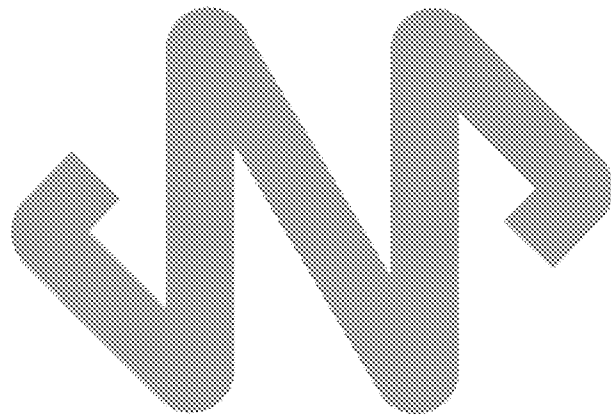




J N P G R O U P

CONSULTING ENGINEERS

Flood Risk Assessment

Project: Land West of Arundel Road,
Angmering

Client: Redrow Homes

Reference: C86473-JNP-66-XX-RP-C-2002 P03

Date: March 2022

DOCUMENT CONTROL SHEET

Prepared by

Ben Douglas

BEng (Hons) IEng MICE

Principal Civil Engineer

Approved by

Sarah Longstaff

BSc (Hons) MSc FGS

Principal Hydrogeologist

FOR AND ON BEHALF OF JNP GROUP

Date: March 2022

Document Issue Record

Rev	Date	Description	Prepared	Checked	Approved
P01	09/12/2021	First Issue	BD	SLL	CC
P02	16/12/2021	Minor updates	BD	CC	CC
P03	09/03/2022	Updated Layout. Updated to suit groundwater monitoring	BD	SLL	CC

This document is for the sole use and reliance of JNP Group's Client and has been prepared in accordance with the scope of the appointment of JNP Group and is subject to the terms of that appointment.

JNP Group accepts no liability for any use of this document other than by its Client and only for the purposes for which it has been prepared.

No person other than the Client may copy (in whole or in part) or use the contents of this document, without the prior written permission of JNP Group.

Any advice, opinions or recommendations within this document should be read and relied upon only in the context of this document as a whole.

Any comments given within this document are based on the understanding that the proposed works to be undertaken will be as described in the introduction. The information referred to and provided by others and will be assumed to be correct and will not have been checked by JNP Group, JNP Group will not accept any liability or responsibility for any inaccuracy in such information.

Any deviation from the recommendations or conclusions contained in this document should be referred to JNP Group in writing for comment and JNP Group reserve the right to reconsider their recommendations and conclusions contained within. JNP Group will not accept any liability or responsibility for any changes or deviations from the recommendations noted in this document without prior consultation and our full approval.

Contents

1	INTRODUCTION	3
1.1	Terms of Reference	3
1.2	Policy Framework and Key Stakeholders	3
1.3	Sources of Information.....	4
2	DEVELOPMENT SITE	5
2.1	Location	5
2.2	Topography	6
2.4	Geology.....	6
3	PROPOSED DEVELOPMENT.....	8
4	FLOOD RISK ASSESSMENT	9
4.1	Overview.....	9
4.2	Climate Change.....	9
4.3	Groundwater Flood Risk.....	10
4.4	Sequential and Exception Tests.....	12
5	SURFACE WATER DRAINAGE STRATEGY	13
5.1	Existing Drainage (Greenfield Runoff)	13
5.2	Hierarchy for Surface Water Disposal	13
5.3	Proposed Drainage Strategy.....	13
5.4	Sustainable Drainage Systems (SuDS)	14
5.5	Exceedance Events	17
5.6	Water Quality Management	17
5.7	Operation and Maintenance	18
5.8	Drainage During Construction.....	19
6	FOUL WATER DRAINAGE STRATEGY.....	21
7	CONCLUSIONS AND RECOMMENDATIONS.....	22
8	LIMITATIONS	23
APPENDIX A:.....TOPOGRAPHICAL AND GROUND INFORMATION		
APPENDIX B:..... PROPOSED DEVELOPMENT		
APPENDIX C:..... GREENFIELD RUN-OFF RATES		
APPENDIX D:..... DRAINAGE STRATEGY		
APPENDIX E:..... DRAINAGE CALCULATIONS		

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 JNP Group has been commissioned by Redrow Homes to prepare a flood risk assessment for the proposed residential development to the west of Arundel Road in Angmering, West Sussex.

1.1.2 This report assesses flood risk at the development site from all potential sources and describes the measures adopted in the master planning process to manage such risks. It has been prepared in compliance with current policies and best practices.

1.2 Policy Framework and Key Stakeholders

1.2.1 The *National Planning Policy Framework* (NPPF) (February 2019) sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow. Where these tests are not met, national policy is clear that new development should not be allowed.

1.2.2 In areas at risk of flooding or for sites of one hectare (ha) or more, developers must undertake a site-specific flood risk assessment to accompany applications for planning permission (or prior approval for certain types of permitted development).

1.2.3 In decision-taking, local planning authorities must ensure a sequential approach to site selection and master planning is followed so that development is, as far as reasonably possible, located where the risk of flooding (from all sources) is lowest, taking account of climate change and the vulnerability of future uses to flood risk.

1.2.4 Where development needs to be in locations where there is a risk of flooding, local planning authorities and developers must ensure development is appropriately flood resilient and resistant, safe for its users for the development's lifetime, and will not increase flood risk elsewhere.

1.2.5 The Environment Agency (EA) is a statutory consultee on applications where there is a risk of flooding from the sea or main rivers.

1.2.6 Lead local flood authorities (unitary authorities or county councils) are responsible for managing local flood risk from ordinary watercourses, surface water or groundwater, and for preparing local flood risk management strategies. Local planning authorities work with lead local flood authorities to ensure local planning policies are compatible with the local flood risk management strategy.

1.2.7 West Sussex County Council (WSCC) is the lead local flood authority (LLFA) and its strategy for managing local flood risk is set out in Local Flood Risk Management Strategy (2013) and 'Water. People. Places. A guide for master planning sustainable drainage into developments' (2013).

1.2.8 Arun District Council (ADC) is the local planning authority (LPA) and its policies on flood risk management are set out in Local Plan Local Plan 2011 – 2031.

1.2.9 Where relevant, local planning authorities and developers must also take advice from:

- Internal drainage boards; to identify the scope of their interests.
- Sewerage undertakers; to ensure they can assess the impact of new development on their assets and plan any required improvements. Southern Water (SW) is the local sewerage undertaker.
- Reservoir undertakers; to avoid an intensification of development within areas at risk from reservoir failure and ensure they can assess the cost implications of any reservoir safety improvements required due to change in land use downstream of their assets.
- Navigation authorities; in relation to developments adjacent to, or which discharge into, canals (especially where these are impounded above natural ground level).

1.3 Sources of Information

1.3.1 This flood risk assessment has been based on the following sources of information:

- Bespoke topographic survey undertaken by SubVision Surveys Ltd (Ref. SS-RED-001, February 2021);
- British Geological Survey's *Geoindex Tool*;
(<https://mapapps2.bgs.ac.uk/geoindex/home.html>)
- DEFRA / EA's aquifer and source protection data
(<https://mapa1.defra.gov.uk/Mapa1Map.aspx>)
- EA's Flood Map for Planning;
(<https://flood-map-for-planning.service.gov.uk/>)
- EA's Long Term Flood Risk Information;
(<https://flood-warning-information.service.gov.uk/long-term-flood-risk/napp>)
- WSCC's Preliminary Flood Risk Assessment Volume II, Technical Report (2011)
- WSCC's Strategic Flood Risk Assessment Volume II, Technical Report (2010);
- Water. People. Places. A guide for master planning sustainable drainage into developments – LLFAs of the South East of England and AECOM, (2013);
- ADC's Strategic Flood Risk Assessment (2016);
- Land off Arundel Road, Angmering - Flood Risk Assessment & Outline Surface Water Drainage Strategy, 881292-R3(00)-FRA (2019).
- E&P Groundwater Monitoring Results

2.1 Location

Table 2.1: Site Location

OS K	OS Y	Area (ha)	Nearest Postcode
506554	105259	9.1	BN16 4DN

This aerial photograph shows the Angmering area. A white line delineates the 'Site Boundary' in the upper left. The road 'A27' runs horizontally across the top. The town of 'Angmering' is visible in the lower center. The road 'A280' is shown in the bottom right corner. A white oval highlights a specific area on the right side of the image.

2.1.3 The surrounding land uses are summarised in the following table.

Direction	Land Use
North	Steyne Woods
East	Nine new houses, Arundel Road, woods and arable land beyond.
South	Angmering Recreation Ground
West	Arable farmland

2.2 Topography

- 2.2.1 The available topographic information (Appendix A) shows that ground levels within the development site range between 23.0 m above Ordnance Datum (aOD) adjacent to Arundel Road in the north east and 11.0m aOD in the north west.

2.3 Hydrology

- 2.3.1 An unnamed watercourse is located c. 70m to the north of the site, flowing north east to west. From the Ordnance Survey map, this appears to rise from a spring just to the north of the A27, but the alignment is also an overland flow route to the north east of the spring.
- 2.3.2 The watercourse discharges into ponds (named Decoy ponds) to the north west of the site, which in turn flow into the Black Ditch and ultimately the River Arun.
- 2.3.3 A ditch is located along the western site boundary. The northern part of this falls towards the unnamed watercourse. The part of the ditch near the south western corner of the site is understood to connect to a ditch to the west via a culvert, with this ultimately discharging to downstream watercourses.

2.4 Geology

- 2.4.1 The geology of the site has been determined by reference to the 1:50,000 scale British Geological Survey (BGS) online Geoindex Tool
<http://mapapps2.bgs.ac.uk/geoindex/home.html>
- 2.4.2 No artificial or Made Ground is indicated to be present underlying the site. The superficial geology of the site to be is indicated to be Head deposits, which underlie all but the north east of the site and are described by the BGS as *“poorly sorted and poorly stratified, angular rock debris and/or clayey hillwash and soil creep”*.
- 2.4.3 The underlying geology is indicated to be the London Clay Formation, which is part of a syncline orientated north west to south east with the axis just to the north of the site. The outcrop of the underlying clays, silts and sands of the Lambeth Group is just off-site to the north.
- 2.4.4 There are no faults denoted within 500 m of the site.
- 2.4.5 JNP Group have consulted online borehole records held by the BGS. There are borehole records c. 500m to the west, albeit on the outcrop of the Lambeth group so slightly lower in the geological sequence. These boreholes are used for groundwater abstraction from the Chalk which underlies the Lambeth group. The borehole logs indicate 30m of Lambeth group above the Chalk indicating that there be at least this thickness beneath the site.
- 2.4.6 The RSK report includes the results of infiltration testing. This was undertaken in four trial pits excavated to between 1.8m and 2.5m bgl. The strata encountered was clays classified as head deposits or London Clay. The pits were dry. Infiltration did not occur in three pits and a very low rate of 6.7×10^{-7} m/s was determined from the testing the fourth pit.

