magnitude	Environmental Impact
Substantial	A very large change in water quality which could result in exceedance of statutory objectives and/or breaches of legislation A substantial change to flood risk off site resulting in the flooding of properties A substantial change off site resulting in improving flood risk
High	A large change in water quality within 1000m of the Site A large change to flood risk off site resulting in the flooding of properties A large change off site resulting in improving flood risk
Moderate	An intermediate change in water quality within 500m of the Site An intermediate change to flood risk to properties or infrastructure off site An intermediate change off site resulting in improving flood risk
Minor	A small change in water quality within 100m of the Site. A small change to the flood risk within the Site boundary A small change on site resulting in improving flood risk
Negligible	No noticeable change in water quality / flood risk
Neutral	No detectable change in water quality / flood risk

Table 3.3: Environmental Impacts

Significance of Effects

4.4. The significance of effect is determined using the significance matrix in Section 6 of the Environmental Statement Addendum Part 1 Report. This identifies the receptor level across the top of the matrix and the magnitude of environmental impact down the side and where they meet within the matrix identifies the significance of the effect.

Impact Prediction Confidence

4.5. It is also of value to attribute a level of confidence by which the predicted impact has been assessed. The criteria for these definitions are set out below:

Confidence Level	Description
High	The predicted impact is either certain i.e. a direct impact, or believed to be very likely to occur, based on reliable information or previous experience.
Low	The predicted impact and its levels are best estimates, generally derived from first principles of relevant theory and experience of the assessor. More information may be needed to improve confidence levels.

Table 3.4: Confidence Levels

5. Baseline Information

5.1. This section sets out all of the baseline data that has been collected to inform the proposals and the assessment of the environmental impact of Drainage and Flood Risk.

5.2. All baseline data used within this assessment is referenced within the relevant Technical Report that has been produced alongside and to inform this Addendum Technical Paper. This report are outlined below.

5.3. The updated Flood Risk Assessment and Drainage Strategy (1015524-RPT-CL-002) is included in Appendix 3.1.

Existing Site

5.4. The Topographical Survey (ES Addendum Part 1 Report, Appendix 7) forms the basis of the existing features and levels of the Site has been used as the basis of development. This has enabled locations of existing drainage to be verified and existing flow routes to be identified.

5.5. The topography of the Site is generally flat with some minor undulation, gently sloping from the west of the Site towards the east and south-east at a general slope of 1 in 94. There is a fall of approximately 17.0m across the Site.

5.6. The natural course of Bradley Brook along the southern boundary of the Site forms the lowest elevation on the Site. It falls approximately 12.0m from west to east across the Site and has a depth of approximately 2.0-2.5m.

5.7. Bradley Brook originates at Barleycastle Lane to the west of the Site. The Brook flows from west to east until it enters a culvert beneath the motorway.

Flood Risk & Water Bodies

5.8. After passing beneath the motorway, Bradley Brook continues to Lymm Reservoir and Dam. From here it continues as Stillen Brook and Sow Brook before discharging into the Manchester Ship Canal.

5.9. There is currently no ratings available from the EA on the water quality within either Bradley Brook, Sow Brook or Stillen Brook.

5.10. A number of ponds can be found at the existing Site. These appear to be manmade or historically occurring depressions to aid in drainage. No positive outfalls have been found from these ponds.

5.11. A number of watercourses were encountered in and around Bradley Gorse (dense woodland to the south east of the Development Site). These watercourses appear to be part of the natural drainage system which eventually connects to Bradley Brook.

5.12. The Site sits within National Flood Zone 1 land and is not at risk of flooding from rivers or seas, as shown below in the Planning Flood Map taken from the Planning Service Website (gov.uk).

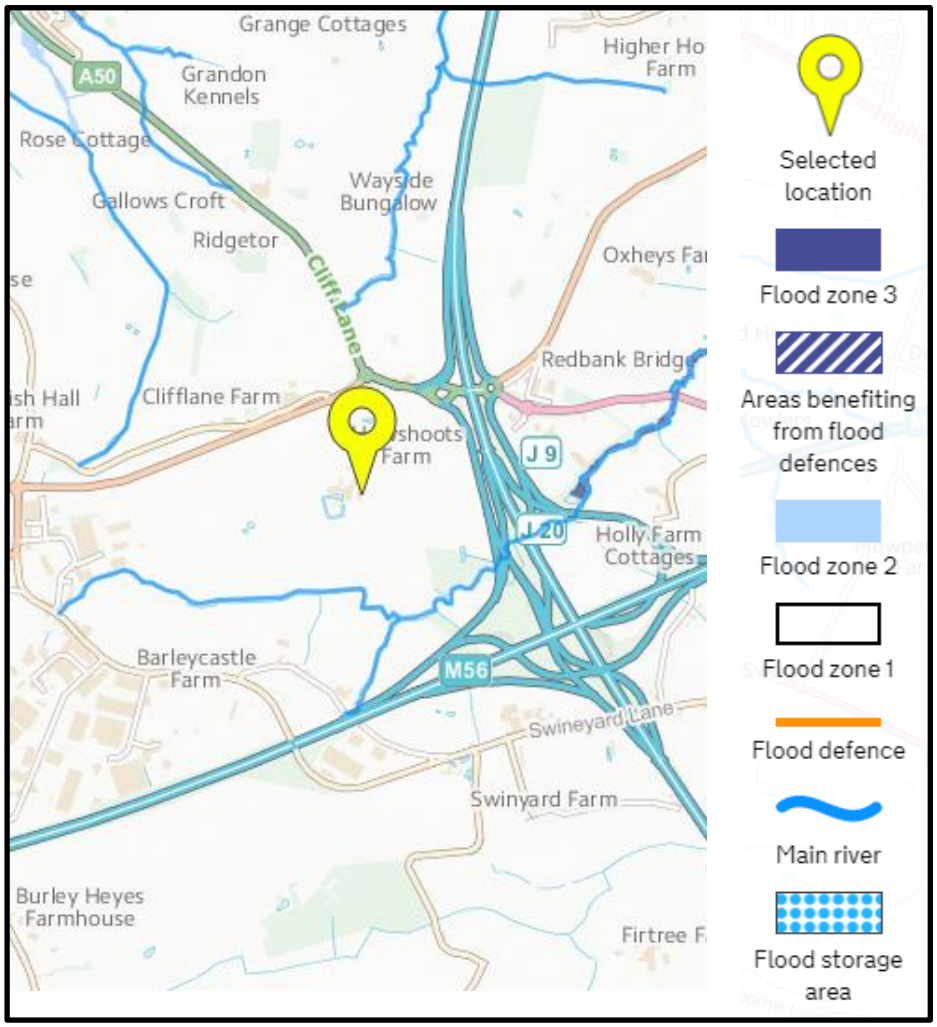


Figure 3.1: Flood Zone Map taken from Planning Service (gov.uk)

5.13. The flood risk to the Development Site from overland (surface water) flooding is deemed to be low. The image below shows the areas that are classed as low, middle and high flood risk from overland sources. Only isolated areas within the Development are highlighted due to localized low spots or existing water bodies. Bradley Brook and its tributaries (to the south) are shown to be high flood risk. This will not encroach on to the Development as the Brook will be at a substantially lower elevation than the adjacent development.

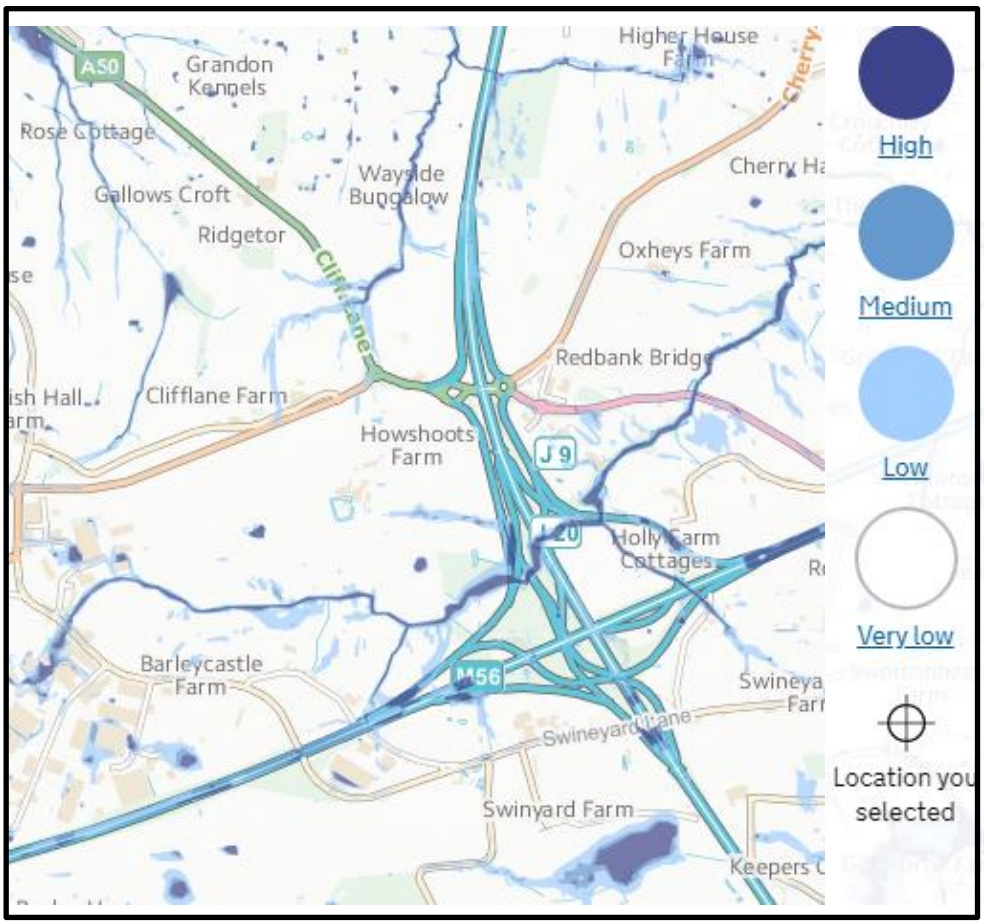


Figure 3.2: Flood Risk from Surface Water Map taken from Planning Service (gov.uk)

Drainage and Controlled Waters

5.14. There are no United Utilities assets within the Site boundary. United Utilities plans show combined and surface water sewers in the industrial area to the west and south-west of the Site and in the commercial/residential area across the M6 Motorway to the east. Existing United Utilities Sewer Plans can be found in the updated Flood Risk and Drainage Strategy document in Appendix 3.1.

5.15. Three Site outfalls were identified in which surface water flows are disposed of offsite. To the north-east a ditch taking flows from an unknown source is culverted beneath the B5356, It was observed that this ditch takes a small, unidentified foul flow. A second ditch was located to the north west and is assumed to be culverted beneath the B5356. The final outfall is where Bradley Brook meets the M6 and is culverted beneath it.

5.16. Pipework discharges into the Bradley Brook culvert and it assumed that this is the surface water drainage from the M6 Motorway above it. The B5356 is drained by gullies along it entire length along the northern boundary of the Site. It is unknown at this stage where these gullies discharge.

5.17. Due to access issues during a Site walkover it has not been possible to identify surface water discharge strategy at the existing properties. It is assumed at this time to be contained within the Site and either infiltrate or discharge naturally to one of the outfalls.

5.18. It was observed and informed during a Site walkover that the foul drainage to the agricultural and housing buildings drains to nearby cesspits which are routinely emptied by an external party. A single foul outlet discharges into the ditch to the north east of the Site.

5.19. No land drainage has been identified at this time and it is currently assumed that the existing ponds across the Site is the only form of agricultural drainage.

5.20. The overall existing drainage constraints plan (located within Appendix 3.1 as part of the Drainage Strategy) includes all elements of the above.

Hydrogeology

5.21. Geology is covered in more detail in the ES Technical Paper 1 – Ground and Contamination. Items related to drainage, flood risk and water quality are covered here.

5.22. The underlying bedrock at the Site has been identified as a Secondary B aquifer. The superficial deposits are currently classified as a Secondary (undifferentiated) aquifer.

5.23. The bedrock is expected to have poor ground water flow characteristics, limiting the rate at which groundwater could move.

5.24. Groundwater monitoring results indicate the presence of groundwater between 0.1 and 0.75m below ground level.

5.25. Infiltration testing had not yet been carried out at the Site. However, the Site has been identified as being in an area with a low suitability for infiltration. Due to this and the presence of shallow groundwater it is anticipated that soakaways will not be feasible.

6. Alternatives Considered

6.1. A number of considerations have influenced the evolution of the Proposed Development as detailed below.

6.2. More traditional drainage methods were considered but the inclusion of proposed Sustainable Urban Drainage Systems (SuDS) have been specified to achieve higher levels of water quality and treatment for stormwater following investigation into the wider area.

Similarly, more traditional methods of road drainage were considered, such as gully to pipe or kerb drain to pipe to underground structure or even a free-flowing infrastructure. However, as stormwater detention basins, ponds and swales have been included wherever space permits, some areas of traditional road drainage will not be required. Instead stormwater will be able to discharge directly into swales, ponds and attenuation basins to improve water treatment. This is an improvement on standard schemes that may only concentrate on plot developments (future reserved matters/detailed applications by building parcel). This was influenced by the investigation into the wider area, including the local flood risk and guidance document as well as LLFA and EA expectations.

6.3. The existing uncontrolled foul discharge into the ditch in the north east of the Site and the cesspits at the agricultural and housing buildings will be designed out. The remaining foul water drainage around the existing properties will be left unaffected by the Development.

6.4. The natural collection of surface water in the existing ponds will continue in cases where they are retained.

6.5. Consideration of the drainage strategy for the site meant that any disturbed existing pond within the application boundary would be replaced, at a rate of 2 for 1, for water body loss mitigation and to provide enhanced habitat for Great Crested Newts and other wildlife.

6.6. By reducing the Development to greenfield runoff rates, the existing surface water flow rate off site will be maintained.

7. Potential Environmental Effects

7.1. The following section looks at the potential environmental effects from the Development Site in both the construction and operational phase. The potential risks are identified below.

Construction Phase

7.2. The following are potential environmental impacts from the construction phase that have been assessed.

7.3. Groundwater ponding from large excavations during construction causing flood risk and potential pollutant pathways from construction activities.

7.4. Storm water flows overland during the installation of impermeable surfaces or removing topsoil and vegetation prior to installing storm water drainage connections, attenuation or a live connection, creating a potential flood risk and pollution pathway during the works although only temporary so likelihood is low.

7.5. Due to potential existing live drainage pipes and tanks in the Development relating to the housing and agricultural building, flow routes may be cutoff temporarily during construction (note: these may be confirmed as redundant).

7.6. The existing cesspits serving the properties and agricultural buildings may be ruptured during construction works, creating a potential pollution pathway to the small watercourses.

7.7. The existing foul drainage serving the housing and agricultural buildings may be damaged during construction, causing a potential pollution pathway to the small watercourses.

7.8. Pollution of Bradley Brook or its tributaries by conveyed storm water with silt and sediment (dealing with solids with low settleability) from any potential spills during construction or any surface water flows.

7.9. Excessive ponding from intense storms increasing groundwater is only a temporary risk as likelihood of very severe storms during the period is reduced.

7.10. A foul rising main will be laid along Grappenhall Lane, from the development to the centre of Appleton Thorn village. There is no flood or pollution risk from these works. Potential traffic management, vibration and noise risks will be managed by the contractors CEMP.

These effects are summarized below with an assessment of their impact and significance.

Nature of Impact	Receptor	Environmental Impact	Significance of Effect	Confidence Level
Groundwater ponding in excavations causing flood risk	Local	Minor Negative	Minor Adverse	High
Increase in impermeable areas leading to increased flood risk	Local	Minor Negative	Minor Adverse	High
Existing flow routes cut off	Local	Moderative Negative	Minor Adverse	High
Existing cesspit tanks	Local	High Negative	Minor Adverse	High
Pollution to minor watercourses	Local	High Negative	Minor Adverse	High
Pollution through conveyed storm water with silt/sediment	Local	High Negative	Minor Adverse	High
Excessive ponding leading to raised groundwaters	Local	Moderative Negative	Minor Adverse	High

Table 3.5: Significance of Effect - Construction Phase

Operational Phase

7.11. The following are potential environmental impacts from the operation phase that have been assessed.

7.12. Risk of flooding to the Site from offsite sources from overland routes although this has been identified as low risk at the outset as detailed within the updated Flood Risk Assessment in Appendix 3.1.

7.13. Risk of flooding from the Site to offsite sources due to the increased development causing increased surface water runoff.

7.14. Future impact of climate change on increased storm events creating more intense rainfall periods with additional surface water to deal with.

7.15. Potential increase in flow to receiving waters from increased hard standing areas and newly generated waste.

7.16. Potential increase in pollutants to receiving waters from the new storm water system from the type of surfacing and operation in relation to water quality.

7.17. Potential increase in pollutants to the below aquifer in relation to water quality

7.18. The existing uncontrolled discharge of foul water to the ditch in the north east of the Site will be removed.

7.19. The removal of cesspits that serve the housing and agricultural buildings, which are known to have negative effect on local water quality.

7.20. The removal of agricultural waste and leachate potential due to the loss of farmland and associated storage.

7.21. Developing over a groundwater recharge zone which could limit the amount of water re-entering the ground and depleting resources although this has been assessed as baseline as having no effect due to the interconnectivity of the pathways and is expanded within the mitigation section (however no mitigation required).

These impacts are identified below with an assessment of their likely impact and significance of effect.

Nature of Impact	Receptor	Environmental Impact	Significance of Effect	Confidence Level
Overland flows originating offsite flooding the Site	Local	Moderate Negative	Minor Adverse	High

Nature of Impact	Receptor	Environmental Impact	Significance of Effect	Confidence Level
Increased development leading to increased flood risk offsite	Local	High Negative	Minor Adverse	High
Climate change impact on storm intensity	Local	High Negative	Minor Adverse	High
Increased storm and foul water flow to receiving waters	Local	High Negative	Minor Adverse	High
Increased pollution to receiving waters due to increased industrial surfaces	Local	High Negative	Minor Adverse	High
Potential pollutants to below underlying aquifer	Local	High Negative	Minor Adverse	High
Removal of existing uncontrolled drainage	Local	Moderate positive	Minor benefit	High
Removal of existing cesspits	Local	Moderate positive	Minor benefit	High
Removal of existing agricultural waste runoff	Local	High positive	Minor benefit	High
Developing over a groundwater recharge zone	Local	High Negative	Negligible	High

Table 3.6: Significance of Effect - Operation Phase

8. Proposed Mitigation

8.1. This section outlines the proposed environmental impact mitigation measures in the construction and operational phase to address the adverse impacts and their effects identified in the assessment within Section 7.

Construction Phase

8.2. All of the mitigation measures to be put in place during the construction period will be provided through the FCEMP (Framework Construction Environmental Management Plan) with Section 4.8 identifying Hydrogeology and Hydrology mitigation. The FCEMP is included in Appendix 9 of the ES Addendum Part One Report.

8.3. All large and deep construction excavations should be avoided as far as possible. Where this is not possible, they should be covered, especially in periods of heavy rain. As a last resort, they should be managed in accordance with Pollution Prevention Guideline (PPG) 5 and potentially pumped out under controlled fashion as outline in Section 4.8 of the FCEMP. No connection from excavations should be made to the watercourse unless treatment processes are put in place.

8.4. Haul roads or matting should be provided as part of the construction works to prevent consolidation of the Site, which will reduce permeability and increase runoff but will limit the amount of disturbed sediment/soils from reaching surface waters.

8.5. Should waters onsite be found to be polluted, treatment may be necessary before disposal and this should include settlement of solids in a lagoon, removal of hydrocarbons through interceptors and other treatment techniques to be developed in the FCEMP or part of the environmental management plan on site. In accordance with the FCEMP, oil spill skits are to be based at the construction compound as well as being carried with all site plant and vehicles.

8.6. A portion of surface water attenuation should be developed prior to increasing the impermeable area, where necessary, to utilize as storage. Water management on site is to be in accordance with PPG5.

8.7. A suitable surface water management system should be developed as part of any construction plans which should include the use of temporary drainage where required.

8.8. If existing live flows (that are required to be retained) are to be cut off by the works (either overland or underground) temporarily these are to maintained in a like for like scenario without hindering the course of flow or adding to it. This will be closely linked to the proposed detailed design for retention of any existing flow conveyance routes.

8.9. The cesspits serving the housing and agricultural buildings will be emptied completely prior to removal. Temporary measures to collect the flows to these cesspits will be required prior to picking the flows up with the new drainage.

8.10. Based on walkover observations there are existing drainage connections to the ditch in the north east, ditch in the north west and Bradley brook. During construction, existing flows and connections may need to be retained until construction is complete. The existing drainage systems are not to be used to discharge newly generated site runoff during construction without the required treatment to prevent any potential pollution to the receiving waters.

8.11. Potential pollution spills should be managed and monitored in accordance with the FCEMP. This should include providing bunds around at-risk areas, particularly handling oils and fuels and these areas should be isolated and away from potential water pathways

8.12. Disturbance of ground should be limited to works required for the permanent scheme, otherwise haul roads, lay down or matting should be used to prevent consolidation and increase potential runoff with silts/solids entering existing drainage pathways. Disturbance of ground through major earthworks should be planned, designed and phased to ensure that it is not a direct source for stormwater to convey silts/solids overland.

8.13. In order to minimise the risk of sediment on the construction site, vegetation should only be removed from areas that need to be removed and stockpiles should be seeded or covered.

8.14. Any drainage ditches, swales, ponds or basins to be excavated are to be sealed or finished immediately to prevent the conveyance of silts and solids to receiving waters.

8.15. Any vehicles accessing the Site and tracking through the disturbed ground are to be removed of potential debris that could pollute offsite waters prior to them leaving site. This should include a wheel wash facility to be detailed in the FCEMP and should be located away from potential water pathways. As outlined in the FCEMP, Section 4.8, wheel Washington facilities will be located a minimum of 30m from the watercourses and drainage sources.

8.16. All works should follow the EA's Pollution Prevention Guidelines.

8.17. If any waters onsite are known to be polluted, treatment may be necessary before disposal to the surface water receptor. Treatment should include settlement and separation in accordance with the FCEMP and PPG.

8.18. The potential ponding of temporary excavations should be dealt with as detailed above in relation to restricting and sealing earthworks and therefore will be minimal. However, where collection of water is inevitable, due to the procedures put in place this will have no impact to the receiving waters.

8.19. Any works that are planned to take place within 8m of Bradley Brook, an EA Main River, will require to be done under permit from the EA.

Operational Phase

8.20. Flooding from all offsite sources has been reviewed as part of an updated Flood Risk Assessment (located within Flood Risk Assessment and Drainage Strategy, Appendix 3.1). Flooding from all offsite sources was found to be low risk and no mitigation is required.

8.21. Potential flooding from the Development Site was also reviewed as part of the updated Flood Risk Assessment (located within Appendix 3.1) and was found to be low risk when assessed with the proposed drainage mitigation which includes the restriction of storm water flows and attenuation to extreme storm periods.

8.22. The proposed updated Drainage Strategy (Appendix 3.1) outlines the mitigation measures included in restriction and attenuation to reduce offsite flood risk to low levels providing minor betterment to the existing situation.

8.23. The increased impermeable/developable area is to be drained via a new foul and storm water system and conveyed to new outfalls detailed below.

8.24. The foul water network has been sized and designed to accept all flows from the proposed Development Site in accordance with Sewers for Adoption, and conveyed to a purpose-built pumping station within the Development. The pumping station will discharge to a United Utilities foul sewer west of the Site in Appleton Thorn village. This has been agreed with United Utilities (correspondence included within the updated Flood Risk Assessment in

Appendix 3.1) who have confirmed that their system can accommodate the proposed flows. It is United Utilities responsibility to ensure that their waste water treatment works has the capacity to accept these flows.

8.25. The storm water network has been sized and designed to accept all flows from the proposed Development Site with additional flood protection including climate change allowances. The system has multiple new discharge locations to Bradley Brook at a restricted rate of discharge (Greenfield Runoff Rate).

8.26. The storm water design is in accordance with the LLFA Flood Risk/Drainage design guidance and the Framework, with requirements set out in the next paragraphs.

8.27. The limited storm water discharge will reduce flood risk offsite from the Development Site.

8.28. In order to provide flood risk protection to the Site and to the surrounding neighbourhood to manage the limited storm water discharge, onsite attenuation will be provided both in the main infrastructure and within the plots. This will be to the required return periods as required by the LLFA including allowances for climate change in accordance with the Framework. All storm water flows for the 1 in 30 year storm events will be contained below ground with all flows for the 1 in 100 year events plus climate change allowance of 40% being contained safely within the site boundaries overland and/or underground.

8.29. Proposed detention basins, ponds and surface water features are included within the scheme as part of the proposed development stormwater attenuation requirement.

8.30. All new impermeable surfacing (roads, car parks, roofs etc.) will be drained to the new storm water drainage network and conveyed to new outfalls to Bradley Brook. As part of the main network, Sustainable urban Drainage Systems (SuDS) have been included to improve water quality prior to the discharge to the receiving waters. SuDS will naturally filter the water and remove pollutants and solids prior to discharge.

8.31. Swales are proposed to drain the access road where levels allow. All impermeable areas from the proposed Development plots, along with the water from the main highway will then pass through detention basin or pond systems. In addition to this, on plot SuDS will be required for each development unit.

8.32. No infiltration is proposed to the sub-strata below due to the low permeability at the surface. As all developable/impermeable areas will be drained, treated and discharged Bradley Brook there will be no risk of pollution to the underlying aquifer.

8.33. Limiting re-entry of fallen stormwater onto the Development Site over the underlying aquifer and recharging the groundwater will have no adverse effect on the aquifer recharge. Areas of proposed landscaping will still slowly infiltrate to ground as they do now. Areas of new impermeable surfacing will intercept stormwater that previously discharged to ground although this will have a negligible impact on water resources as any rainwater will be collected and conveyed through SuDS infrastructure to an open discharge to Bradley Brook on the southern boundary of the Site which closely follows the regional groundwater regime. The brook lies 2.0-2.5m lower than the proposed Development existing and finished levels.

8.34. Existing uncontrolled drainage will be removed or where it is not possible to be removed, be incorporated into the proposed drainage system.

8.35. With Bradley Brook having a target river quality rating of "good" by 2027 in accordance with the River Basin Management Plans, the proposals should aid the process of improving/ not degrading the water quality with the mitigation measures identified above including new treatment and controlled discharge of storm water flows and newly conveyed foul and waste flows to the sewer network.

8.36. No works will restrict access to the banks of the Bradley Brook or its tributary and the responsibility for general maintenance responsibilities will lie with the Riparian land owner to further ensure the working condition. The riparian land owner and the responsibilities are outlined in the EA document Living on the edge (2016) and covered and included in the Drainage Strategy, Appendix 3.1.

9. Potential Residual Effects

9.1. The following tables show the residual significance of the environmental effect from drainage and flood risk post mitigation through both the construction and operational phase.

Potential Residual Effects – Construction Phase

9.2. The overall impact of the proposal in terms of Flood Risk and Drainage issues during the construction phase is highlighted in the table below:

Nature of Impact	Receptor	Environmental Impact	Significance of Effect	Confidence Level	Mitigation	Residual Significance of Effect
Groundwater ponding in excavations causing flood risk and potential pollutant pathway	Local	Minor Negative	Minor Adverse	High	Large holes avoided, covered then managed through PPG 5	Negligible
Increase in impermeable areas leading to increased flood risk	Local	Minor Negative	Minor Adverse	High	Temporary drainage install, attenuation install early	Negligible
Existing flow routes cut off	Local	Moderative Negative	Minor Adverse	High	Diversions to be put in place where required	Negligible
Existing cesspit tanks	Local	High Negative	Minor Adverse	High	Emptied and decommissioned with diversions put in place where required	Negligible
Pollution to minor watercourses	Local	High Negative	Minor Adverse	High	No untreated water to be discharged to watercourses (including treatment where required). Management of earthworks.	Negligible

Nature of Impact	Receptor	Environmental Impact	Significance of Effect	Confidence Level	Mitigation	Residual Significance of Effect
Pollution through conveyed storm water with silt/sediment	Local	High Negative	Minor Adverse	High	No untreated water to be discharged to existing systems (including treatment where required). Management of earthworks.	Negligible
Excessive ponding leading to raised groundwaters	Local	Moderative Negative	Minor Adverse	Excessive ponding leading to raised groundwaters	Earthworks, excavation, potential treatment and conveyance procedures as all above.	Negligible

Table 3.7: Residual Significance of Effect - Construction Phase

9.3. All impacts assessed have a negligible effect during construction phase considering proposed mitigation.

Potential Residual Effects – Operational Phase

9.4. The overall impact of the proposal in terms of Drainage and Flood Risk issues during the operational phase is highlighted in the table below including mitigation and residual effects:

Nature of Impact	Receptor	Environmental Impact	Significance of Effect	Confidence Level	Mitigation	Residual Significance of Effect
Overland flows originating offsite flooding the Site	Local	Moderate Negative	Minor Adverse	High	Preservation of existing open watercourses and drainage routes	Negligible
Increased development leading to increased flood risk offsite	Local	High Negative	Minor Adverse	High	All storm water conveyed, restricted, attenuated and controlled and afforded greater protection than the previous Site.	Minor Benefit

Nature of Impact	Receptor	Environmental Impact	Significance of Effect	Confidence Level	Mitigation	Residual Significance of Effect
Climate change impact on storm intensity	Local	High Negative	Minor Adverse	High	40% allowance to be made within the drainage system or overland storage.	Minor Benefit
Increased storm and foul water flow to receiving waters	Local	High Negative	Minor Adverse	High	Flows to be restricted to equivalent Greenfield Runoff from site to mimic undeveloped state (existing uncontrolled drainage connections removed)	Minor Benefit
Increased pollution to receiving waters due to increased industrial surfaces	Local	High Negative	Minor Adverse	High	SuDS treatment proposed including interceptors permeable paving, swales, ponds and detention basins to improve falling stormwater quality. Removal of existing leachate.	Minor Benefit
Potential pollutants to below underlying aquifer	Local	High Negative	Minor Adverse	High	All impermeable areas are to be treated and conveyed direct to the brook system.	Neutral
Removal of existing uncontrolled drainage	Local	Moderate positive	Minor benefit	High	None required.	Negligible
Removal of existing cesspits	Local	Moderate positive	Minor benefit	High	None required.	Negligible
Removal of existing agricultural waste runoff	Local	High positive	Minor benefit	High	None required.	Negligible
Developing over a groundwater recharge zone	Local	High Negative	Negligible	High	None required.	Negligible

Table 3.8: Residual Significance of Effect - Operation Phase

9.5. All impacts for the operational phase have been considered and with mitigation are assessed as having either no or negligible effect or a minor benefit.

10. Additive Impacts (Cumulative Impacts and their Effects)

10.1. For the purposes of this ES we define the additive cumulative effects as:

'Those that result from additive impacts (cumulative) caused by other existing and/or approved projects together with the project itself

10.2. The developments that are likely to have a cumulative impact when considered with the proposed Development have been scoped with the Local Authority and Key Consultees during the preparation of this ES (a full list is included within Section 9 of the ES Addendum Part One Report). The table overleaf includes the agreed list of cumulative developments that have been assessed in respect of Drainage and Flood Risk. These are als o shown geographically on the plan included at **Appendix 11** of the ES Addendum Part One Report. The developments which are not considered to influence the catchments and/or drainage infrastructure of the proposed development have not been included in the table.

No.	Cumulative Development	Details	Status	Justification for Inclusion in Cumulative Assessment
4	**Land off Barleycastle Lane, Appleton, Warrington** LPA Ref: 2017/31757 Liberty Properties	Full Planning application (Major) - Demolition of all existing on-site buildings and structures and construction of a National Distribution Centre building (Use Class B8) with ancillary office accommodation (Class B1(a)), vehicle maintenance unit, vehicle washing area, internal roads, gatehouse, parking areas, perimeter fencing, waste management area, sustainable urban drainage system, landscaping, highways improvements and other associated works. (Gross internal floor space of 56,197m², together with 1,858m² of ancillary office)	Refused Planning Permission by WMBC 14-11-2018. Decision subsequently appealed (Appeal Reference: APP/M0655/W/19/3222603) and considered at Public Inquiry. Decision pending following closure of Inquiry. New planning application submitted under Ref: 2019/34739 and granted planning permission at committee by WBC in July 2019. Referred to the SoS with decision pending.	**Potential relationship to Drainage and Flood Risk due to proximity and influence on related catchments and drainage infrastructure.**

No.	Cumulative Development	Details	Status	Justification for Inclusion in Cumulative Assessment
6	**Blue Machinery Ltd, Barleycastle Trading Estate, Lyncastle Road, Warrington, WA4 4SY** LPA Ref: 2016/28994	Full Planning Application for new industrial warehouse building for storage (replacing smaller storage building), single storey extension to existing building for further storage and two storey extension for additional office space, associated parking provision and landscaping. (1,699m2 new build, 180m2 and 265m2 extensions)	Application Approved 17-02-2017 (3 years to implement planning permission)	**Potential relationship to Drainage and Flood Risk due to proximity and influence on related catchments and drainage infrastructure.**

No.	Cumulative Development	Details	Status	Justification for Inclusion in Cumulative Assessment
7	**Land off Lyncastle Way, Barleycastle Lane, Appleton, Warrington, WA4 4SN** LPA Ref: 2015/25255 Morley Estates	Full Planning Application for industrial / warehouse development (Sui Generis) to facilitate a plant hire business with elements of vehicle / plant repair, servicing, maintenance and plant storage / distribution / parking and associated offices / welfare facilities, vehicular access via existing service road, acoustic bunding and fencing and other means of enclosure, soft landscaping, 36 car park spaces, fuel pumps (and associated underground tanks), vehicle / plant wash bay and sub-station (Resubmission of 2014/24618) (4,545sqm industrial warehouse building)	Application Approved 16-10-2015 (3 years to implement planning permission)	**Potential relationship to Drainage and Flood Risk due to proximity and influence on related catchments and drainage infrastructure.**

Table 3.9: Cumulative Development

10.3. Both Construction and Operational phases will be considered and the short, medium and long-term impacts assessed.

10.4. The Barleycastle Lane application lies adjacent the Site to the west on the opposite bank of Bradley Brook. The application area lies immediately south of the Appleton Industrial Park and shares a boundary of approximately 300m with the Site. The application area lies at a higher elevation than the majority of the Site however, the Bradley Brook between the areas will prevent surface water drainage or flood influences having an impact on the Site. The application area will have to restrict surface water discharge to the brook to greenfield runoff rates therefore will not have an increased impact on the brook. Additionally, the application will have to provide flood resilience in the design of the drainage system including attenuation, prevention of surface flooding up to the 1 in 30 year design storm event, prevent flood waters from leaving the site up to the 1 in 100 year design storm event, and provide resilience in the system for climate change. Further to this, the application site will have to provide systems to prevent pollution from entering the brook. The foul water drainage from the application area is to connect to an upstream section of the foul sewer which the Site will make use off.

10.5. The Blue Machinery application (No. 6) lies approximately 1km south-west of the Site, off Arley Road. The application relates to the alternation and redevelopment of an existing site in use for industrial applications. The application will have a similar impact to drainage and flood as the pre-application area so would have a negligible impact on the Site. The application area generally falls to the west away from the Site. The foul water drainage from the application area is to connect to an upstream section of the foul sewer which the Site will make use off.

10.6. The Land off Lyncastle Way application lies approximately 700m south-west of the Site. The application relates to development of an industrial warehouse and associate offices, yards and carparking on a brownfield site. The application area will contribute to Bradley Brook through a United Utilities surface water sewer but will have to restrict surface water discharge to greenfield runoff rates therefore will not have an increased impact on the brook. Additionally, the application will have to provide flood resilience in the design of the drainage system including attenuation, prevention of surface flooding up to the 1 in 30 year design storm event, prevent flood waters from leaving the site up to the 1 in 100 year design storm event, and provide resilience in the system for climate change. Further to this, the application site will have to provide systems to prevent pollution from entering the brook. The foul water drainage from the application area is to connect to an upstream section of the foul sewer which the Site will make use off.

10.7. The studied cumulative developments may have an impact on the receiving waters and sewers for the Development Site however, consultation and agreement with the EA, LLFA and UU have confirmed that capacity exists in the proposed receiving waters (Bradley Brook and the foul sewer system in Appleton Thorn) to accept the Development Site flows.

10.8. No other cumulative developments, as referenced in Appendix 11 of the ES Addendum Part 1 Report, have been considered as part of this Technical Paper as no additional pathway or relation in terms of Flood Risk and Drainage exists to or from the Development Site.

11. Conclusion

11.1. This Addendum technical paper has assessed the environmental impact of Flood Risk and Drainage which includes assessment of potential water quality.

11.2. The assessment concludes that the proposals have no negative impact on the environment and generally through the operational phase will have a minor benefit due to removal of existing cesspits and uncontrolled drainage. Flow restrictions and treatment measures will be put in place as part of the new drainage infrastructure.

11.3. The Site is located within National Flood Zone 1 land, land at low risk of flooding from rivers or the sea. The proposed Development has also been assessed as low risk of flooding from all sources including overland, drainage, groundwater and infrastructure.

11.4. Due to the controlled proposed drainage system with flow restrictions and water storage, the risk of offsite flooding is low.