- 2.4.7 EA Aquifer Maps indicate that the Head deposits are classified as a Secondary (Undifferentiated) Aquifer, the London Clay is not classified and the Lambeth group as a secondary A Aquifer.
- 2.4.8 The Environment Agency define a Principal Aquifer as:
- “These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.”*
- 2.4.9 The Environment Agency define a Secondary-A Aquifer as:
- “Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.”*
- 2.4.10 The site’s proximity to groundwater Source Protection Zones (SPZs) was determined by reference to the EA’s website. The site is not located within or close to a SPZ. Based on the available geological and hydrogeological information, infiltration drainage is deemed unfeasible at the development site.

3 PROPOSED DEVELOPMENT

- 3.1.1 The proposed development (Figure 3.1 and Appendix B) comprises approximately 160 residential properties with associated hard paved / impermeable surfaces (e.g. roofs, roads, driveways, parking areas, etc.), public open space and a SUDS basin. The impermeable area totals approximately 3.33ha, including a 10% allowance for urban creep of the residential dwellings.
- 3.1.2 Under Table 2 of the *Flood Risk and Coastal Change Guidance* (March 2014), the proposed residential development is classified as more vulnerable.

Figure 3.1: Proposed Development



4 FLOOD RISK ASSESSMENT

4.1 Overview

- 4.1.1 All potential sources of flood risk at the development site have been assessed based on the information listed in Section 1.3 and are summarised in Table 4.1. The key sources of flood risk to the proposed development are further described in the ensuing sections.

Table 4.1: Potential Sources of Flood Risk

Source	Flood Risk
Coastal	No risk, site 10m + aOD
Fluvial	Site Flood Zone 1 – low risk. ADC SFRA indicates site will still be FZ1 when climate change is considered.
Surface Water	Very low risk predicted across site, small discrete areas at higher risk associated with ditch along western boundary. Increased surface water flood risk resulting from development will be mitigated by drainage strategy.
Groundwater	Winter groundwater monitoring found a perched water table in the Head Deposits. Considered Low risk after further SI advice. However, the perched water table needs to be considered in the designs. See section 4.3.
Sewers	ADC SFRA indicates only two reported incidents in BN16 4 postcode. Pre-development private sewer system on site to septic tank in SW of developed area. System will be replaced during development. Low risk.
Infrastructure Failure	Very low risk

4.2 Climate Change

- 4.2.1 The NPPF sets out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change. This includes demonstrating how flood risk will be managed now and over the development's lifetime, taking climate change into account.
- 4.2.2 In accordance with the EA's guidance Flood Risk Assessment: Climate Change Allowances (July 2021), the proposed development with anticipated life span into the 2080's (2070 to 2115) must take account of the following allowances:

- Peak River Flows (Southern river basin district)
 - * Central 25%
- Peak Rainfall Intensity
 - * Upper End 40%

4.3 Groundwater Flood Risk

4.3.1 Groundwater flooding occurs when the level of water filling the pores and / or cracks in the underlying soil and / or rock (i.e. water table) rises and emerges on the surface. The level of the water table varies seasonally and depends upon long term rainfall, thickness and porosity of the underlying strata and groundwater abstraction.

4.3.2 Groundwater flooding is most common in areas where the underlying bedrock and superficial deposits are very porous, but it can also happen at locations where superficial layers of sand or gravel overlay impermeable bedrock.

4.3.3 Groundwater flooding usually occurs after days or weeks of prolonged rainfall and often lasts for days or weeks, as subsiding of the water table can be a very slow process.

4.3.4 Besides posing a direct flood risk to developments (particularly basements), high water table levels can exacerbate other sources of flood risk by preventing infiltration and / or leaking into drainage systems.

4.3.5 The ground water monitoring undertaken by Eastwood & Partners in March 21 to February 22 encountered groundwater on average 0.6-0.7m bgl across the site. This is understood to be perched groundwater in the Head Deposits. The Site Investigation team concluded that:

"Based on the groundwater monitoring results, it is likely that the water present within the monitoring wells represents a perched water table within the Head Deposits. These superficial deposits are present across the site and the base of this strata was not encountered in any of the exploratory holes, the deepest of which reached 6.45 m bgl. The solid geology underlying the Head Deposits is the London Clay Formation. The true groundwater level is likely to be present within the solid geology at depth, with the Head Deposits containing perched groundwater sat over the relatively impermeable London Clay.

The gas monitoring was undertaken between September 2020 and April 2021 and a wide range of water depths were recorded. Therefore it is clear that the water depth across the site exhibits a significant seasonal variation.

Water strikes were not recorded during RSK's investigation, however as this was undertaken in August, this would not be unexpected. The installation of the additional groundwater monitoring wells by E&P was undertaken in March 2021 and some water strikes were noted at a depth of around 4 m bgl. This is deeper than the resting perched groundwater table at this time of year, however this is likely to be a result of the cohesive nature of the soils and the low ingress rate of the groundwater. Therefore, any trenches as part of the construction works are likely to remain dry if left open for short periods, but water is likely to seep into these excavations if left open for longer periods, particularly during wetter periods of the year."

4.3.6 With this in mind, the location and depth of proposed SuDS and underground structures (e.g. foundations and drainage infrastructure) must consider the likelihood of perched groundwater in their design and construction.

4.3.7 Since the groundwater is deemed to be a perched water body in the Head Deposits, which are generally cohesive, the associated risk is deemed to be manageable through appropriate design of site levels and finished floor levels.

- 4.3.8 Should the risk of groundwater discharging directly into SuDS be confirmed and the provision of additional runoff storage volume proven unfeasible, measures to divert groundwater flows around SuDS and towards the watercourses – such as impermeable lining and land drains – will be designed and implemented to ensure groundwater flows reach the intended recipients without posing a flood risk to the proposed development.
- 4.3.9 Despite the recommendations made by E&P, it is recommended that provision is made for dewatering of excavations and inflow rates may vary across the site.

4.4 Sequential and Exception Tests

- 4.4.1 The sequential, risk-based approach to the location of development is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. The aim is to keep development out of medium and high flood risk areas (Flood Zones 2 and 3) and other areas affected by other sources of flooding where possible.
- 4.4.2 Application of the sequential approach in the master planning process, in particular application of the *Sequential Test*, helps ensure that development can be safely and sustainably delivered, and developers do not waste resources promoting proposals which are inappropriate on flood risk grounds.
- 4.4.3 The *Sequential Test* ensures that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. The aim is to steer new development to Flood Zone 1 (areas with a low probability of sea or river flooding). Where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2 (areas with a medium probability of sea or river flooding), applying the *Exception Test* if required. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (areas with a high probability of sea or river flooding) be considered, taking into account the flood risk vulnerability of land uses and applying the *Exception Test* if required.
- 4.4.4 Table 2 of the *Flood Risk and Coastal Change Guidance* categorises different types of uses and development according to their vulnerability to flood risk. Table 3 of the *Flood Risk and Coastal Change Guidance* (Table 4.2) maps these vulnerability classes against flood zones to indicate where development is appropriate and where it should not be permitted.

Table 42: Flood Risk Vulnerability and Flood Zone Compatibility

Flood Zone	Flood Risk Vulnerability				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test	✓	✓	✓
Zone 3a	Exception Test	✗	Exception Test	✓	✓
Zone 3b	Exception Test	✗	✗	✗	✓

Key:

✓ Development is appropriate

✗ Development should not be permitted

- 4.4.5 The site is located in Flood Zone 1 and at no significant risk of flooding from any potential source, thus following a sequential approach to steer development away from flood risk. The Exception Test is not required for less vulnerable development in Flood Zone 1.

5 SURFACE WATER DRAINAGE STRATEGY

5.1 Existing Drainage (Greenfield Runoff)

5.1.1 Runoff generated within the existing developed part of the site is understood to be conveyed towards the ditch along the western boundary.

5.1.2 Greenfield runoff rates of 10.3 l/s (100.0% AEP), 12.1 l/s (Q_{BAR}), 27.5 l/s (3.3% AEP) and 38.7 l/s (1.0% AEP) have been established for the development site using the *IH124* methodology with *ICP SuDS* correction for small catchments (Appendix C).

5.2 Hierarchy for Surface Water Disposal

5.2.1 The National Standards for Sustainable Drainage Systems (Defra, 2011) state that the following options must be considered in accordance with the hierarchy for surface water disposal:

Discharge to Ground (Infiltration)

5.2.2 Based on the available geologic and hydrogeological information (Section 3 of this report), infiltration drainage is deemed unfeasible at the development site.

Discharge to Surface Water Body

5.2.3 There are appropriate surface water bodies to the west of the site, into which it is proposed to discharge surface water as detailed further in the following sections.

Discharge to Sewer

5.2.4 As discharge to surface water is proposed, discharge to sewer is not considered further.

5.3 Proposed Drainage Strategy

5.3.1 The proposed surface water drainage strategy has been designed in accordance *Sewers for Adoption* and / or *Building Regulations Part H* and in compliance with the *NPPF*, local requirements and current best practices³, to collect, convey and attenuate runoff from all impermeable areas (3.29 ha) before discharging into the ditch to the west of the site.

5.3.2 Given the unfeasibility of infiltration drainage, the volume of runoff leaving the proposed development cannot be reduced to greenfield / existing values and the excess volume must be discharge at a low rate that will not pose a flood risk downstream of the site. The proposed drainage strategy has been designed to limit discharge to the Q_{BAR} greenfield runoff rate of 12.1 l/s.

5.3.3 The proposed drainage strategy divides the site into two catchments; the residential development and associated infrastructure, and the public open space (POS) in the south (Appendix D). A drainage strategy is appended which demonstrates how the drainage principles can be met.

³ e.g. *Non-Statutory Technical Standards for Sustainable Drainage Systems* (March 2015) and *The SuDS Manual* (2015).