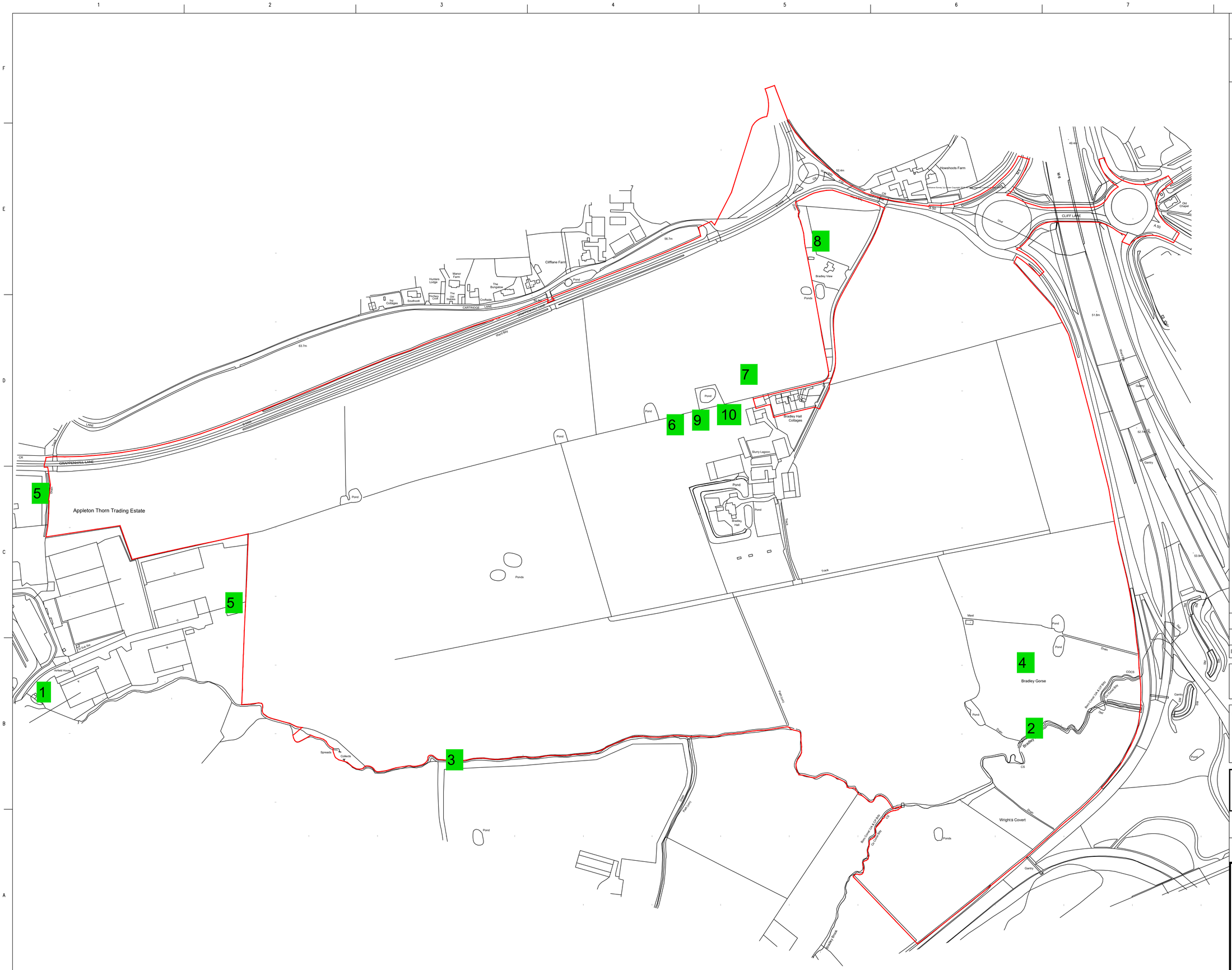
11.5. Existing overland flow routes have been incorporated into the operational phase design, reducing the impact on the surface water runoff regime.

11.6. Potential pollutant linkages were identified to receiving waters and the below ground aquifer. Through the construction process these can be managed to ensure no adverse environmental impact. In the operational phase, the proposed drainage system provides levels of natural treatment through SuDS such as swales, ponds and detention basins to increase water quality prior to the sole discharge points to Bradley Brook.

11.7. The below ground aquifer is protected by potential polluted waters by the interception of the drainage system and the result of this interception on any loss of groundwater recharge is assessed as negligible.

12. Appendices

Appendix 3.1 – Drainage and Flood Risk Receptor Plan



1015524	A1

Based on.

Architects Drg No.	Rev
Structural Drg No.	Rev
Survey Drg No.	Rev
Other Drg No.	Rev
Other Drg No.	Rev

Notes

ID	RECEPTOR
1	UNITED UTILTIES SEWERS
2	BRADLEY BROOK
3	BRADLEY BROOK TRIBUTARY
4	BRADLEY GORSE
5	ADJACENT SITE
6	GROUNDWATER
7	BRADLEY HALL COTTAGES
8	BRADLEY VIEW
9	SITE USERS
10	CONSTRUCTION WORKER

Issue	Date	Description	By	Chkd	Verfd
A	06/02/19	RED LINE UPDATED	RB	MH	GC
-	27/11/17	RED LINE UPDATED	JA	LF	LF

Project
SIX:56 WARRINGTON

Client
LANGTREE / FIRST INDUSTRIAL

Architect
STEPHEN GEORGE PARTNERS

Title
DRAINAGE AND
FLOOD RISK RECEPTOR PLAN

Drawing No.	Drawing Status
CLXX(52)0001	INFORMATION
Job No.	Scale
1015524	NTS

CUNDALL

4th Floor, Partnership House
Regent Farm Road,
Gosforth,
Newcastle, NE3 3AF
Telephone: +44 (0)191 213 1515

Website: www.cundall.com

True scale at 1:1

Appendix 3.2 – Updated Flood Risk Assessment and Drainage Strategy

Six 56 Warrington

Flood Risk Assessment and Drainage Strategy

Langtree PP and Panattoni

Job No:	1015524
Doc Ref:	1015524-RPT-CL-002
Revision:	F
Revision Date:	14 October 2020

Project title	Six 56 Warrington	**Job Number**
Report title	Flood Risk Assessment and Drainage Strategy	1015524

Document Revision History

Revision Ref	Issue Date	Purpose of issue / description of revision
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A	20 February 2019	*For comment*
B	26 February 2019	*For comment*
C	13 March 2020	*For comment*
D	20 March 2020	*Revised for ES Addendum*
E	09 October 2020	*Appendix F & K Updated*
F	14 October 2020	*Appendix D Updated*

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Signed by: Wilkins, Bill

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Verified by
Signed by: Wilkins, Bill

Executive Summary

This Flood Risk Assessment (FRA) & Drainage Strategy (DS) has been prepared for Langtree PP & Panattoni to support an outline planning application for the proposed Six 56 Warrington development, Grappenhall Lane, Warrington, WA4 4SL.

This report has been written to meet the requirements of a site-specific flood risk assessment in accordance with the National Planning Policy Framework (NPPF) and its associated Planning Practice Guidance (PPG).

The site is centred at Eastings 365675 and Northings 384515. The site is an irregular shape consisting of agricultural land, associated farm buildings, and woodland. It is bound by Grappenhall Lane and Cliff Lane to the north, the M6 motorway and M6 / M56 junction slip-lanes to the east, Bradley Brook to the south, and Appleton Industrial Park to the west. The site is currently in use as agricultural farmland. Bradley Hall Farm is located in the centre of the site; the farmhouse has a moat which is a scheduled monument.

The proposed development comprises of the construction of access roads with supporting services and infrastructure for future plot developments. The development, as illustrated on the masterplan, has been divided into 7 plots which will be developed under detailed reserved matters in the future, following the grant of outline planning permission. Access to and from the site is to be from two proposed roundabouts to be constructed on the B5356. Bradley Hall Farm and its associated moat will be retained as part of the development. The existing farms buildings to the north-east of the Farmhouse will be demolished. The remaining properties are outside the development boundary and will re-main untouched.

This FRA has identified a low risk of flooding from fluvial & tidal sources, surface water, groundwater, artificial drainage and infrastructure failure.

The proposed development lies within Flood Zone 1. There are areas approximately 230m to the north east of the development that are designated as being at a low, medium and high risk of flooding from Bradley Brook. These areas do not have any impact on the proposed redevelopment.

There are small areas at low, medium and high risk of surface water flooding within the site boundary. These are focused in 3 areas, Bradley Brook along the southern boundary, around an existing pond and at an existing low point in the road and fields to the east of the site. The proposed development will be a suitable distance away and height above Bradley Brook to ensure there is no risk of surface water flooding. The levels of the development will also ensure that these existing low points are removed and that if any surface water flooding did occur, it could reach Bradley Brook before reaching a plot FFL.

The development proposals comprise an increase in the impermeable area on site. However, the control of flow rates to greenfield rates, the introduction of a controlled surface water drainage system, surface water attenuation features(s) and SuDS features, where applicable, will ensure the drainage situation is not worsened from the condition presently found on the existing site.

The primary means of surface water discharge is proposed to be Bradley Brook along the southern boundary of the development. Foul flows will be directed to a pumping station and pumped to the nearest suitable foul sewer within Appleton village, at a point agreed with United Utilities.

The proposed drainage systems will be subject to a maintenance plan which should be carried out by an appointed management company. This will ensure maintenance of the infrastructure in the future.

Generally, with every development there are residual risks of flooding. With careful design and construction and by enacting regular inspection and maintenance of infrastructure, these risks can be minimised.

Under these conditions, the overall flood risk posed to the site is low.

It is recommended that the detailed drainage design is carried out in accordance with local authorities' requirements.

Contents

1.0 Introduction

1.1 Reason for report and planning context

This FRA has been prepared for Langtree PP & Panattoni to support an outline planning application for the proposed Six 56 Warrington development, Grappenhall Lane, Warrington, WA4 4SL.

This report has been produced to establish the risk of flooding to the development area and from the proposed development to the vicinity and to identify areas requiring further study, if any.

1.2 Scope of report

This report has been written to meet the requirements of a site-specific flood risk assessment in accordance with the NPPF paragraphs 99-104, and its associated PPG and includes the following:

An appraisal of the availability and adequacy of existing information on flood risk.

An appraisal of the flood risk posed to the site, and potential impact of the development on flood risk elsewhere.

An appraisal of the scope of possible measures to reduce the flood risk to acceptable levels, if necessary.

1.3 Policy review

1.3.1 National Planning Policy Framework (NPPF)

The government's national policy on development and flood risk is covered by the NPPF and the associated Planning Practice Guidance (PPG). The principal aim of the NPPF for flood risk is that:

"Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere" (Department for Communities and Local Government, 2018)

1.3.2 Development vulnerability classification

Table 2 of the PPG, enclosed in Appendix A (Department for Communities and Local Government, 2018) identifies the development vulnerability classification for various development types. The proposed development is to construct several storage & distribution units, which is classified by Table 2 as a '*less vulnerable development*'.

1.3.3 Sequential test

The sequential test aims to steer new development towards areas with the lowest probability of flooding. The sequential test matrix, enclosed in Appendix A (Department for Communities and Local Government, 2014), indicates 'less *vulnerable*' developments are appropriate in Flood Zones 1, 2, and 3a. The development lies within a Flood Zone 1 and consists of a red line boundary area of approximately 98.09ha. Not including any works to existing roads, there is a development area of approximately 91.50ha.

1.3.4 Exception test

An exception test is carried out where a development does not meet the sequential test categories, requiring a demonstration that the benefits of the development outweigh the flood risk. An exception test is not required for this development as no parts of the site lie within Flood Zone 3a.

1.3.5 Limitations

This report has been informed by a desk study of the site and surrounding area from sources as confirmed in references and appendices.

1.3.6 Significance criteria

Risk is defined as the combination of the impact and probability of a flood event. The following significance criteria has been used in this report to quantify the severity of flood risk. If any sources of flooding are deemed to pose anything above a low risk to the site, the location and severity of the potential flooding will be examined in more detail to determine whether this is an acceptable risk or whether mitigation measures will be required to ensure that the risk is reduced.

Table 1 Risk Assessment Matrix

RISK ASSESSMENT MATRIX	**Impact**			
Probability of Event ↓		**Low**	**Medium**	**High**
	Low	Low	Medium-Low	Medium
	Medium	Medium-Low	Medium	Medium-High
	High	Medium	Medium-High	High

1.4 Local literature & consultation

The development is predominantly located entirely within the Warrington Council boundary. A small section to the south east of the site, proposed for ecological mitigation, resides within the Cheshire East local authority boundary. The southern boundary of the development is along Bradley Brook which also represents the Cheshire East Council boundary. As the proposal for the surface water is to discharge into Bradley Brook the FRA will also look at Cheshire East flood risk assessment literature.

After flowing beneath the M6 motorway, Bradley Brook flows northwards to Lymm reservoir and dam. Following this it continues through Lymm until it discharges into the Manchester Ship Canal approximately 4.60km to the north from the development. The Ship Canal connects to the River Mersey at close proximity to this discharge point. Due to this, the FRA will also look at literature regarding the Mid Mersey Water Cycle.

1.4.1 Warrington Borough Council (WBC) SFRA – January 2008

The strategic flood risk assessment (SFRA) focuses assessment on potential areas for development within the borough. It also sets out the procedures to follow to assess the suitability of sites in terms of flood risk. The SFRA contains the following information of interest to this development:

- To understand fluvial flooding correctly, consideration should be given to controlling the effect of the Manchester Ship Canal (MSC). The MSC has considerable capacity and works in union with the River Mersey to convey flows. However, as it is a manmade structure, the canal's capacity is not considered in the EA flood maps and calculations for the area that were available at the time.
- JBA Consulting produced their own flood risk study maps to include the MSC. Both these and the EA flood risk maps are no longer available for this document. However, the report does discuss that there is a risk of fluvial flooding to the centre of Warrington from the River Mersey. However, this is predominantly caused by tidal effects.
- The development is located within the Lymm region of the borough, whilst discussing this region the document does not mention any significant risk of flooding from Bradley brook.

1.4.2 WBC SFRA, Volume 1 – SFRA Guidance Report – September 2011

This guidance report introduces the process of the WBC SFRA. The report focuses on how to put flood risk information in to practice and the level of detail required for specific site FRAs. As such it does not contain specific flood risk information or maps. However, it does contain a section discussing the Environment Agencies Catchment Flood

Management Plans (CFMP) which contains a map showing that the development is located in a Policy Option 4 area. The definition of Policy Option 4 is that any development should:

Take action to sustain the current scale of flood risk into the future.

1.4.3 WBC SFRA, Volume 2 – SFRA Technical Report – September 2011

Volume 2 of the SFRA contains the detailed flood risk information collected during the Level 1 and Level 2 assessment of the borough. The SFRA contains the following information of interest to this development:

- Historical records are limited for the area as the town only expanded significantly in the 1980s. The major historical flood events are concentrated around the River Mersey tributaries to the north of Warrington. This is because Warrington itself benefits from the MSC. Since the construction of the MSC, Warrington has not suffered from fluvial flooding.
- Critical drainage areas were identified and these all lay north and west of Warrington.
- The EA fluvial and tidal flood risk map now includes the MSC. The current maps represent an undefended scenario where all sluice gates along the MSC are closed. This increases the flood zone extents through Warrington.
- The fluvial & tidal flood risk map shows the land north of Lymm at risk of fluvial flooding from the MSC and large areas at risk of fluvial & tidal flooding throughout Warrington from the River Mersey.
- A Warrington Hazard mapping study was done to show the effect of flooding if all the MSC sluice gates were open. These maps only cover Warrington itself but show a reduced flood zone compared to the EA maps.

1.4.4 WBC, Environment & Regeneration Surface Water Flooding Evidence Base – May 2012

This document aims to provide evidence regarding the extent of surface water flooding across the borough. The conclusion for the area is that the ground rises south of the Mersey and does so at a gentle slope. This means that flooding from surface water running down flow paths in this area is not common. However, the flat nature of the ground means that in some locations it can be difficult for surface water to drain away effectively. This means that the micro-topography of individual developments and roads is deemed a significant influence in surface water flooding.

The document recommends that all developments control water at source with SuDS systems and also consider exceedance events to establish what flow-paths surface water may take.

1.4.5 WBC Economic Regeneration, Growth & Environment, Warrington Preliminary Flood Risk Assessment 2017-2023 – May 2017

This preliminary flood risk assessment (PFRA) document builds on the 2011 original. The aim of the PFRA is provide a high level overview of flood risk from local flood sources through a review of historic events and computer models. The PFRA contains the following information of interest to this development:

- The results of the 'communities at risk' analysis where the borough was divided into 1km square clusters to identify areas considered to be at high risk of flooding. 6 different clusters were identified, and these are all located in central Warrington or north of the Mersey.
- WBC have identified no incidents of historically significant harmful consequences of surface water or fluvial flooding. Although areas existing with a highwater table within the borough, there are no records of any groundwater flooding occurring. A map of historic flood events is provided and no events are shown in the vicinity of the development. (Although events may not be recorded due to the rural nature of the site)
- Due to the existence of many Victoria era combined sewers across the Borough there is a risk during larger storm events of the sewers becoming overloaded. A map is provided showing known areas where overloading has occurred is included and there are no records of it occurring in the vicinity of the development.
- Records of tidal flooding have been recorded since 1767. However central Warrington and the areas south of the River Mersey have benefited from the construction of the MSC and no tidal flooding has occurred in these areas since it's construction.
- Future flood risk is discussed, and EA flood maps are included. There are areas at low, medium and high risk of surface water flooding along the length of Bradley Brook and in the vicinity of the development. The risk of fluvial flooding from the River Mersey is considered low due to the MSC. However, there is a continued risk of flooding from tidal sources along the entire length of the River.

- The area around the development is considered susceptible to groundwater flooding. However, the PFRA concludes that this is highly unlikely in reality.

1.4.6 Cheshire East Council SFRA. Final Report – August 2013

This SFRA assess the risk levels from each source of flooding in the region with an aim of providing the information required to determine permittable development areas. The SFRA contains the following information of interest to this development:

- The main source of flood risk in the area is from main rivers and ordinary watercourses.
- Due to the flat topography of much of the region, surface water flooding is also an extensive risk. The area around Bradley Brook is shown to be at a low topography. The 1in200 year flood map included in the report shows that some shallow and deep surface water would occur in the vicinity of Bradley Brook. However, the majority of this is based around the M56 and M6 motorways.
- The area around Bradley Brook is located in a CFMP Policy 4 area. As this is an EA policy the definition matches Warrington and states that developments should:

Take action to sustain the current scale of flood risk into the future.

- Due to the rural nature of the area around Bradley Brook there are no historical records of property flooding in the vicinity of the Bradley Brook. However, some cases of 'non-significant historic flooding' have occurred in the vicinity of Bradley Brook.
- The area around Bradley Brook is deemed as susceptible to groundwater flooding which the SFRA states may reduce the effectiveness of SuDS systems or infiltration in this area.
- There was a recorded canal breach on the Bridgewater Canal to the north of the development in 1907 when the embankment failed through subsidence.
- A map of floodplains shows that there are no functional flood plains along the boundary with Bradley Brook.

1.4.7 Mid Mersey Water Cycle Study (Outline Phase). Final Report – April 2011

This report was produced to provide an overview on any constraints to development caused by the water cycle of the Mid Mersey region. As part of this it aims to identify where and when developments may overload existing infrastructure and whether new infrastructure of management interventions are required. The report contains the following information of interest to this development:

- There are no major constraints to growth in the Mid Mersey region but there are still a number of issues to address. The main issue being the capacity of the UU wastewater treatment works, with St Helens treatment works being the biggest concern.
- The report contains a flood risk map that divides the region into low, medium or high percentage of flood zone 3 locations. The development is located in an area with a low rating whilst Bradley Brook passes through an area with a medium rating.
- The report contains a map outlining the suitability for infiltration SuDS systems. The development is located in an area designated as having a low suitability.

1.4.8 Correspondence with Local Authorities

The development is in its preliminary stage, with the drainage methodology yet to be formalised. The drainage planning of the scheme will comply with the recommendations within the Warrington SFRA and in accordance with both the Technical Standards for Sustainable Drainage (DEFRA, 2015) and the NPPF. This will endeavour to minimise the immediate and cumulative impacts associated with flooding with respect to both the quantity and flow of the water.

The drainage scheme should incorporate sustainable techniques in line with the local authorities' core strategies as shown in Warrington's Flood Risk literature outlined and Environmental Assessment (LCC & EA, 2017). For greenfield sites the principle is to maintain the flow rate to greenfield runoff rates.

The drainage scheme should also consider the effects of climate change over the life of the development. The percentage factor used to account for climate change will be agreed with the local authority.

The LLFA have been contacted and have confirmed that the greenfield runoff rates will apply if discharging into Bradley Brook.

The EA have been contacted and have confirmed that Bradley Brook to the south is classed as a main river. As such access must be maintained at all times and permits will be required to work within 8m of the top banks. They have also stated that foul flows must discharge to sewers.

UU have been contacted and have confirmed that due to the difficulties crossing the M6 Motorway, a connection to the 450mm diameter sewer in Grappenhall Lane will be considered if a formal application is made.

A copy of the LLFA, EA and UU correspondence is enclosed in Appendix P.

1.5 Site overview

1.5.1 Existing site

The proposed Six 56 development is located at Bradley Hall Farm off Cliff Lane in the south-east of Warrington, WA4 4SL. The site is centred at Eastings 365675 and Northings 384515. The site is an irregular shape consisting of agricultural land, associated farm buildings, and woodland. It is bound by Grappenhall Lane and Cliff Lane to the north, the M6 motorway and M6 / M56 junction slip-lanes to the east, Bradley Brook to the south, and Appleton Industrial Park to the west.

The site is currently in use as agricultural farmland.

The site has vehicular access off Cliff Lane by a unadopted road. This provides access to the properties of Bradley Hall Cottages and Bradley View. There are four agricultural access routes off Grapenhall Lane to the farmland. A public right-of-way follows the private road to Bradley Hall Farm and continues to cross Bradley Brook, and on to Barleycastle Lane.

The total site area is approximately 91.5 hectares (not including any works to existing roads). Approximately 3.8 hectares of the site are wooded and approximately 1.2 hectares are occupied by the existing farm buildings and associated housing. A drawing highlighting the existing hardstanding area is enclosed in Appendix E.

A scheduled monument is located at the centre of the site. The Bradley Hall moat was scheduled in 1991 and remains waterfilled. The associated medieval hall has been replaced a number of times with a modern house now occupying the site.

An aerial photograph of the site is enclosed in Appendix B.

1.5.2 Surrounding areas

The immediate surrounding area could be considered open country side apart from the Appleton Industrial Park immediately to the west. The M6 and M56 are major features of the local area with Junction 20 immediately to the east. The Warrington Lymm motorway services is located approximately 200m to the east. The Stretton Green and Appleton Thorn Trading Estate is situated approximately 400m to the south-west and Appleton Thorn village is approximately 1.3 km to the west. Lymm village lies approximately 4 km to the north-east and Warrington town centre lies approximately 6 km to the north-west.

The site lies on the south-eastern boundary of the Warrington Borough council area. The boundary of Cheshire East council area lies opposite Bradley Brook at the southern boundary.

1.5.3 Topography

The site is generally flat with some minor undulation, gently sloping from the west of the site towards the east and south-east. The natural course of Bradley Brook forms the lowest elevation on the site, with a ground level of 50.47 AOD. Where it is interrupted by the motorway slip-road, the brook has a channel level of 48.54m AOD as it enters the culvert passing under the motorway.

The highest elevation on the site, with a level 67.52m AOD, was recorded at the most western point next to the Industrial Park. The highest ground level next to Bradley Brook was recorded as being 62.32m AOD with a channel level of 59.65m AOD.

The ground levels increase at the southern tip of the site on the opposite side of Bradley Brook with the highest level of 56.62m AOD recorded at the southern most point.

Bradley Hall moat lies in a generally flat area of the site with ground levels of approximately 58.20m AOD. The channel level of the moat was recorded between 56.09m AOD and 56.66m AOD.

The site has a general slope of 1 in 94 from the highest to lowest ground elevation, with areas that are locally flatter or steeper.

A copy of the topographical survey of the site is enclosed in Appendix C.

1.5.4 Geology & hydrogeology

The ground conditions at the site have been studied in detail and can be assessed in report 1015524.RPT.GL.004 Interpretive Geoenvironmental Ground Investigation Report by Cundall. A summary of the ground conditions follows.

The entire site is covered by a thin layer of topsoil overlying firm to stiff glacial till, underlain by the bedrock of the Bollin Mudstone Member (red marl interbedded with evaporite deposits). Groundwater monitoring results indicate the presence of groundwater between around 0.10 and 0.75 m bgl (+53.66 and +66.37 m OD) within the upper profile of the Glacial Till deposits and topsoil.

The DEFRA Magic Map online resource record the underlying bedrock geology to be classified as a Secondary B Aquifer. The superficial deposits are classified as a Secondary (undifferentiated) Aquifer. No groundwater protection zones are indicated to be on site.

The DEFRA Soilscape is recorded as being slowly permeable, seasonally wet loamy and clayey soils.

A copy of the BGS and DEFRA maps for the site are enclosed in Appendix H.

1.5.5 Watershed & hydrology

Bradley Brook forms the southern boundary of the site originating at Barleycastle Lane approximately 350m west of the site. The photographs below show the brook, which flows in an eastern direction to the boundary of the site to the motorway slip-road. The brook was diverted for a short section during the construction of the motorway before entering a culverted section. The brook continues to the north-east towards Lymm village where it is interrupted by Lymm Dam. It continues as Stillen Brook and then Sow Brook before discharging into the Manchester Ship Canal (MSC).

Photographs showing Bradley Brook (and tributary)

The MSC lies approximately 2.9km north of the site originating in Manchester 18 km to the north-east, and outfalling to the Mersey Estuary 29 km to the west

The Bridgewater Canal lies approximately 1.7 km to the north passing through Lymm village and past Grapenhall village.

1.5.6 Existing drainage

A review of the existing drainage in the vicinity of the development has been carried out from plans provided by United Utilities (UU) dated 15.11.2017, enclosed in Appendix I. The plans show that there are no UU assets within the site boundary.

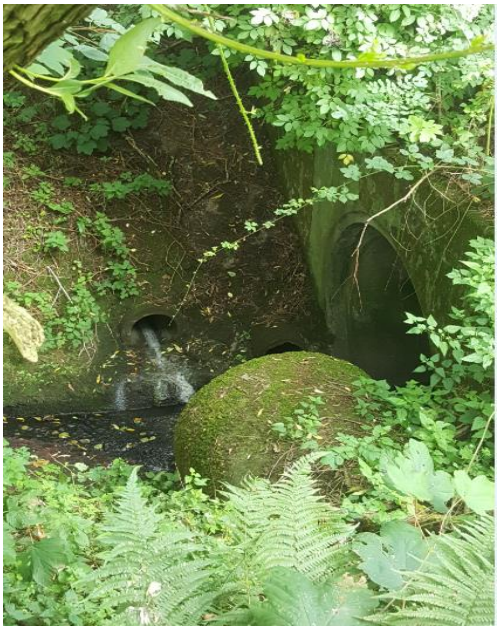
Site walkovers have identified three site outfalls in which surface water flows are disposed of offsite. In the north-east a ditch taking surface water flows from an unknown source is culverted beneath the B5356. The photographs below show this ditch which also has a connection from an adjacent property that appears to discharge foul flows.

Photograph showing surface water flow to the ditch (L) and additional connection from adjacent property appears to discharge waste to head of the ditch (R)

A second ditch was also located on the northern section of the western boundary of the site bordering the industrial area behind. A piped connection was noted into the ditch however no flow was observed. As per the photographs below, it is assumed this is then culverted across the highway (B5356) to the north although this could not be identified.

Photographs showing incoming connection to ditch (L) and ditch appearing to fall towards the northern boundary (R) but no culvert/outlet could be identified

The final outfall is where Bradley Brook meets the M6 and is culverted beneath it. An incoming connection discharges into Bradley Brook as per the photograph below and it assumed that this is the surface water from the M6 motorway above it.



Photograph showing incoming connections to Bradley Brook

A copy of the OS Water Network Lines map is enclosed in Appendix J.

Due to access limitations the surface water discharge strategy from the existing properties has not yet been identified. It is assumed at this time to be contained within site and either infiltrate or discharge naturally to one of the outfalls.

Foul drainage around the existing buildings was identified and was found to drain to nearby cess-pits which are routinely emptied by an external party. A single foul outlet was found to be discharging into the ditch in the north-east of the site.

1.5.7 Proposed development

The proposed development comprises of the construction of access roads with supporting services and infrastructure for future plot developments. The development is expected to be divided into 7 plots as shown on the illustrative masterplan enclosed in Appendix D. These will be delivered through separate reserved matters in the future, following the grant of outline planning permission.

Access to and from the site is to be from two proposed roundabouts to be constructed on the B5356.

Bradley Hall Farmhouse and its associated moat will be retained as part of the development. The existing farms buildings to the north-east of the Farmhouse will be demolished. The remaining properties are outside the development boundary and will re-main untouched.

The total hardstanding area of the development will be dependent on the layout of individual plots. The supporting infrastructure to the plots such as access roads and substations will have a total hardstanding area of 3.1ha. If the layout of all 7 plots remain as per the proposed illustrative development masterplan provided in Appendix D, the total hardstanding area for the development will be approximately 56.6ha (not including any work to the existing roads).

2.0 Flood Risk Identification

2.1 Fluvial & Tidal

The EA flood map enclosed in Appendix G.1 indicates that the proposed development lies within Flood Zone 1. Flood Zone 1 is defined as land with a low probability of flooding, i.e. land having less than 1 in 1,000 annual probability of river or sea flooding.

The EA Risk of flooding from Rivers and Sea map enclosed in Appendix G.4 shows that there are areas approximately 230m to the east of the development that are designated as being at a low, medium and high risk of flooding from Bradley Brook. These areas do not impact the site.

By reducing the development to greenfield runoff rates, it will ensure that flooding around Bradley Brook does not worsen. As discussed in section 1.4, the capacity of the MSC has helped to ensure that fluvial flooding is not a risk further downstream once the Brook discharges.

Due to the distance from the sea and River Mersey, there is no tidal influence on the site.

Assessment of Impact: **LOW**

Assessment of Probability: **LOW**

The overall risk posed to the site due to fluvial and tidal flooding is therefore considered **low.**

2.2 Surface water

The EA 1in1000 year flood map enclosed in Appendix G.6, indicates that there are areas of low, medium and high risk of surface water located within the site and around the boundary of the site. These are focused in 3 areas where steps will be taken to remove the risk:

- Bradley Brook along the southern boundary. The development buildings and associated hardstanding will be constructed several metres away from the brook and will slope down to the brook. This will leave the plots a minimum of 2.0m above the invert of the brook, limiting the potential for surface water to enter the development.
- The centre of the site around an existing pond. The existing pond will be removed as part of the development.
- A low point on the road and field to the east of the development. There will be a slope down from the nearest plot and associated hardstanding down to this low point. This will leave the nearest plot approximately 5.0m above the low point, limiting the potential for surface water to enter the development.

As discussed in section 1.4 there is a general risk of surface water in this area due to the relatively gentle topography. Following the recommendations of the 2012 WBC, Environment & Regeneration Surface Water Flooding Evidence report, careful consideration will be given to the micro topographies across the development. All external hardstanding areas will be sloped adequately to ensure there is no build-up of surface water on the development.

Ponds, basins and watercourses will be designed to allow the development to mimic the existing site topography and behaviour as far as possible.

Assessment of Impact: **LOW**

Assessment of Probability: **LOW**

The overall risk posed to the site due to surface water flooding is therefore considered **low.**

2.3 Groundwater

Groundwater flooding occurs when water levels in the ground rise above surface elevations. Groundwater flooding does not generally pose a significant risk to life due to the slow rate at which the water level rises.

Both the 2017 WBC PFRA and Cheshire East 2013 SFRA have located the site and surrounding area in a location susceptible to groundwater flooding. However, both conclude that there are no historical records of any ground water flooding occurring and that this is likely to be the case in the future.

This is confirmed by the Geosmart Groundwater Flooding Risk map enclosed in Appendix G.7 which shows the entire site as being located in an area of negligible risk.

Additional factors used to assess how the site would perform under ground water influence include the ground composition. The MagicMap of the development classifies the bedrock zone as a secondary B aquifer and the superficial deposits as a secondary (undifferentiated) aquifer. The bedrock is expected to have poor ground water flow characteristics, limiting the rate at which groundwater could move. The superficial deposit will require further testing in the future.

The proposed site does not include any basements and is predominantly covered in hard surfacing, limiting the potential for groundwater emergence.

Assessment of Impact: **LOW**

Assessment of Probability: **LOW**

The overall risk posed to the site due to groundwater flooding is therefore considered **low.**

2.4 Artificial drainage

2.4.1 Existing drainage

UU Sewers

According to the 2017 WBC PFRA there has been no historical flood incidents relating to UU in the vicinity of the site. The closest recorded incident was approximately 2.9km away in Lymm.

As discussed in Section 1.5.6, there are no records of any sewers within the site or at the immediate boundaries. The closest UU asset is a combined sewer located approximately 0.3km east of the site, on the other side of the M6 motorway.

Assessment of Impact: **LOW**

Assessment of Probability: **LOW**

The overall risk posed to the site due to existing artificial UU sewer flooding is therefore considered **low.**

Existing site drainage

A detailed underground utilities survey of the site has not yet been carried out. However, it has been observed and informed that the foul drainage to the farm, cottages and hall, all drain to nearby septic tanks which are routinely emptied by an external party.

The existing storm water drainage has not yet been identified due to access restrictions. At this time, it is assumed that all storm drainage is contained within the site and infiltrated through soakaways or natural pathways with eventual discharge to one of the site outfalls. Further investigation is required to verify existing routing and strategy when access is possible although due to the isolated nature of the properties this should have no impact on the new strategy for the development.

The provision of a new drainage system designed in accordance with local legislation, including attenuation and SuDS features, should pose no flood risk to the existing site drainage.

Assessment of Impact: **LOW**

Assessment of Probability: **LOW**

The overall risk posed to the site due to existing artificial drainage flooding is therefore considered **low.**

2.4.2 Proposed drainage

New drainage infrastructure will be installed to collect surface flows within the development. This will be discussed in detail in Section 4. The proposed surface water discharge rate will be maintained at the greenfield runoff rate for the entire development. The exact flow rate will be agreed with the Lead Local Flood Authority.

All modelling of the surface water system will include a climate change factor for extreme storm events, the value of which will be agreed with the local authorities. This has not been formally agreed but at this time a factor of 40% will be applied in line with Table 2 of the EA *Flood risk assessment climate change allowances* guidance.

The drainage hierarchy for surface water discharge is:

(1) Infiltration into ground
(2) Discharge to a surface water body
(3) Discharge to a surface water sewer
(4) Discharge to a combined sewer

Whilst there is limited potential, infiltration to the ground will be studied and subject to site confirmation testing. As the site is identified as being in an area with low suitability for infiltration and there is a presence of shallow groundwater it is anticipated that soakaways will not be feasible.

Assuming infiltration is not possible, all surface water from the development will be discharged, at greenfield rates, into Bradley Brook.

To contain the flood risk introduced on site by restricting the surface water discharge rate, surface water attenuation features will be provided. Where possible, the addition of SuDS features will be incorporated into the scheme, such as swales, basins and ponds.

Foul waters will discharge by gravity through a network of underground pipes. These will discharge to a foul pumping station located within the development. Foul flows will be directed to the nearest suitable foul sewer, at a point agreed with UU. The proposal at this stage is to discharge to the 450mm foul sewer in Grappenhall Lane to the west of the development.

The primary drainage and pumping station will be offered for adoption by UU and other systems that remain private will be subject to a maintenance plan which should be carried out by an appointed management company. This will ensure maintenance of the infrastructure in the future.

Assessment of Impact: **LOW**

Assessment of Probability: **LOW**

The overall risk posed to the site due to the proposed artificial drainage flooding is therefore considered **low.**

2.5 Infrastructure failure

2.5.1 Reservoir failure

The nearest area to be influenced by potential reservoir failures lies approximately 2.2km to the north east from the site at Lymm reservoir. Any flooding occurring here would fall north towards the MSC. Due to this topography the site is not considered to at risk from a reservoir failure.

Assessment of Impact: **LOW**

Assessment of Probability: **LOW**

The overall risk posed to the site due to the proposed reservoir flooding is therefore considered **low.**

2.5.2 Canal failure

The JBA Canal Failure map enclosed in Appendix G.8 shows that the site is not at risk from canal failure. There was a recorded canal breach on the Bridgewater Canal in 1907 when the embankment failed through subsidence.

The Bridgewater Canal is located over 20m lower than the site levels. Due to this topography the site is not considered to at risk from a canal failure.

Assessment of Impact: **LOW**

Assessment of Probability: **LOW**

The overall risk posed due to canal flooding is therefore considered **low.**

3.0 Flood Risk Analysis & Mitigation

3.1 Flood risk summary

A summary of the flood risks identified in Section 2 are shown in the table below.

Table 2 Risk Completed Assessment Matrix for the Site

RISK ASSESSMENT MATRIX	→ Impact			
Probability of Event ↓		**Low**	**Medium**	**High**
	Low	A, B, C, D, E, F, G, H, I		
	Medium			
	High			

Key:

A: Fluvial Flooding – (Section 2.1)

B: Tidal Flooding – (Section 2.1)

C: Surface Water/Pluvial/Overland Flow – (Section 2.2)

D: Groundwater Flooding – (Section 2.3)

E: Artificial Drainage: Existing Drainage: UU – (Section 2.4.1)

F: Artificial Drainage: Existing Drainage: Existing Site Drainage – (Section 2.4.1)

G: Artificial Drainage: Proposed Drainage – (Section 2.4.2)

H: Infrastructure Failure: Reservoirs – (Section 2.5.1)

I: Infrastructure Failure: Canals – (Section 2.5.2)

3.2 Mitigation measures

The site has a low risk of flooding from fluvial & tidal sources, surface water, groundwater, artificial drainage and infrastructure failure. No additional action is required to mitigate the risks posed from these sources.

The site is at medium risk from groundwater flooding. The mitigation factors that can be enacted to reduce the risk of flooding are discussed below.