- 5.3.4 Surface water run-off from the residential catchment will be collected via a series of rainwater pipes and permeable paving before discharging into a below ground drainage network. This conveys run-off in a similar direction to the current drainage, through oversized pipes to a SuDS basin in the north west of the site. The basin incorporates a low flow channel across the base. Discharge from the basin is into an existing drain which outfalls into the ditch to the west of the site. The discharge rate is limited to the Qbar rate of 12.1 l/s. The SuDS basin operates as a detention basin with the maximum water level sufficient to accommodate run-off from a 1 in 100 year storm event plus 40% increase in rainfall due to climate change plus 300mm freeboard. When the capacity of the basin is exceeded, additional storage is provided by an off-line attenuation tank beneath the public open space to the south of the basin.
- 5.3.5 The ditch to the north of the public open space of the site is shallow and the basin has been retained by an embankment, to ensure that gravity drainage can be maintained. However, it is noted that the watercourse into which the ditch discharges c. 70m to the north is at a lower level. If a direct connection could be achieved, there could be scope to lower the basin and reduce the embankment. However, access across third party land would need to be obtained.
- 5.3.6 A swale is proposed to the south of the residential development / north of POS in the south of the site. This will again mimic the existing drainage, flowing to the west into an existing surface water drain which is understood to discharge to the drain to the west of the site and ultimately surface watercourses downstream.
- 5.3.7 The proposed drainage strategy (Appendix D) has been designed so that:
- flooding does not occur on any part of the site for all events up to 3.3% AEP (1 in 30 years);
 - flooding does not occur in any part of a building or utility plant susceptible to water for all events up to 1.0% AEP (1 in 100 years) + 40% climate change allowance.
- 5.3.8 The performance of the proposed surface water drainage strategy has been tested for storm events with 100.0% AEP, 3.3% AEP and 1.0% AEP + 40% climate change and durations of 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640 and 10080 minutes.
- 5.3.9 The results of the simulations are included in Appendix E and demonstrate how the proposed surface water drainage strategy can manage surface water flood risk at the development site without increasing flood risk elsewhere for storm events up to the 1.0% AEP + 40% climate change allowance.
- 5.4 Sustainable Drainage Systems (SuDS)**
- 5.4.1 In accordance with the *NPPF*, (major) developments should incorporate sustainable drainage systems (SuDS) unless there is clear evidence that this would be inappropriate. In addition to water quantity control, SuDS should consider opportunities to provide water quality and amenity / biodiversity benefits (i.e. multifunctionality approach).
- 5.4.2 While the proposed drainage strategy is largely reliant on permeable paving in driveways and the roads that will remain private, a detention basin and a swale to manage runoff quantity, Table 5.1 shortlists other SuDS deemed compatible with the site's characteristics

and which inclusion in the proposed development must be continuously assessed as the design progresses.

- 5.4.3 It is important to note the need to remove silt from runoff prior to discharge into SUDS features. SuDS such as filter drains, swales, bioretention systems and permeable paving are sustainable alternatives to proprietary treatment systems otherwise required to manage silt.

Table 5.1: Sustainable Drainage Systems (SuDS)

Subs Component	Description and Opportunities
Green / Blue Roofs	Green roofs are areas of living vegetation installed on the top of buildings for a range of reasons including visual benefit, ecological value, enhanced building performance and reduction of surface water runoff. A blue roof is a roof designed explicitly to store water for use within the building (rainwater harvesting) or controlled discharge. Green roofs that include reservoir storage zones beneath the growing medium could also be considered blue roofs. Green roofs can improve the thermal performance of buildings, help combat the urban heat island effect and contribute to improved air quality. Through evapotranspiration, green roofs can reduce peak flow rates to a site drainage system (principally for small and medium-sized events) but are unlikely to have a significant impact on downstream attenuation storage requirements. Blue roofs can be designed to provide significant attenuation (and evapotranspiration). Pitched roofs are not conducive to the use of blue / green roofs but their use could be considered for structures where flat roofs are proposed. Due to nature of the scheme, green roofs are not proposed.
Filter Drains/Strips	Filter drains are trenches filled with stone/gravel that create temporary subsurface storage for the filtration, attenuation and conveyance of surface water runoff. Ideally, filter drains receive lateral inflow from adjacent impermeable surfaces pre-treated over a filter strip. Filter drains can help manage peak flows by naturally limiting rates of conveyance through the filter medium and by providing attenuation storage when the rate of flow at the outlet is controlled. Filter drains can be effectively incorporated into the landscape and public open spaces and can have minimal land-take requirements. The use of filter drains is typically restricted to flat sites (unless placed parallel to contours). Filter drains are best located adjacent to (small) impermeable surfaces such as car parks and roads / highways. Due to the proposal for permeable paving to be used for private areas and driveways, filter drains/strips are not proposed.

Subs Component	Description and Opportunities
Swales	Swales are shallow, flat bottomed, vegetated open channels designed to treat, convey and often attenuate surface water runoff. Swales can also provide aesthetic and biodiversity benefits. Swales can help reduce flow rates by facilitating infiltration and / or providing attenuation storage when flow at the outlet is controlled. Coarse to medium sediments and associated pollutants can be removed by filtration through surface vegetation and ground cover. Swales are well suited for managing runoff from linear features such as main roads / highways. Swales are generally difficult to incorporate into dense urban developments, where space is limited. A swale is proposed to the north of the POS in the south of the site.
Bioretention Systems	Bioretention systems (including rain gardens) are shallow landscaped depressions that can reduce runoff rates and volumes and treat pollution. They also provide attractive landscape features and biodiversity. Bioretention systems can help reduce flow rates from a site by promoting infiltration / evapotranspiration and providing some attenuation storage. Bioretention systems can also provide very effective treatment functionality. Bioretention systems are a very flexible surface water management component that can be integrated into a wide variety of developments / densities using different shapes, materials, planting and dimensions. A bioretention system is not proposed on the development. An adoptable detention basin has been proposed instead.
Permeable Paving	Permeable paving provide a pavement suitable for pedestrian and / or vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying structural layers. The water is temporarily stored beneath the overlying surface before use, infiltration to the ground or controlled discharge downstream. Permeable paving help reduce flow rates from a site by providing attenuation storage. A flow control structure is required to constrain the rate of water discharged from the sub-base via an outlet pipe. Pervious pavement drainage has been shown to have decreased concentrations of a range of surface water pollutants, including heavy metals, oil and grease, sediment and some nutrients. Permeable paving are typically built as an alternative to impermeable surfaces and therefore require no extra development space for their construction. Permeable paving is proposed for the private driveways and shared driveways across the site
Detention Basins	Detention basins are landscaped depressions that are normally dry expect during and immediately following storm events. They can be on-line components where surface runoff from regular events is routed through the basin or off-line components into which runoff is diverted once flows reach a specific threshold. Detention basins can be vegetated depressions (providing treatment in on-line components) or hard landscaped storage areas. Off-line basins will normally have an alternative principal use (e.g. amenity or recreational facility or urban (hard) landscaping). A large adoptable detention basin is proposed in the north western corner of the site.

5.5 Exceedance Events

5.5.1 Plot levels are set 150 mm above external ground levels and external ground levels have been designed to safely route overland flows away from buildings and towards the watercourse to the west of the site, using the less vulnerable parts of the proposed development such as public open spaces, parking areas and roads to convey and store overland flows.

5.5.2 Overland flows resulting from exceedance events are expected to leave the developed site to the west as currently occurs (i.e. pre-development conditions), without posing any increased flood risk on site or elsewhere.

5.6 Water Quality Management

5.6.1 The suitability of the proposed drainage strategy to manage the development's pollution risk has been assessed using the simple index approach in *The SuDS Manual* (2015), as summarized in .

Table 5.1: Surface Water Quality Management (Simple Index Approach)

Runoff Route / Treatment Train 1 – Residential Area				
Land Use / SuDS	Hazard Level	TSS	Metals	Hydrocarbons
Pollution Hazard Indices				
Residential Roofs	Very Low	0.20	0.20	0.05
Driveways, residential car parks and low traffic roads	Low	0.50	0.40	0.40
SuDS Mitigation Indices				
Permeable paving	-	0.70	0.60	0.70
Detention Basin	-	0.50	0.50	0.60
Total SuDS Mitigation Index = Permeable paving Index + 0.5 (Detention Basin Index)				
Detention Basin	-	0.95	0.85	1.0
Total SuDS Mitigation Index ≥ Pollution Hazard Index (for each contaminant type)				

Runoff Route / Treatment Train 2 – POS in the south of the site				
Land Use / SuDS	Hazard Level	TSS	Metals	Hydrocarbons
Pollution Hazard Indices				
POS in the south of the site (analogous to driveways, residential car parks and low traffic roads)	Low	0.50	0.40	0.40
SuDS Mitigation Indices				
Swale	-	0.50	0.60	0.60
Total SuDS Mitigation Index ≥ Pollution Hazard Index (for each contaminant type)				

5.7 Operation and Maintenance

- 5.7.1 The function of the surface water drainage system must be understood by those responsible for maintenance, regardless of whether individual components are below ground or on the surface. In any system properly designed, monitored and maintained, performance deterioration can usually be minimised.
- 5.7.2 The long-term operation and maintenance of the proposed surface water drainage strategy will be the responsibility of the entities as detailed in Table 5.2. Appropriate legal agreements defining maintenance responsibilities and access rights over the lifetime of the proposed development must be established prior to construction.

Table 5.2: Entities Responsible for SuDS Maintenance

SuDS Component	Location	Function	Responsible Entity
Swale	POS in the south of the site	Store, convey and treat runoff	Private management company
Permeable paving	Private & public parking areas	Store & treat runoff	Owner or private management company
Detention Basin	North west of site	Store & treat runoff	Water Authority

- 5.7.3 Where the user / benefiter of a system is not responsible for maintenance, then it is important to ensure that they know when the SuDS is not functioning correctly and who to contact if any issue arises.
- 5.7.4 Maintenance plans are often required to clearly identify who is responsible for maintaining proposed SuDS as well as the maintenance regime to be applied. Maintenance plans can also form a useful tool for public engagement with SuDS and understanding their wider benefits. The maintenance requirements of the proposed surface water drainage strategy are summarised in .

Table 5.2: Typical Operation and Maintenance Requirements

Operation and Maintenance Activity			
	Swale	Permeable paving	Detention basin
Regular Maintenance			
Inspection	■	■	■
Litter and debris removal	■	■	■
Grass cutting	■	□	■
Weed and invasive plant control		□	□
Shrub management (including pruning)	□	□	□
Shoreline vegetation management			□
Aquatic vegetation management			□
Occasional Maintenance			

Operation and Maintenance Activity			
	Swale	Permeable paving	Detention Basin
Sediment management	■	■	■
Vegetation replacement	□		□
Vacuum sweeping and brushing		■	
Remedial Maintenance			
Structure rehabilitation/repair	□	□	□
Infiltration surface reconditioning	□	□	

■ Will be required

□ May be required

5.8 Drainage During Construction

5.8.1 Drainage is typically an early activity in the construction of a development, taking form during the earthworks phase. However, the connection of piped drainage system to SuDS components should not take place until the end of construction works, unless a robust strategy for silt removal prior to occupation of the site is implemented.