3.3 Residual risk

Whilst the risk of flooding to the development is low it should be acknowledged that there is potential for residual risks. At this site, the residual risk comes from the failure or blockage of site drains and sewers or from burst water mains which cannot be predicted. By designing for the worst outcome, the potential impact of these risks can be mitigated. Endorsing regular inspection and maintenance regimes and careful working practices should reduce the potential of failures of infrastructure. The utilisation of building finished floor levels above the surrounding area will prevent inflow into the buildings.

During the design life of the development, potential changes to the climate could affect the operation of the drainage system. By implementing allowances for climate change within the design, extra capacity and a level of future proofing can be achieved.

3.4 Access & Egress

All the site roads and the surrounding public highways lie in a Flood Zone 1. Access and egress should be maintained at all times to the development. The proposed development shows two access points to the north onto the B5356 which will need to remain operational.

4.0 Proposed Drainage

This section of the report will provide information used in the development of the drainage design and the principles that were followed. The strategy uses sustainable principles and will aim to promote approaches in keeping with the nature of the existing site and current legislation.

This section should be read in conjunction with proposed drainage strategy drawing CLXX(52)0004 provided in Appendix K.

4.1 Design standards and guidance

As well as local literature referenced earlier in this report, other design standards, industry guidance, government guidance and literature are used in the development of this drainage strategy.

British Standards and European Norms (BS EN)

- BS EN 752: Drain and sewer systems outside buildings
- BS EN 12056: Gravity drainage systems inside buildings

Construction Industry Research and Information Association (CIRIA)

- C625: Model agreements for SuDS (2004)
- C753: The SuDS manual

Department of Communities and Local Government (DCLG)

- Building Regulations Approved Document H: drainage and waste disposal published 2010
- National Planning Policy Framework (NPPF) published 2018
- Flood risk and coastal change Planning Policy Guidance, published 6 March 2014
- Climate Change Planning Policy Guidance, published 12 June 2014
- Water supply, wastewater and water quality Planning Policy Guidance, published 23 March 2015

Department of Environment, Food and Rural Affairs (DEFRA)

- Non-Statutory Technical Standards for Sustainable Drainage – Practice Guidance published 2015

Water Research Centre

- Sewers for Adoption 6th Edition
- Sewers for Adoption 7th Edition

4.2 Proposed surface water drainage

All proposed drainage systems should give preference to the SuDS hierarchy, which sets out that schemes should aim to mimic natural drainage as closely as possible, and that discharge of surface runoff should be dealt with in the following ways in order of preference (Department for Communities and Local Government, 2014):

- Into the ground (infiltration)
- To a surface water body
- To a surface water sewer, highway drain, or another drainage system
- To a combined sewer

As discussed in Section 1.5.4 the site is located in an area of low suitability for infiltration and there is a presence of shallow groundwater. This means that infiltration is unlikely to be used as a point of discharge for surface water. This will be confirmed during the site investigation; however, it will not be used as the primary point of discharge in this strategy.

Following the hierarchy, Bradley Brook will be used to provide a primary discharge method for surface water.

Gullies will be used to drain the access roads across the site. Wherever possible these will connect directly to basins, ponds and swales. Where space or levels restrictions do not allow for SuDS systems, an underground piped system located beneath the access roads will be used to drain the remaining road areas. These underground piped systems will direct flows to a system of basins, ponds and swales which will discharge into Bradley Brook.

Each plot will require an individual drainage design. Whatever the surface water layout for plot, a proposed surface water connection point into an attenuation basin or pond will be provided. This will ensure all surface water across the development is directed through a SuDS system. Some of these basins and ponds will connect to the underground piped system whereas others will outfall directly into Bradley Brook. Each connection to Bradley Brook will be restricted to the greenfield runoff rate.

The drainage systems will be designed so that there is no flooding to the development in a 1 in 30-year event and so that there is no property flooding in a 1 in 100 year plus climate change event.

The existing ponds will be filled in and built-over as part of the development. However, these existing ponds will be replaced at a rate of 2 for 1 for water body offset mitigation.

Drawings highlighting the existing and proposed waterbodies at the site are enclosed in Appendix F.

4.2.1 Flow Rate

In line with the local literature recommendations discussed in Section 1.4, the flow rate off site will be reduced to Greenfield runoff rates. The total site area being drained to Bradley Brook is approximately 91.5 hectares (not including any works to existing roads). Applying this area to the IH 124 method generates a QBar flowrate of 501.66 l/s. This will be the maximum flow rate off the site.

A copy of the HR Wallingford Greenfield Runoff calculations is enclosed in Appendix N.

To manage the flow of surface water across the site, flow control devices will be used. These will be designed to ensure that the flow rate from individual plots cannot overwhelm the system of basins, ponds and swales. If required additional underground attention will be provided within each plot as required.

The drainage will be designed to ensure that a self-cleansing velocity of 1.0 l/s is achieved within the pipework. Check dams and flow control devices will be used if required to reduce the velocity of surface water within swales.

4.2.2 Climate change

In line with the NPPF, the Planning Portal Guidance documents, the SFRA and WBC planning guidance, climate change should be considered for all developments. As LLFA, WBC sets the criteria for climate change for the development. Following Table 2 of the EA *Flood risk assessment climate change allowances* guidance, a climate change factor of 40% will be assessed for the capacity of the proposed surface water drainage system.

4.2.3 SuDS Considerations

Due to the anticipated poor soakaway potential, the SuDS methods suitable to the site are limited to those that improve water quality, volume control, provide amenity to the end users of the development, and promote biodiversity, in-keeping with the nature of the existing site.

The MicroDrainage SuDS planner tool was used on the development which uses criteria such as hydrology, land use and maintenance to identify the most appropriate SuDS techniques for any given site. This tool listed pervious pavements, wet ponds, storm water wetlands and online/offline storages as the highest ranked SuDS features for this development. As the majority of external hardstanding areas will be taking slow moving heavy goods vehicles, it is unlikely that porous paving could be used at the development.

For these reasons swales, basins and ponds have been selected as the SuDS systems for the development.

A copy of the SuDS planner results is enclosed in Appendix M.

4.2.4 Surface water treatment

Surface water runoff from all hardstanding areas within the development will pass through basins, ponds and/or swales. Where gully pots and channel drains are used, silt traps will be provided. The basins, ponds and swales will provide filtration and settlement of the surface water. The vegetation of the swales, filter strips and filter drains will allow capture and filtration of hydrocarbons, heavy metals and nutrients.

All vehicle car parks and service yards will be drained via. hydrocarbon interceptors.

4.2.5 Storage Requirements

For preliminary storage requirement calculations, it was assumed that the total developable area for each plot is 100% hardstanding. This leaves a total hardstanding area (not including any works to existing roads) of 56.6ha.

Using this area of hardstanding with the flow rate of 501.66 l/s (discussed in Section 4.2.1), this means that approximately 29,216 – 39,855m^3 of storage would be required at the development.

There is approximately 28,514m^2 of development area available in the form of basins, ponds and swales. The exact attenuation available in these areas will depend on detailed levels design. However, any additional attenuation required will be available in for form of oversized pipes and individual plot underground attenuation if required.

A copy of the MicroDrainage storage estimation calculations for the developed area and individual plots is enclosed in Appendix O.

4.3 Proposed foul water drainage

A new drainage system will be constructed for the proposed development in accordance with BS EN 752 and Approved Document H. The foul flows will be collected in separate gravity foul water drainage system located beneath the access roads. The foul system will contain foul water connection points for the individual plots to connect to in the future.

All foul flows on the development will be directed to an adoptable foul water pump installation that will convey waters to a UU sewer in Grappenhall Lane to the west of the site.

The foul waters will be stored temporarily in the local wet well to maximise the efficiency of the pumps. The pumps will be arranged in a duty-standby arrangement, and storage will be provided in the event the pump fails, in accordance with Sewers for Adoption 6th Edition.

4.3.1 Proposed flow rates

The peak flow rate from the development has been calculated based on the office and warehouse floor spaces. These areas have been taken from the proposed site plan in Appendix D, with the hub areas assumed to be the same as commercial.

A flow rate of 750 litres/day/100m^2 has been used for office areas and 300 litres/day/100m^2 for warehouse areas.

Based on these flow rates and the total areas for the site, a peak flow rate of 62.77 l/s has been calculated.

A copy of the foul flow calculations is enclosed in Appendix L.

Pipes will be laid for a minimum fall of 1 in 40 to provide self-cleansing velocities where the volume of flow is less than 1 l/s. Where flushing toilets contribute to a pipe, the fall can be relaxed to 1 in 80 where the pipe is 100mm diameter, in line with Approved Document Part H. Elsewhere, the drainage system will be designed to achieve a target self-cleansing velocity of 0.75m/s. The depth of flow within the foul pipes will be restricted to d/D = 0.75 to ensure proper ventilation.

The pumping station will be designed by a specialist pump supplier who will set the pump based on the flow rate to achieve efficiency of the system. The flowrate will be confirmed and agreed by UU.

4.3.2 Storage

Referring to Sewers for Adoption 6th Edition, the storage requirement for commercial or industrial is for 1 hour of the peak design flow. Based on a peak design flow of 62.77 l/s, this means that 226m^3 of storage will be required at the development. This will be provided in an integral wet well as per UU's requirements.

4.3.3 Pumping station compound

In accordance with Sewers for Adoption 7th Edition, as used by UU for pumping station adoptions, the pumping station should be located in a position that is accessible, safe and dedicated for this purpose. The compound should have sufficient area to provide for;

- Wet well
- Valve box
- Associated pipework
- Kiosk

- Mobile generator or temporary pumping equipment
- Adequate space for maintenance operations

A position or space for a 4000-gallon tanker is required either in the compound or off an adjacent highway. The compound should be located more than 15m away from the nearest habitable building and away from any areas susceptible to flooding. The compound should be adequately surfaced to allow any required maintenance to be effectively carried-out and should be fenced off in accordance with local planning.

The development plan and drainage layout has included appropriate space for the pumping station, providing a minimum 10m x 8.0m compound area with access from the adjacent main (adopted) site road, which will provide access for the required tanker.

The pumping station should be located in a considerate position relative to habitable buildings and away from any areas susceptible to flooding.

4.4 Overland Flows

All plot buildings will be positioned on site so that they are suitably higher than the levels at Bradley Brook. The surrounding hardscape will initially fall away from plots to limit the ability for overland flow to reach floor levels. The proposed site will generally follow the existing land falls, maintaining a drop-in levels from the west to the south and south-east

In the event of exceedance of the drainage system or other overland flow, the levels will be designed to ensure that surface water can reach Bradley Brook or one of the proposed swales, basins or ponds prior to reaching a plot FFL.

5.0 Maintenance

5.1 Maintenance Responsibilities

The drainage system proposed for the development, including basins, ponds and swales will need to be maintained. The maintenance responsibility will be divided as follows:

- The adopted foul and surface water network, located primarily beneath the access roads, will fall under the responsibility of United Utilities. This will include the foul pumping station and rising main.
- The existing highways drainage within the B5356 will remain the responsibility of the Highways Authority following any upgrade work. This will include the two proposed roundabouts at the development entrances.
- The maintenance of all foul and surface water drainage within individual plots will fall under the responsibility of the individual plot owners. This will include the maintenance of any swales or ponds located within the plot boundary.
- The maintenance of private foul and surface water drainage located outside of plot areas will be the responsibility of the facilities manager that will be appointed by the Langtree and Panattoni for the development. This will include all basins, ponds and swales located in private land within the development.

5.2 Maintenance Plan

A maintenance regime for all private drainage should be enacted regularly as part of the normal facilities management duties. A maintenance schedule should be established following construction and updated as necessary throughout the lifetime of the development. A record maintenance log should be kept and updated accordingly.

The following schedule should be used as the basis of maintenance at the site.

	Maintenance Activity	Frequency of activity (months)				
		1	3	6	12	A/R
	Manholes (General)					
1	Check cover is not damaged and fits securely			X		
2	Check inlet and outlet are free flowing and not obstructed			X		
3	Check security of fitting for all manhole ironmongery			X		
4	Check benching for scour or build-up of debris			X		
5	Check joints in construction for damage or inflow				X	
6	Record maintenance inspection in log book			X		
	Gullies & drainage channels					
7	Check grating is undamaged and fits securely	X				
8	Inspect internal gully/sump chamber, remove debris from traps and check outfall is clear and free flowing			X		
9	Record maintenance inspection in log book	X				
	Conveyance Pipes					
10	Carry out flow test between manholes to ensure free flow of system				X	
11	Jetting and clearance of blockages, debris or silt					X
12	Inspection by CCTV – should problem arise as a result of the flow test					X
13	Cutting of growth into pipe					X
14	Record maintenance inspection in log book				X	X
	Grassed Filter strips & swales					

	Maintenance Activity	Frequency of activity (months)				
		1	3	6	12	A/R
15	Remove litter and debris	X				
16	Cut grass – for access	X				
17	Inspect inlets and outlets for blockages and clear if required	X				
18	Inspect banksides, structures, pipework etc for evidence of physical damage	X				X
19	Inspect inlets and surface for silt accumulation, establish appropriate silt removal frequencies		X			X
20	Manage other vegetation and remove nuisance plants - Monthly for 6 months, quarterly for 2 years, then half yearly	X	X	X		
21	Tidy all dead growth before start of growing season				X	
22	Remove sediments from inlets, outlets and forebay				X	X
23	Re-seed areas of poor vegetation growth					X
24	Repair of erosion or other damage by re-seeding or re-turfing					X
25	Realignment of energy dissipation elements					X
26	Repair/rehabilitation of inlet and outlet					X
27	Relevel uneven surfaces and reinstate design levels					X
28	Rehabilitate infiltration surface using scarifying and spiking techniques if performance deteriorates					X
29	Record maintenance inspection in log book	X				
	Grassed Attenuation Ponds and Basins					
30	Remove litter and debris	X				
31	Cut grass – for access	X				
32	Inspect inlets and outlets for blockages and clear if required	X				
33	Inspect banksides, structures, pipework etc for evidence of physical damage	X				X
34	Inspect inlets and surface for silt accumulation, establish appropriate silt removal frequencies		X			X
35	Manage other vegetation and remove nuisance plants - Monthly for 6 months, quarterly for 2 years, then half yearly	X	X	X		
36	Tidy all dead growth before start of growing season				X	
37	Remove sediments from inlets, outlets and forebay				X	X
38	Re-seed areas of poor vegetation growth					X
39	Repair of erosion or other damage by re-seeding or re-turfing					X
40	Realignment of energy dissipation elements					X
41	Repair/rehabilitation of inlet and outlet					X
42	Relevel uneven surfaces and reinstate design levels					X
43	Rehabilitate infiltration surface using scarifying and spiking techniques if performance deteriorates					X
44	Record maintenance inspection in log book	X				
	Pumping Station					
45	Pumping station should be maintained in accordance with the plans provided by the specialist suppliers.					X

	Maintenance Activity	Frequency of activity (months)				
		1	3	6	12	A/R
	Flow Controls					
46	Check flow control mount to ensure secure fitting		X			
47	Check inlet to flow control is free flowing and not obstructed		X			
48	Remove silt from the sump			X		
49	Record maintenance inspection in log book	X				
	Petrol Interceptors					
50	Pumping station should be maintained in accordance with the plans provided by the specialist suppliers.					X
51	Inspect the integrity of the separator and all mechanical parts			X		
52	Service any electrical systems			X		
53	Conduct safe silt/contaminate removal in accordance with waste transit and disposal regulations			X		
54	Record maintenance inspection in log book					X

Note: A/R = as required or as soon as practical

6.0 Conclusion & Recommendations

6.1 Conclusion

The site has a low risk of flooding from fluvial & tidal sources, surface water, groundwater, artificial drainage and infrastructure failure. Mitigation factors are not required on the development. Under these conditions, the overall flood risk posed to the site is low.

The development proposals comprise an increase in the impermeable area on site. However, the control of flow rates to greenfield rates, the introduction of a controlled surface water drainage system, surface water attenuation features(s) and SuDS features, where applicable, will ensure the drainage situation is not worsened from the condition presently found on the existing site.

Foul waters will discharge by gravity through a network of underground pipes to a foul pumping station. Foul flows will be directed to the nearest suitable foul sewer, at a flow rate and point to be agreed with UU.

The probability of flooding, both on site and downstream of the site, will therefore be maintained as low as a result of the proposed development.

6.2 Recommendations

The flood risk assessment has identified that the overall flood risk is low. However, we recommend that the proposed drainage systems are subject to a maintenance plan which should be carried out by an appointed management company. This will ensure maintenance of the infrastructure in the future.

Further discussion should be had with the relevant authorities as design develops to ensure:

- Discharge rates and locations are in accordance with the local authorities' requirements
- The provision for SuDS and climate change factor is in accordance with local authorities' requirements
- Each development plot carries out a suitable SuDS design in keeping with this report, using SuDS features wherever possible to restrict outflow to not greater than greenfield runoff
- Each development provides suitable water treatment runoff prior to discharge to site wide systems or Bradley Brook.

A site investigation, including infiltration testing will be carried out at the site. The findings of the report may help to improve judgement of drainage design with regard to infiltration potential for the surface water design. These findings should be reviewed once the investigation and report are complete.

Appendix A – NPPF Technical Guidance

Table 1: Flood zones
(Note: These flood zones refer to the probability of river and sea flooding, ignoring the presence of defences)

Zone 1 - low probability

Definition
This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

Appropriate uses
All uses of land are appropriate in this zone.

Flood risk assessment requirements
For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a flood risk assessment. This need only be brief unless the factors above or other local considerations require particular attention.

Policy aims
In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems[1].

Zone 2 - medium probability

Definition
This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.

Appropriate uses
Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses, as set out in table 2, are appropriate in this zone. The highly vulnerable uses are only appropriate in this zone if the Exception Test is passed.

Flood risk assessment requirements
All development proposals in this zone should be accompanied by a flood risk assessment.

Policy aims
In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage systems.

Zone 3a - high probability

Definition
This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Appropriate uses
The water-compatible and less vulnerable uses of land (table 2) are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone.

The more vulnerable uses and essential infrastructure should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.

[1] Sustainable drainage systems cover the whole range of sustainable approaches to surface drainage management. They are designed to control surface water run off close to where it falls and mimic natural drainage as closely as possible.

Flood risk assessment requirements
All development proposals in this zone should be accompanied by a flood risk assessment.

Policy aims
In this zone, developers and local authorities should seek opportunities to:

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems;
- relocate existing development to land in zones with a lower probability of flooding; and
- create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.

Zone 3b - the functional floodplain

Definition
This zone comprises land where water has to flow or be stored in times of flood.

Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify the functional floodplain.

Appropriate uses
Only the water-compatible uses and the essential infrastructure listed in table 2 that has to be there should be permitted in this zone. It should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows; and
- not increase flood risk elsewhere.

Essential infrastructure in this zone should pass the Exception Test.

Flood risk assessment requirements
All development proposals in this zone should be accompanied by a flood risk assessment.

Policy aims
In this zone, developers and local authorities should seek opportunities to:

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems;
- relocate existing development to land with a lower probability of flooding.

Table 2: Flood risk vulnerability classification

Essential infrastructure • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly vulnerable • Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use[2]. • Installations requiring hazardous substances consent[3]. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as "essential infrastructure")[4].
More vulnerable • Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste[5]. • Sites used for holiday or short-let caravans and camping, *subject to a specific warning and evacuation plan*.[6]
Less vulnerable • Police, ambulance and fire stations which are *not* required to be operational during flooding. • Buildings used for shops, financial, professional and other services, • restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non–residential institutions not included in "more vulnerable", and assembly and leisure. • • Land and buildings used for agriculture and forestry. • • Waste treatment (except landfill and hazardous waste facilities). • • Minerals working and processing (except for sand and gravel working). • • Water treatment works which do not need to remain operational during times of flood. • • Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).

[2] For any proposal involving a change of use of land to a caravan, camping or chalet site, or to a mobile home site or park home site, the Sequential and Exception Tests should be applied.

[3] See Circular 04/00: *Planning controls for hazardous substances* (paragraph 18) at: www.communities.gov.uk/publications/planningandbuilding/circularplanningcontrols

[4] In considering any development proposal for such an installation, local planning authorities should have regard to planning policy on pollution in the National Planning Policy Framework

[5] For definition, see *Planning for Sustainable Waste Management: Companion Guide to Planning Policy Statement 10* at www.communities.gov.uk/publications/planningandbuilding/planningsustainable

[6] See footnote 3

Water-compatible development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Notes to table 2:

a. This classification is based partly on Department for Environment, Food and Rural Affairs and Environment Agency research on *Flood Risks to People* (*FD2321/TR2*)[7] and also on the need of some uses to keep functioning during flooding.

b. Buildings that combine a mixture of uses should be placed into the higher of the relevant classes of flood risk sensitivity. Developments that allow uses to be distributed over the site may fall within several classes of flood risk sensitivity.

c. The impact of a flood on the particular uses identified within this flood risk vulnerability classification will vary within each vulnerability class. Therefore, the flood risk management infrastructure and other risk mitigation measures needed to ensure the development is safe may differ between uses within a particular vulnerability classification.

[7] See website for further details. www.defra.gov.uk/science/Project_Data/DocumentLibrary/FD2320_3364_TRP.pdf

Table 3: Flood risk vulnerability and flood zone 'compatibility'

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zones (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception test required	✓	✓
	Zone 3a	Exception test required	✓	×	Exception test required	✓
	Zone 3b functional floodplain	Exception test required	✓	×	×	×

Key:

- ✓ Development is appropriate.
- × Development should not be permitted.

Notes to table 3:

This table does not show:

a. the application of the Sequential Test which guides development to Flood Zone 1 first, then Zone 2, and then Zone 3;

b. flood risk assessment requirements; or

c. the policy aims for each flood zone.

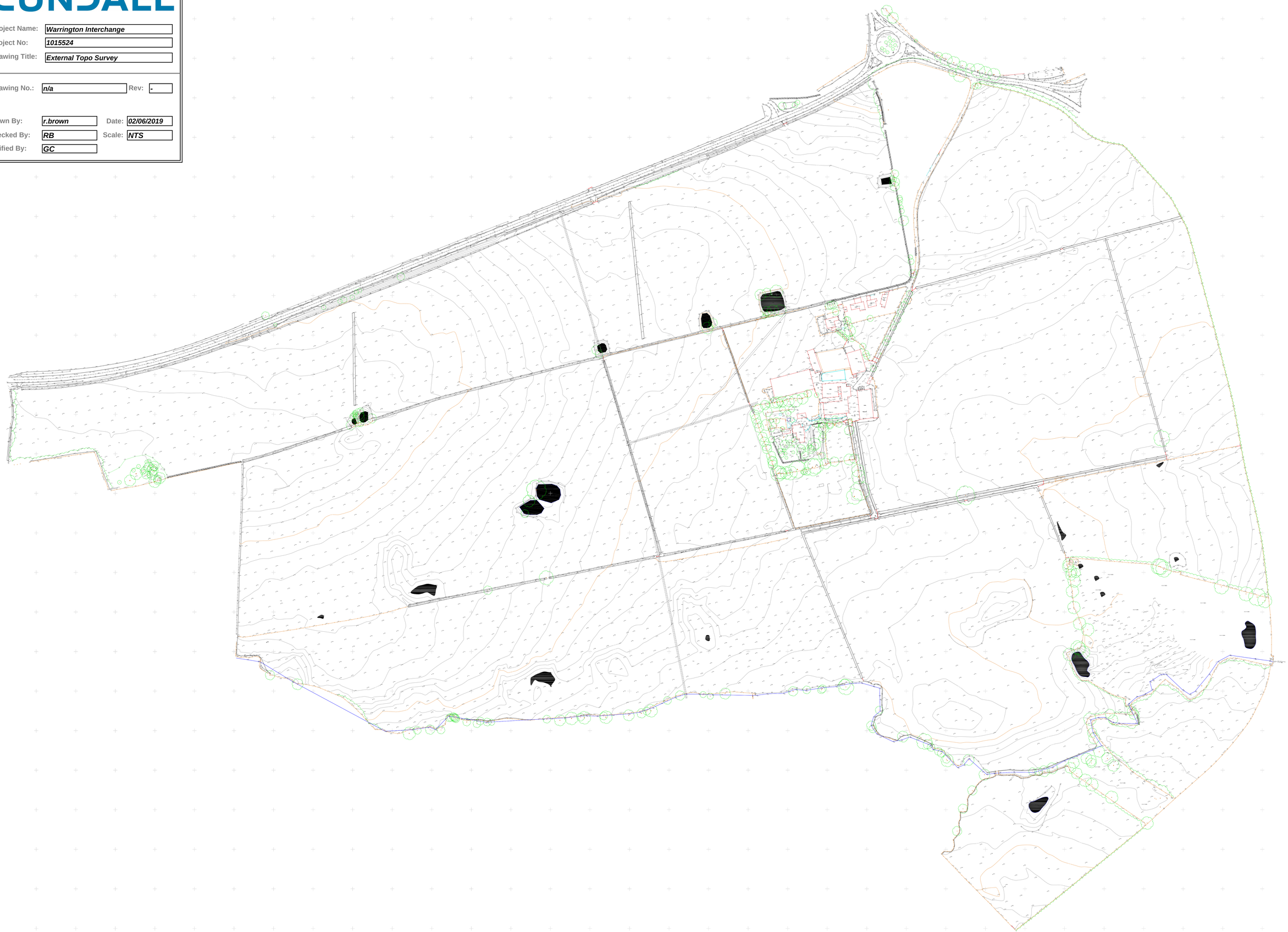
Appendix B – Existing Site

Site boundary enclosed. The aerial imagery is taken from Google Maps to show the existing site.

Appendix C – Topo Survey

CUNDALL

Project Name:	*Warrington Interchange*
Project No:	*1015524*
Drawing Title:	*External Topo Survey*
Drawing No.:	*n/a*
Rev:	*-*
Drawn By:	*r.brown*
Date:	*02/06/2019*
Checked By:	*RB*
Scale:	*NTS*
Verified By:	*GC*



Appendix D – Proposed Site Plan

Rev	Date	By	Description

Langtree

PANATTONI

Stephen George + Partners LLP
Architects + Masterplanners

Waterfront House
2a Smith Way
Grove Park
Enderby
Leicester LE19 1SX
t: +44 (0)116 247 0557
www.stephengeorge.co.uk

Six 56 Warrington

Illustrative Masterplan

CDE Reference

Drawn:	mjm	Drawing Status:	Preliminary
Team:	MMS	CAD Reference:	16-184-F013-001
Scale:	1:2500 @ A1	Date:	09/2018

Project No:	Dwg No:	Rev:
16-184-F013	001	AG

Appendix E – Hardstanding Drawings

KEY

EXISTING HARDSTANDING

PROPOSED DEVELOPMENT BOUNDARY

N

1015524 | A1

Based on.

Architects Drg No.	Rev
Structural Drg No.	Rev
Survey Drg No.	Rev
Other Drg No.	Rev
Other Drg No.	Rev

Notes

- TO BE READ IN CONJUNCTION WITH ALL RELEVANT CUNDALL DRAWINGS.
- TO BE READ INC CONJUNCTION WITH THE CUNDALL FLOOD RISK & DRAINAGE STRATEGY DOCUMENT 1015524-RPT-CL-002

Issue	Date	Description	By	Chkd	Verfd
-	06.02.19	FIRST ISSUE	RB	MH	GC

Project
SIX:56 WARRINGTON

Client
LANGTREE / FIRST INDUSTRIAL

Architect
STEPHEN GEORGE PARTNERS

Title
EXISTING HARDSTANDING

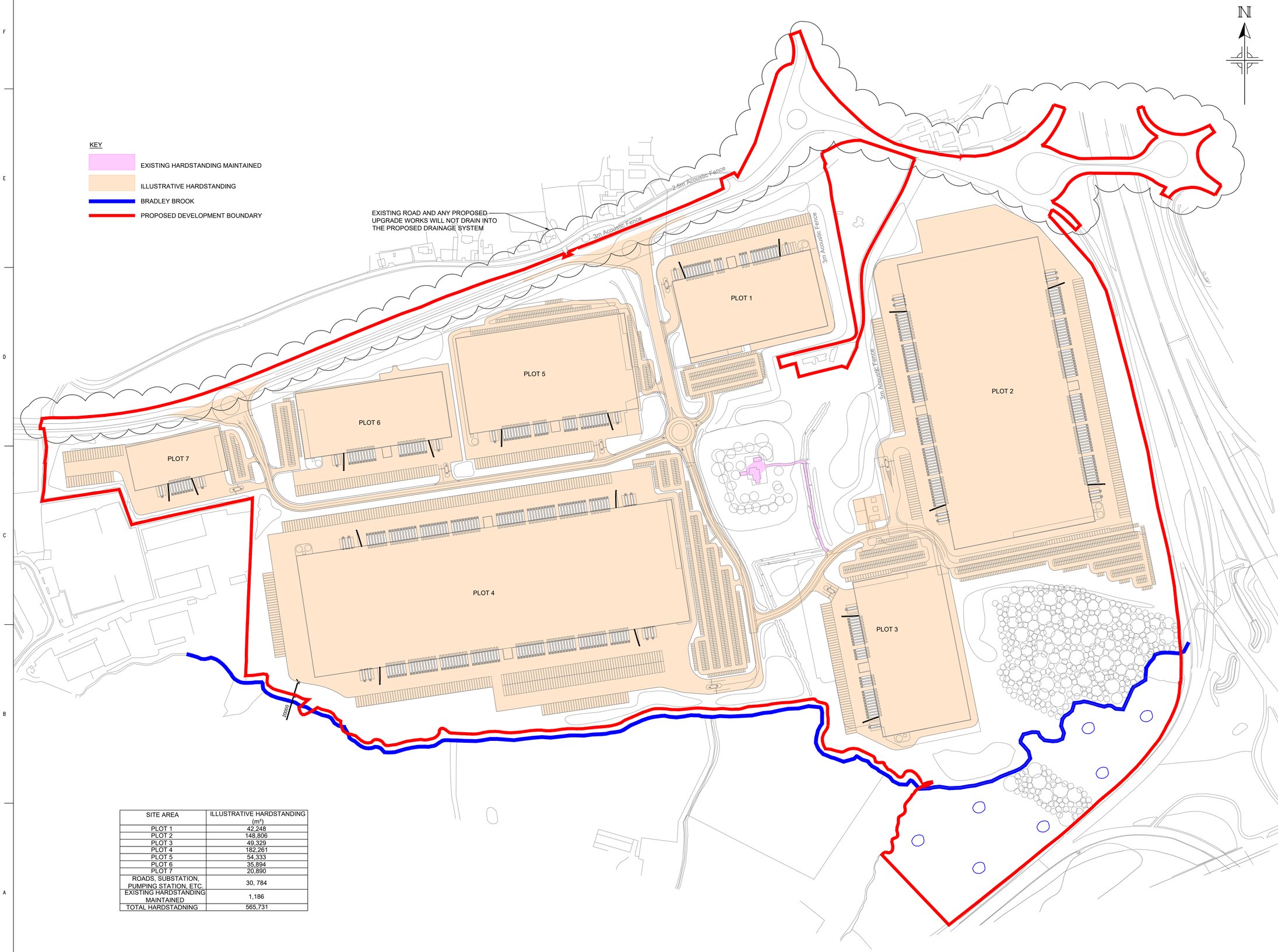
Drawing No.	Drawing Status
CLXX(90)0010	INFORMATION
Job No.	Scale
1015524	1:2500

CUNDALL

4th Floor, Partnership House
Regent Farm Road,
Gosforth,
Newcastle, NE3 3AF
Telephone: +44 (0)191 213 1515

Website: www.cundall.com

True scale at 1:1



SITE AREA	ILLUSTRATIVE HARDSTANDING (m^2)
PLOT 1	42,248
PLOT 2	148,806
PLOT 3	49,329
PLOT 4	182,261
PLOT 5	54,333
PLOT 6	35,894
PLOT 7	20,890
ROADS, SUBSTATION, PUMPING STATION, ETC.	30, 784
EXISTING HARDSTANDING MAINTAINED	1,186
TOTAL HARDSTADNING	565,731

1015524 | A1

Based on.
Architects Drg No. Rev
Structural Drg No. Rev
Survey Drg No. Rev
Other Drg No. Rev
Other Drg No. Rev

Notes

- TO BE READ IN CONJUNCTION WITH ALL RELEVANT CUNDALL DRAWINGS.
- TO BE READ INC CONJUNCTION WITH THE CUNDALL FLOOD RISK & DRAINAGE STRATEGY DOCUMENT 1015524-RPT-CL-002
- LAYOUT BASED ON THE STEPHEN GEORGE + PARTNERS LLP ILLUSTRATIVE MASTERPLAN

Issue	Date	Description	By	Chkd	Verfd
D	14.10.20	LANDSCAPE LAYOUT UPDATE	MH	JH	BW
C	20.03.20	LANDSCAPE LAYOUT UPDATE	EM	MH	DB
B	25.02.20	UPDATED TO LANDSCAPE LAYOUT	EM	RB	MH
A	26.03.19	UPDATED TO CLIENTS COMMENTS	RB	MH	GC
-	06.02.19	FIRST ISSUE	RB	MH	GC

Project
SIX:56 WARRINGTON

Client
LANGTREE / FIRST INDUSTRIAL

Architect
STEPHEN GEORGE PARTNERS

Title
PROPOSED HARDSTANDING AREAS

Drawing No.
CLXX(90)0011

Drawing Status
INFORMATION

Job No.
1015524

Scale
1:2500

CUNDALL

4th Floor, Partnership House
Regent Farm Road,
Gosforth,
Newcastle, NE3 3AF
Telephone: +44 (0)191 213 1515

Website: www.cundall.com

True scale at 1:1

Appendix F – Waterbodies Drawings

KEY

62.0 EXISTING CONTOURS
62.5

EXISTING WATERBODY (4396m²)

PROPOSED DEVELOPMENT BOUNDARY

WATERSHED DIRECTION

98m²
632m²
214m²
114m²
128m²
37m²
594m²
400m²
321m²
28m²
34m²
357m²
30m²
85m²
25m²
25m²
26m²
466m²
469m²
288m²

True scale at 1:1

1015524 | A1

Based on.

Architects Drg No.	Rev
Structural Drg No.	Rev
Survey Drg No.	Rev
Other Drg No.	Rev
Other Drg No.	Rev

Notes

- TO BE READ IN CONJUNCTION WITH ALL RELEVANT CUNDALL DRAWINGS.
- TO BE READ INC CONJUNCTION WITH THE CUNDALL FLOOD RISK & DRAINAGE STRATEGY DOCUMENT 1015524-RPT-CL-002

Issue	Date	Description	By	Chkd	Verfd
-	06.02.19	FIRST ISSUE	RB	MH	GC

Project
SIX:56 WARRINGTON

Client
LANGTREE / FIRST INDUSTRIAL

Architect
STEPHEN GEORGE PARTNERS

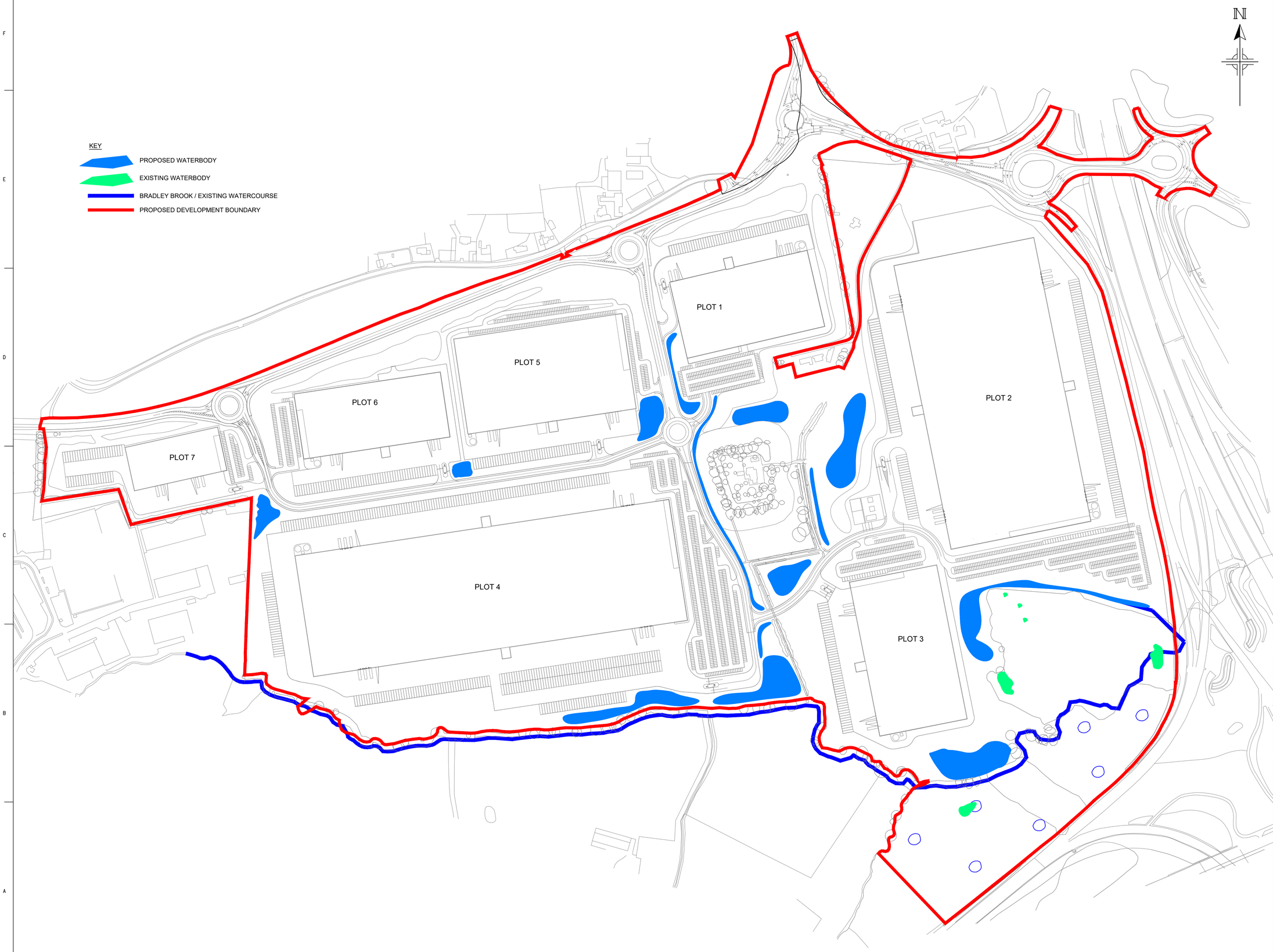
Title
EXISTING WATERBODIES

Drawing No.	Drawing Status
CLXX(90)0012	INFORMATION
Job No.	Scale
1015524	1:2500

CUNDALL

4th Floor, Partnership House
Regent Farm Road,
Gosforth,
Newcastle, NE3 3AF
Telephone: +44 (0)191 213 1515

Website: www.cundall.com



1015524 | A1

Based on.

Architects Drg No.	Rev
Structural Drg No.	Rev
Survey Drg No.	Rev
Other Drg No.	Rev
Other Drg No.	Rev

Notes

- TO BE READ IN CONJUNCTION WITH ALL RELEVANT CUNDALL DRAWINGS.
- TO BE READ IN CONJUNCTION WITH THE CUNDALL FLOOD RISK & DRAINAGE STRATEGY DOCUMENT 1015524-RPT-CL-002
- LAYOUT BASED ON THE STEPHEN GEORGE + PARTNERS LLP ILLUSTRATIVE MASTERPLAN

Issue	Date	Description	By	Chkd	Verfd
D	09.10.20	REVISED PLOT 1 BUND	MH	RT	BW
C	20.03.20	LANDSCAPE LAYOUT UPDATED	EM	MH	DB
B	25.02.20	UPDATED TO UPDATED LANDSCAPE LAYOUT	EM	RB	MH
A	26.03.19	UPDATED TO LANDSCAPE LAYOUT	RB	MH	GC
-	06.02.19	FIRST ISSUE	RB	MH	GC

Project
SIX:56 WARRINGTON

Client
LANGTREE / FIRST INDUSTRIAL

Architect
STEPHEN GEORGE PARTNERS

Title
PROPOSED WATERBODIES

Drawing No.	Drawing Status
CLXX(90)0013	INFORMATION
Job No.	Scale
1015524	1:2500

CUNDALL

4th Floor, Partnership House
Regent Farm Road,
Gosforth,
Newcastle, NE3 3AF
Telephone: +44 (0)191 213 1515

Website: www.cundall.com

True scale at 1:1

Appendix G – Flood Maps

G.1: EA Flood Zones Map

G.2: JBA 1in100 Year Return Flood Map

G.3: JBA 1in1000 Year Return Flood Map

G.4: EA Risk of Flooding from Rivers and Sea Map

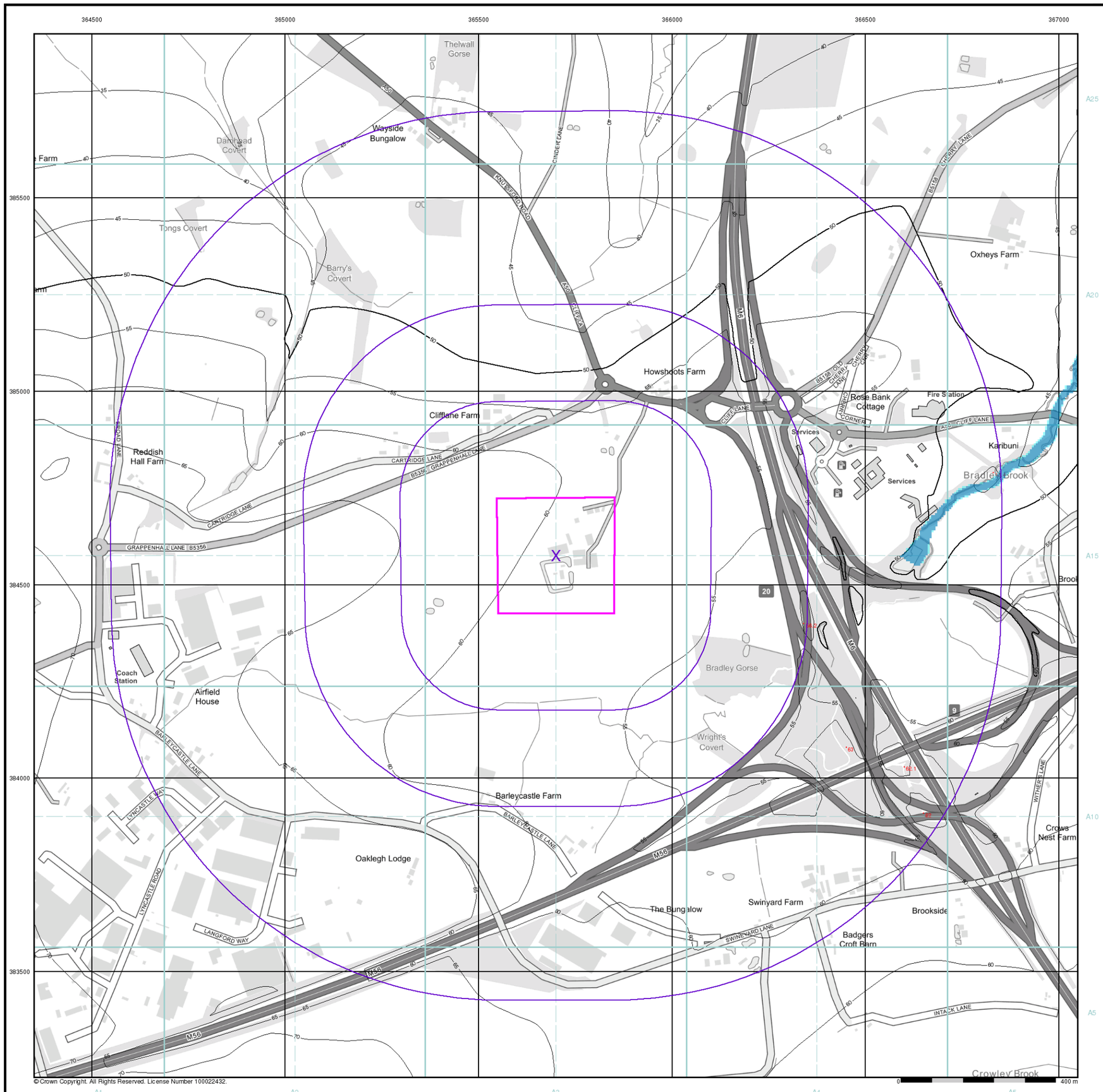
G.5: EA Surface Water 1in100 Year Return Map

G.6: EA Surface Water 1in1000 Year Return Map

G.7: GeoSmart Information Groundwater Flood Map

G.8: JBA Canal Failure Map

G.9: EA Historic Flood Map



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LANDMARK INFORMATION GROUP®

EA/NRW Flood Data Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Flood Data

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Contours (height in metres)

Standard Contour 105 100 95

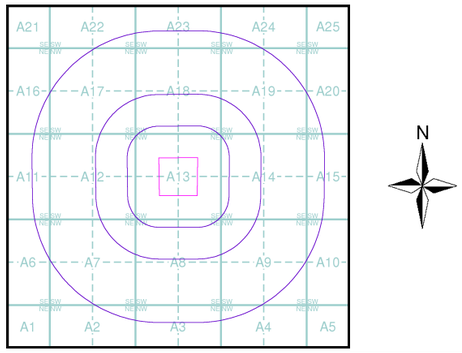
Master Contour

Spot Height *167.8

MLW Mean Low Water

MHW Mean High Water

EA/NRW Flood Data Map - Slice A



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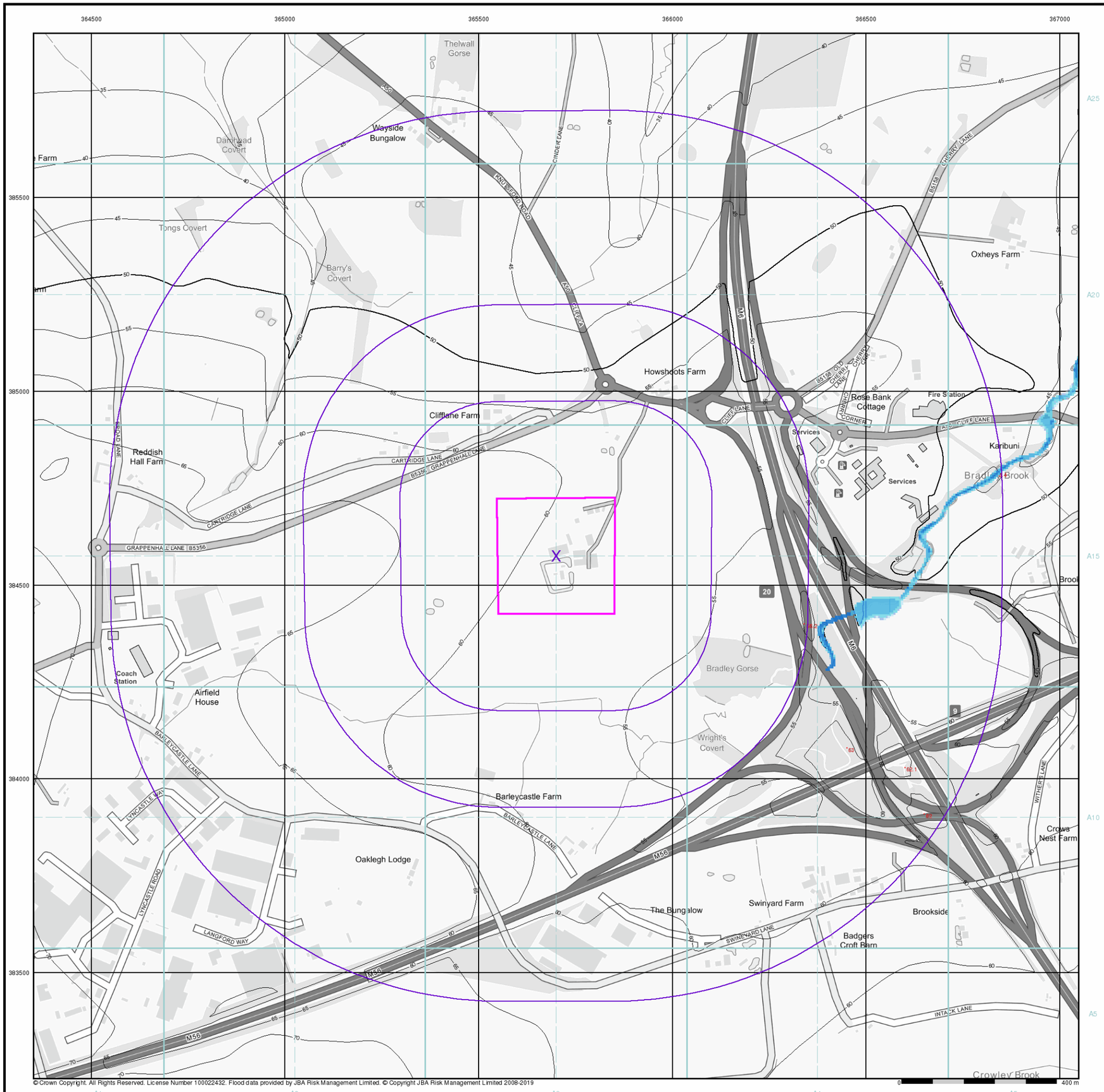
National Grid Reference:	365700, 384580
Slice:	A
Site Area (Ha):	9.
Search Buffer (m):	1000

Site Details

Bradley Hall Farm, Cliff Lane, Grappenhall, WARRINGTON, WA4 4SL

Landmark® INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



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LANDMARK INFORMATION GROUP®

JBA 100 Year Return Flood Map (Undefended) (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point

Modelled Flood Depth

Fluvial Depth	Coastal Depth
0.01m - 0.05m	0.01m - 0.05m
0.05m - 0.1m	0.05m - 0.1m
0.1m - 0.3m	0.1m - 0.3m
0.3m - 1m	0.3m - 1m
>1m	>1m

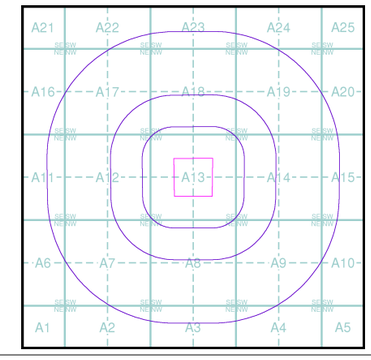
Contours (height in metres)

Standard Contour 105 100 95 — MLW Mean Low Water

Master Contour — MHW Mean High Water

Spot Height 167.8

JBA 100 Year Return Flood Map (Undefended) - Slice A



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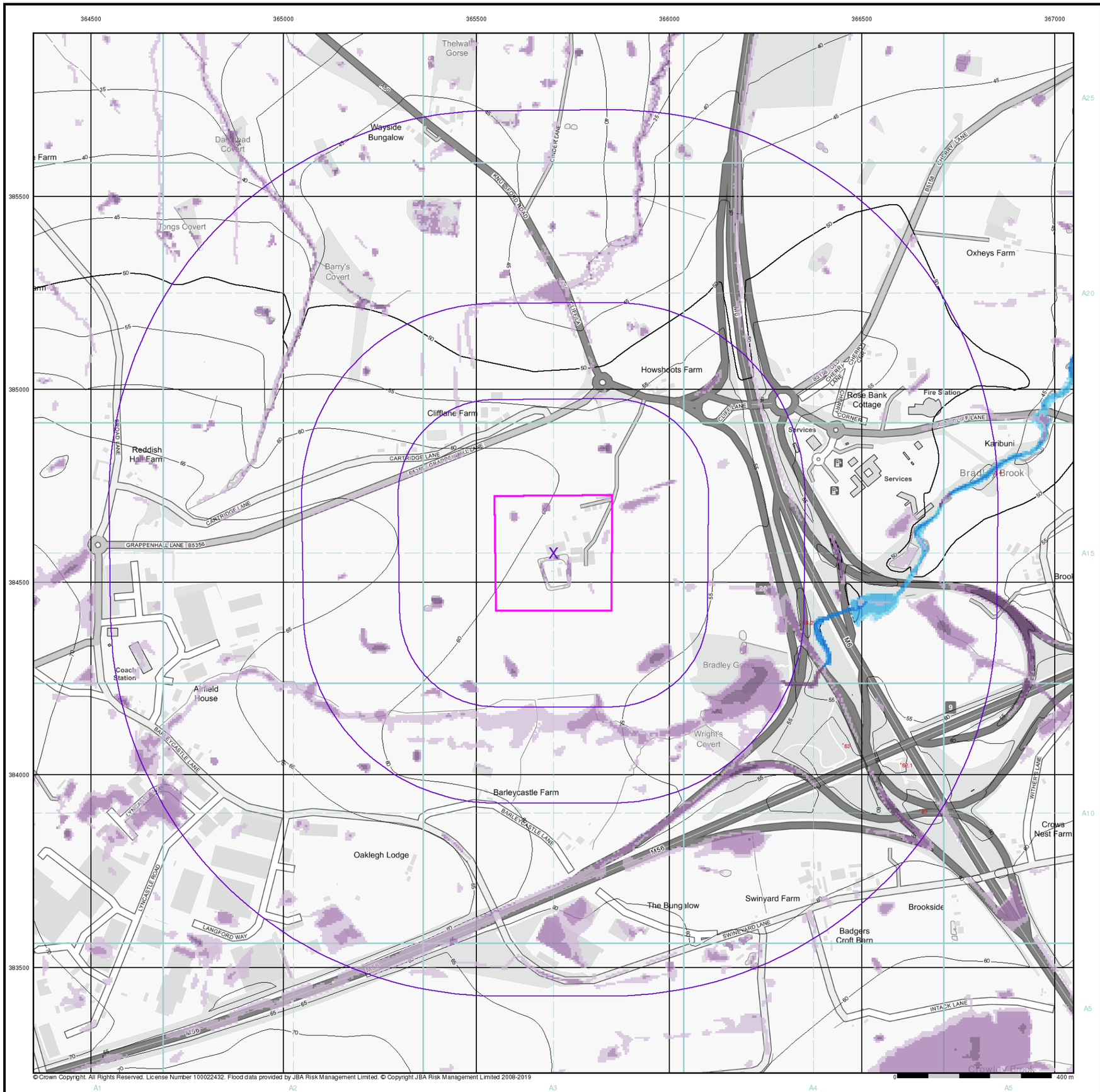


Envirocheck®

LANDMARK INFORMATION GROUP®

JBA 1000 Year Return Flood Map (Undefended) (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point

Modelled Flood Depth

Pluvial Depth	Fluvial Depth	Coastal Depth
0.1m	0.01m - 0.05m	0.01m - 0.05m
0.1m - 0.3m	0.05m - 0.1m	0.05m - 0.1m
0.3m - 1m	0.1m - 0.3m	0.1m - 0.3m
>1m	0.3m - 1m	0.3m - 1m
	>1m	>1m

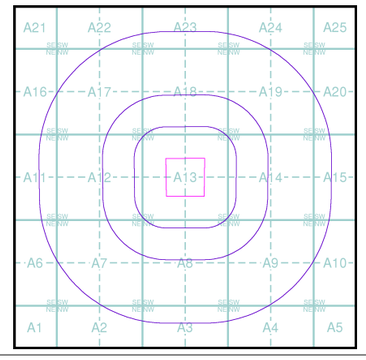
Contours (height in metres)

Standard Contour 105 100 95 — MLW Mean Low Water

Master Contour — MHW Mean High Water

Spot Height 157.8

JBA 1000 Year Return Flood Map (Undefended) - Slice A



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Customer Ref:	1015524
National Grid Reference:	365700, 384580
Slice:	A
Site Area (Ha):	9.
Search Buffer (m):	1000

Site Details

Bradley Hall Farm, Cliff Lane, Grappenhall, WARRINGTON, WA4 4SL

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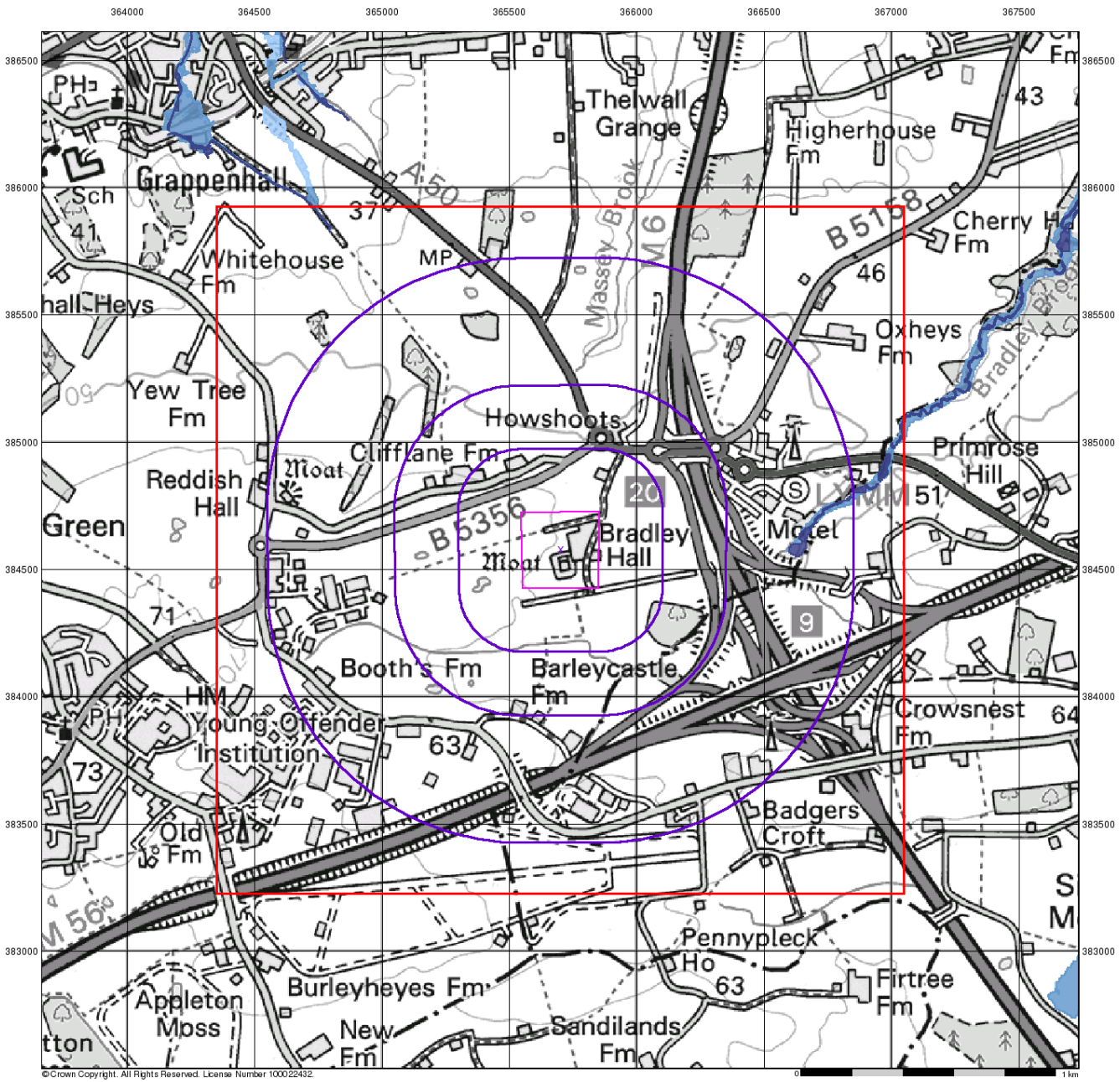


Envirocheck®

LANDMARK INFORMATION GROUP®

EA/NRW RoFRS Data (1:50,000)

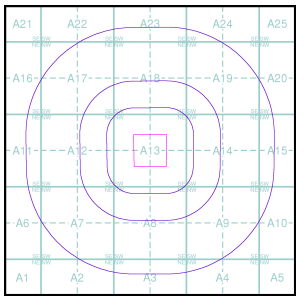
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Risk of Flooding from Rivers and Sea (RoFRS)

- High Risk
- Medium Risk
- Low Risk
- Very Low Risk

EA/NRW RoFRS Data Map - Slice A



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Customer Ref:	1015524
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Slice:	A
Site Area (Ha):	9.
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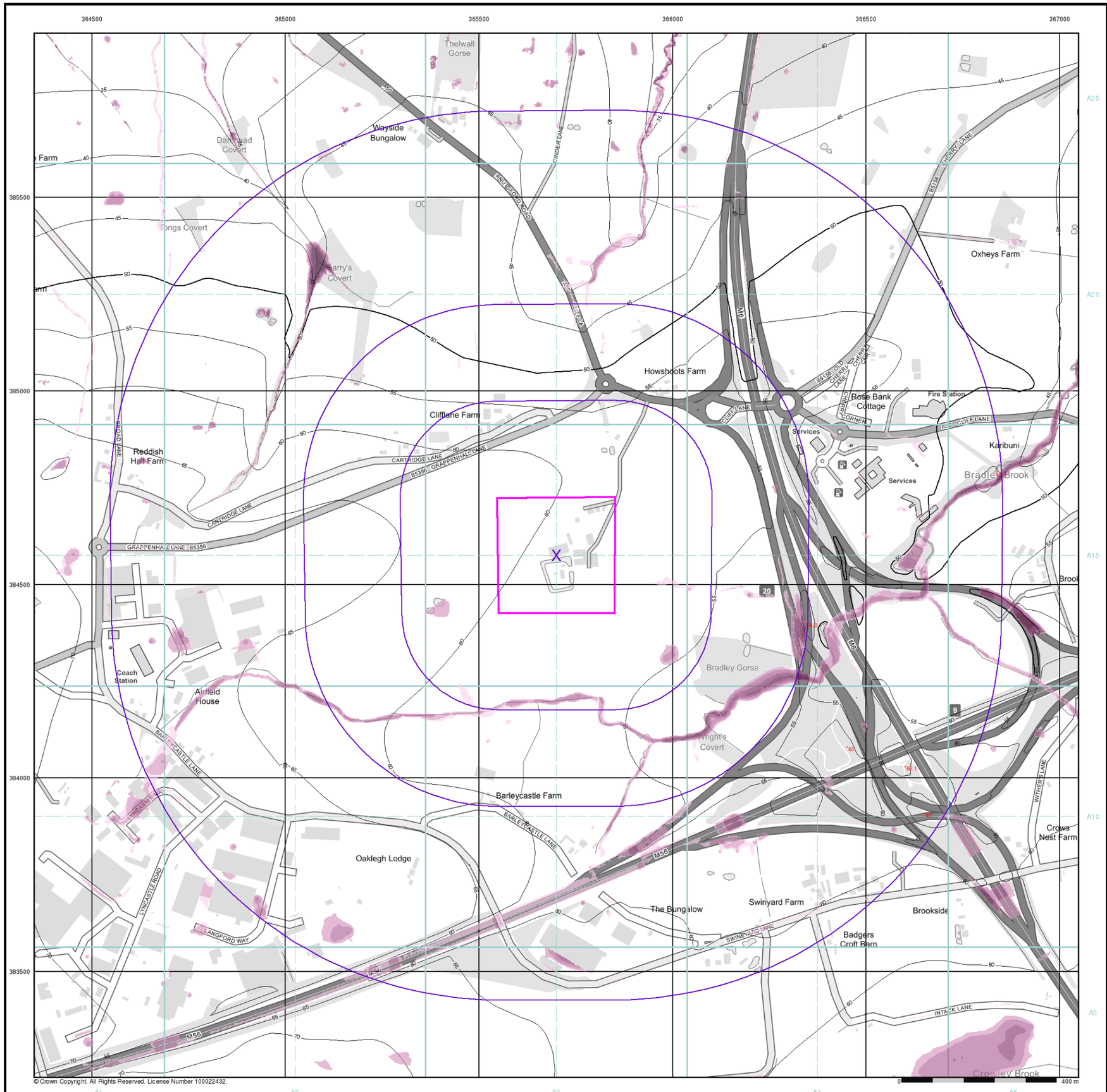


Envirocheck®

LANDMARK INFORMATION GROUP®

EA/NRW Surface Water 100 Year Return Depth Map

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Depth

- 0 - 0.15m
- 0.15 - 0.30m
- 0.30 - 0.60m
- 0.60 - 0.90m
- 0.90 - 1.20m
- > 1.20m

Contours (height in metres)

Standard Contour | Master Contour | Spot Height *167.8

MLW Mean Low Water

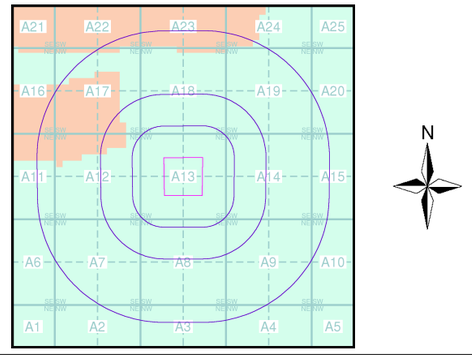
MHW Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



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National Grid Reference:	365700, 384580
Slice:	A
Site Area (Ha):	9.
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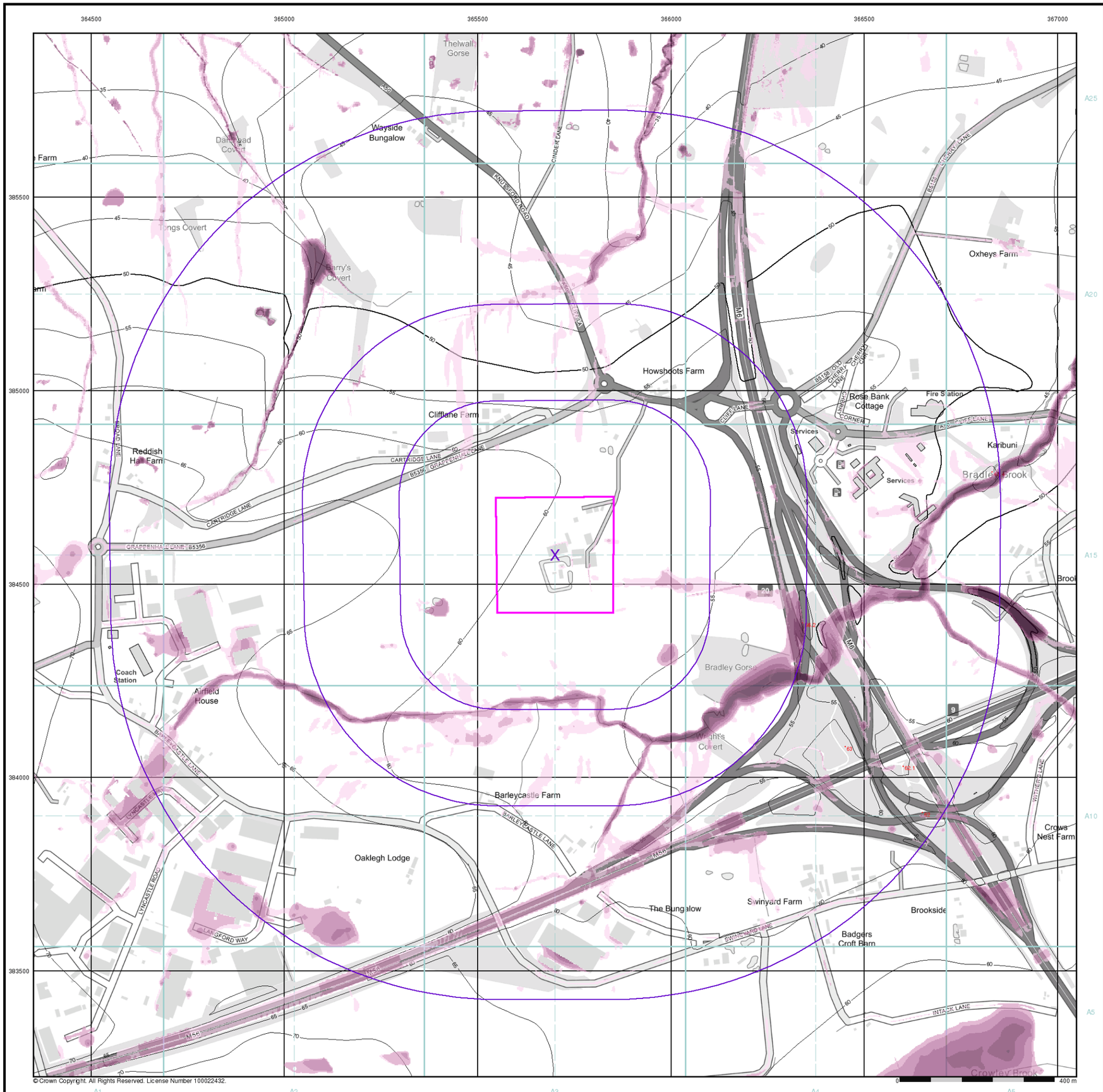

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EA/NRW Surface Water 1000 Year Return Depth Map (1:10,000)

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Depth

- 0 - 0.15m
- 0.15 - 0.30m
- 0.30 - 0.60m
- 0.60 - 0.90m
- 0.90 - 1.20m
- > 1.20m

Contours (height in metres)

Standard Contour | Master Contour | Spot Height *167.8

MLW Mean Low Water

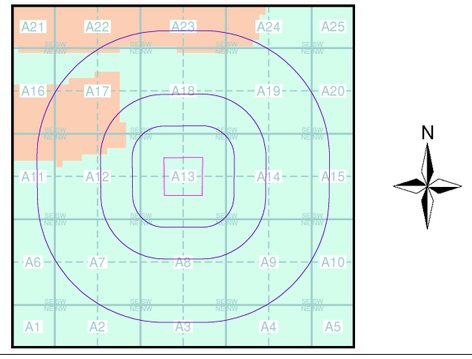
MHW Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



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Slice:	A
Site Area (Ha):	9.
Search Buffer (m):	1000

Site Details

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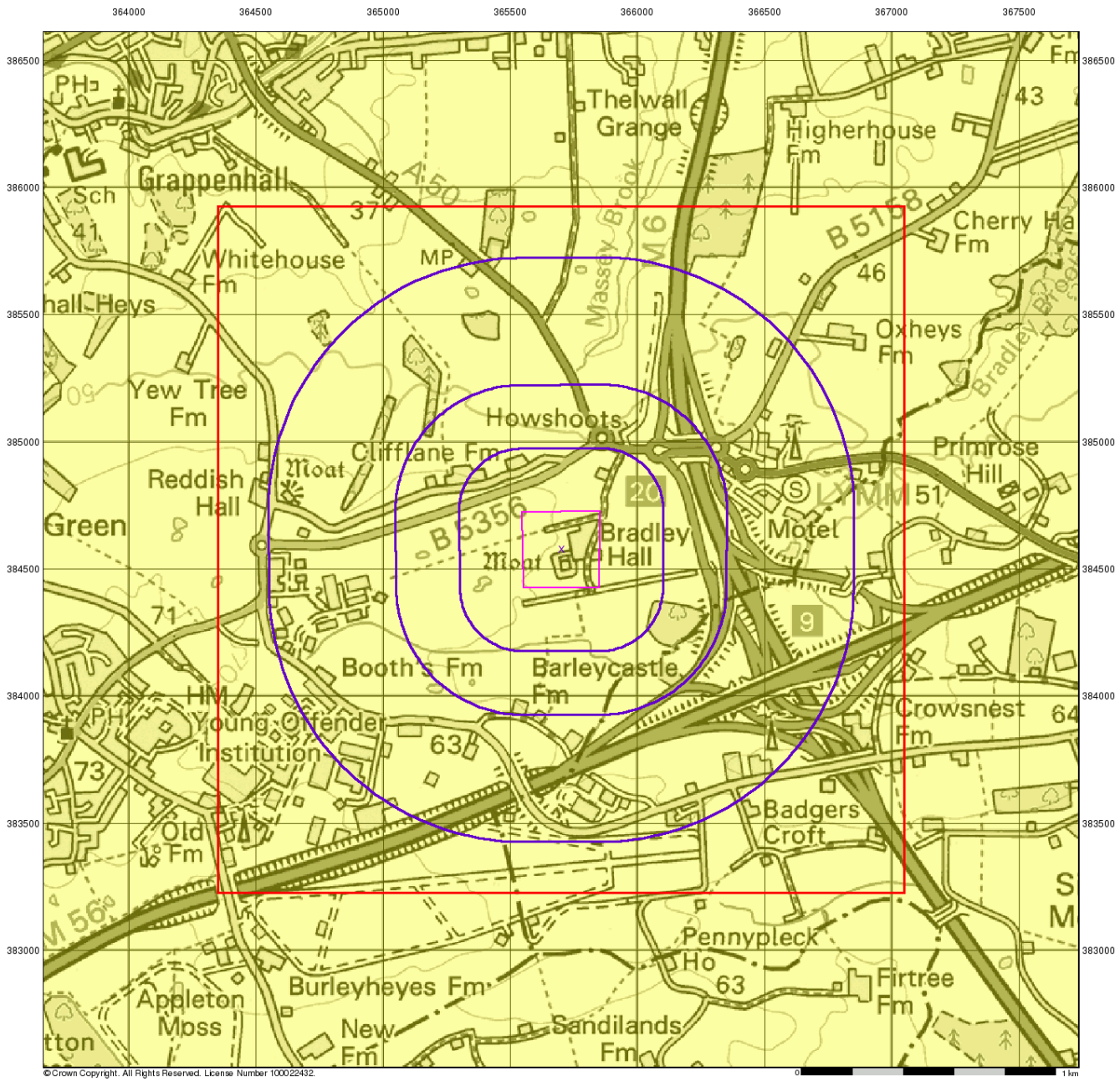

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GeoSmart Information Groundwater Flood Map (1:50,000)

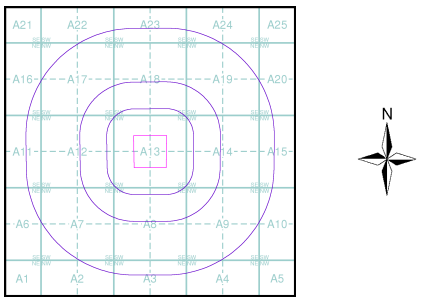
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice

GeoSmart Information Groundwater Flooding Risk

- High Risk
- Moderate Risk
- Low Risk
- Negligible Risk

GeoSmart Information Groundwater Flood Map - Slice A



Order Details

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Customer Ref:	1015524
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Slice:	A
Site Area (Ha):	9.
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Site Details