5.8.2 Silt-laden runoff from construction sites represents a common form of waterborne pollution and cannot enter SuDS components not specifically designed to manage this, as it can overwhelm the system and pollute receiving water features. Any gullies and piped systems should be capped off during construction and fully jetted and cleaned prior to connection to SuDS components.

5.8.3 The three principal aspects of drainage during construction are conveying runoff, controlling runoff and trapping sediments:

- Conveyance of runoff can be achieved through small ditches / swales, channels and drains. Runoff control measures should be implemented to ensure that runoff does not overwhelm the temporary drainage system causing flooding on site or elsewhere.
- Control of runoff can be achieved through perimeter ditches or appropriate grading to ensure that any runoff from the construction site stays on site. Runoff rates leaving the site should be managed so they do not exceed pre-development conditions.
- Construction runoff should be directed to dedicated infiltration basins with adequate upstream sediment and pollution control such as sediment basins, silt fences and straw bales prior to infiltration or off-site discharge.

5.8.4 Additional conveyance, control and treatment measures should be installed as needed during grading. Slope stability needs to be considered when using open water features to convey, control and treat runoff across the site. Any necessary surface stabilisation measures should be applied immediately on all disturbed areas where construction work is either delayed or incomplete.

- 5.8.5 Maintenance inspections should be performed weekly, and maintenance repairs should be made immediately after periods of rainfall.
- 5.8.6 All drainage infrastructure (namely underground features) must be protected from damage by construction traffic and heavy machinery through the implementation of measures such as protective barriers and storing construction materials away from the drainage infrastructure.

6 FOUL WATER DRAINAGE STRATEGY

- 6.1.1 Sewerage undertakers have a legal obligation under the Water Industries Act 1991 to provide developers with the right to connect to public (foul) networks. The Water Industries Act 1991 also contains safeguards to ensure that flows resulting from new developments do not cause detriment to the existing public sewerage networks by imposing a duty on sewerage undertakers to carry out works required to accommodate additional flows into their networks.
- 6.1.2 It is understood from the RSK FRA that foul sewage from the existing development is conveyed through a network of underground drains towards a septic tank in the south west of the site. The stormwater overflow pipe is thought to connect to the west ditch.
- 6.1.3 Foul water is conveyed to the west of the site via a gravity system. As invert levels of the existing public foul drainage network are not deep enough to allow gravity drainage from this point, on site pumping of foul flows will be required. The proposed foul water drainage strategy (Appendix D) envisages a pumping station (designed to adoptable standards, with a cordon sanitaire of 15 m to all dwellings) in the western part of the site, with the rising main pumping the discharge back through the site and along Arundel Road to the south to connect with the Southern Water sewer.
- 6.1.4 The proposed foul drainage design will need to be confirmed with Southern Water.

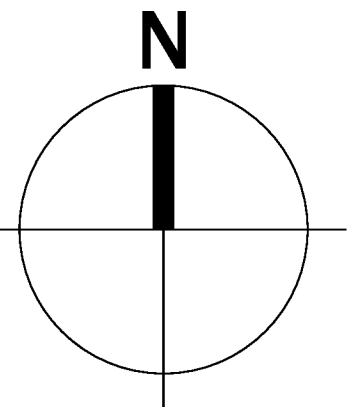
7 CONCLUSIONS AND RECOMMENDATIONS

- 7.1.1 JNP Group has been commissioned by Redrow Homes to prepare a Flood Risk Assessment for the proposed residential development to the west of Arundel Road in Angmering, West Sussex.
- 7.1.2 The site comprises agricultural land and an existing small industrial park and caravan storage facility.
- 7.1.3 The site slopes from c. 23m aOD in the east to 11m aOD in the west.
- 7.1.4 The site is underlain by Head deposits underlain by the London Clay Formation.
- 7.1.5 The underlying strata are classified as a Secondary (Undifferentiated) Aquifer (Head deposits). The London Clay is not classified as an aquifer. The site is not in a groundwater source protection zone.
- 7.1.6 Based on the available geologic and hydrogeologic information, and the previous use of the site, infiltration drainage is deemed unfeasible at the development site.
- 7.1.7 An unnamed watercourse is located c. 70m to the north of the site, flowing north east to west. A ditch is located along the western site boundary. The northern part of this falls towards the unnamed watercourse. The part of the ditch near the south western corner of the site is understood to connect to a ditch to the west via a culvert, with this ultimately
- 7.1.8 The Flood Risk Assessment section of this report demonstrates that the risk of flooding from all sources (fluvial, tidal, surface water, groundwater, sewer and reservoir) is low.
- 7.1.9 In conclusion, the proposed development is not at risk of flooding and does not increase flood risk off-site.
- 7.1.10 This report is intended for the use of the developer of the site in support of their planning application for the site only.

8 LIMITATIONS

- 8.1.1 The information, conclusions and recommendations presented within this report are deemed to be current at the time of issue. No guarantee can be given to the status of this information other than at the time of issuing. Where necessary, the user shall confirm the status of any applicable assessments and consents.
- 8.1.2 This report has been commissioned by Redrow Homes. No third party may receive a copy of this report without first obtaining our permission in writing.
- 8.1.3 This report is confidential and has been prepared solely for the benefit of Redrow Homes and those parties with whom a warranty agreement has been executed or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of this report, written approval must be sought from JNP Group and a charge may be levied against such approval. JNP Group accepts no responsibility or liability for the consequences of this document being used for any purpose or project other than for which it was commissioned, or this document being used by any third party with whom an agreement has not been executed.
- 8.1.4 The copyright of this report remains with JNP Group at all times.

APPENDIX A: TOPOGRAPHICAL AND GROUND INFORMATION



NOTES

THIS SURVEY IS ORIENTATED TO ORDNANCE SURVEY GRID NORTH. THE SURVEY TO A PLANE GRID. HORIZONTAL MEASUREMENTS TAKEN FROM THIS SURVEY WILL BE GROUND DISTANCES.

LOCAL SCALE FACTOR: 0.6667498

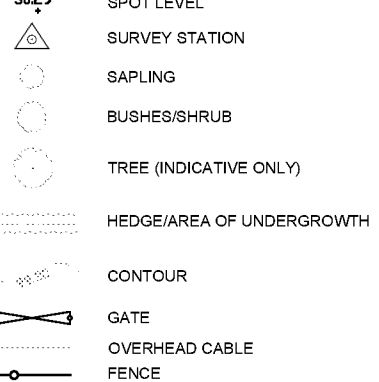
ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM GENERATED BY ACTIVE GP NETWORK.

NO ALLOWANCE HAS BEEN MADE FOR SUB SURFACE ACCESS TO MANHOLES OR

ALL FLOW TYPES (SURFACE, SUBSURFACE, OR COMBINED) ARE ASSUMED AND THEREFORE REQUIRE VERIFICATION.

ROAD MARKINGS:-

LEGEND



ABBREVIATIONS

[illegible]

STATION CO-ORDINATES

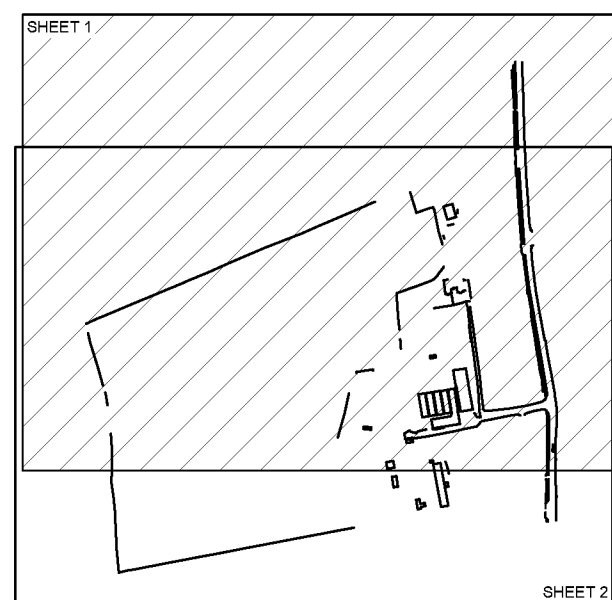
STATION	EASTING	NORTHING	LEVEL	DESCRIPTION
STN1	509755.98	102625.18	18.81	Survey Nail
STN2	509752.98	102630.44	18.11	Survey Nail
STN3	509746.03	102555.24	20.37	Survey Nail
STN4	509732.58	102643.52	22.85	Survey Nail
STN6	509728.18	102655.13	17.13	Survey Nail
STN50	509888.45	102624.28	17.92	Survey Nail
STN51	509867.78	102629.31	18.16	Survey Nail
STN56	509825.22	102627.80	16.42	Survey Nail

TREE SCHEDULE

No.	DIAM.	SPREAD	HEIGHT
TE1	0.50	10	5
TE2	1.00	8	20
TE3	0.90	8	20
TE4	0.90	12	12
TE5	0.70	8	20
TE6	0.90	8	20
TE7	0.90	8	20
TE8	1.40	20	20
TE9	0.90	12	12
TE10	0.90	12	10
TE11	0.15	8	8
TE12	0.80	12	12
TE13	0.30	6	6
TE14	0.30	6	6
TE15	0.90	10	10
TE16	0.30	6	8
TE17	0.30	6	8
TE18	0.40	2	3
TE19	0.80	8	8

REE DIAMETER MEASURED APPROXIMATELY 1.5M ABOVE GROUND LEVEL. TREE
SPREADS ARE SYMBOLIC ONLY AND ARE REPRESENTATIVE OF THE GENERALED
CANOPY SIZE. TREE BOLE MAY NOT SIT CENTRALLY TO THE CANOPY. TREE HEIGHT
ESTIMATED FROM GROUND LEVEL.

PLOT LOCATIONS



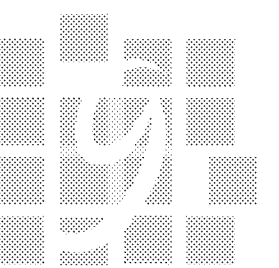
Date	Revision notes	B
DO NOT SCALE		

tus

INFORMATION

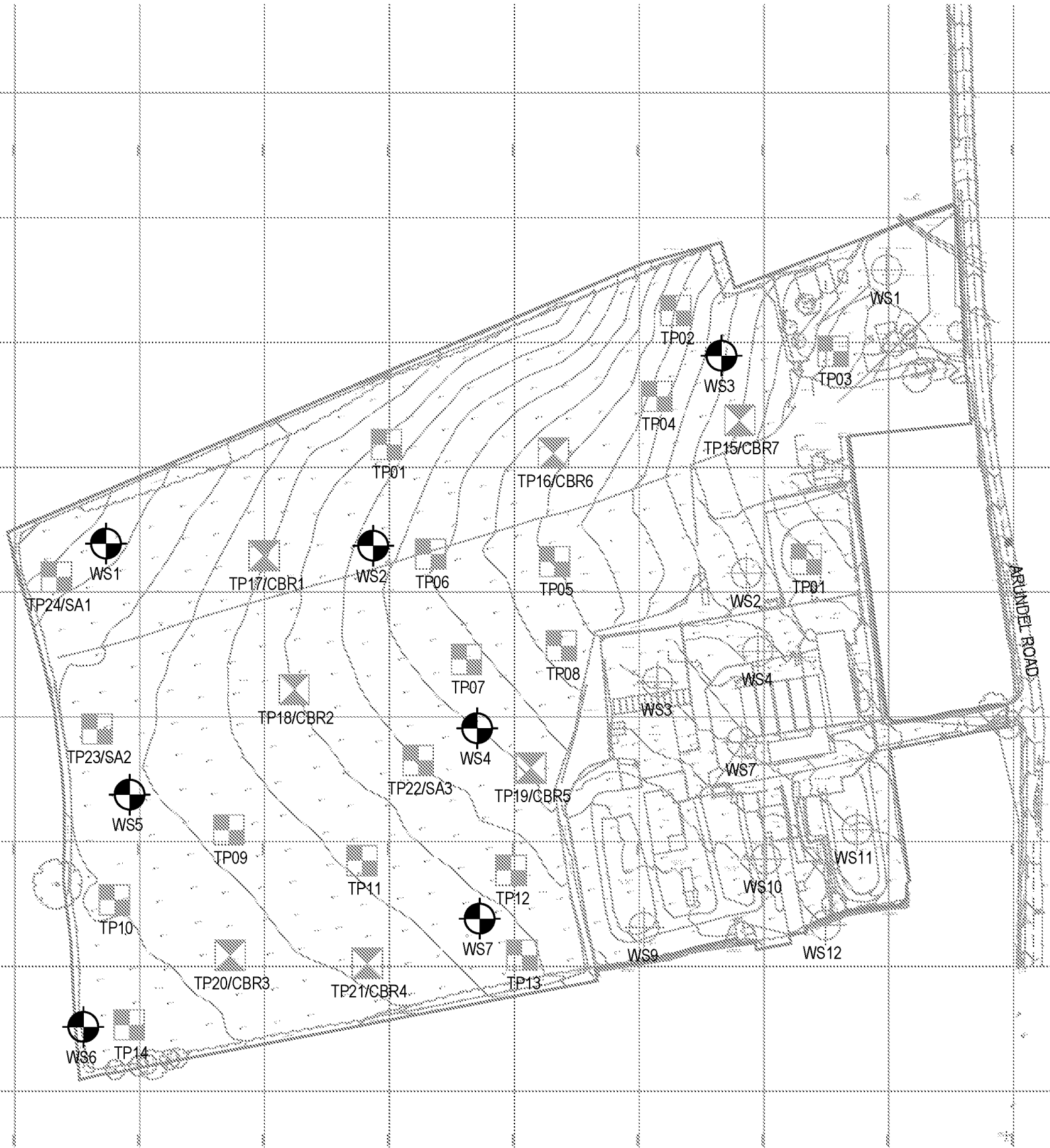
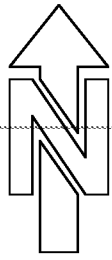
Arundel Road,
Angmering.

TOPOGRAPHICAL SURVEY
AS OF 13.09.17
SHEET 1 OF 2



GLADMAN
Gladman House, Alexandra Way
Compleston Business Park
Congleton, Cheshire
CW12 1JH
Tel: 01260 238800
Fax: 01260 238807
www.gladman.co.uk

Drawn By	Publish Date	Scale(s)	Sheet Size
JH/JW	20.09.17	1:500	A0
Project no.	Drawing no.	Revision	



INFORMATION WITHIN THIS DRAWING IS NOT NECESSARILY PRODUCED TO SCALE.
ALWAYS USE FIGURED DIMENSIONS AND CO-ORDINATES - IF IN DOUBT, ASK.

- Approximate location of trial pit excavated by RSK in August 2020
- Approximate location of trial pit with CBR excavated by RSK in August 2020
- Approximate location of window sample borehole carried out by RSK in August 2020
- Approximate location of window sample borehole carried out by Eastwood & Partners on 04.03.2021

A	First Issue.			
REV	DESCRIPTION	SIG	CHK	DATE

REDROW HOMES LTD

LAND OFF ARUNDEL ROAD,
ANGMERING

EXPLORATORY HOLE LOCATION PLAN

Eastwood & Partners

CONSULTING ENGINEERS

St. Andrew's House
23 Kingfield Road
Sheffield
S11 9AS

Tel 0114 255 4554
Fax 0114 255 4330

mail@eastwoodandpartners.com
www.eastwoodandpartners.com

SCALE WHEN PLOTTED AT A3 1:2000			DRAWING STATUS PRELIMINARY	
DRAWN TC	CHECKED CC	DATE 22.03.2021	DRAWING NUMBER 45487/002	REV A

Winter Groundwater Monitoring Results

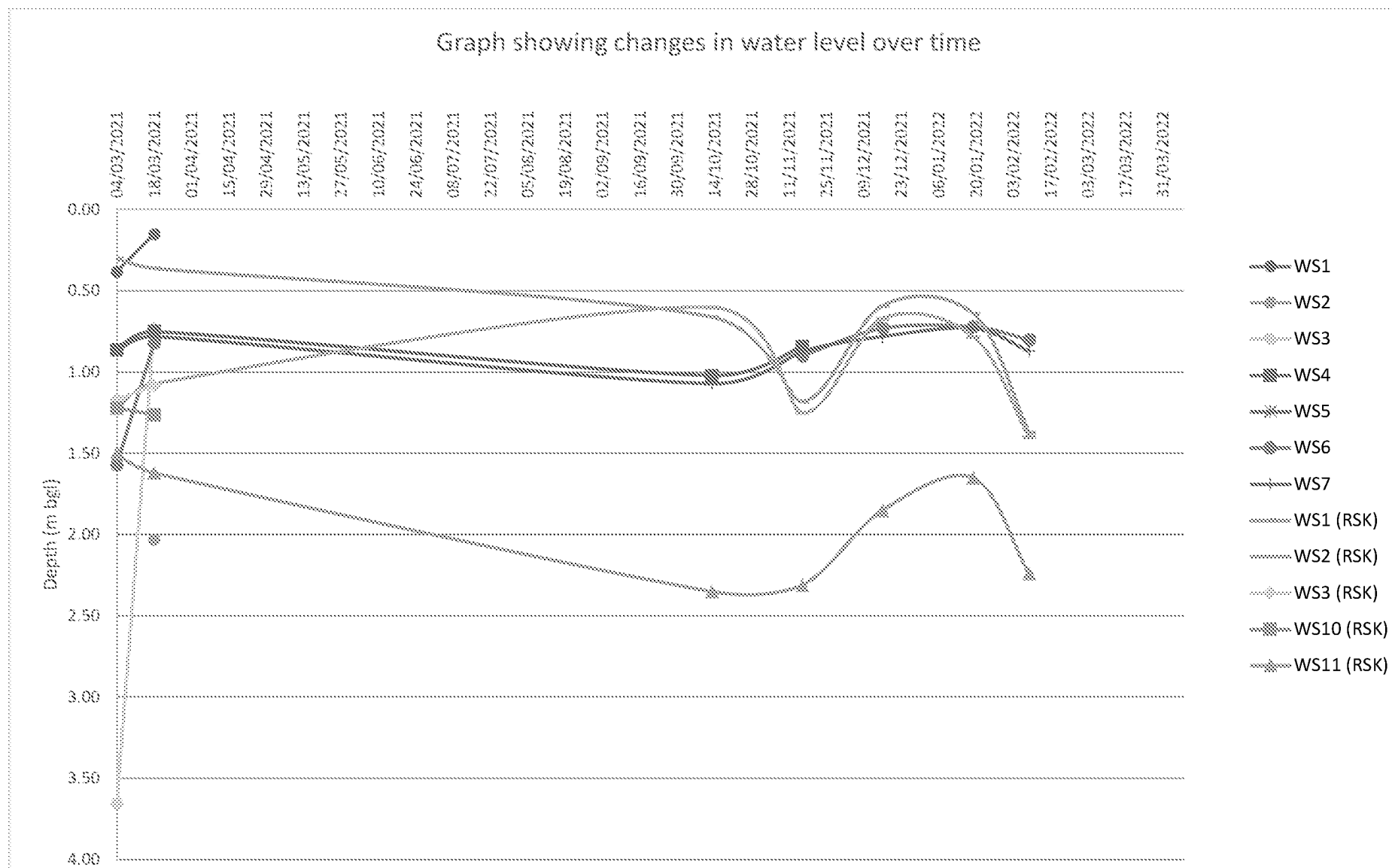
BH	Monitoring Date							Depth
	04/03/2021	18/03/2021	13/10/2021	16/11/2021	16/12/2021	19/01/2022	09/02/2022	
WS1	0.38	0.15						2.40
WS2		2.03						4.00
WS3	3.65	0.73						4.00
WS4	0.86	0.75	1.02	0.84	0.71	0.65	0.71	3.12
WS5		0.93	1.73	0.77	0.53	0.64	0.78	4.00
WS6	1.57	0.82		0.90	0.73	0.72	0.80	3.00
WS7	0.87	0.78	1.07	0.87	0.78	0.73	0.87	3.92
WS1 (RSK)	0.30	0.36	0.66	1.18	0.59	0.64	1.37	2.80
WS2 (RSK)	1.24	1.07	0.60	1.25	0.67	0.78	1.40	4.00
WS3 (RSK)	1.17	1.08						3.05
WS4 (RSK)								
WS7 (RSK)								
WS9 (RSK)								
WS10 (RSK)	1.22	1.26						2.70
WS11 (RSK)	1.50	1.62	2.35	2.31	1.85	1.65	2.24	4.18

Well monitored and found to be dry

Could not locate

Well located but found to be damaged. Monitoring not possible.