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Fax: 0844 844 9951
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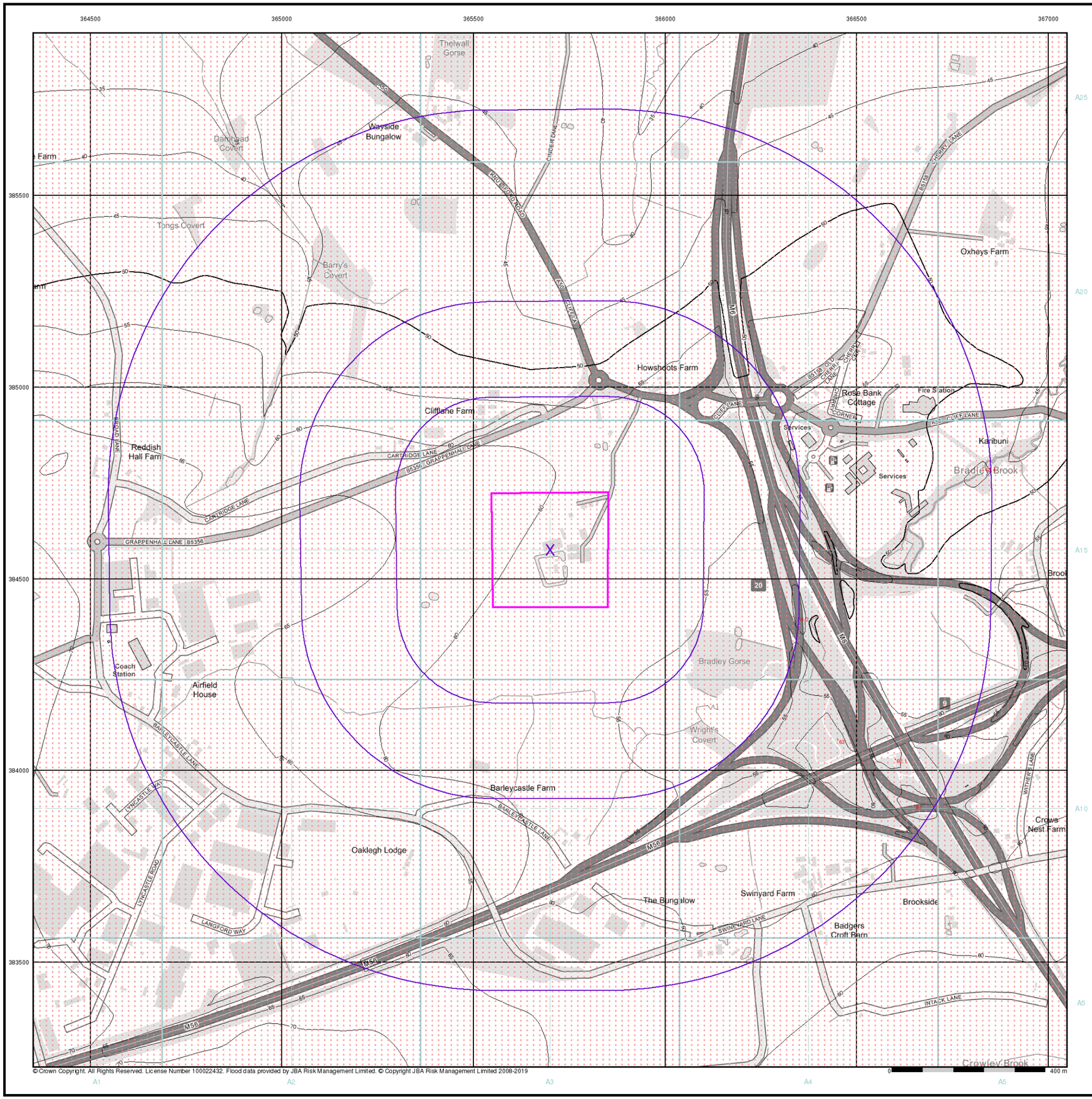

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JBA Canal Failure Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point

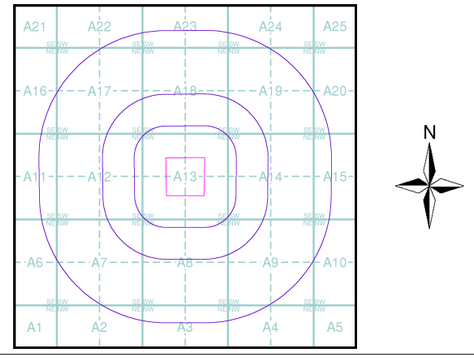
Flood Data

- Canal Failure
- Coverage

Contours (height in metres)

- Standard Contour (105)
- Master Contour (100)
- Spot Height (*167.8)
- MLW Mean Low Water
- MHW Mean High Water

JBA Canal Failure Flood Map - Slice A



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Site Area (Ha):	9.
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Site Details

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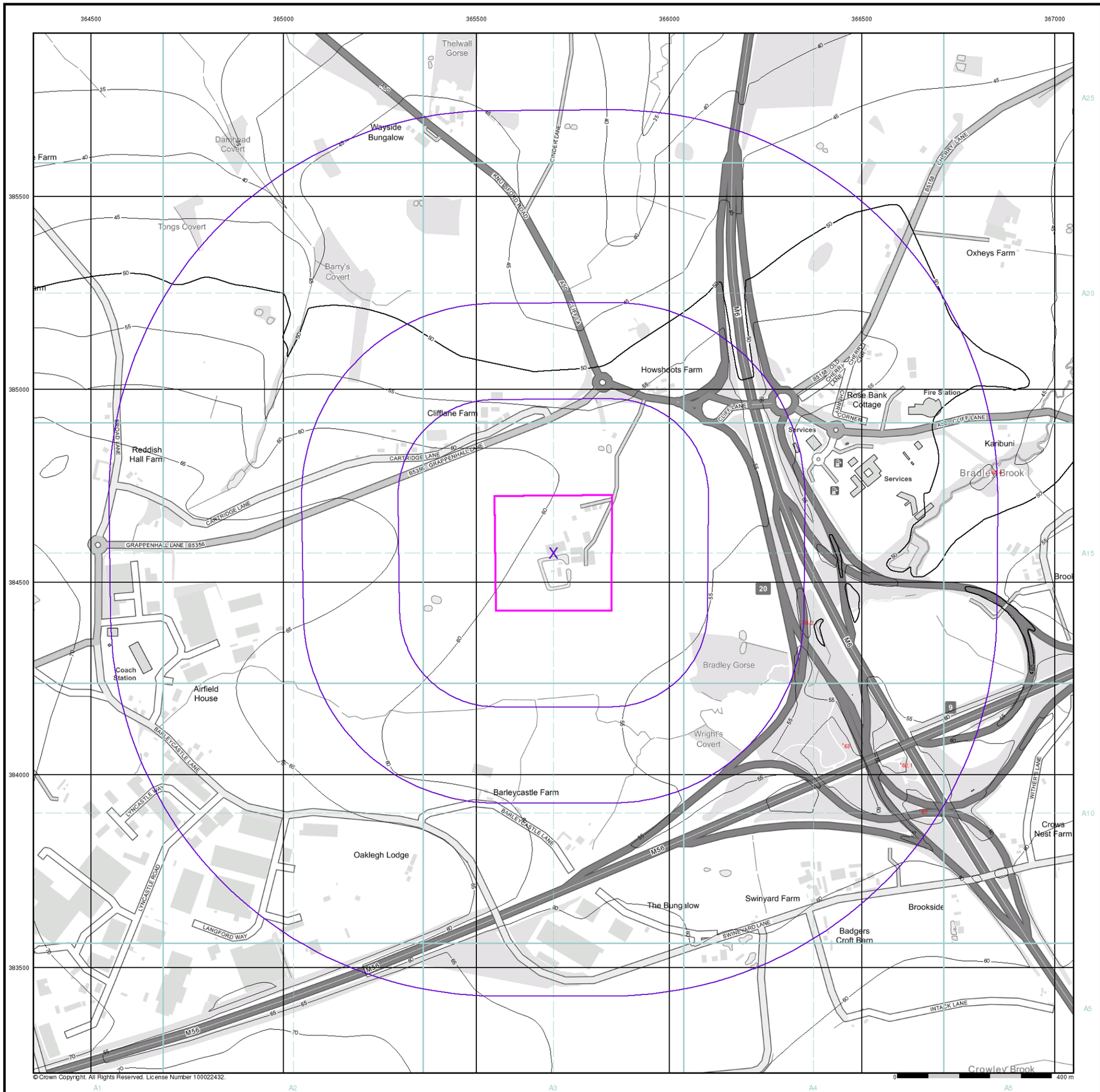

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EA/NRW Historic Flood Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID

Historic Flood Events Data

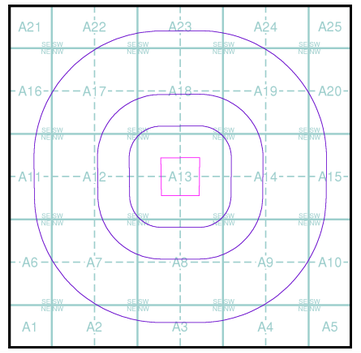
- Channel Capacity Exceeded (no raised defences)
- Channel Capacity Exceeded /Surface Water
- Groundwater/High Water Table
- Local Drainage/Surface Water
- Mechanical Failure
- Obstruction/Blockage - Bridge
- Obstruction/Blockage - Channel
- Historical Flood Liabilities
- Obstruction/Blockage - Culvert
- Obstruction/Blockage - Debris Screen
- Operational Failure/ Breach of Defence
- Other
- Overtopping of Defences
- Surface Water
- Unknown

Contours (height in metres)

Standard Contour 105 100 95
Master Contour
Spot Height *167.8

MLW Mean Low Water
MHW Mean High Water

EA/NRW Historic Flood Map - Slice A



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Customer Ref:	1015524
National Grid Reference:	365700, 384580
Slice:	A
Site Area (Ha):	9.
Search Buffer (m):	1000

Site Details

Bradley Hall Farm, Cliff Lane, Grappenhall, WARRINGTON, WA4 4SL

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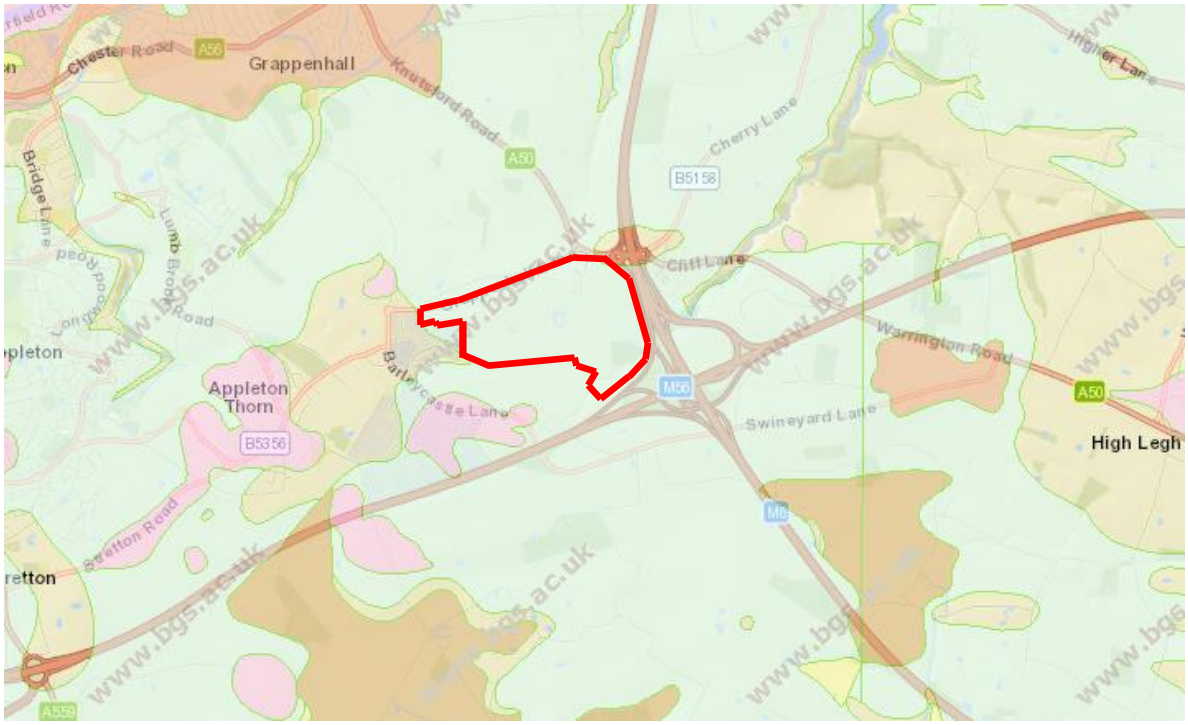
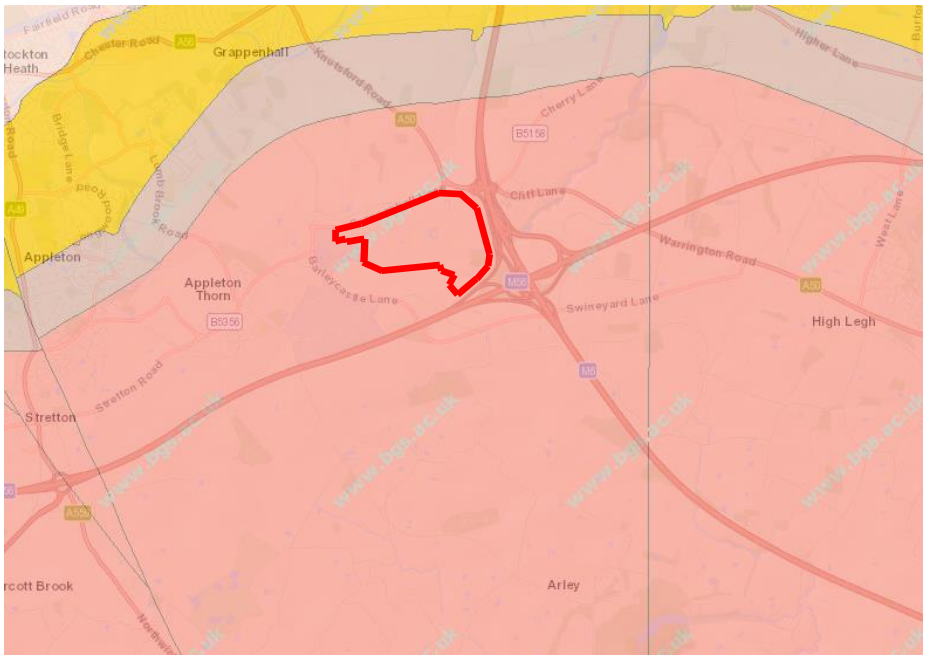
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

Appendix H –Ground Maps



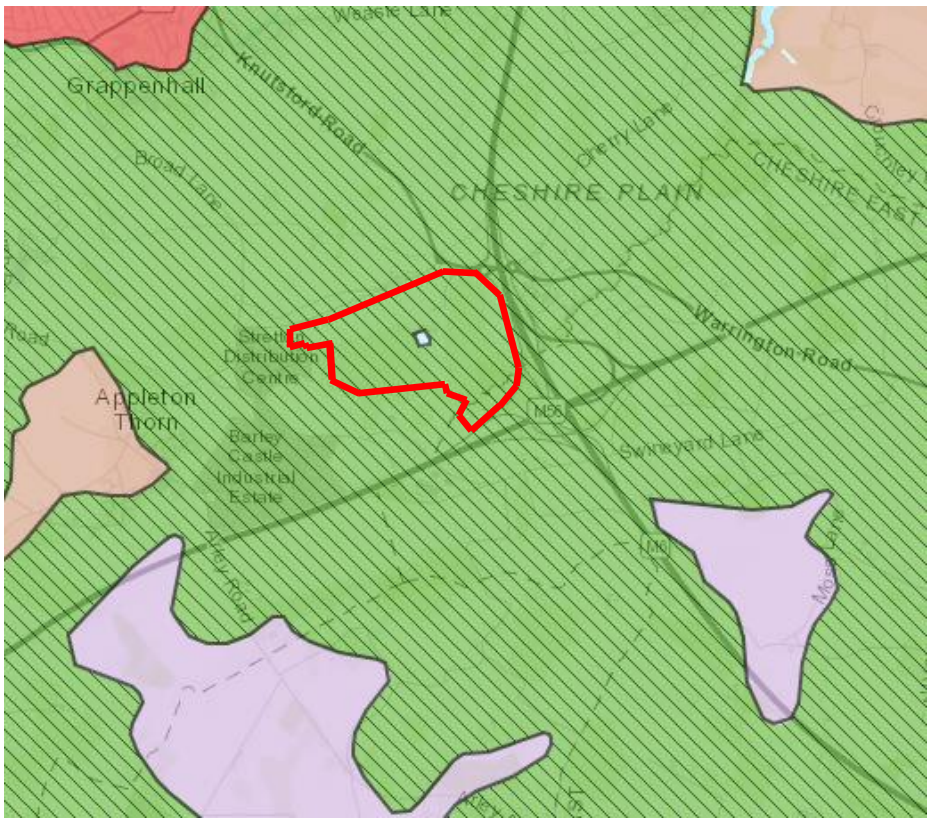
TILL, DEVENSIAN - DIAMICTON

BGS Superficial Ground Map



BOLLIN MUDSTONE MEMBER - MUDSTONE

BGS Bedrock Map



Soilscape 18:
Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils

DEFRA Soilscapes Map

Appendix I – United Utilities Plans

Refno Cover Func Invert Size.x Size.y Shape Mati Length Grad Refno Cover Func Invert Size.x Size.y Shape Mati Length Grad

WASTE WATER SYMBOLOGY

Foul Surface Combined Overflow

Manhole
Manhole, Side Entry
MainSewer, Public
MainSewer, Private
MainSewer, S104
Rising Main, Public
Rising Main, Private
Rising Main, S104
Highway Drain, Private

Foul Surface Combined

WW Site Termination
Air Valve
Cascade
Non Return Valve
Extent of Survey
Flow Meter
Gulley
Hatch Box
Head of System
Hydrobrake / Vortex
Inlet
Inspection Chamber
Bifurcation
Catchpit
Contaminated Surface Water
WW Pumping Station
Sludge Pumping Station
Sewer Overflow
TJunction/Saddle
LampHole
OilInterceptor
PenStock
Pump
RoddingEye
Soakaway
Summit
Valve
Valve Chamber
Washout Chamber
DropShaft
WW Treatment Works
Septic Tank
Vent Column
Network Storage Tank
Orifice Plate
Vortex Chamber
Penstock Chamber
Blind Manhole

Foul Surface Combined Overflow

Screen Chamber
Discharge Point
Outfall

Sludge Main, Public
Sludge Main, Private
Sludge Main, S104

ABANDONED PIPE

MainSewer
Rising Main
Highway Drain
Sludge Main

Control Kiosk
Unspecified

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SJ6584NE
Scale: 1:1250 Date: 15/08/2017
0 Nodes
Sheet 1 of 1

United Utilities
helping life flow smoothly

SEWER RECORDS

Printed By: Property Searches

OS Sheet No: SJ6584NE

Scale: 1:1250 Date: 15/08/2017

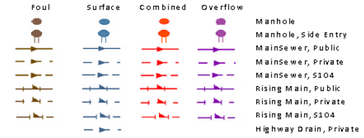
Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad	Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad
3901	55.76	FO																	
3904		FO																	
3902		FO	0	225		CI	VC	18.62											
3903		FO	48.59	300		CI	VC	25.98											
3906		FO																	
3905		FO																	

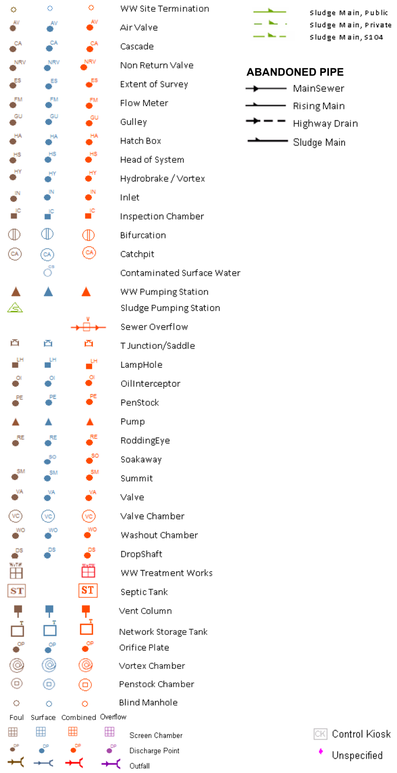
OS Sheet No: SJ6684NW

Scale: 1:1250 Date: 15/08/2017

Printed By: Property Searches

WASTE WATER SYMBOLOGY





ABANDONED PIPE

- MainSewer
- Rising Main
- Highway Drain
- Sludge Main

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SJ6684NW

Scale: 1:1250 Date: 15/08/2017

6 Nodes

Sheet 1 of 1

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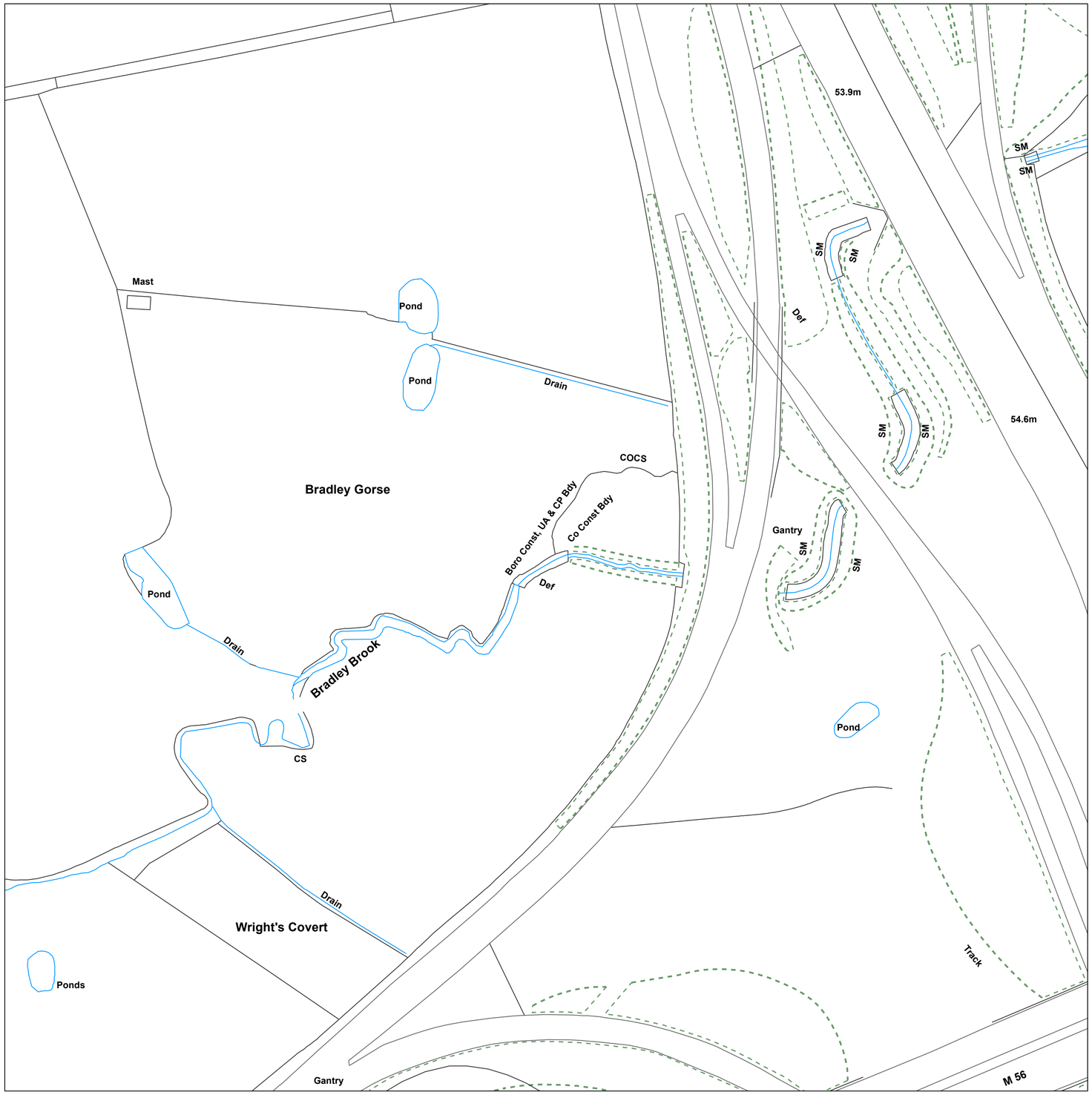
SEWER RECORDS



Refno Cover Func Invert Size.x Size.y Shape Mati Length Grad Refno Cover Func Invert Size.x Size.y Shape Mati Length Grad

OS Sheet No: SJ6684SW

Scale: 1:1250 Date: 15/08/2017

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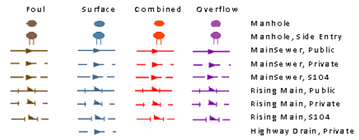
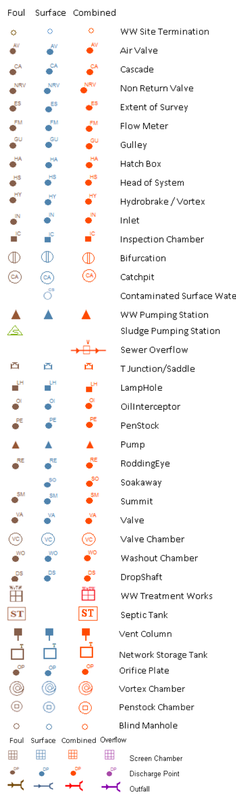
WASTE WATER SYMBOLOGY





ABANDONED PIPE

- MainSewer
- Rising Main
- Highway Drain
- Sludge Main

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SJ6684SW
Scale: 1:1250 Date: 15/08/2017
0 Nodes
Sheet 1 of 1

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SEWER RECORDS

Refno Cover Func Invert Size.x Size.y Shape Mati Length Grad Refno Cover Func Invert Size.x Size.y Shape Mati Length Grad

WASTE WATER SYMBOLOGY

Foul Surface Combined Overflow

Manhole
Manhole, Side Entry
MainSewer, Public
MainSewer, Private
MainSewer, S104
Rising Main, Public
Rising Main, Private
Rising Main, S104
Highway Drain, Private

Foul Surface Combined

WW Site Termination
Air Valve
Cascade
Non Return Valve
Extent of Survey
Flow Meter
Gulley
Hatch Box
Head of System
Hydrobrake / Vortex
Inlet
Inspection Chamber
Bifurcation
Catchpit
Contaminated Surface Water
WW Pumping Station
Sludge Pumping Station
Sewer Overflow
TJunction/Saddle
LampHole
OilInterceptor
PenStock
Pump
RoddingEye
Soakaway
Summit
Valve
Valve Chamber
Washout Chamber
DropShaft
WW Treatment Works
Septic Tank
Vent Column
Network Storage Tank
Orifice Plate
Vortex Chamber
Penstock Chamber
Blind Manhole

Foul Surface Combined Overflow

Screen Chamber
Discharge Point
Outfall

Control Kiosk
Unspecified

Sludge Main, Public
Sludge Main, Private
Sludge Main, S104

ABANDONED PIPE

MainSewer
Rising Main
Highway Drain
Sludge Main

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SJ6584SE
Scale: 1:1250 Date: 15/08/2017
0 Nodes
Sheet 1 of 1

United Utilities
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SEWER RECORDS

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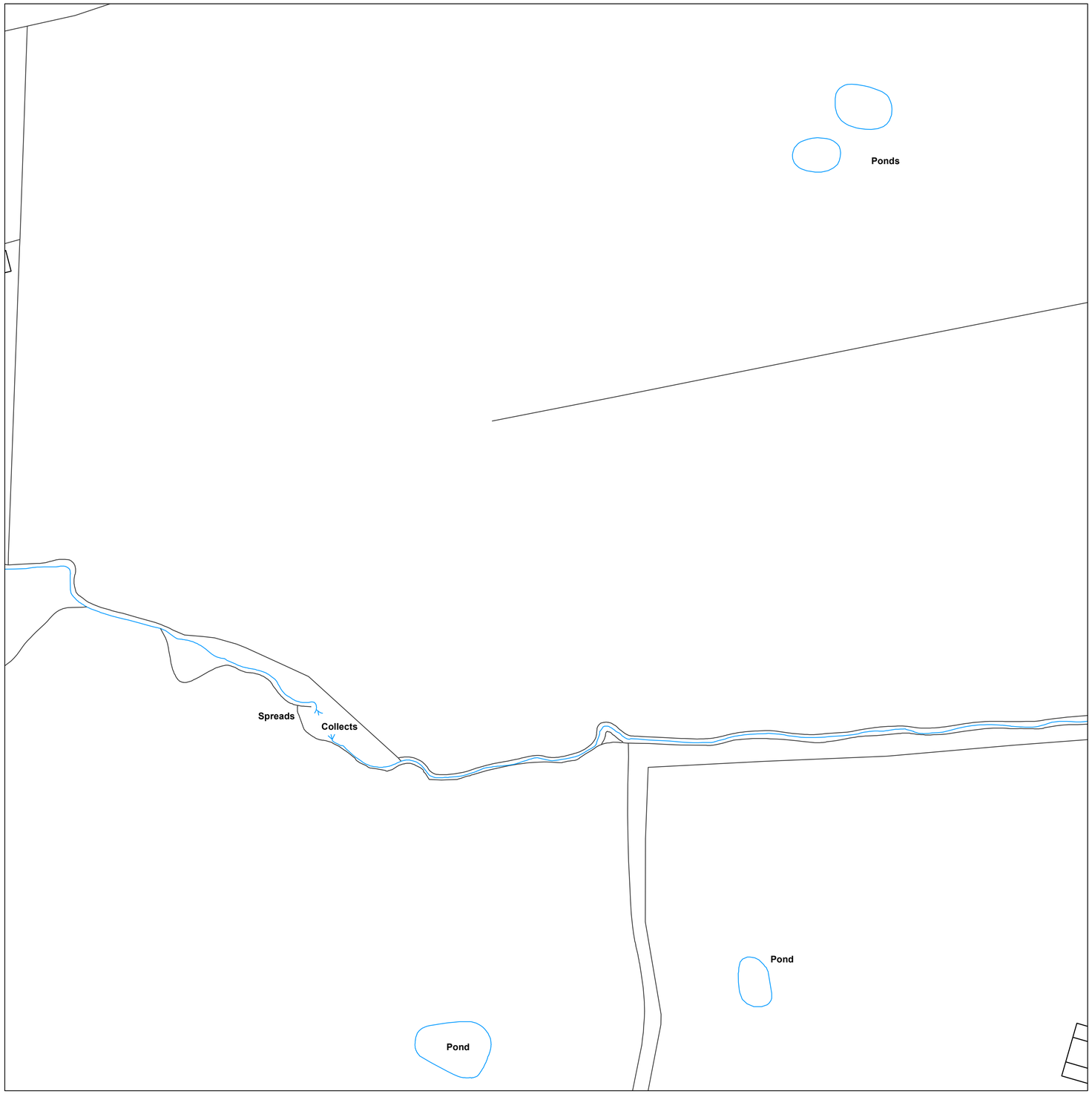
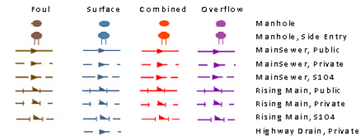
OS Sheet No: SJ6584SE

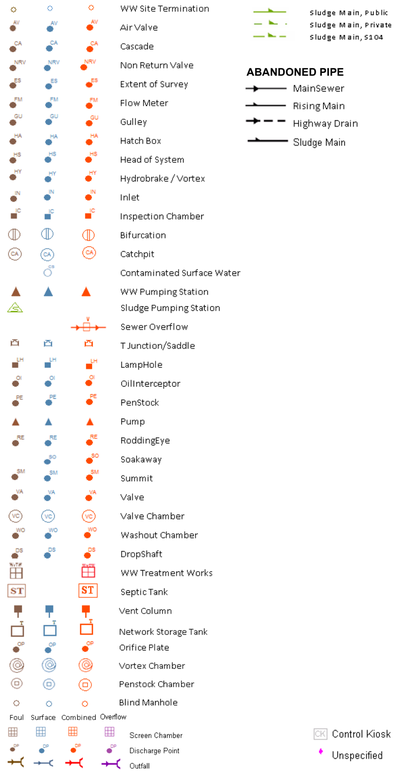
Scale: 1:1250 Date: 15/08/2017



Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad	Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad

WASTE WATER SYMBOLOGY





ABANDONED PIPE

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
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CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SJ6584SW
Scale: 1:1250 Date: 15/08/2017
0 Nodes
Sheet 1 of 1

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SEWER RECORDS

Printed By: Property Searches

OS Sheet No: SJ6584SW

Scale: 1:1250 Date: 15/08/2017

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad
5301		SW							
6000		SW							
6001		SW							
6003		SW							
6100		SW							
6401		FO							
6402		FO							
6403		SW							
6404		FO							
7000		SW							
7003		SW							
7301		FO							
6004		SW	0	750		CI	CO	35.36	

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad

WASTE WATER SYMBOLOGY

Foul Surface Combined Overflow

Manhole
Manhole, Side Entry
MainSewer, Public
MainSewer, Private
MainSewer, S104
Rising Main, Public
Rising Main, Private
Rising Main, S104
Highway Drain, Private

Foul Surface Combined

WW Site Termination
Air Valve
Cascade
Non Return Valve
Extent of Survey
Flow Meter
Gulley
Hatch Box
Head of System
Hydrobrake / Vortex
Inlet
Inspection Chamber
Bifurcation
Catchpit
Contaminated Surface Water
WW Pumping Station
Sludge Pumping Station
Sewer Overflow
TJunction/Saddle
LampHole
OilInterceptor
PenStock
Pump
RoddingEye
Soakaway
Summit
Valve
Valve Chamber
Washout Chamber
DropShaft
WW Treatment Works
Septic Tank
Vent Column
Network Storage Tank
Orifice Plate
Vortex Chamber
Penstock Chamber
Blind Manhole

Foul Surface Combined Overflow

Screen Chamber
Discharge Point
Outfall

Control Kiosk
Unspecified

Sludge Main, Public
Sludge Main, Private
Sludge Main, S104

ABANDONED PIPE

MainSewer
Rising Main
Highway Drain
Sludge Main

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SJ6484SE
Scale: 1:1250 Date: 15/08/2017
13 Nodes
Sheet 1 of 1

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SEWER RECORDS

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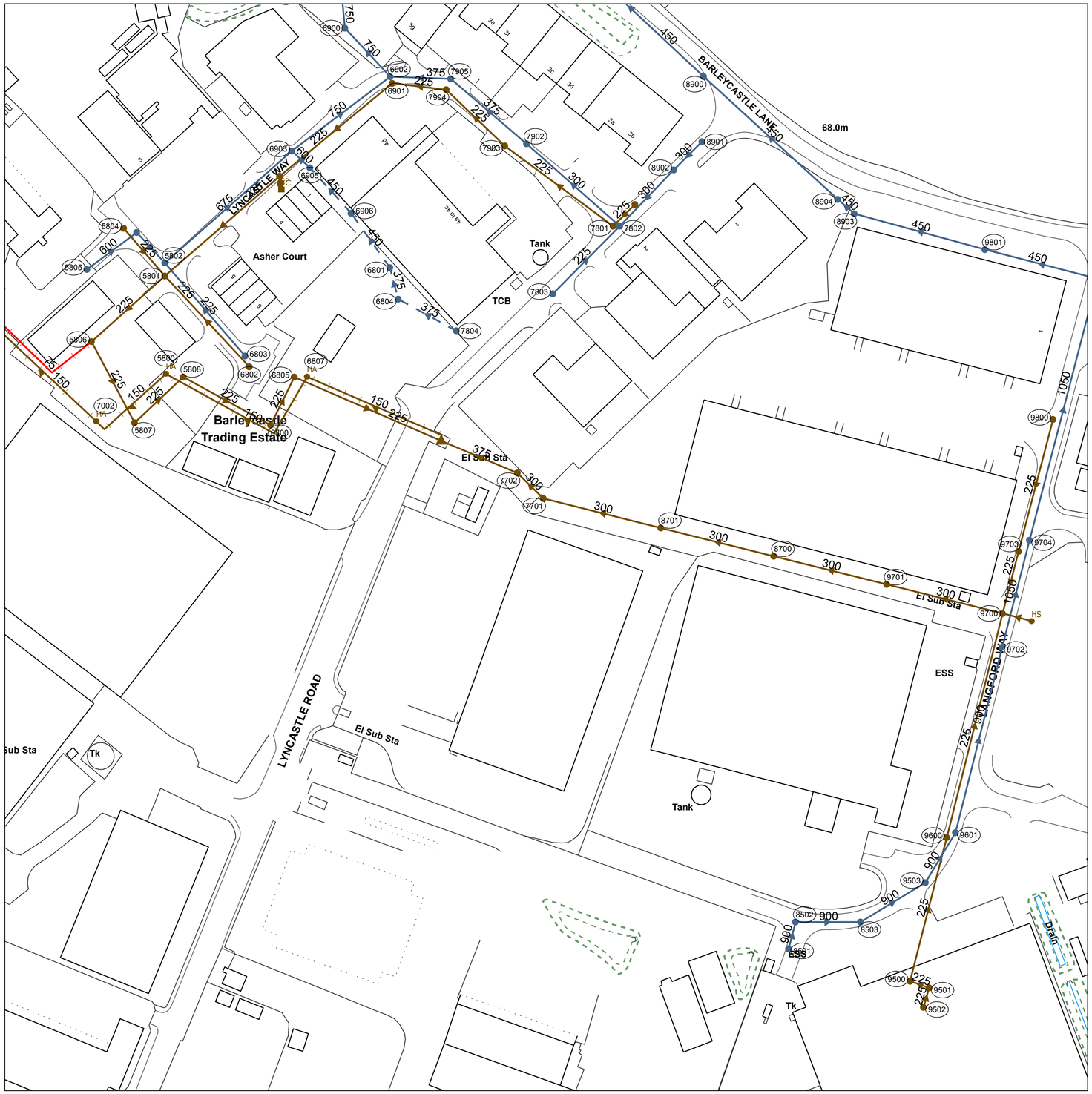
OS Sheet No: SJ6484SE