Graph showing changes in water level over time

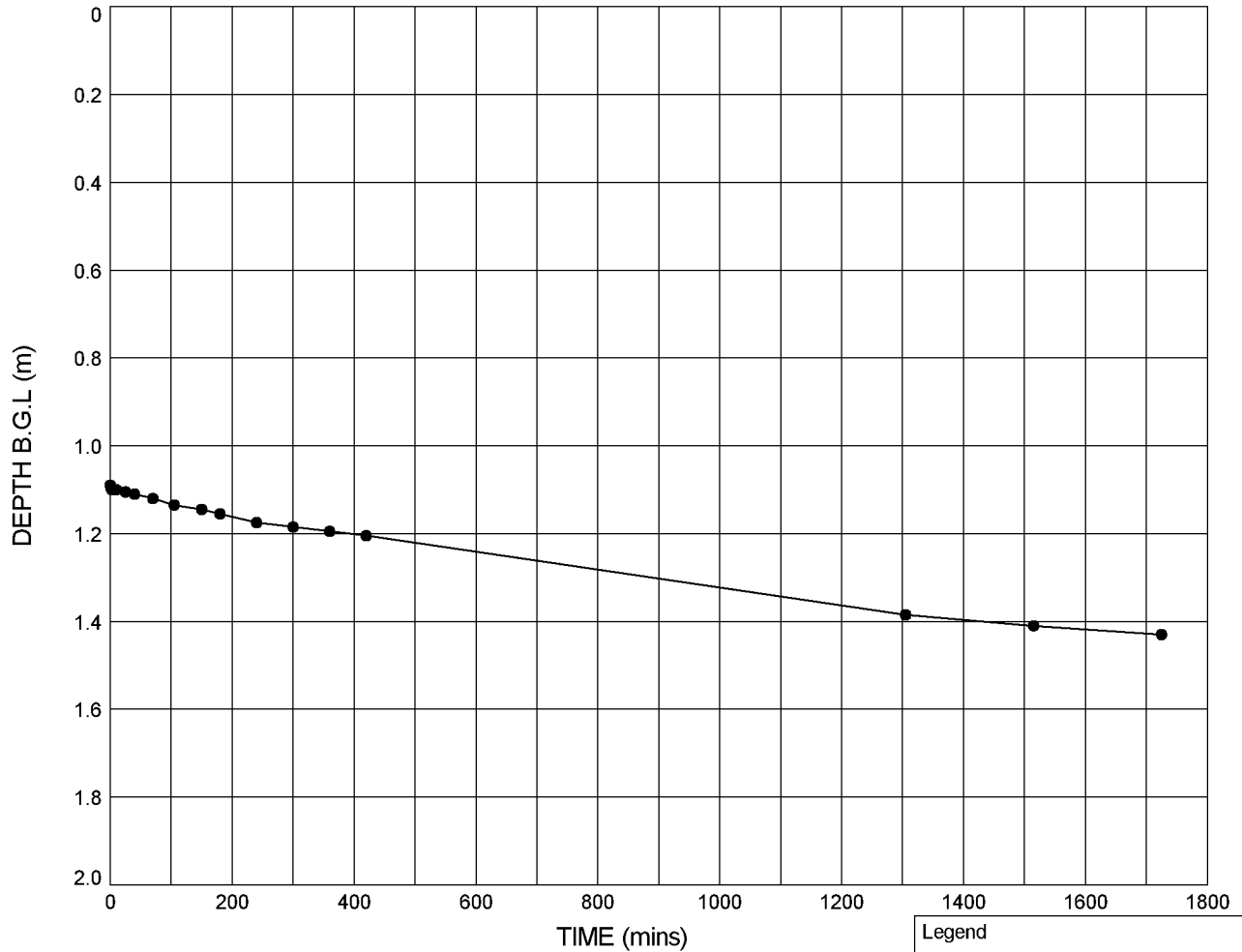


FULL SCALE SOAKAWAY TEST

Non-standard test

Soakaway Test - Position ID : **TPSA1**

Plot of Depth of Water Below Ground Level Against Time



Test 1

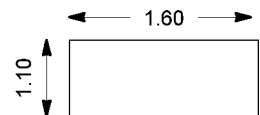
Pit start depth: = **2.00** m
 Pit final depth: = **1.95** m
 Effective depth, D_e = **0.86** m
 Effective storage volume, V_{p75-25} = **0.7568** m³
 Surface area, a_{p50} = **4.0820** m²
 Time, t_{p75-25} = **240950** secs
 Infiltration rate, f = **7.69×10^{-7}** m/s

Please note test data was extrapolated to obtain $t_{p75-tp25}$.

Legend

● Test 1 (26.08.20)

Plan (Not to scale)



No Bearing Taken



STRUCTURAL SOILS
 1a Princess Street
 Bedminster
 Bristol
 BS3 4AG

Compiled By

K. Flincher

Date

28/08/20

Checked By

[Signature]

Date

01/09/20

Contract

Angmering

Contract Ref:

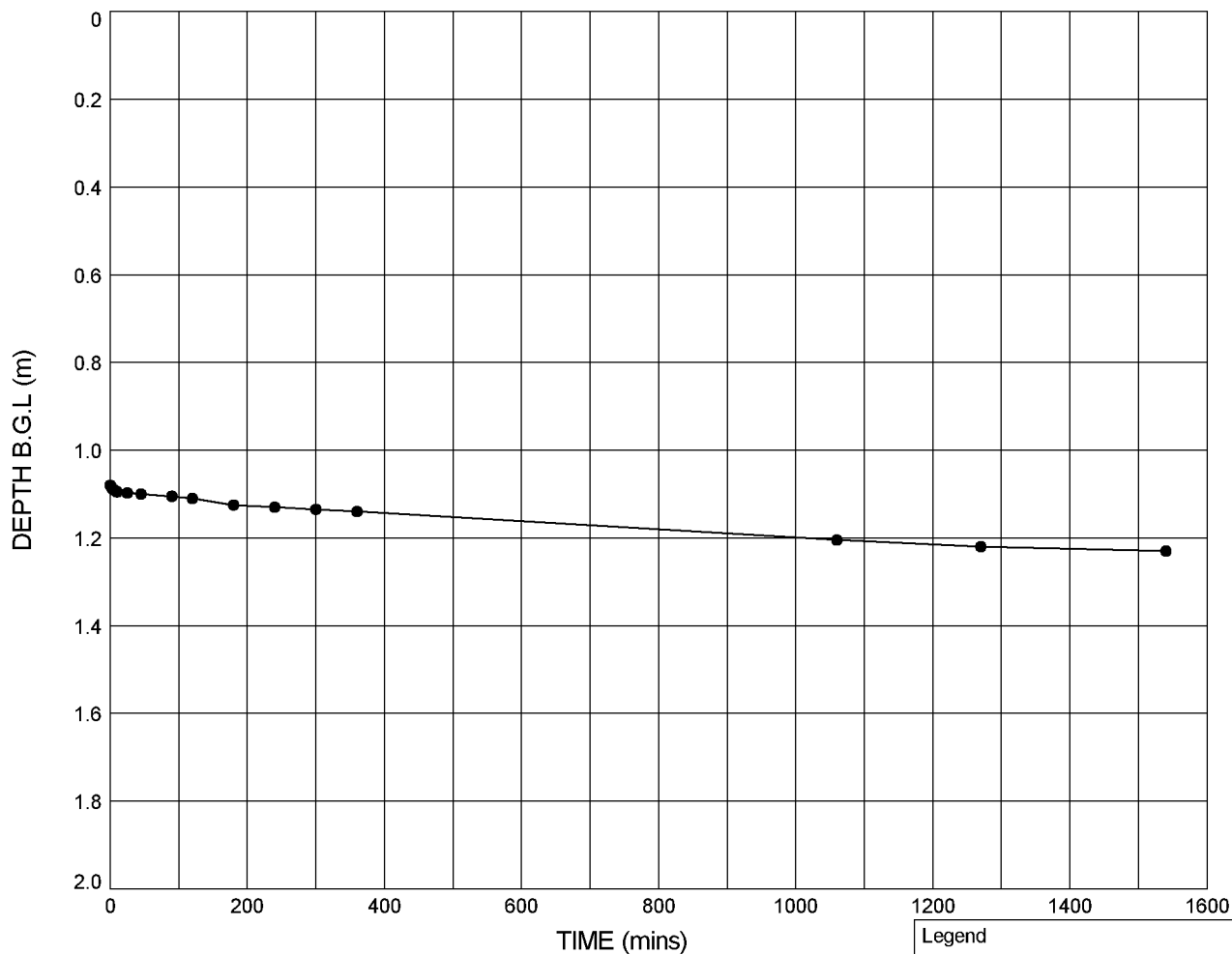
749615

FULL SCALE SOAKAWAY TEST

Non-standard test

Soakaway Test - Position ID : **TPSA2**

PLOT OF DEPTH OF WATER BELOW GROUND LEVEL AGAINST TIME



Test 1

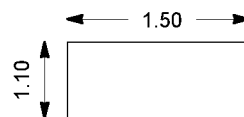
Pit start depth: = **2.00** m
 Pit final depth: = **1.85** m
 Effective depth, D_e = **0.77** m
 Effective storage volume, V_{p75-25} = **0.6353** m³
 Surface area, a_{p50} = **3.6520** m²
 Time, t_{p75-25} = **N/A** secs
 Infiltration rate, f = **N/A** m/s

Notes: Test 1 - Unable to calculate infiltration rate due to insufficient drop in water level.