Scale: 1:1250 Date: 15/08/2017



Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad
5800		FO							
5801	66.3	FO	0	225		CI	VC	45.46	
5802	66.31	SW							
5803	66.31	SW							
5804	66.35	FO	63.59	225		CI	VC	29.07	
5805	66.36	SW	64.6	600		CI	CO	28.59	1430
5806		FO							
5807		FO							
5808		FO							
6800		SO							
6801	65.52	SW							
6802	66.35	FO	63.82	225		CI	VC	57.32	
6803	66.33	SW	65.07	225		CI	VC	56.77	315
6804	65.48	SW							
6805		FO	0	225		CI	VC	74.03	
6807		FO							
6900		SW							
6901	65.94	FO	63.96	225		CI	VC	67.38	217
6902	65.95	SW							
6903	66.07	SW	64.36	750		CI	CO	56.87	437
6904	66.08	FO							
6905	65.56	SW							
6906	65.52	SW	64.59	450		CI	CO	28.32	0
6908		FO							
7701	68.53	FO							
7702	68.34	FO							
7801	67	FO	64.81	225		CI	VC	62.2	173
7802	67.03	SW							
7803	66.89	SW	65.46	225		CI	VC	43.91	488
7804	65.56	SW	64.75	375		CI	CO	30.57	0
7901	67.05	FO	65.07	225		CI	VC	14.13	61
7902	66.45	SW							
7903	66.31	FO							
7904	66.05	FO							
7905	66.03	SW							
8501	69.32	SW	66.63	900		CI	CO	12.71	55
8502	69.33	SW							
8503	68.97	SW							
8700	68.91	FO							
8701	68.93	FO							
8900		SW							
8901	67.24	SW	0	300		CI	CO	18.41	
8902	67.19	SW	0	300		CI	CO	36.08	
8903		SW	0	450		CI	CO	10.2	
8904		SW							
9500	69.93	FO							
9501	69.73	FO							
9502	69.83	FO	66.23	225		CI	VC	9.34	
9503	68.56	SW							
9600	68.49	FO							
9601	68.2	SW							
9700	68.27	FO							
9701	68.41	FO							
9702	68.19	SW							
9703	68.45	FO	64.49	225		CI	VC	29.49	92
9704	68.74	SW							
9800	68.8	FO	65	225		CI	VC	62.97	123
9801		SW							
7002		FO							
9602		FO	0	225		CI	VC	13.93	
7700		FO	0	150		CI	DI	70.52	

WASTE WATER SYMBOLOGY

Foul Surface Combined Overflow

Manhole
Manhole, Side Entry
MainSewer, Public
MainSewer, Private
MainSewer, S104
Rising Main, Public
Rising Main, Private
Rising Main, S104
Highway Drain, Private

Foul Surface Combined

WW Site Termination
Air Valve
Cascade
Non Return Valve
Extent of Survey
Flow Meter
Gulley
Hatch Box
Head of System
Hydrobrake / Vortex
Inlet
Inspection Chamber
Bifurcation
Catchpit
Contaminated Surface Water
WW Pumping Station
Sludge Pumping Station
Sewer Overflow
TJunction/Saddle
LampHole
OilInterceptor
PenStock
Pump
RoddingEye
Soakaway
Summit
Valve
Valve Chamber
Washout Chamber
DropShaft
WW Treatment Works
Septic Tank
Vent Column
Network Storage Tank
Orifice Plate
Vortex Chamber
Penstock Chamber
Blind Manhole

Sludge Main, Public
Sludge Main, Private
Sludge Main, S104

ABANDONED PIPE
MainSewer
Rising Main
Highway Drain
Sludge Main

Foul Surface Combined Overflow

Screen Chamber
Discharge Point
Outfall

Control Kiosk
Unspecified

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SJ6483NE
Scale: 1:1250 Date: 15/08/2017
61 Nodes
Sheet 1 of 1

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SEWER RECORDS

Printed By: Property Searches

OS Sheet No: SJ6483NE

Scale: 1:1250 Date: 15/08/2017

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad
0001	72.45	SW	70.45	225		CI	CO	17.05	142
0002	72.48	FO	69.58	150		CI	CO	26.38	85
0003	72.6	SW	70.71	225		CI	CO	37.45	197
0004		FO							
0005	72.48	SW	70.52	225		CI	CO	14.12	202
0006		FO		100		CI	VC	3.54	
3201		SW							
0008		FO		100		CI	CI	399.52	
1101		FO		0		CI	DI	27.84	

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad

Printed By: Property Searches

OS Sheet No: SJ6484SW

Scale: 1:1250 Date: 15/11/2017

WASTE WATER SYMBOLOGY

Foul Surface Combined Overflow

Manhole
Manhole, Side Entry
MainSewer, Public
MainSewer, Private
MainSewer, S104
Rising Main, Public
Rising Main, Private
Rising Main, S104
Highway Drain, Private

Foul Surface Combined

WW Site Termination
Air Valve
Cascade
Non Return Valve
Extent of Survey
Flow Meter
Gulley
Hatch Box
Head of System
Hydrobrake / Vortex
Inlet
Inspection Chamber
Bifurcation
Catchpit
Contaminated Surface Water
WW Pumping Station
Sludge Pumping Station
Sewer Overflow
TJunction/Saddle
LampHole
OilInterceptor
PenStock
Pump
RoddingEye
Soakaway
Summit
Valve
Valve Chamber
Washout Chamber
DropShaft
WW Treatment Works
Septic Tank
Vent Column
Network Storage Tank
Orifice Plate
Vortex Chamber
Penstock Chamber
Blind Manhole

Foul Surface Combined Overflow

Screen Chamber
Discharge Point
Outfall

Control Kiosk
Unspecified

Sludge Main, Public
Sludge Main, Private
Sludge Main, S104

ABANDONED PIPE

MainSewer
Rising Main
Highway Drain
Sludge Main

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SJ6484SW
Scale: 1:1250 Date: 15/11/2017
9 Nodes
Sheet 1 of 1

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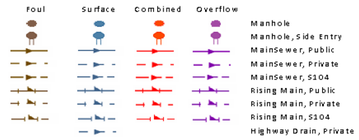
SEWER RECORDS

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad
5000	68.8	FO	66.65	450		CI	CO	103.16	24
5001	69.11	SW	66.16	375		CI	VC	34.34	
5301	65.14	FO	63.44	225		CI	VC	146.35	49
6101	70.57	FO	67.46	225		CI	VC	42.24	106
6102	69.13	FO	67.03	225		CI	VC	96.89	77
6103	70.34	SW	67.61	300		CI	VC	133.61	94
6201	67.48	FO	65.76	225		CI	VC	122.35	54
7000		FO							
7001	71.34	SW							
7002		FO	0	150		CI	VC	66.28	
7005		SW							
7006	71.27	FO	67.18	450		CI	CO	9.59	480
7007	70.7	FO							
7008		FO							
7009	70.1	FO							
7010		SW							
7011		FO	0	150		CI	VC	31.52	
7012		FO							
7013		FO							
7100		SW							
7101	71.55	SW	69.23	225		CI	VC	19.85	124
7102		FO							
7103	71.03	SW	68.83	300		CI	CO	7.4	148
7104	71	FO	68.7	225		CI	VC	14.51	63
7105	70.91	SW	68.7	375		CI	CO	29.95	
7106	70.92	FO	68.45	225		CI	VC	30.34	
7107	70.7	SW	68.43	375		CI	CO	13.23	46
7108	70.76	FO	68.23	225		CI	VC	40.66	70
7109	70.43	SW							
7110	70.47	FO							
7111	70.75	FO							
7114		FO		100		CI	VC	14.46	
7115	71.58	SW							
7116	71.58	FO							
7117		FO							
7119		SW							
7201		FO	0	150		CI	VC	49.52	
7202	71.72	SW	70.77	225		CI	VC	50.02	53
8001	72.45	SW							
8002		FO							
8003	71.71	SW	70.03	225		CI	VC	27.12	75
8004		FO	0	150		CI	VC	22.18	
8005	71.46	SW	69.65	225		CI	VC	10.39	36
8006		FO	0	150		CI	VC	15.79	
8007		FO		100		CI	VC	19.25	
8101	71.34	SW	69.31	375		CI	CO	43.96	400
8102		FO							
8103	71.47	SW	69.16	375		CI	CO	26.39	240
8104	71.47	FO	69.17	225		CI	VC	10.47	150
8105	71.27	SW	69.03	375		CI	CO	19.82	283
8106	71.25	FO	69.02	225		CI	CO	22.04	551
8107	71.14	SW							
8108	71.15	FO							
8109	71.76	SW							
8110		FO							
8111		SW							
8112		FO							
8113		FO	0	150		CI	VC	21.73	
8114	71.57	SW	70.13	300		CI	VC	24.71	190
8120		FO		100		CI	VC	12.74	
8122		FO		100		CI	VC	9.12	
8123		FO							
8126		FO		150		CI	VC	23.91	
8128		FO							
8129		FO							
8204	70.85	SW	69.81	225		CI	VC	10.01	125
8205	70.86	FO	69.32	150		CI	VC	11.09	158
8206	70.96	SW	69.71	225		CI	VC	26.37	155
8207	70.95	FO	69.22	150		CI	VC	24.35	111
9000	71.85	FO							
9001		FO	0	150		CI	VC	35.01	
9002		SW	0	150		CI	VC	38.6	
9003		FO	0	150		CI	VC	21.36	
9004	72.54	SW	70.49	225		CI	VC	14.21	142
9005	71.85	SW							
9006		SW	0	150		CI	VC	33.48	
9007		FO							
9008	72.75	SW	70.86	225		CI	CO	21.25	142
9009		SW		150		CI	VC	15.61	
9011		FO		0		CI	VC	14.61	
9012		FO		100		CI	VC	56.14	
9014		FO							
9015		SW							
9016		FO							
9017		FO							
9101	71.53	SW							
9102		FO							
5002		SW							
6105		FO	67.56	225		CI	CO	4.47	64
7003		SW	0	225		CI	VC	6.29	
7004		FO	0	150		CI	VC	7.94	
7016		FO							
7110		FO							
7112		SW	68.78	375		CI	CO	7.09	142
7113		SW	68.14	300		CI	CO	25.4	88
7118		FO							
7203		SW							
8010		FO							
8011		FO							
8115		FO	33.62	225		CI	VC	22.44	
8116		FO	69.1	225		CI	CO	11.84	148
8117		SW							
8118		FO							
8119		SW	34.36	300		CI	VC	7.14	
8125		FO							
8128		FO							
9010		FO							
9103		FO	0	150		CI	PVC	312.77	
9104		FO							
6100		SW	67.73	300		CI	VC	34.33	429
7014		FO							
7015		FO		100		CI	VC	14.82	
8127		FO							

WASTE WATER SYMBOLOGY



LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

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OS Sheet No: SJ6384SE

Scale: 1:1250 Date: 15/11/2017

OS Sheet No: SJ6384SE
Scale: 1:1250 Date: 15/11/2017
113 Nodes
Sheet 1 of 1

United Utilities
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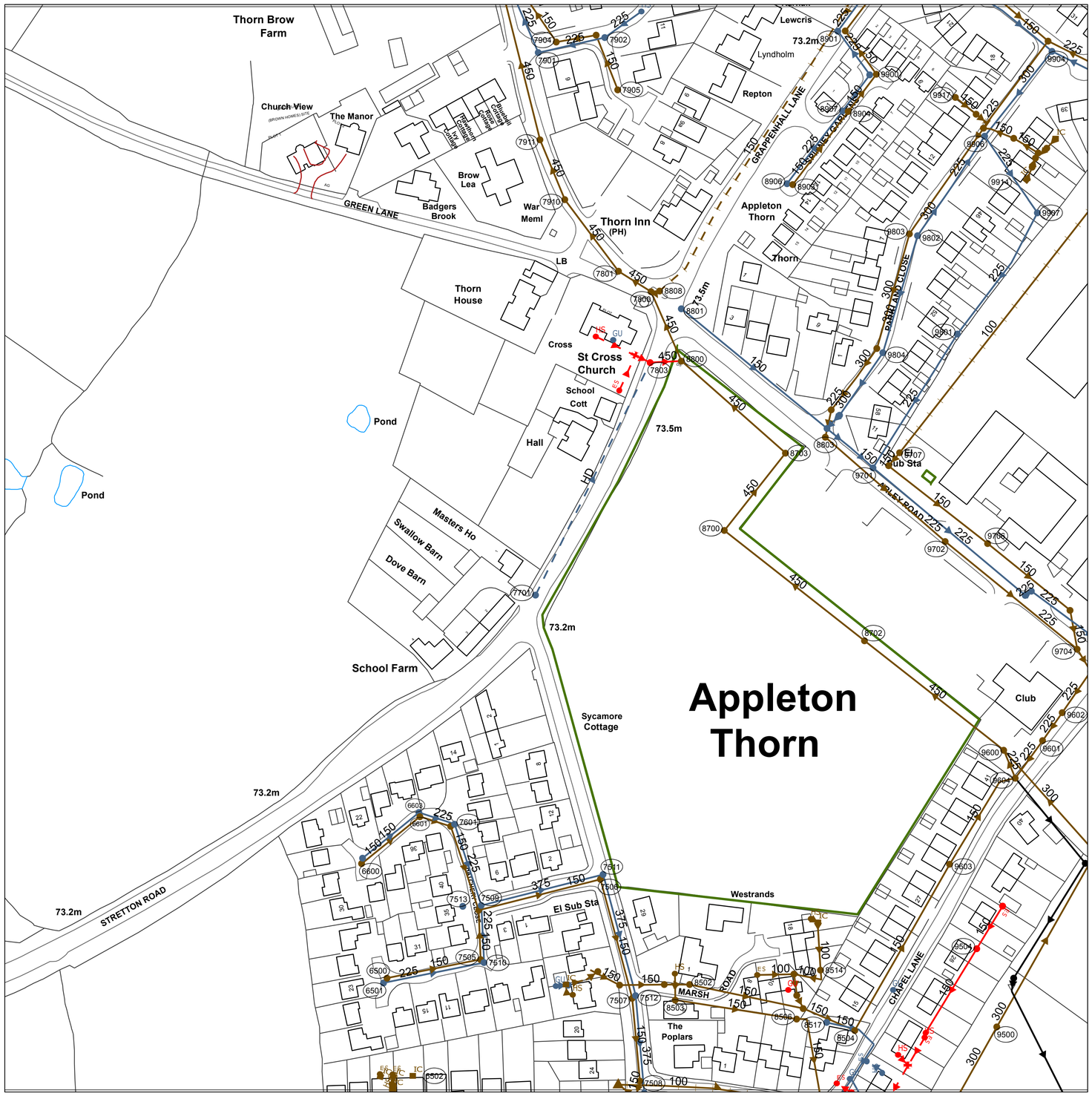
SEWER RECORDS



Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad
6500	72.19	FO	70.3	150		CI	VC	44.03	88
6501	72.13	SW	70.93	225		CI	VC	47.32	93
6502		FO							
6503		FO							
6504		FO							
6511		FO							
6600	72.43	FO	70.83	150		CI	VC	34.59	80
6601	72.7	FO							
6602	72.45	SW	71.25	150		CI	VC	33.43	90
6603	72.7	SW							
7500	72.06	FO							
7501		FO	0	150		CI	VC	20.64	
7503		SW							
7505	72.31	FO							
7506	72.56	FO	68.9	150		CI	VC	56.82	93
7507	71.99	FO							
7508	71.7	FO	67.89	150		CI	VC	7.7	
7509	72.13	SW							
7510	72.32	SW							
7511	72.54	SW	69.59	375		CI	VC	57.87	113
7512	71.93	SW							
7513		SW							
7514		FO							
7515		FO							
7600	72.47	FO	70.2	150		CI	VC	40.83	64
7601	72.47	SW							
7701		SW	0			CI		119.66	
7800	73.69	FO							
7801	73.22	FO	67.48	450		CI	CO	41.32	459
7803		CO							
7901	71.39	SW	69.66	225		CI	VC	31.75	
7902	71.34	SW							
7903		FO							
7904		FO	0	150		CI	VC	30.67	
7905		FO	0	150		CI	VC	27.16	
7910	72.41	FO							
7911	71.89	FO							
8501		FO	0	150		CI	VC	11.69	
8502		FO	0	150		CI	VC	53.59	
8503		FO	0	150		CI	VC	56.81	
8504		FO	0	150		CI	VC	88.34	
8505		FO	0	150		CI	VC	25.61	
8506		FO	0	150		CI	VC	48.16	
8509		SW	69.78	225		CI	VC	32.07	
8510		FO							
8512		FO		100		CI	VC	9.84	
8513		FO		100		CI	VC	6.78	
8514		FO		100		CI	VC	17.13	
8517		SW		150		CI	VC	25.06	
8700	72.42	FO							
8702	72.1	FO	67.98	450		CI	CO	82.35	515
8703	72.37	FO							
8800	73.05	FO							
8801		SW	0	150		CI	VC	87.1	
8802		SW							
8803	72.29	FO							
8804	72.9	FO	70.74	225		CI	VC	12.87	22
8805	72.86	SW							
8808		FO	0	225		CI	PVC	4.06	
8900	71.96	FO							
8901	71.92	SW							
8903	71.65	FO	70.61	150		CI	VC	42.31	114
8904	71.37	FO	70.24	150		CI	VC	21.56	90
8905	71.12	SW	69.92	225		CI	VC	24.57	83
8906	71.65	SW	70.24	225		CI	VC	42.23	235
8907	71.36	SW	70.06	225		CI	VC	20.84	149
9500	71.67	FO	68.85	300		CI	VC	92.41	330
9504		CO		150		CI	VC	45.69	
9505		CO							
9600	71.76	FO							
9601	73.78	FO	69.74	225		CI	VC	21.41	
9602		FO	0	225		CI	VC	15.8	
9603		FO	0	150		CI	VC	51.86	
9604	72	FO							
9701	72.59	SW							
9702	72.46	FO							
9703	72.34	SW	71.04	225		CI	VC	3.45	
9704	72.39	FO							
9705	72.21	SW							
9706		FO							
9707		FO							
9708		FO		150		CI	VC	18.22	
9709		FO							
9801		SW							
9802	72.97	SW	71.7	300		CI	VC	56.28	69
9803		FO	0	300		CI	VC	55.06	
9804	72.92	SW	70.85	300		CI	VC	35.14	
9805		FO	0	300		CI	VC	17.21	
9900	71.13	FO	70	150		CI	VC	24.64	103
9901		FO							
9902		FO							
9903	73.14	FO							
9904	73.14	SW							
9905	72.99	FO							
9906	73.04	SW	71.58	225		CI	VC	42.94	195
9907	72.46	SW							
9909		FO							
9910		FO		150		CI	VC	5.02	
9911		FO							
9913		FO		100		CI	VC	4.44	
9914		FO							
9916		FO							
9917		FO		150		CI	VC	12.36	
6505		FO							
6506		FO							
6507		FO							
7502		SW		100		CI	PVC	5.8	
7516		FO							
7517		FO							
7802		SW							
7805		CO	0			CI		20.13	
7908		SW	0	225		CI	VC	20.74	
8411		CO	0	0		CI	UN	6.76	
8500		CO	0	0		CI	UN	15.03	
8507		FO	0	150		CI	VC	12.14	
8511		FO		100		CI	VC	18.33	
8516		CO							
8518		FO							
8519		SW							
8701		SW							
8806		SW	34.99	300		CI	CO	4.21	
8807		FO							
9501		SW							
9506		CO							
9507		SW							
9508		SW	71.64	225		CI	VC	27.47	549
9912		FO							
9915		FO							
6509		FO							
6510		FO							
7804		CO							
8410		CO		0		CI	UN	24.09	
9918		FO							
9501	72.51	FO							
9506		FO							
9607		FO							
7504		FO	0	100		CI	PVC	90.31	

WASTE WATER SYMBOLOGY

Foul Surface Combined Overflow

Manhole
Manhole, Side Entry
MainSewer, Public
MainSewer, Private
MainSewer, S104
Rising Main, Public
Rising Main, Private
Rising Main, S104
Highway Drain, Private

Foul Surface Combined

WW Site Termination
Air Valve
Cascade
Non Return Valve
Extent of Survey
Flow Meter
Gulley
Hatch Box
Head of System
Hydrobrake / Vortex
Inlet
Inspection Chamber
Bifurcation
Catchpit
Contaminated Surface Water
WW Pumping Station
Sludge Pumping Station
Sewer Overflow
TJunction/Saddle
LampHole
OilInterceptor
PenStock
Pump
RoddingEye
Soakaway
Summit
Valve
Valve Chamber
Washout Chamber
DropShaft
WW Treatment Works
Septic Tank
Vent Column
Network Storage Tank
Orifice Plate
Vortex Chamber
Penstock Chamber
Blind Manhole

Foul Surface Combined Overflow

Screen Chamber
Discharge Point
Outfall

Sludge Main, Public
Sludge Main, Private
Sludge Main, S104

ABANDONED PIPE

MainSewer
Rising Main
Highway Drain
Sludge Main

Control Kiosk
Unspecified

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SJ6383NE

Scale: 1:1250 Date: 15/11/2017

137 Nodes

Sheet 1 of 1

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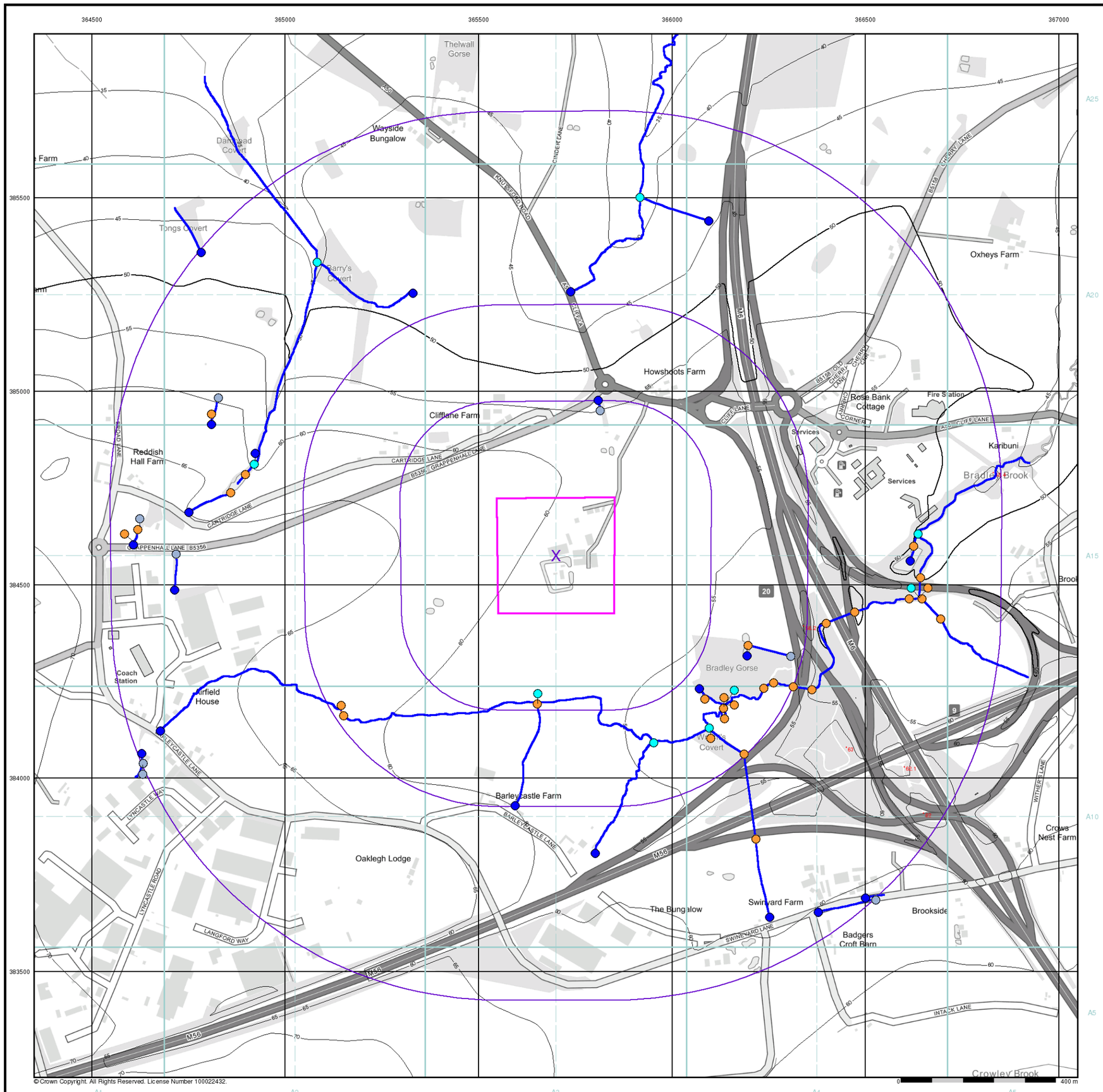
SEWER RECORDS

Printed By: Property Searches

OS Sheet No: SJ6383NE

Scale: 1:1250 Date: 15/11/2017

Appendix J – OS Water Network Lines Map



Envirocheck®

LANDMARK INFORMATION GROUP®

OS Water Network Lines Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point

OS Water Network Data

- Canal
- Reservoir
- Foreshore
- Marsh
- Tidal River
- Inland River
- Drain
- Other
- Lake
- Transfer
- Lock Or Flight Of Locks
- Sea
- Junction
- Outlet
- Pseudo
- Source
- Other

Contours (height in meters)

Standard Contour 105 100 95

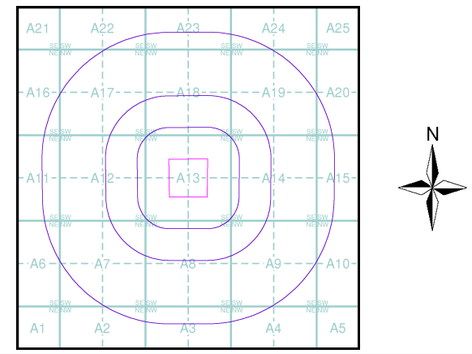
Master Contour

Spot Height *167.3

MLW Mean Low Water

MHW Mean High Water

OS Water Network Map - Slice A



Order Details

Order Number:	191758327_1_1
Customer Ref:	1015524
National Grid Reference:	365700, 384580
Slice:	A
Site Area (Ha):	9.
Search Buffer (m):	1000

Site Details

Bradley Hall Farm, Cliff Lane, Grappenhall, WARRINGTON, WA4 4SL

Landmark® INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

Appendix K – Proposed Drainage Strategy

KEY

- SURFACE WATER DRAINAGE PIPE
- FOUL WATER DRAINAGE PIPE
- FOUL WATER RISING MAIN
- SURFACE WATER ATTENUATION POND/SWALE
- SURFACE WATER HEADWALL
- EXISTING BROOK/WATERCOURSE
- SITE BOUNDARY

FOUL RISING MAIN TO CONTINUE DOWN THE ROAD UNTIL IT CONNECTS TO THE EXISTING 450mm DIAMETER FOUL SEWER IN GRAPPENHALL LANE. PUMP RATE AND CONNECTION SUBJECT TO AGREEMENT WITH UNITED UTILITIES

SURFACE WATER DRAIN FOR ENTRANCE ROAD

SURFACE WATER DRAIN FOR ENTRANCE ROAD

PLOT 7

PLOT 7 FOUL WATER CONNECTION

PLOT 7 PROPOSED SURFACE WATER CONNECTION INTO ATTENUATION POND

PLOT 7 PROPOSED SURFACE WATER CONNECTION. FLOW RATE RESTRICTED TO GREENFIELD RUNOFF RATES.

PLOT 6

PLOT 6 PROPOSED SURFACE WATER CONNECTION. FLOW RATE RESTRICTED TO GREENFIELD RUNOFF RATES.

PLOT 6 PROPOSED SURFACE WATER CONNECTION INTO ATTENUATION POND.

PLOT 6 FOUL WATER CONNECTION

PLOT 5

PLOT 5 PROPOSED SURFACE WATER CONNECTION. FLOW RATE RESTRICTED TO GREENFIELD RUNOFF RATES.

PLOT 5 PROPOSED SURFACE WATER CONNECTION INTO ATTENUATION POND

PLOT 5 FOUL WATER CONNECTION

PLOT 1

PLOT 1 FOUL WATER CONNECTION

PLOT 1 PROPOSED SURFACE WATER CONNECTION INTO ATTENUATION POND

PLOT 1 PROPOSED SURFACE WATER CONNECTION. FLOW RATE RESTRICTED TO GREENFIELD RUNOFF RATES.

PLOT 2

PLOT 2 PROPOSED SURFACE WATER CONNECTION INTO ATTENUATION POND

PLOT 2 FOUL WATER CONNECTION

PLOT 2 PROPOSED SURFACE WATER CONNECTION INTO ATTENUATION POND

FOUL PUMPING STATION PUMP RATE SUBJECT TO AGREEMENT WITH UNITED UTILITIES.

PROPOSED SURFACE WATER CONNECTIONS INTO SWALE. FLOW RATE RESTRICTED TO GREENFIELD RUNOFF RATES.

PLOT 4

PLOT 4 FOUL WATER CONNECTION

PLOT 4 PROPOSED SURFACE WATER CONNECTION INTO ATTENUATION POND

PLOT 3

PLOT 3 FOUL WATER CONNECTION

EXISTING CULVERTED WATERCOURSE

EXISTING BRADLEY GORSE MAINTAINED

BRADLEY BROOK

CONNECTION BETWEEN ATTENUATION POND AND EXISTING WATERCOURSE. FLOW RATE RESTRICTED TO GREENFIELD RUNOFF RATES.

BRADLEY BROOK

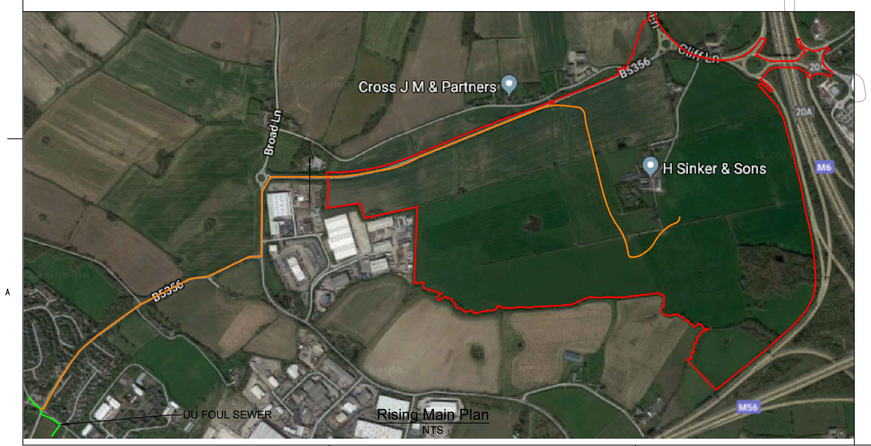
CONNECTION BETWEEN ATTENUATION POND AND BRADLEY BROOK. FLOW RATE RESTRICTED TO GREENFIELD RUNOFF RATES.

PLOT 3 PROPOSED SURFACE WATER CONNECTION INTO ATTENUATION POND

BRADLEY BROOK

ECOLOGICAL MITIGATION AREA

DRAINAGE STRATEGY
SCALE 1:2500



Rising Main Plan
NTS

True scale at 1:1

1015524 | A1

Based on.

Architects Drg No.	Rev
Structural Drg No.	Rev
Survey Drg No.	Rev
Other Drg No.	Rev
Other Drg No.	Rev

Notes

- TO BE READ IN CONJUNCTION WITH ALL RELEVANT CUNDALL DRAWINGS.
- TO BE READ INC CONJUNCTION WITH THE CUNDALL FLOOD RISK & DRAINAGE STRATEGY DOCUMENT 1015524-RPT-CL-002
- LAYOUT BASED ON THE STEPHEN GEORGE + PARTNERS LLP ILLUSTRATIVE MASTERPLAN

Issue	Date	Description	By	Chkd	Verfd
D	09.10.20	REVISED PLOT 1 BUND	MH	RT	BW
C	20.03.20	UPDATED TO LATEST LANDSCAPE LAYOUT	EM	MH	DB
B	25.02.20	UPDATED TO LATEST LANDSCAPE LAYOUT	EM	RB	MH
A	26.03.19	FOUL RISING MAIN UPDATED	RB	MH	GC
-	06.02.19	FIRST ISSUE	RB	MH	GC

Project
SIX:56 WARRINGTON

Client
LANGTREE / FIRST INDUSTRIAL

Architect
STEPHEN GEORGE PARTNERS

Title
DRAINAGE STRATEGY

Drawing No.	Drawing Status
CLXX(52)0004	INFORMATION
Job No.	Scale
1015524	1:2500

CUNDALL

4th Floor, Partnership House
Regent Farm Road,
Gosforth,
Newcastle, NE3 3AF
Telephone: +44 (0)191 213 1515

Website: www.cundall.com

Appendix L – Foul Calculations

Foul Peak Flow Rate Calculation

Plot	Office	Hub	Warehouse
1	1393.5	371.6	21553.5
2	1486.4	743.2	78224.3
3	1393.5	371.6	26802.5
4	1393.5	743.2	90889.3
5	1393.5	372	31354.8
6	1114.8	372	19017.2
7	743.2	0	8175.5
Total:	8918.4	2973.6	276017.1
Litres/day:	66888	8920.8	828051.3

	litres/day/100m
Office Flow	750
Warehouse Flow	300

Total (l/day):	903860.10
Total (l/s):	10.46
Peak Flow Rate (l/s):	62.77

Foul Storage Requirement

Peak Flow Rate (l/s):	62.77
1 Hour Storage (m³):	225.97
2 Hour Storage (m³):	451.93

Appendix M – SuDS Planner Results

Results

Order By: Total

	Quick Rank View	Hydrological	Land Use	Site Features	Total	Community and Environment	Economics and Maintenance
Pervious Pavements	(1, 9, 5)	28 (1st)	16 (8th)	24 (5th)	68 (1st)	12 (9th)	19 (5th)
Wet Ponds	(2, 2, 1)	24 (3rd)	18 (2nd)	24 (5th)	66 (2nd)	20 (2nd)	22 (1st)
Stormwater Wetlands	(2, 1, 5)	22 (6th)	18 (2nd)	26 (3rd)	66 (2nd)	22 (1st)	19 (5th)
Online / Offline Storage	(2, 7, 8)	18 (10th)	20 (1st)	28 (2nd)	66 (2nd)	13 (7th)	18 (8th)
Dry Detention	(5, 7, 3)	20 (8th)	18 (2nd)	26 (3rd)	64 (5th)	13 (7th)	20 (3rd)
Green Roofs	(6, 5, 2)	26 (2nd)	4 (13th)	30 (1st)	60 (6th)	14 (5th)	21 (2nd)
Grassed Swales	(7, 5, 5)	22 (6th)	18 (2nd)	18 (8th)	58 (7th)	14 (5th)	19 (5th)
Filter Drains	(8, 11, 11)	20 (8th)	18 (2nd)	18 (8th)	56 (8th)	11 (11th)	15 (11th)
Filtration Techniques	(9, 9, 13)	16 (12th)	16 (8th)	22 (7th)	54 (9th)	12 (9th)	12 (13th)
Bioretention Area	(10, 3, 12)	18 (10th)	16 (8th)	18 (8th)	52 (10th)	17 (3rd)	14 (12th)
Infiltration Basin	(11, 11, 9)	24 (3rd)	16 (8th)	10 (12th)	50 (11th)	11 (11th)	17 (9th)
Grassed Filter Strip	(12, 4, 3)	12 (13th)	18 (2nd)	16 (11th)	46 (12th)	16 (4th)	20 (3rd)
Infiltration Trench / Soakaway	(12, 11, 9)	24 (3rd)	16 (8th)	6 (13th)	46 (12th)	11 (11th)	17 (9th)

Appendix N – HR Wallingford Greenfield Runoff Estimations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Elidir Millen
Site name:	Warrington Interchange
Site location:	Developed Boundary

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

Site Details

Latitude:	53.35652° N
Longitude:	2.51838° W
Reference:	2165459695
Date:	Feb 19 2020 11:09

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 91.5

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	826	826
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	501.66	501.66
1 in 1 year (l/s):	436.44	436.44
1 in 30 years (l/s):	852.82	852.82
1 in 100 year (l/s):	1043.45	1043.45
1 in 200 years (l/s):	1188.93	1188.93

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Elidir Millen
Site name:	Warrington Interchange
Site location:	Plot 1

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

Site Details

Latitude:	53.35652° N
Longitude:	2.51838° W
Reference:	610478942
Date:	Feb 19 2020 11:18

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 4.22

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	826	826
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	24.73	24.73
1 in 1 year (l/s):	21.51	21.51
1 in 30 years (l/s):	42.04	42.04
1 in 100 year (l/s):	51.43	51.43
1 in 200 years (l/s):	58.6	58.6

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Elidir Millen
Site name:	Warrington Interchange
Site location:	Plot 2

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

Site Details

Latitude:	53.35652° N
Longitude:	2.51838° W
Reference:	2262452721
Date:	Feb 19 2020 11:34

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 14.90

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	826	826
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	87.31	87.31
1 in 1 year (l/s):	75.96	75.96
1 in 30 years (l/s):	148.42	148.42
1 in 100 year (l/s):	181.6	181.6
1 in 200 years (l/s):	206.91	206.91

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Elidir Millen
Site name:	Warrington Interchange
Site location:	Plot 3

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

Site Details

Latitude:	53.35652° N
Longitude:	2.51838° W
Reference:	1407992208
Date:	Feb 19 2020 11:39

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 4.93

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	826	826
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	28.89	28.89
1 in 1 year (l/s):	25.13	25.13
1 in 30 years (l/s):	49.11	49.11
1 in 100 year (l/s):	60.09	60.09
1 in 200 years (l/s):	68.46	68.46

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Elidir Millen
Site name:	Warrington Interchange
Site location:	Plot 4

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

Site Details

Latitude:	53.35652° N
Longitude:	2.51838° W
Reference:	1445355195
Date:	Feb 19 2020 11:47

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 18.2

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	826	826
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	106.64	106.64
1 in 1 year (l/s):	92.78	92.78
1 in 30 years (l/s):	181.29	181.29
1 in 100 year (l/s):	221.81	221.81
1 in 200 years (l/s):	252.74	252.74

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Elidir Millen
Site name:	Warrington Interchange
Site location:	Plot 5

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

Site Details

Latitude:	53.35652° N
Longitude:	2.51838° W
Reference:	1793123962
Date:	Feb 19 2020 11:49