Legend

● Test 1 (26.08.20)

Plan (Not to scale)



No Bearing Taken



STRUCTURAL SOILS
 1a Princess Street
 Bedminster
 Bristol
 BS3 4AG

Compiled By

K. Flunocher

Date

28/08/20

Checked By

[Signature]

Date

01/09/20

Contract

Angmering

Contract Ref:

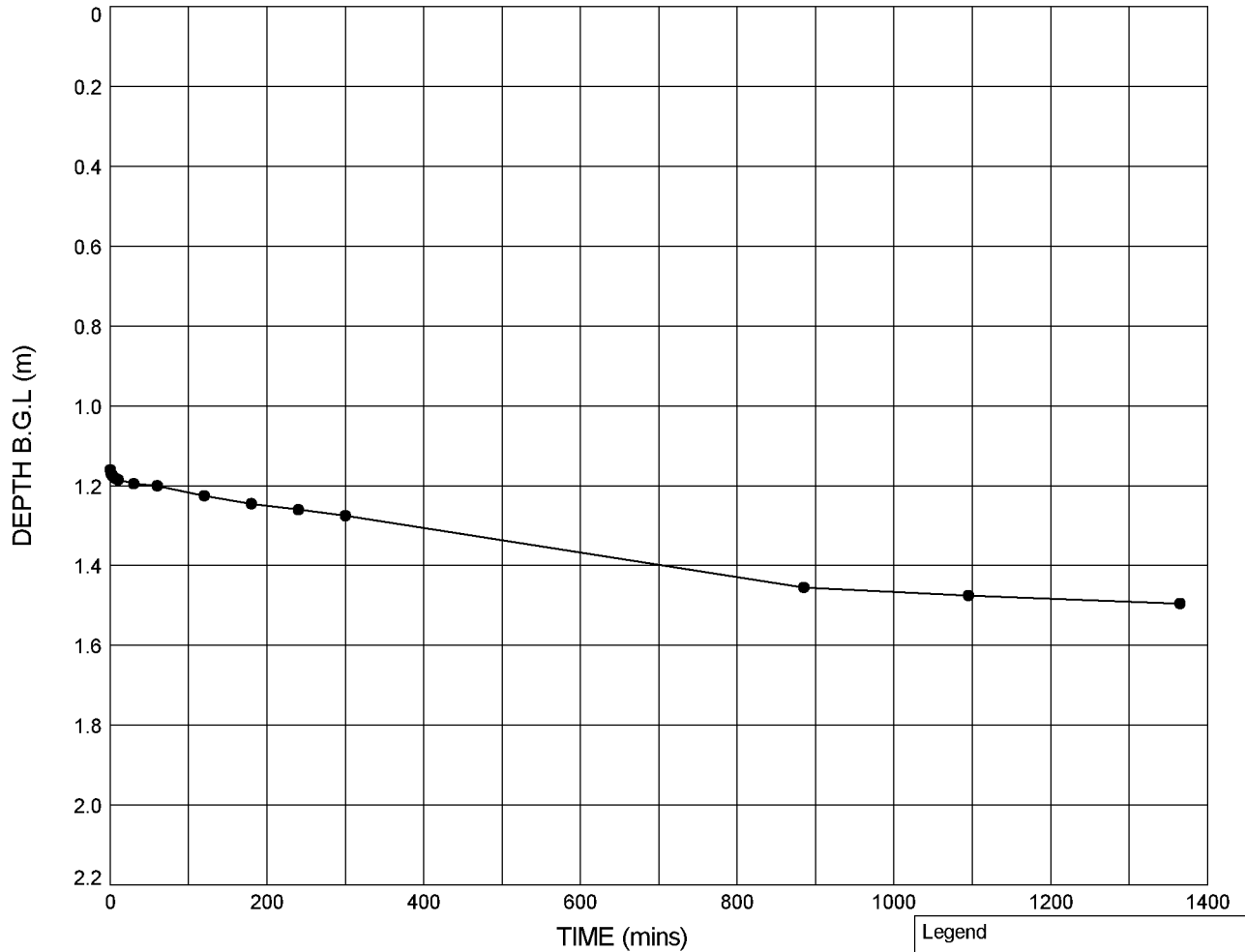
749615

FULL SCALE SOAKAWAY TEST

Non-standard test

Soakaway Test - Position ID : **TPSA3**

PLOT OF DEPTH OF WATER BELOW GROUND LEVEL AGAINST TIME



Test 1

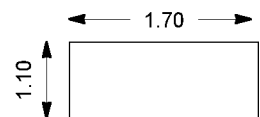
Pit start depth: = **2.10** m
 Pit final depth: = **2.00** m
 Effective depth, D_e = **0.84** m
 Effective storage volume, V_{p75-25} = **0.7854** m³
 Surface area, a_{p50} = **4.2220** m²
 Time, t_{p75-25} = **284325** secs
 Infiltration rate, f = **6.54×10^{-7}** m/s

Please note test data was extrapolated to obtain $t_{p75-tp25}$.

Legend

● Test 1 (26.08.20)

Plan (Not to scale)



No Bearing Taken



STRUCTURAL SOILS
 1a Princess Street
 Bedminster
 Bristol
 BS3 4AG

Compiled By

K. L. M. Ocher

Date

28/08/20

Checked By

S. J. M. Ocher

Date

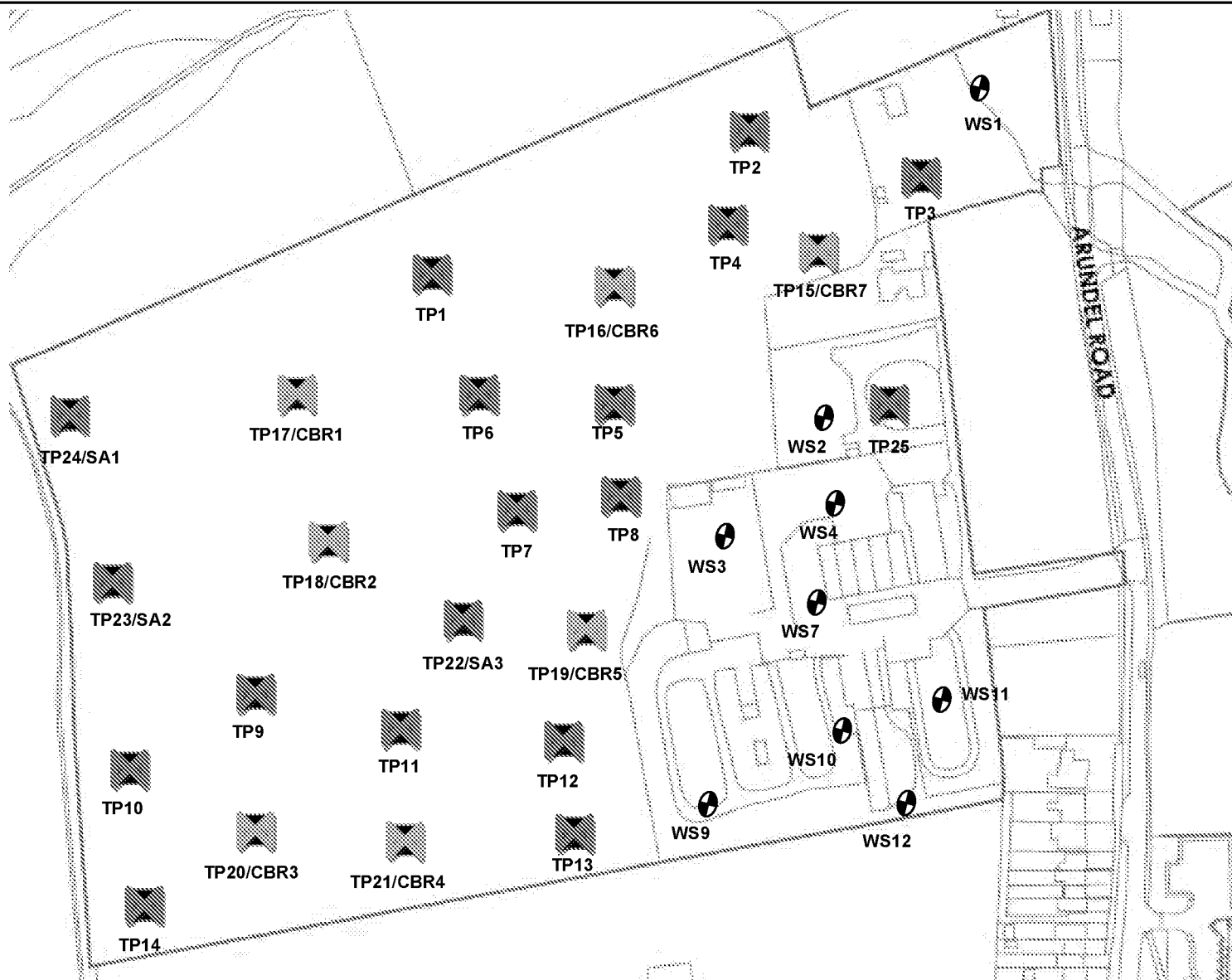
01/09/20

Contract

Angmering

Contract Ref:

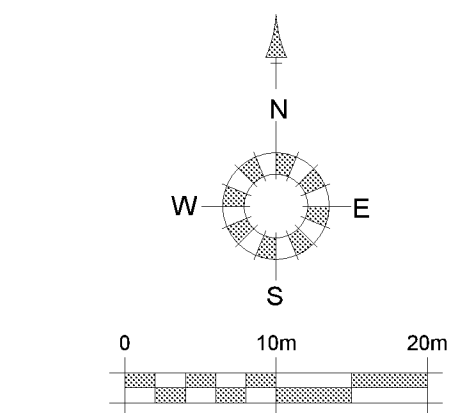
749615



HOLE LOCATION PLAN

Client:	Gladman Developments Ltd	Figure No:	Figure 2
Site:	Arundel Rd, Angmering	Job No:	52207
Scale:	NTS	Source:	

APPENDIX B: PROPOSED DEVELOPMENT



Site Plan Legend	
Site Area 8.9Ha	
	Application Site Boundary Line
	Boundary Line
	Existing Trees/Hedgerow
	Proposed Trees
	Dwelling Reference
	Plot Number
	Allocated Parking
	Visitor Parking
	1.8m Brick Wall
	1.8m Timber Fence
	Shared Ownership
	Affordable Rent
	M4 / 2
	M4 / 3

<

Planning

William
Older
Hall

Nursery

Sports Court

17.1m

68
66b
66a
66

APPENDIX C: GREENFIELD RUN-OFF RATES

JNP Group		Page 1
The Innovation Centre Queens Meadow Bus. Park Hartlepool TS25 5TG		
Date 20/08/2021 12:31 PM File	Designed by Muddasser.Ali Checked by	
Micro Drainage Source Control 2020.1.3		