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 5.43

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	826	826
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	31.82	31.82
1 in 1 year (l/s):	27.68	27.68
1 in 30 years (l/s):	54.09	54.09
1 in 100 year (l/s):	66.18	66.18
1 in 200 years (l/s):	75.41	75.41

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Elidir Millen
Site name:	Warrington Interchange
Site location:	Plot 6

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

Site Details

Latitude:	53.35652° N
Longitude:	2.51838° W
Reference:	638082904
Date:	Feb 19 2020 11:52

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 3.59

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	826	826
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	21.04	21.04
1 in 1 year (l/s):	18.3	18.3
1 in 30 years (l/s):	35.76	35.76
1 in 100 year (l/s):	43.75	43.75
1 in 200 years (l/s):	49.85	49.85

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Elidir Millen
Site name:	Warrington Interchange
Site location:	Plot 7

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

Site Details

Latitude:	53.35652° N
Longitude:	2.51838° W
Reference:	1049705388
Date:	Feb 19 2020 11:57

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 2.09

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	826	826
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	12.25	12.25
1 in 1 year (l/s):	10.65	10.65
1 in 30 years (l/s):	20.82	20.82
1 in 100 year (l/s):	25.47	25.47
1 in 200 years (l/s):	29.02	29.02

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Elidir Millen
Site name:	Warrington Interchange
Site location:	Supporting Infrastructure

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

Site Details

Latitude:	53.35652° N
Longitude:	2.51838° W
Reference:	1394529597
Date:	Feb 19 2020 12:07

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 3.08

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	826	826
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

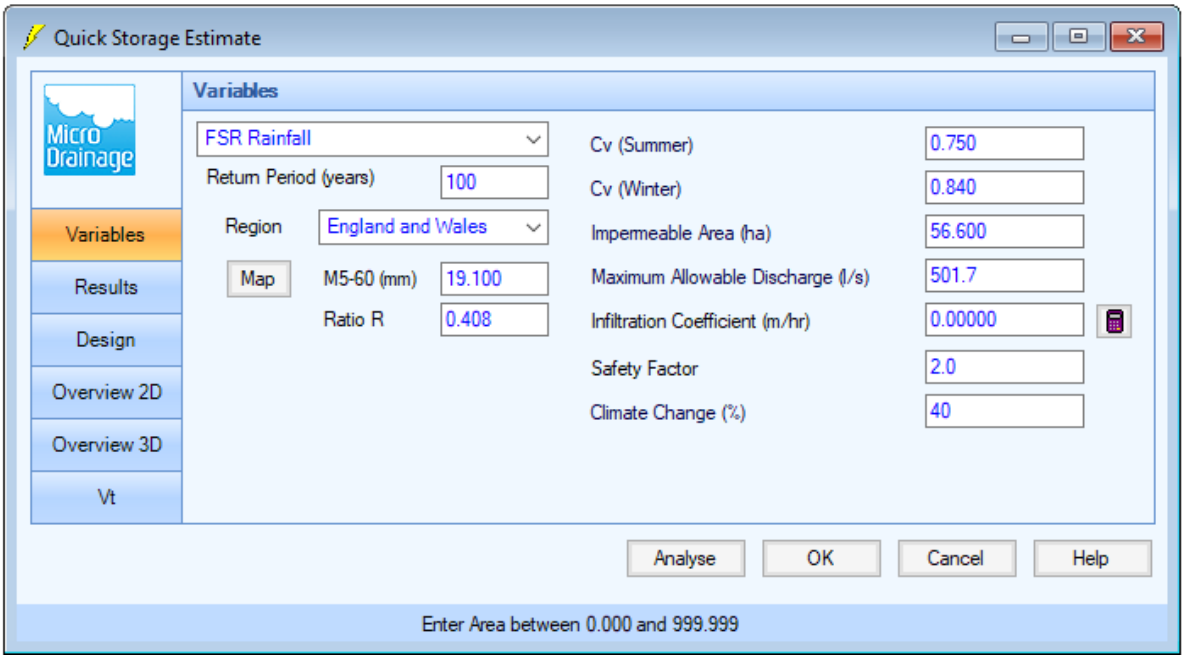
Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

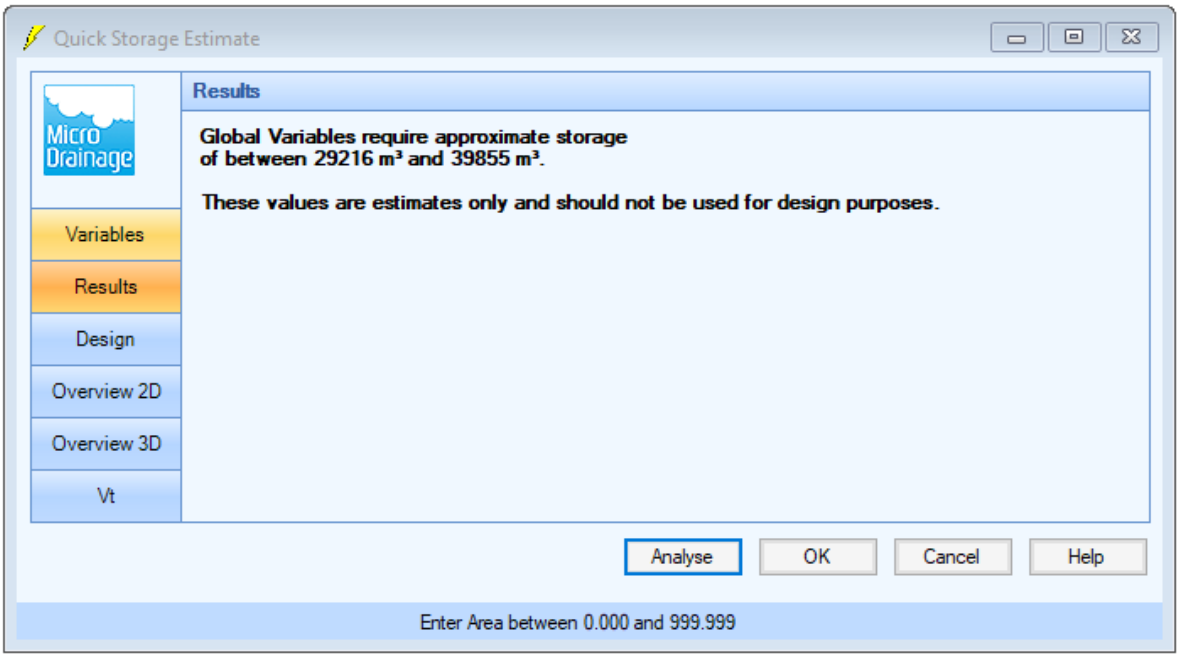
Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	18.05	18.05
1 in 1 year (l/s):	15.7	15.7
1 in 30 years (l/s):	30.68	30.68
1 in 100 year (l/s):	37.54	37.54
1 in 200 years (l/s):	42.77	42.77

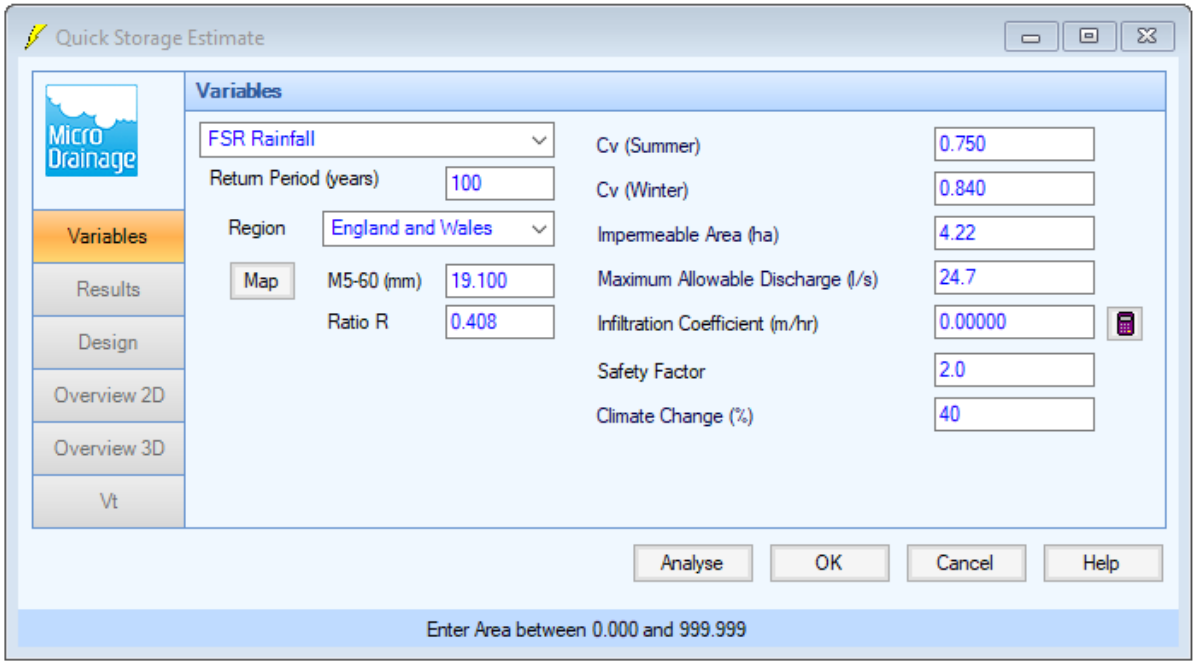
Appendix O – MicroDrainage Storage Estimations

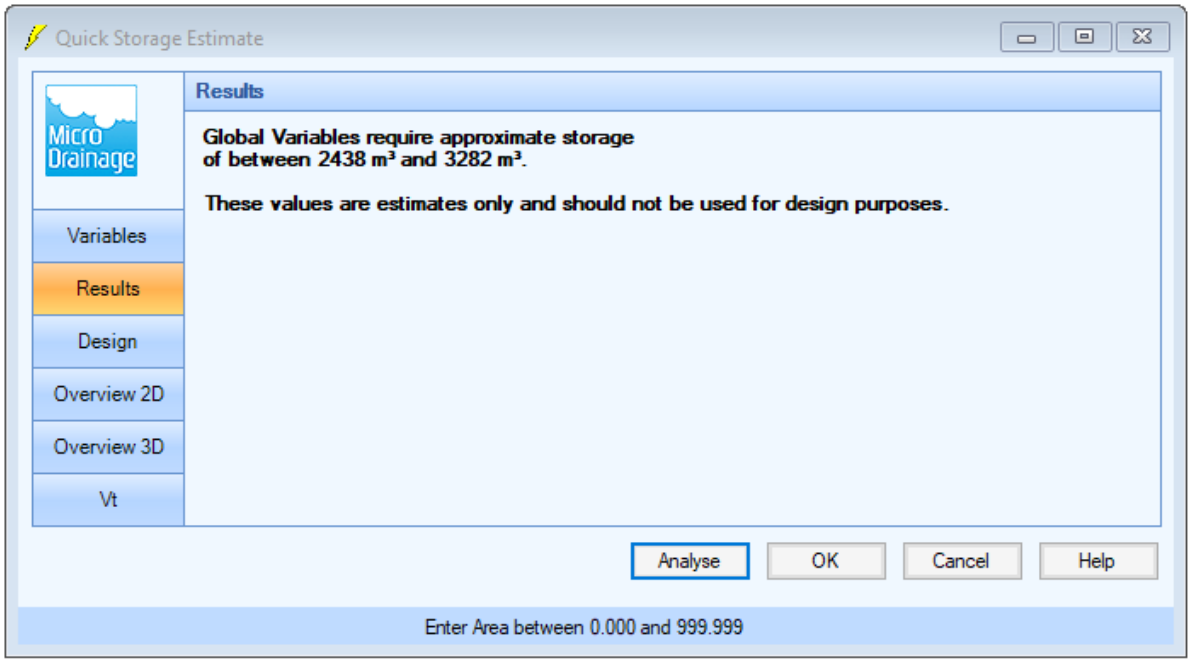
Total Developed Area (Not including existing road upgrade)



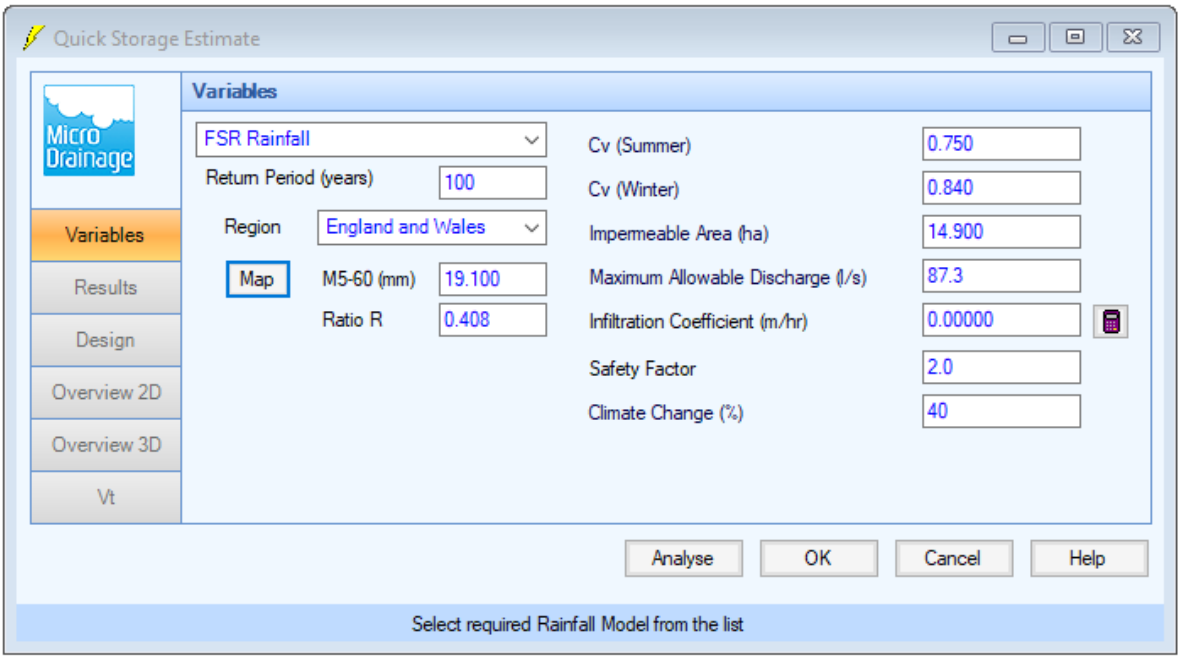


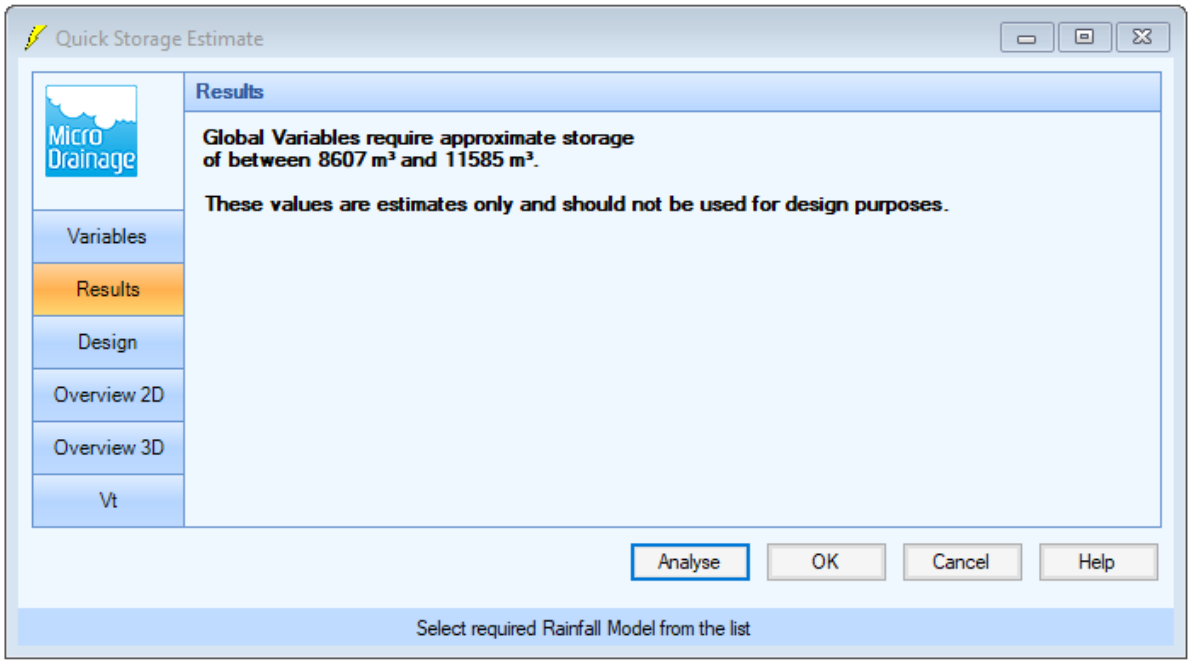
Plot 1


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
FSR Rainfall
Return Period (years) 100
Region England and Wales
Map
M5-60 (mm) 19.100
Ratio R 0.408
Cv (Summer) 0.750
Cv (Winter) 0.840
Impermeable Area (ha) 4.22
Maximum Allowable Discharge (l/s) 24.7
Infiltration Coefficient (m/hr) 0.00000
Safety Factor 2.0
Climate Change (%) 40
Analyse
OK
Cancel
Help
Enter Area between 0.000 and 999.999

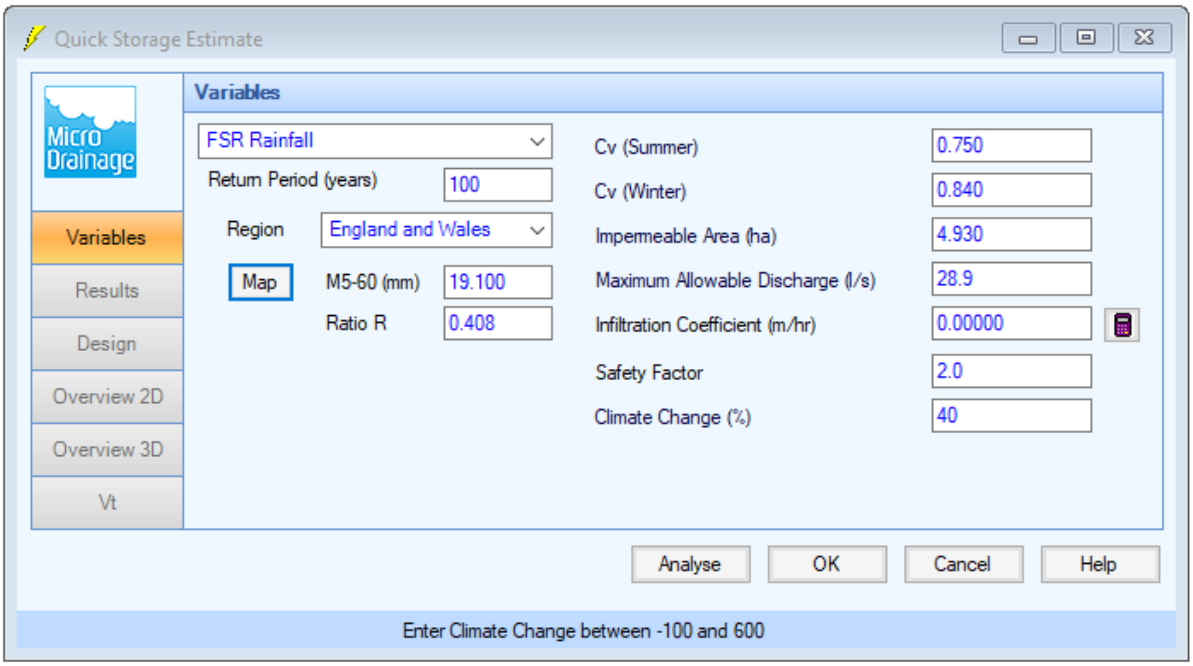

Quick Storage Estimate
Micro Drainage
Results
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Global Variables require approximate storage
of between 2438 m³ and 3282 m³.
These values are estimates only and should not be used for design purposes.
Analyse
OK
Cancel
Help
Enter Area between 0.000 and 999.999

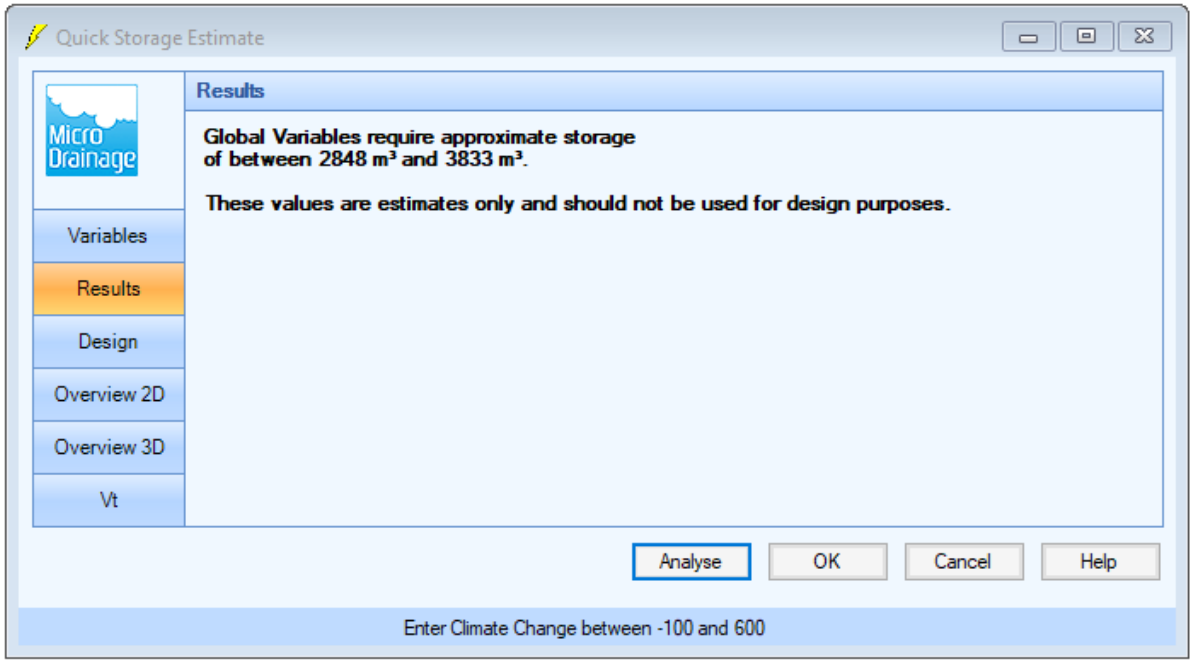
Plot 2


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Variables
FSR Rainfall
Return Period (years) 100
Region England and Wales
Map
M5-60 (mm) 19.100
Ratio R 0.408
Cv (Summer) 0.750
Cv (Winter) 0.840
Impermeable Area (ha) 14.900
Maximum Allowable Discharge (l/s) 87.3
Infiltration Coefficient (m/hr) 0.00000
Safety Factor 2.0
Climate Change (%) 40
Analyse
OK
Cancel
Help
Select required Rainfall Model from the list

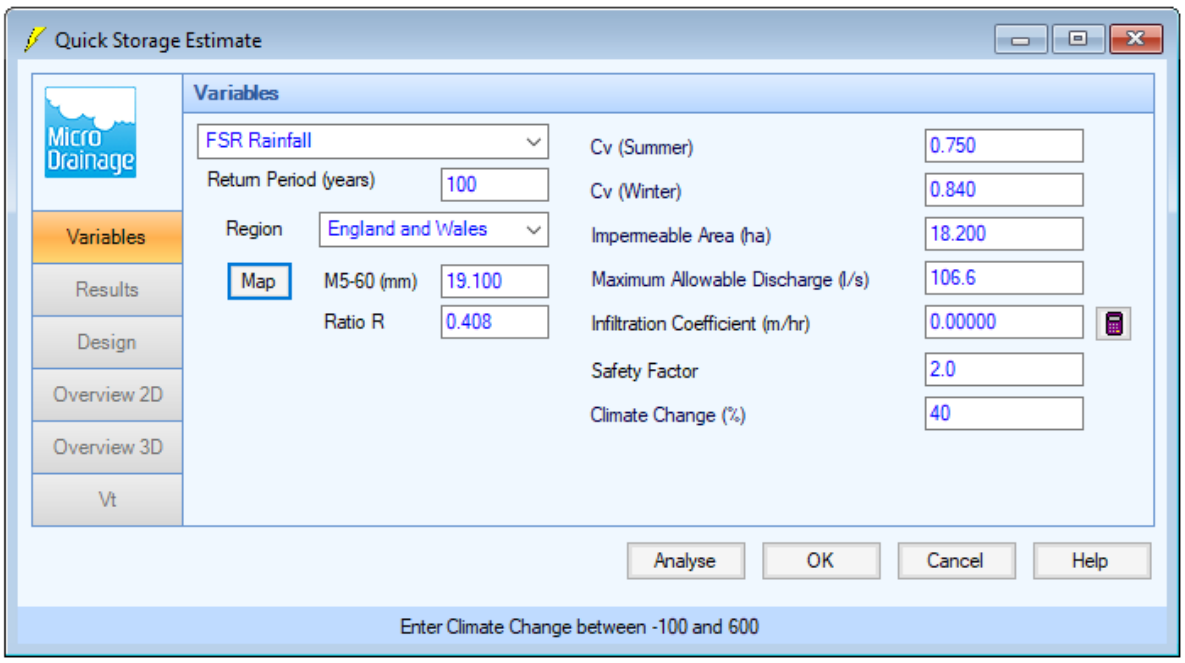

Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Results
Global Variables require approximate storage of between 8607 m³ and 11585 m³.
These values are estimates only and should not be used for design purposes.
Analyse
OK
Cancel
Help
Select required Rainfall Model from the list

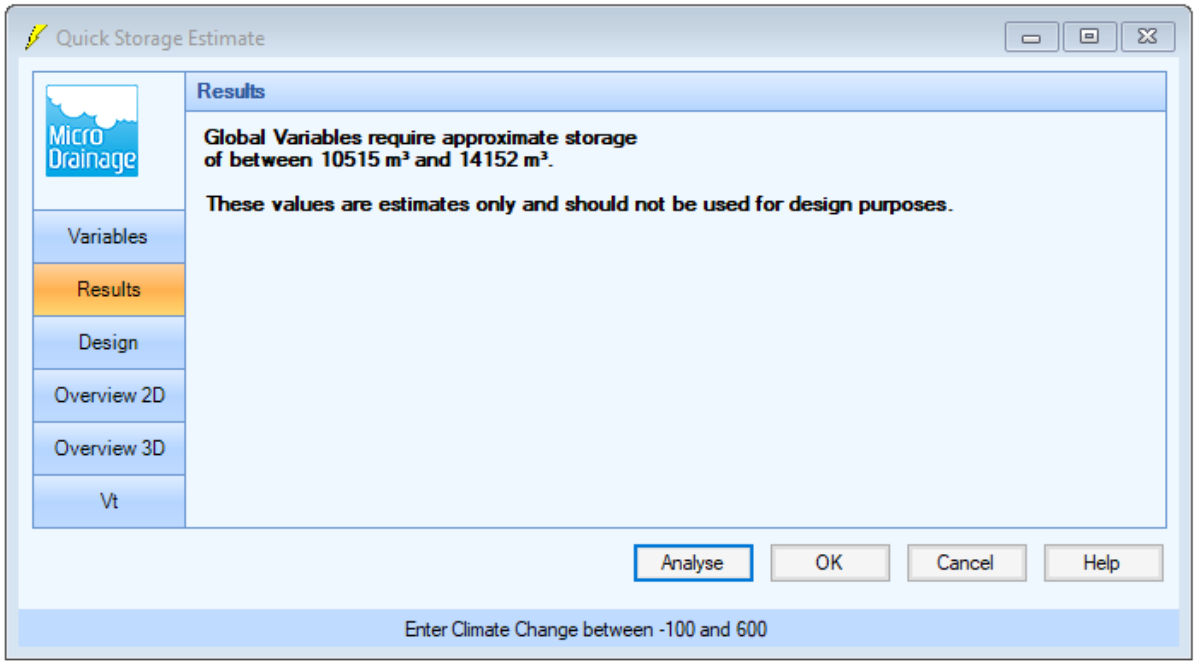
Plot 3


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Variables
FSR Rainfall
Return Period (years) 100
Region England and Wales
Map
M5-60 (mm) 19.100
Ratio R 0.408
Cv (Summer) 0.750
Cv (Winter) 0.840
Impermeable Area (ha) 4.930
Maximum Allowable Discharge (l/s) 28.9
Infiltration Coefficient (m/hr) 0.00000
Safety Factor 2.0
Climate Change (%) 40
Analyse
OK
Cancel
Help
Enter Climate Change between -100 and 600

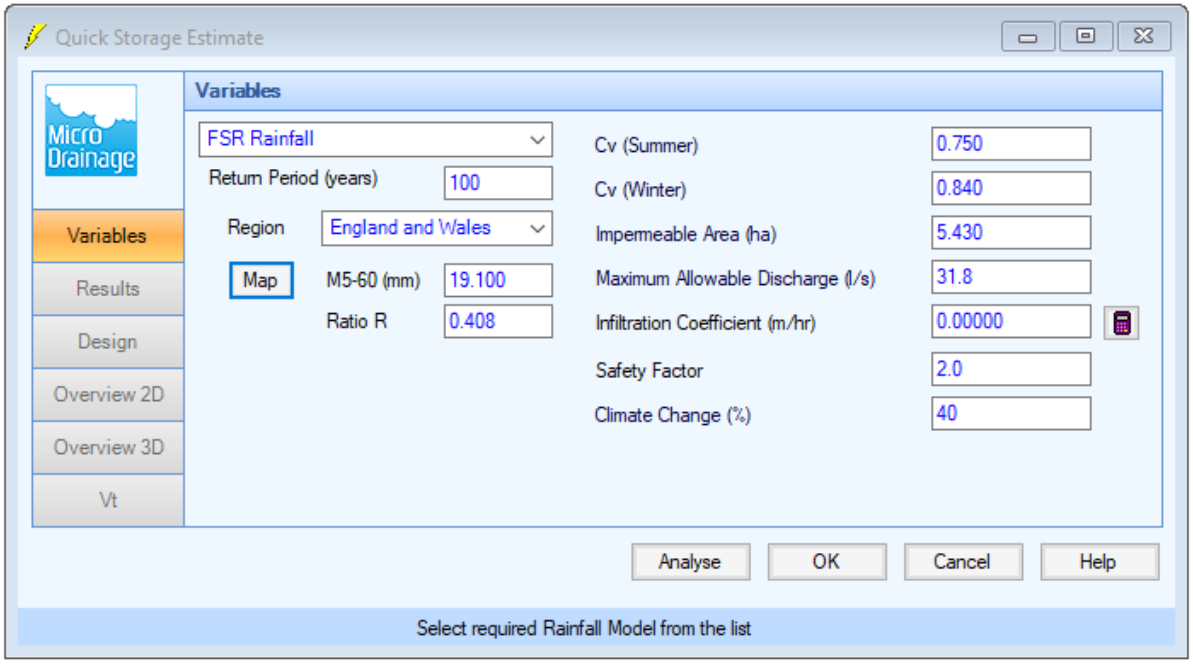

Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Results
Global Variables require approximate storage
of between 2848 m³ and 3833 m³.
These values are estimates only and should not be used for design purposes.
Analyse
OK
Cancel
Help
Enter Climate Change between -100 and 600

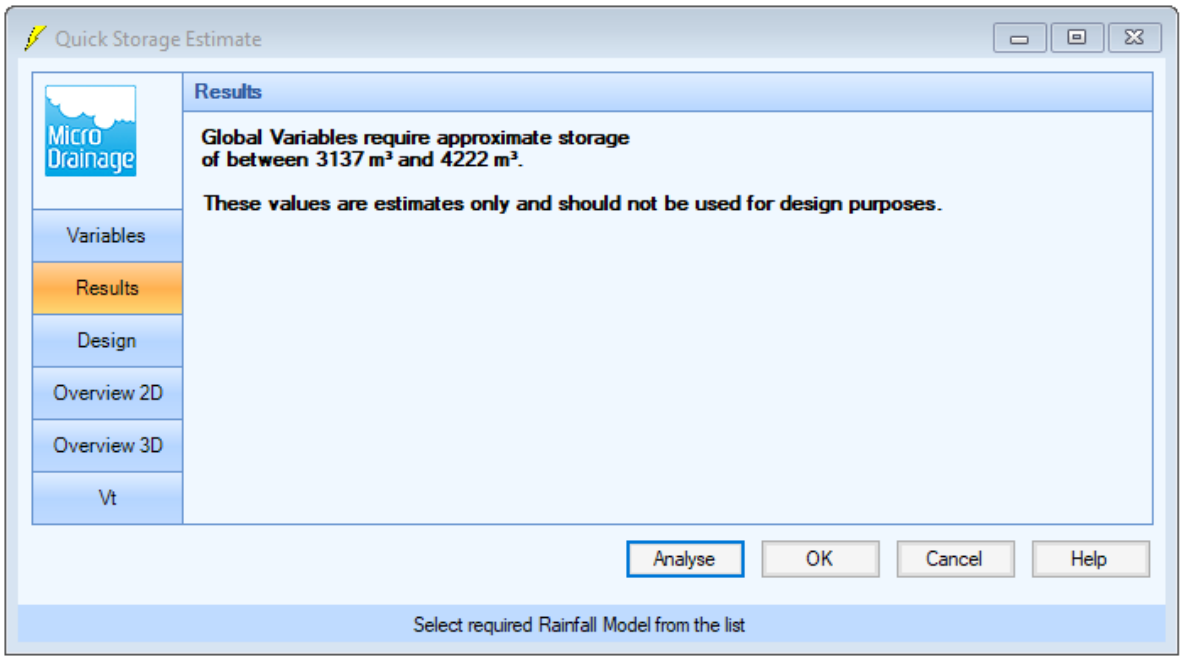
Plot 4


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Variables
FSR Rainfall
Return Period (years) 100
Region England and Wales
Map
M5-60 (mm) 19.100
Ratio R 0.408
Cv (Summer) 0.750
Cv (Winter) 0.840
Impermeable Area (ha) 18.200
Maximum Allowable Discharge (l/s) 106.6
Infiltration Coefficient (m/hr) 0.00000
Safety Factor 2.0
Climate Change (%) 40
Analyse
OK
Cancel
Help
Enter Climate Change between -100 and 600

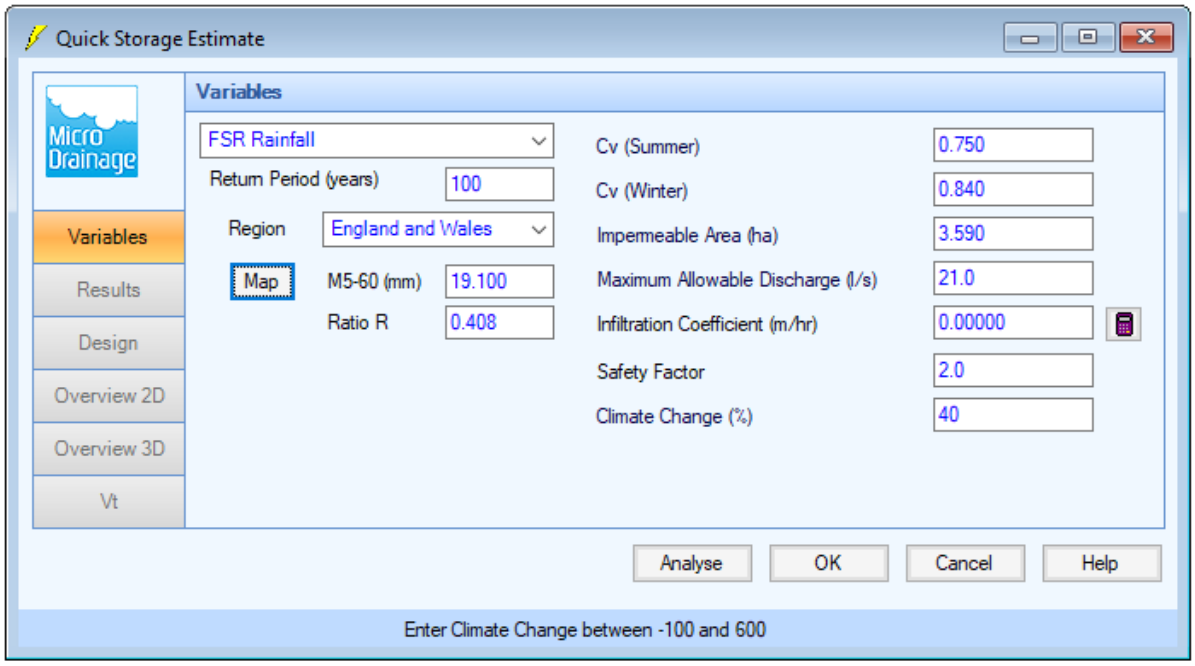

Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Results
Global Variables require approximate storage
of between 10515 m³ and 14152 m³.
These values are estimates only and should not be used for design purposes.
Analyse
OK
Cancel
Help
Enter Climate Change between -100 and 600

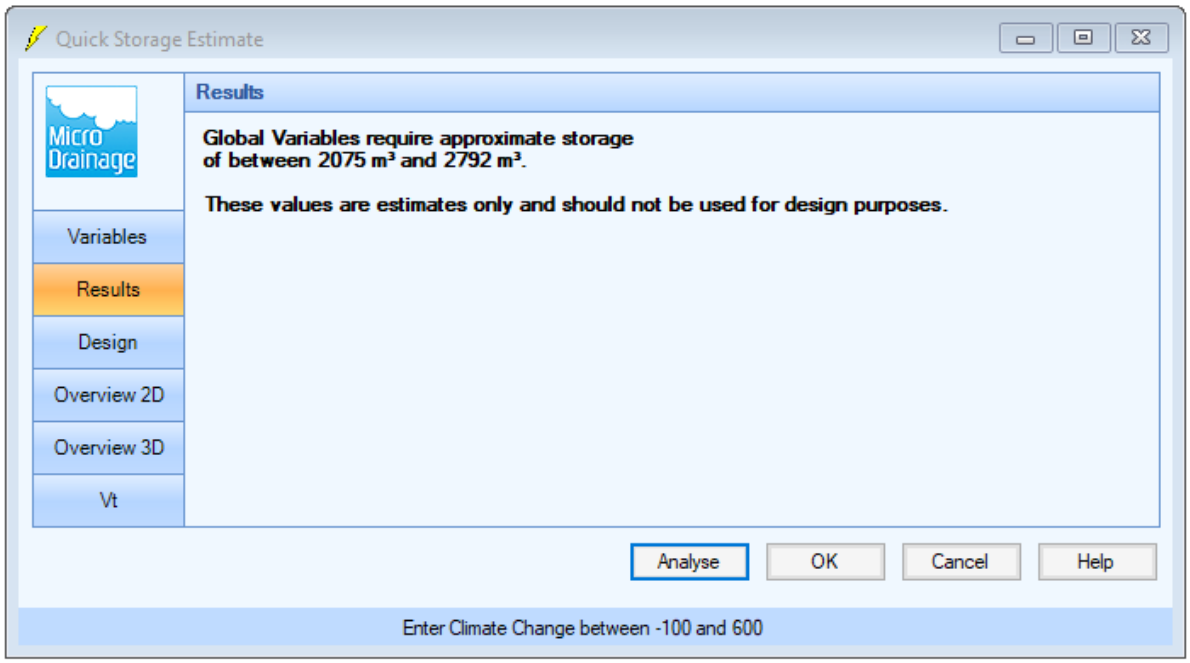
Plot 5


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Variables
FSR Rainfall
Return Period (years) 100
Region England and Wales
Map
M5-60 (mm) 19.100
Ratio R 0.408
Cv (Summer) 0.750
Cv (Winter) 0.840
Impermeable Area (ha) 5.430
Maximum Allowable Discharge (l/s) 31.8
Infiltration Coefficient (m/hr) 0.00000
Safety Factor 2.0
Climate Change (%) 40
Analyse
OK
Cancel
Help
Select required Rainfall Model from the list

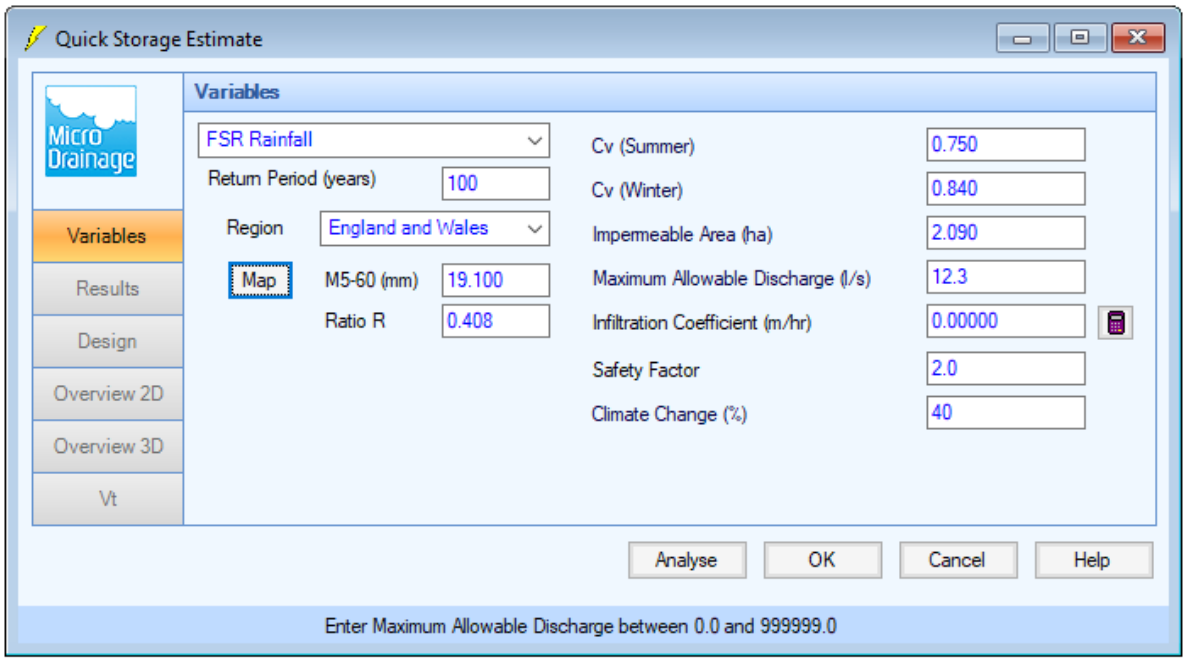

Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Results
Global Variables require approximate storage
of between 3137 m³ and 4222 m³.
These values are estimates only and should not be used for design purposes.
Analyse
OK
Cancel
Help
Select required Rainfall Model from the list

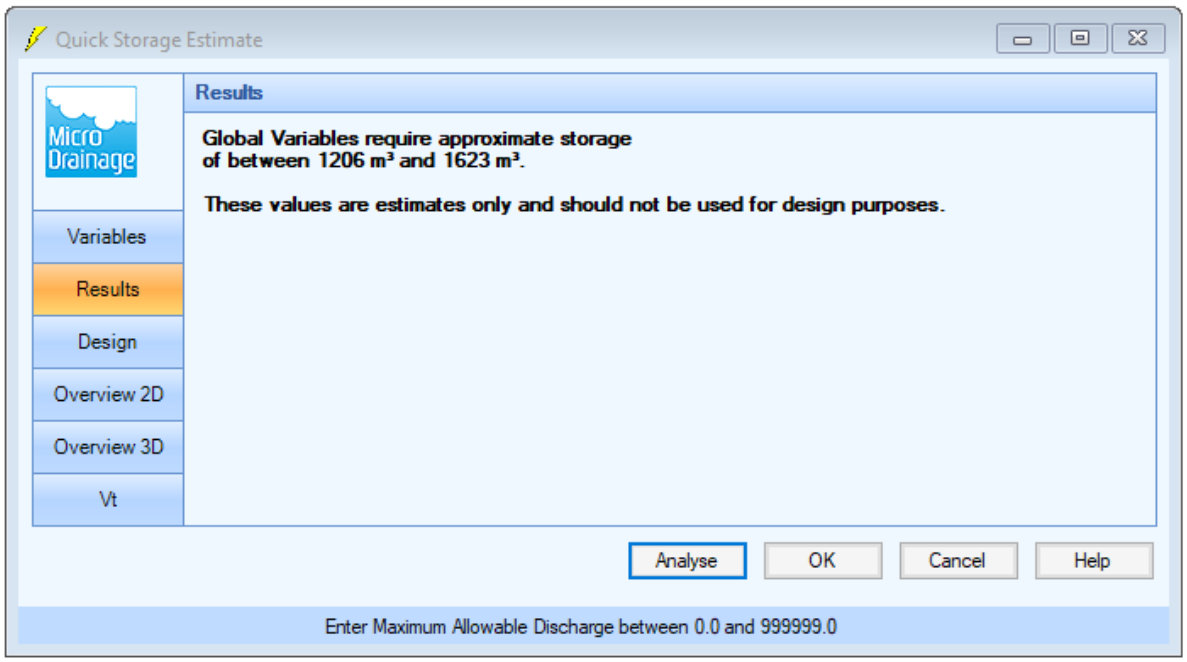
Plot 6


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Variables
FSR Rainfall
Return Period (years) 100
Region England and Wales
Map
M5-60 (mm) 19.100
Ratio R 0.408
Cv (Summer) 0.750
Cv (Winter) 0.840
Impermeable Area (ha) 3.590
Maximum Allowable Discharge (l/s) 21.0
Infiltration Coefficient (m/hr) 0.00000
Safety Factor 2.0
Climate Change (%) 40
Analyse
OK
Cancel
Help
Enter Climate Change between -100 and 600

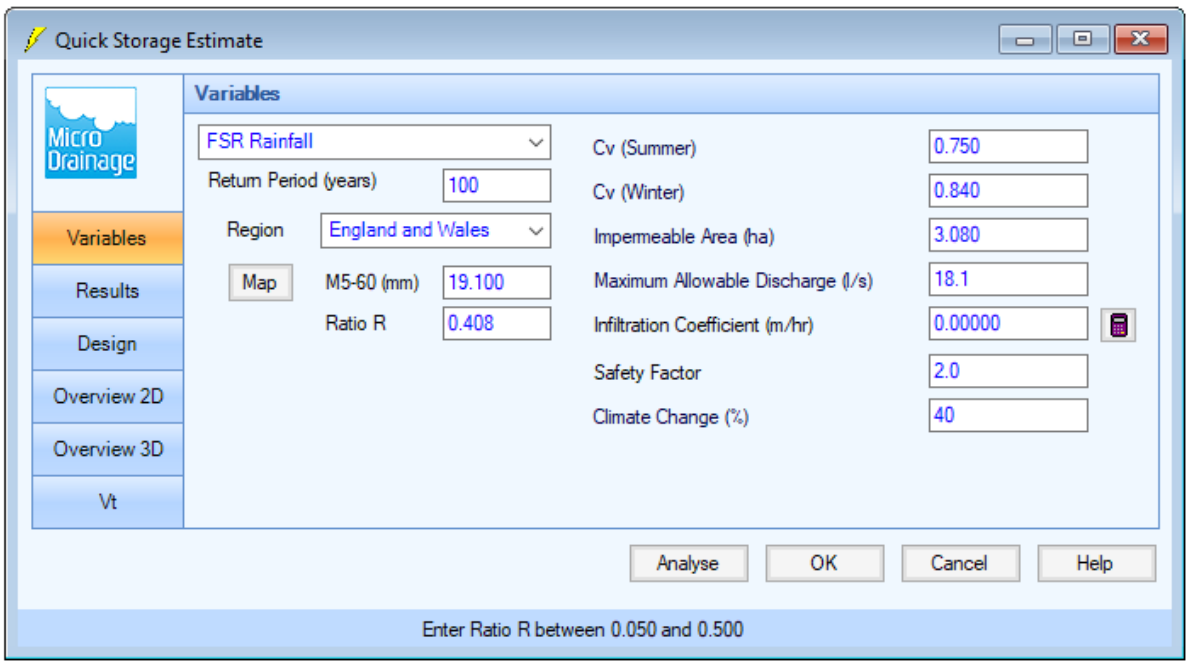

Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Results
Global Variables require approximate storage
of between 2075 m³ and 2792 m³.
These values are estimates only and should not be used for design purposes.
Analyse
OK
Cancel
Help
Enter Climate Change between -100 and 600

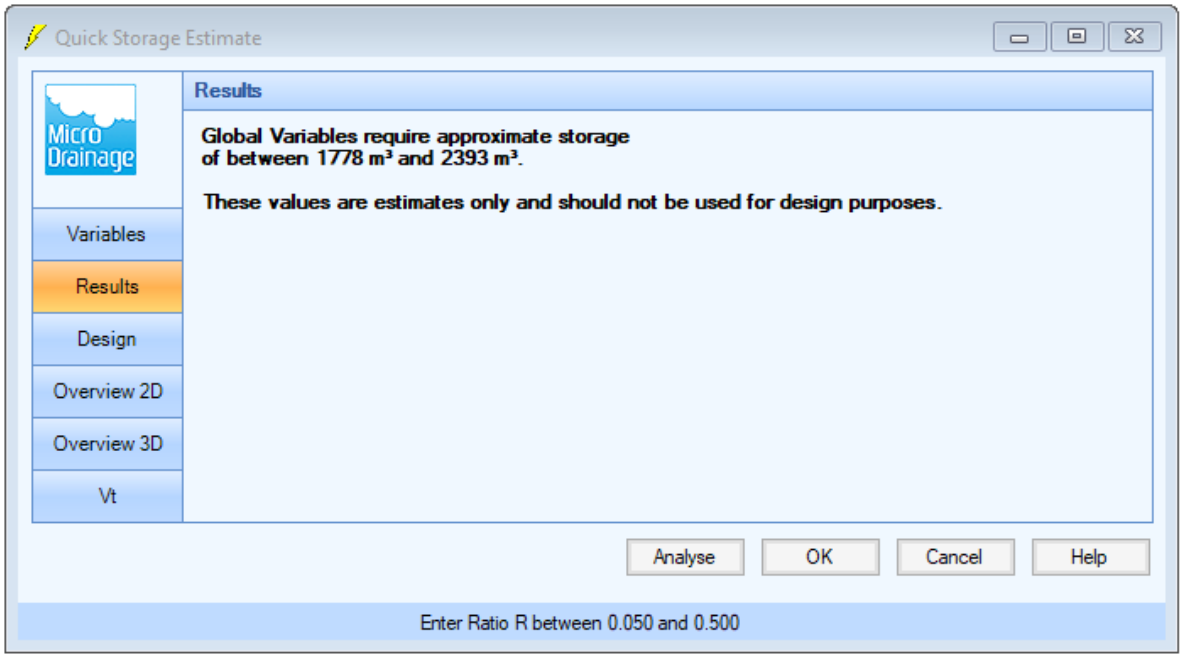
Plot 7


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Variables
FSR Rainfall
Return Period (years) 100
Region England and Wales
Map
M5-60 (mm) 19.100
Ratio R 0.408
Cv (Summer) 0.750
Cv (Winter) 0.840
Impermeable Area (ha) 2.090
Maximum Allowable Discharge (l/s) 12.3
Infiltration Coefficient (m/hr) 0.00000
Safety Factor 2.0
Climate Change (%) 40
Analyse
OK
Cancel
Help
Enter Maximum Allowable Discharge between 0.0 and 999999.0


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Results
Global Variables require approximate storage
of between 1206 m³ and 1623 m³.
These values are estimates only and should not be used for design purposes.
Analyse
OK
Cancel
Help
Enter Maximum Allowable Discharge between 0.0 and 999999.0

Supporting Infrastructure (Roads, substation, pump station, etc.)





Appendix P – Local Authority Correspondence

P.1: LLFA Correspondence

P.2: EA Correspondence

P.3: UU Correspondence

Brown, Richard

From: Flood Risk <floodrisk@warrington.gov.uk>
Sent: 04 August 2017 17:07
To: French, Lee
Subject: RE: Outline Planning Submission Reqs - LLFA

Hi Lee

If you work to the guidelines there should be no issues.

Regards

Colin A Ludden
Asset Design Engineer

Economic Regeneration, Growth & Environment, Warrington Borough Council,
New Town House, Buttermarket Street, Warrington, WA1 2NH
Tel: 01925 442540
Mobile 07740 075778
Email: cludden@warrington.gov.uk
Web: www.warrington.gov.uk

From: French, Lee [mailto:l.french@cundall.com]
Sent: 04 August 2017 15:29
To: Flood Risk
Subject: RE: Outline Planning Submission Reqs - LLFA

Hi Colin,

Thank you very much for that. Do you have any other specific SuDS requirements for Warrington Borough or are you happy for us to propose something for you to review based on NPPF, EA guidelines, CIRIA etc.?

Regards,

Lee French
Associate
Cundall

4th Floor, Partnership House, Regent Farm Road, Gosforth, Newcastle upon Tyne, NE3 3AF, United Kingdom
D +44 191 213 4509
T +44 191 213 1515
M +44 7817 202374

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From: Flood Risk [mailto:floodrisk@warrington.gov.uk]
Sent: 04 August 2017 15:14
To: French, Lee <l.french@cundall.com>
Subject: RE: Outline Planning Submission Reqs - LLFA

Hi Lee

If you are intending to discharge the surface water to the main river then greenfield run-off rates would apply to this site which is 5l/s per hectare and the surface water system & attenuation would need to be designed to cope with the different storm events. Below is a link to their guidelines.

http://evidence.environment-agency.gov.uk/FCERM/Libraries/FCERM_Project_Documents/Rainfall_Runoff_Management_for_Developments_-_Revision_E.sflb.ashx

Regards

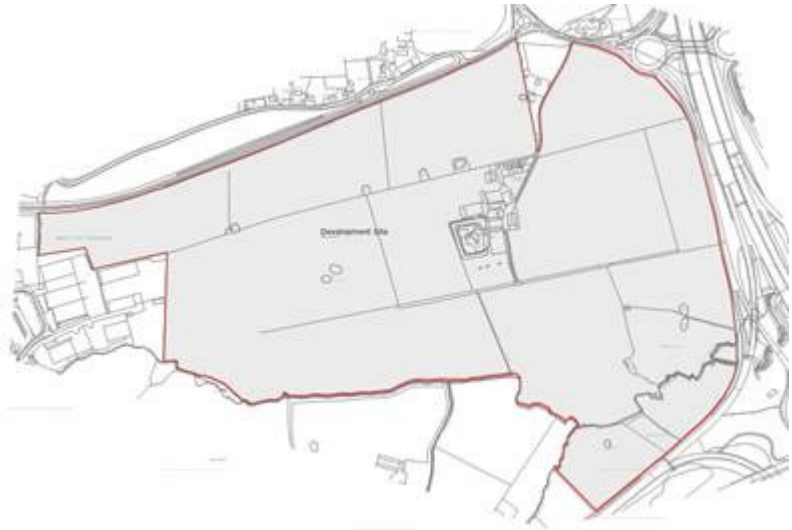
Colin A Ludden
Asset Design Engineer

Economic Regeneration, Growth & Environment, Warrington Borough Council,
New Town House, Buttermarket Street, Warrington, WA1 2NH
Tel: 01925 442540
Mobile 07740 075778
Email: cludden@warrington.gov.uk
Web: www.warrington.gov.uk

From: French, Lee [mailto:l.french@cundall.com]
Sent: 01 August 2017 12:55
To: Flood Risk
Cc: French, Andrew
Subject: Outline Planning Submission Reqs - LLFA

Dear Flood Risk Team,

We are acting Civil Engineer (including Drainage Strategy & Flood Risk Assessment) for a proposed development within Warrington Borough, with a postcode of WA4 4SL. The current stage of the project is scoping and baseline assessment leading up to a planning application. The site boundary is shown below alongside a satellite image.



The site sits within National Flood Zone 1 Land but Bradley Brook (a designated EA river) runs along the southern boundary of the development site before crossing the south western corner.

As part of the scoping and Drainage Strategy/Flood Risk Assessment production we will consult all of your available literature and will submit in accordance with LASOO and NPPF. At this early stage we were just hoping to enquire to see if you had specific Warrington Borough requirements for sites or for planning submission requirements. Or any information relating to this site specifically of course. We would propose to discharge the storm water direct to Bradley Brook should infiltration not be possible in its entirety.

It would be great to discuss any requirements with a member of your team if a contact could be provided.

We look forward to hearing from you.

Regards,

Lee French
Associate
Cundall

4th Floor, Partnership House, Regent Farm Road, Gosforth, Newcastle upon Tyne, NE3 3AF, United Kingdom
D +44 191 213 4509
T +44 191 213 1515
M +44 7817 202374

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Cundall
Partnership House
Gosford
Regent Farm Road
Newcastle upon Tyne
NE3 3AF

Our ref: SO/2017/117420/01-L01
Your ref: 170803/RD12

Date: 21 August 2017

FAO Lee French

Dear Mr French

PROPOSED DEVELOPMENT
WARRINGTON INTERCHANGE, BRADLEY BROOK

Thank you for your preliminary request which was received in this office 18th August 2017.

Environment Agency comments

The watercourse that flows along the southern boundary of the site is Bradley Brook Tributary, which is designated "main river". The watercourse that crosses the south-eastern part of the site is Bradley Brook, which is also designated "main river".

The Environment Agency has discretionary powers, within the Water Resources Act 1991, to carry out works to these watercourses for which access is required to and along the banks of the watercourses.

The layout for the proposed development is to ensure that access is provided to and along the banks of these watercourses.

Under the Environmental Permitting (England and Wales) Regulations 2016, a permit may be required from the Environment Agency for any proposed works or structures, in, under, over or within eight metres of the top of the banks of these watercourses. This was formerly called a Flood Defence Consent. Some activities are also now excluded or exempt. A permit is separate to and in addition to any planning permission granted. Further details and guidance are available on the GOV.UK website: https://www.gov.uk/guidance/flood-risk-activities-environmental-permits

A permit is unlikely to be granted for any proposals within the 8 metres wide strip that would affect access. to and along these watercourses.

The Lead Local Flood Authority, which for the majority of this site is Warrington Borough Council (with Cheshire East Council who cover a relatively small part of the site in the south-eastern corner), will be able to advise/comment on the discharge of surface water (including storm water) from any proposed development.

Yours sincerely

Mr Stephen Sayce
Sustainable Places Planning Advisor

Direct e-mail stephen.sayce@environment-agency.gov.uk

End

Brown, Richard

From: Lunt, John <John.Lunt@uuplc.co.uk>
Sent: 21 November 2017 16:06
To: French, Lee
Cc: Wastewater Developer Services
Subject: Repeat 2: (UU Ref: PDE 4200018154) Warrington Interchange, Grappenhall Lane

Hi Lee,

In reply and in the first instance I can confirm that the point of connection shown clouded is and or would be a suitable connection point from UU's point of view.

Please note however, any proposed rising main must discharge via a reception chamber prior to gravitating (via a short length) in to the public sewerage system and should a pumping station and associated pipework be designed in accordance with SFA and UU's standards then yes the system would be deemed acceptable in principle for adoption.

Should consideration need to made with regard to crossing the M6, UU wouldn't really specify a proposed method of construction as such as we'd usually try and work with the relevant highway authority to ascertain the best practice for all parties concerned.

If I can be of any further assistance at all then please don't hesitate to get in touch.

Regards,

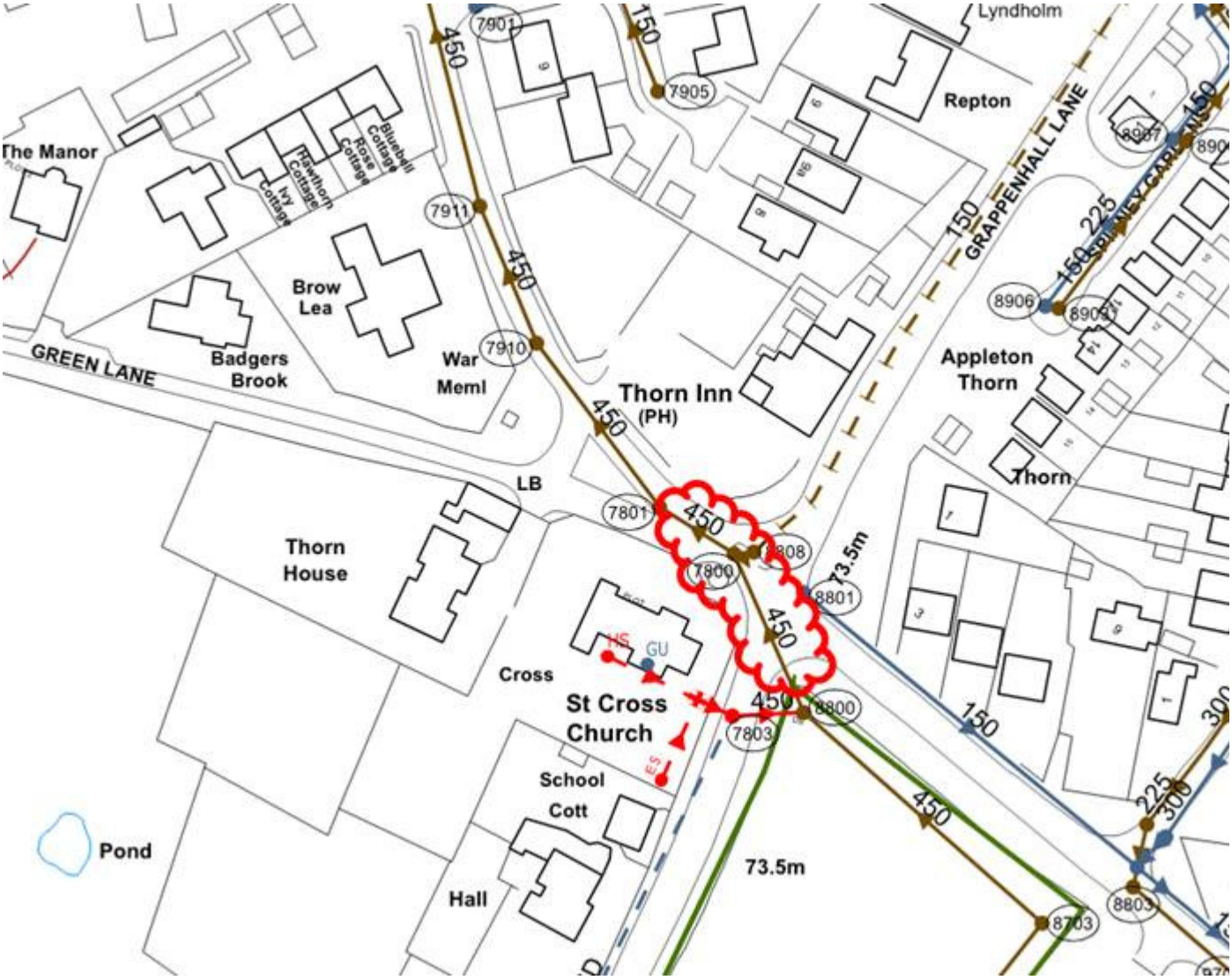
John

John Lunt
Developer Query Engineer
Developer Services and Planning
Operational Services
T: 01925 679411 (Int; 79411)
E-mail: wastewaterdeveloperservices@uuplc.co.uk
United Utilities.com

From: French, Lee [mailto:l.french@cundall.com]
Sent: 21 November 2017 14:09
To: Lunt, John <John.Lunt@uuplc.co.uk>
Cc: French, Andrew <a.french@cundall.com>
Subject: RE: Repeat: (UU Ref: PDE 4200018154) Warrington Interchange, Grappenhall Lane

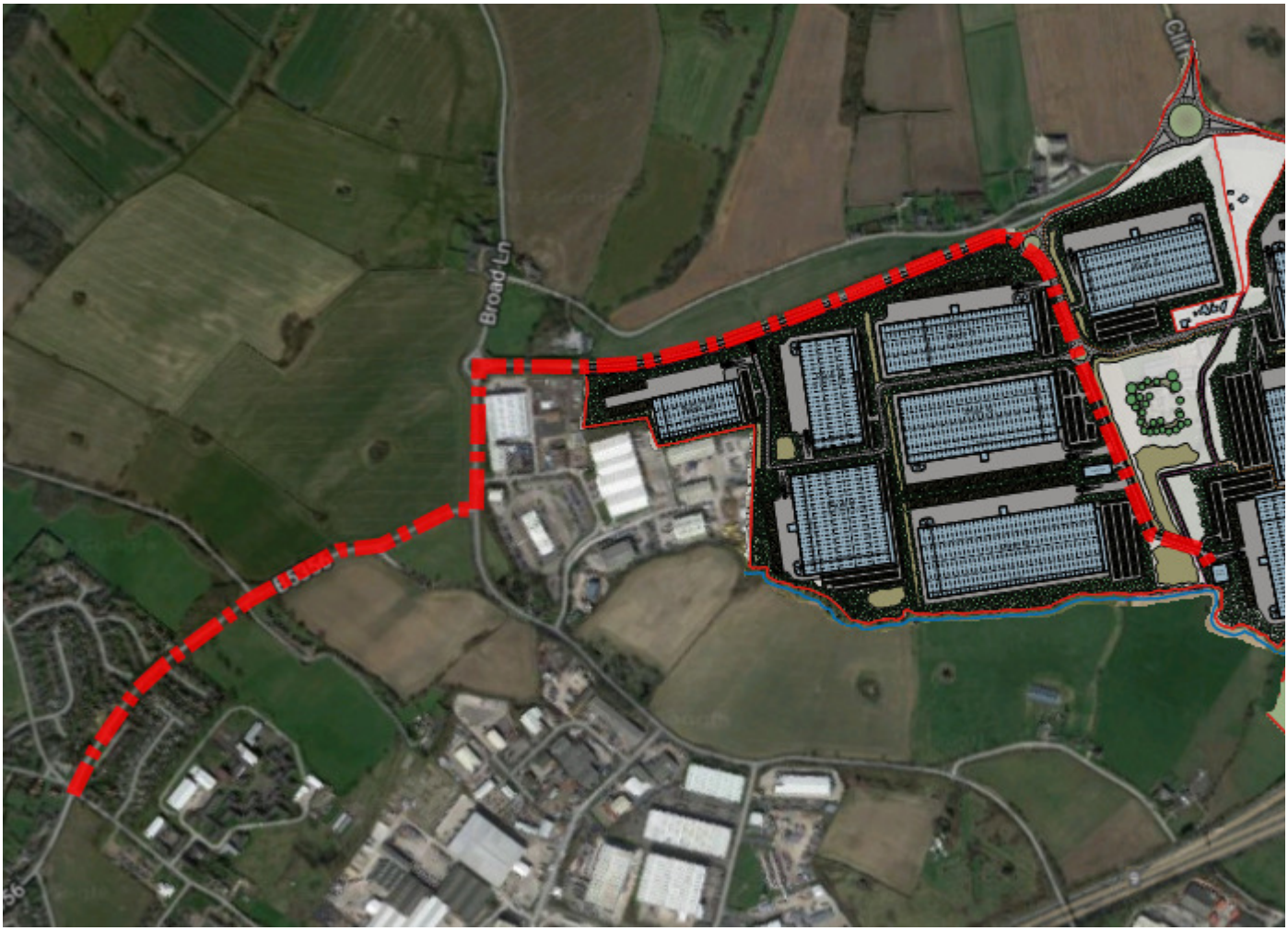
Afternoon John,

As discussed earlier, we have eventually managed to get the asset plans – there was an episode of crossed wires but we got there! Snippet below of the asset plan and the 450mm dia sewer in question. The section we would propose a new connection (either online with new MH or into existing MH) is clouded:



Could you confirm this is the sewer that we would have approval to connect into and discharge the flows from the development?

This is the route we would have to take which would be from our onsite pumping station and would all be under pressure, rising to the connection point (approx. 1.4km from the site boundary, approx. 2.4km from the onsite pumping station):



We would hope (pending design, ownership, coordination, re-instatement requirements, agreement) that the rising main could be located in a combination of highway road and highway verge. It's about a 20m lift/rise. We would also assume if this is designed in accordance with Sewers for Adoption and UU specific requirements, that adoption of the onsite pumping station and rising main would be possible. Plenty more to do on our side for feasibility but as discussed, we are only looking at this from an outline POV at the mo.

I know we also have the other option (crossing the M6 to the east) still on the table but currently this is not seen as practical for obvious reasons as we had mentioned previously. Just to fully investigate this option so we have done full due diligence, would UU have any objections/preference/specific requirements for either a boring under the main M6 carriageway (a nonstarter really) or trying to get a rising main cast within the bridge deck (from above).

If you have any further comments on this please just let me know.

Appreciate the help John.

Regards,

Lee French
Associate
Cundall

4th Floor, Partnership House, Regent Farm Road, Gosforth, Newcastle upon Tyne, NE3 3AF, United Kingdom
D +44 191 213 4509
T +44 191 213 1515
M +44 7817 202374

Cundall Johnston & Partners LLP
10th Floor Manchester One Portland Street
Manchester M1 3LD United Kingdom
Tel:+44 (0)161 244 5660
Asia Australia Europe MENA UK and Ireland
www.cundall.com

Appendix 3.3 – Text Changes from Original ES Technical Paper 3

Six 56 Warrington

ES Addendum – Text Changes from Original ES Technical Paper 3

Part 2 –Flood Risk & Drainage

Section Number / Paragraph Number / Table number / Figure Number in Original Paper	Text Deleted from Original ES	Reason
Title Page	Added: Amendment to, F, 14 October 2020	Recording update
Revision Record	Added: F, 14.10.2020, ES Addendum Issue, M.Hurst, B.Wilkins	Recording update
Section 1, Paragraphs 1.1 to 1.8	Added: 1.1. This document now constitutes part of an addendum to the Environmental Statement originally submitted to Warrington Borough Council (WBC) in March 2019 to accompany the outline planning application for warehouse development (Use Class B8 with ancillary B1(a) offices) and associated infrastructure at the Application Site referred to as Six 56 Warrington. 1.2. Since the submission of the planning application, consultation responses have been received from key consultees and further discussions have taken place with the Council and their key consultees (namely WBC Highway Officers, Highways	To give context for the ES Addendum

	England (HE) and their consultants Atkins, WBC Environmental Protection Officers, Historic England and WBC Conservation Officer and Ramboll landscape designers acting on behalf of WBC). 1.3. Further clarification and information has been provided in line with requests by HE and WBC Highway's Officer relating to the design of the mitigation and the WMMTM traffic model. 1.4. Environmental Protection have concerns with exposure to high noise levels that will be experienced at existing properties on Cartridge Lane and sensitive receptors within the site comprising Bradley Hall Cottages and Bradley View to potentially unacceptably high noise levels, even with mitigation in place, based on the worst case estimates of the proposals as illustrated on submitted masterplan and parameters plans. 1.5. Landscape Consultants Ramboll's acting on behalf of the Council have also recommended further supplementary information,	

	including an assessment of potential effects on the visual amenity of properties in the vicinity, in order to provide greater transparency to the LVIA and its findings and to aid WBC in its determination of the application. 1.6. Consequently, the indicative masterplan and parameters plans have evolved to address comments raised by these key consultees and reduce the noise impacts on sensitive receptors within the site with realignment of estate roads. Further assessments have also been undertaken in respect of noise and vibration and landscape and visual impacts and cultural heritage. This addendum therefore includes additional and updated information to address the comments raised by key consultees. Part 2 of this addendum includes addendums to the following technical papers: • Traffic and Transportation • Water Quality and Drainage • Landscape and Visual Impact	

	• Ecology and Nature Conservation • Socio-Economic • Noise and Vibration • Cultural Heritage 1.7. This addendum should however be read in conjunction with the original ES submitted to WBC in April 2019 as the other technical papers (Ground Conditions and Contamination; Air Quality, Utilities, Energy, Waste and Agricultural Land and Soils) have not been amended or subject to change and as such are not included within this addendum, but still remain valid and still form part of the ES for the planning application. See Appendix 18 of the ES Part 1 Addendum which provides Consultants confirmation that there are no changes to the significance of impacts in the Ground Conditions and Contamination; Socio-Economic, Air Quality, Utilities, Energy, Waste and Agricultural Land and Soils Technical Papers arising from the updated project description presented in this ES Addendum. 1.8. In order to make the addendum more understandable and to avoid	

	extensive cross referencing, changes have been integrated within the original text of this technical paper to form a single addendum to the ES. Wherever changes or additions have been made to the text of the original technical paper, the text has been underlined and anything that is no longer relevant or valid has been struck through but retained within the text. A log is also included within Appendix 3.3 of this technical paper addendum so that the text to be removed (i.e. the text struck through within the paper) is identified and a reason for its removal provided.	
Section 1, Paragraph 1.9	Added: Addendum	To clarify the reference to this paper
Section 1, Paragraph 1.10	Added: Addendum	To clarify the reference to this paper
Section 1, Paragraph 1.11	Added: an updated	To clarify the reference to this paper's appendix
Section 1, Paragraph 1.16	Added: Addendum	To clarify the reference to this paper
Section 1, Paragraph 1.17	Added: Addendum	To clarify the reference to related paper
Section 4, Paragraph 4.4	Added: Addendum	To clarify the reference to this paper
Section 5, Paragraph 5.2	Added: Addendum	To clarify the reference to this paper

Section 5, Paragraph 5.3	Added: updated	To clarify the reference to this paper's appendix
Section 5, Paragraph 5.4	Added: Addendum	To clarify the reference to this paper
Section 5, Paragraph 5.14	Added: updated	To clarify the reference to this paper's appendix
Section 6, Paragraph 6.2	Added: ponds	To provide consistency on the types surface water attenuation proposed for the scheme.
Section 6, Paragraph 6.5	Added: and to provide enhanced habitat for Great Crested Newts and other wildlife	To provide context of the use of SuDS ponds regarding habitat for wildlife.
Section 7, Paragraph 7.11	Added: updated	To clarify the reference to this paper's appendix
Section 8, Paragraph 8.2	Added: Addendum	To clarify the reference to this paper
Section 8, Paragraph 8.14	Added: ponds	To provide consistency on the types surface water attenuation proposed for the scheme.
Section 8, Paragraph 8.20 to 8.22 and 8.24	Added: updated	To clarify the reference to this paper's appendix
Section 8, Paragraph 8.29	Added: ponds	To provide consistency on the types surface water attenuation proposed for the scheme.
Section 8, Paragraph 8.31	Added: or pond	To provide consistency on the types surface water attenuation proposed for the scheme.
Section 9, Table 9.4	Added: ponds	To provide consistency on the types surface water attenuation proposed for the scheme.
Section 10, Paragraph 10.2	Added: Addendum, Addendum	To clarify the reference to this paper

Section 10, Table 3.3: Item No. 4, Status Column	Added: Decision subsequently appealed (Appeal Reference: APP/M0655/W/19/3222603) and considered at Public Inquiry. Decision pending following closure of Inquiry. New planning application submitted under Ref: 2019/34739 and granted planning permission at committee by WBC in July 2019. Referred to the SoS with decision pending.	Updated to reflected the latest status information
Section 10, Paragraph 10.8	Added: Addendum	To clarify the reference to this paper
Section 11, Paragraph 11.1	Added: Addendum	To clarify the reference to this paper
Section 11, Paragraph 11.6	Added: ponds	To provide consistency on the types surface water attenuation proposed for the scheme.
Appendix 3.2, Title	Added: updated	To clarify the reference to this paper's appendix
Appendix 3.3, Title	Added: Appendix 3.3 – Text Changes from Original ES Technical Paper 3	To clarify the reference to this paper's appendix