ICP SUDS Mean Annual Flood

Input

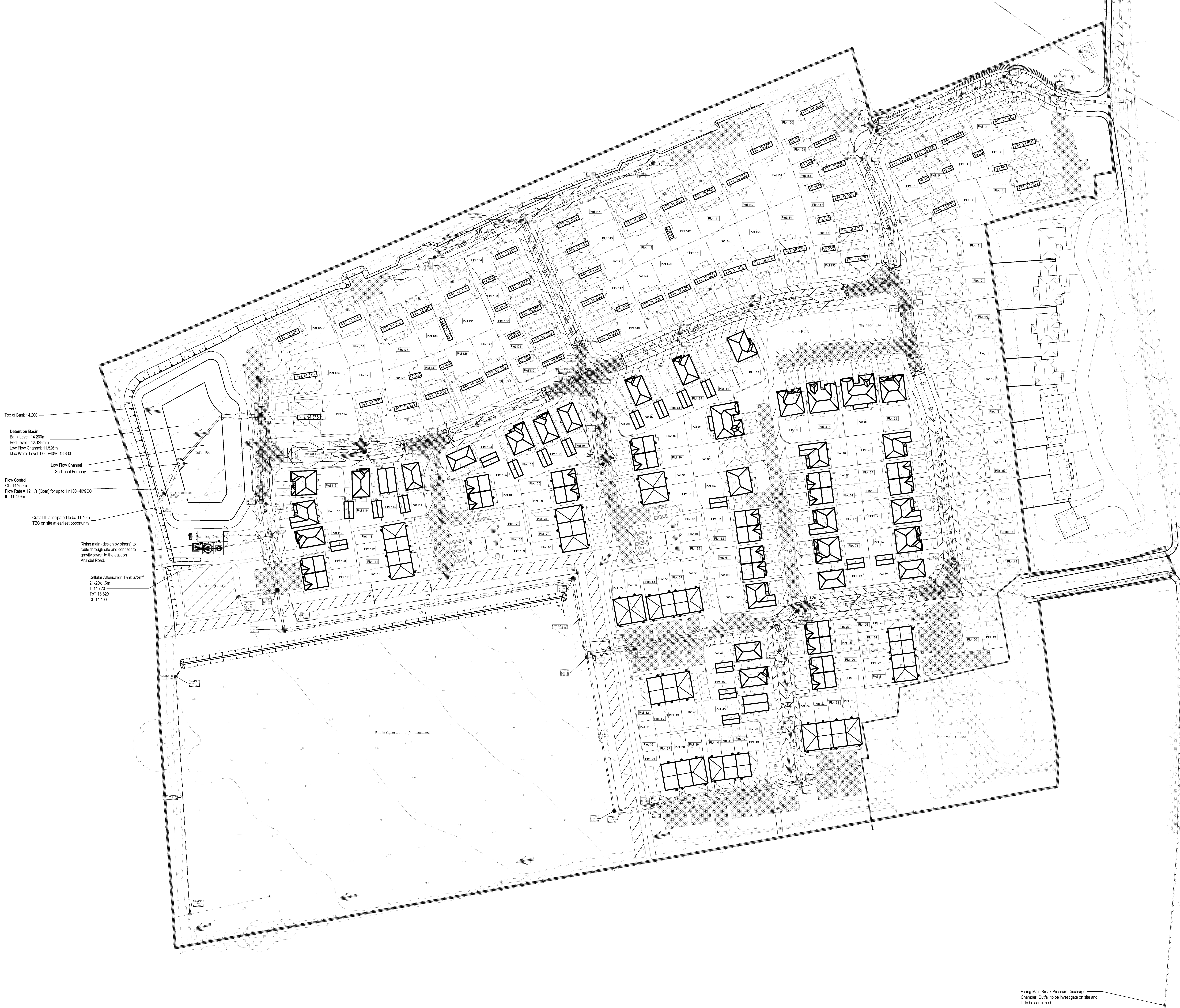
Return Period (years)	1	Soil	0.400
Area (ha)	3.292	Urban	0.000
SAAR (mm)	749	Region Number	Region 7

Results 1/s

QBAR Rural	12.1
QBAR Urban	12.1
Q1 year	10.3
Q1 year	10.3
Q30 years	27.5
Q100 years	38.7

©1982-2020 Innovyze

APPENDIX D: DRAINAGE STRATEGY



- General Notes**
- Where this drawing has been issued in electronic .dwg format, it has been done so in good faith. JNP Group do not take any responsibility for any inaccuracies in the electronic data, which should be checked against the paper (or .pdf) drawing issue. Any apparent discrepancies should be immediately reported to JNP Group. The electronic .dwg file should not be assumed to be to scale and should not be used for 'overlaying', setting out or checking of any third party information. All dimensions should be taken from the paper (or .pdf) version of the drawing. Electronic drawings may contain third party information. JNP Group take no responsibility for this information, which should be checked against the originators paper drawing(s).
 - All dimensions are millimetres (mm), and levels are in metres (m) unless noted otherwise and should be checked on site prior to construction/fabrication.
 - Do not scale from this drawing. Only figured dimensions are to be relied upon. Don't hesitate to get in touch with JNP Group if additional information is required.
 - Any discrepancies between drawings of different scales and between drawings and specifications, where appropriate, to be reported to JNP Group for decision.
 - Copyright reserved. This drawing may only be used for The Client and location specified in the title block. It may not be copied or disclosed to any third party without the prior written consent of JNP Group.
 - This drawing should only be used for construction if the drawing status is 'Construction'. JNP Group takes no responsibility for construction works undertaken to drawings that are not marked with this status.

Health & Safety Note

The details on this drawing have been prepared on the assumption that a competent contractor will be carrying out the works. If the contractor(s) considers that there is insufficient Health and Safety information on this drawing, this should immediately be brought to the attention of the designer.

HAZARD IDENTIFICATION BOX			
This table is provided to assist the Principal Contractor to fulfil their obligations under the CDM Regulations 2015			
Input Hazard	Hazard Type	Hazard Description	Mitigation Measures/Residual Risk
Construction	Construction	Propped Groundwater	Excavations not to be left open for more than 24 hours. If excavations are to be left open for more than 24 hours, then appropriate measures must be taken to ensure the safety of the public and the environment. Any measures may be needed to manage the risk of groundwater.

IMPORTANT

The scheme is subject to the following Statutory Approvals:

- Section 38
- Section 104
- Building Regulations

All construction works prior to approvals above will be undertaken at the contractor's risk.

All adoptable drainage works to be installed in accordance with:

- S104 Sewers - Sewers for Adoption including and applicable local Water Authority addendums

Drainage & Road Layout Standard Drawing Notes

- The contractor is to check and verify all buildings and site dimensions and levels, including sewer invert levels, before works start on site.
- The contractor is to comply in all aspects with the current building legislation, British Standards, building regulations etc.
- The contractor is to check the levels of existing sewers which are to be used as an out-fall prior to commencement of any on-site drainage works. Any discrepancies are to be reported to the Engineer.
- This drawing is to be read in conjunction with and checked against all other drawings, Engineering Details, specification and any structural, geotechnical or other specialist document provided.
- Any anomaly or contradiction between any of the above or difference between actual and drawn details is to be reported to Taylor Wimpey South Midlands.
- Drainage works to be adopted under Section 104 of the Water Industries Act 1991 shall comply with DCG published by Water UK and the combined addendum.
- Roads, footpaths and parking areas which form part of the highway to be adopted under Section 38 of the Highways Act 1980 shall comply with the West Sussex Highway Specification.
- All subgrade structures and unconsolidated material within the road construction width to be removed.
- Formation preparation to be in accordance with Highways Agency Specification for Highway Works (SHW) cl. 616. No prepared formation to be continuously exposed to rain causing degradation below design CBR or to be left uncovered overnight.
- Any soft, damaged or weak spots including past contaminated material are to be excavated and replaced with SHW Type 1 in accordance with SHW cl. 803 laid and compacted to cl. 802, Table 8/4.
- Where ground conditions are deemed to be frost susceptible, refer to Ground Investigation report, track thickness shall be 450mm minimum thickness. All material within 450mm of road construction to be non-frost susceptible.
- Positions of existing services/statutory undertaker's apparatus adjacent to or crossing proposed sewers are to be checked by the contractor prior to starting work.

Contractor shall refer to the services information available from the Developer to identify all existing services. It is the Contractor's responsibility to liaise with all relevant services companies to ensure that all existing services are accurately located prior to commencement of works, and adequately protected during construction.

It is the Contractor's responsibility to liaise with the Developer and all relevant services companies to ensure that all new and diverted services are accurately located and adequately protected during construction.

Legend

- Red Line Boundary
- Plot Finished Floor Level (F.F.L.)
- Proposed Road Contour Levels (0.1m intervals)

Foul Drainage Legend

(Dimensions are approx. internal sizes)

- New Adoptable Foul Water Sewer to be constructed in accordance with SSG Appendix C DCG
- New Adoptable Foul Water Manhole (size and construction may vary), to be constructed in accordance with SSG Appendix C DCG
- New Adoptable Foul Rising Main constructed in accordance with SSG Appendix C DCG
- Phase 2 Proposed Adopted Public Foul Sewer

Surface Water Drainage Legend

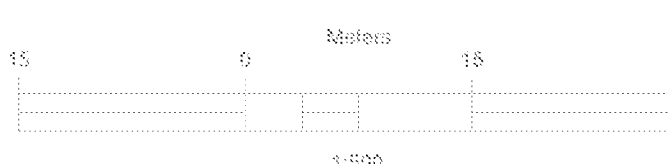
(Dimensions are approx. internal sizes)

- New Adoptable Surface Water Sewer to be constructed in accordance with SSG Appendix C DCG
- New Adoptable Surface Water Manhole (size and construction may vary), to be built in accordance with SSG Appendix C DCG
- New Deep Trapped Road Gully and connection to be adopted by Highways Authority
- Public Sewer Easement, dimensioned as shown on layout
- Phase 2 Proposed Public Surface Water Sewer

Lined Permeable Paving

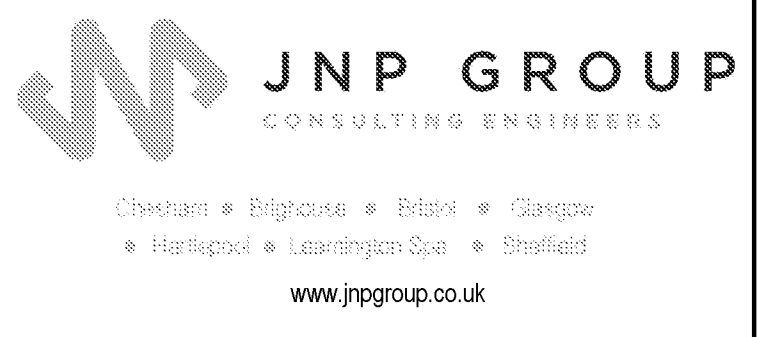
Flood Routing Legend

- Indicative Overland Route of Exceedence Flood Flows
- Surface Water Network Hydraulic Model Overflow Point and Flooded Volume for 1:100yr + 40% Climate Change Storm Event



Lined Permeable Paving to all private drives

P01	09/09/2022	Issued for Information	80/1000/1004
Rev		Revised	80/1000/1004
S2 - Suitable for Information			



Client: Redrow
 Job: Arundel Road Angmering
 Title: Drainage Strategy For Planning Only

APPENDIX E: DRAINAGE CALCULATIONS

JNP Group		Page 1
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A Drainage Strategy Check Angmering	
Date 09/03/2022 14:02	Designed by BID	
File C86473-JNP-92-XX-M2-C-1100 Drai...	Checked by CC	
Innovyze	Network 2020.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model	100
Return Period (years)	2013
FEH Rainfall Version	05326
Site Location	GB 506538 105326 TQ 06538
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm - Main

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.820	4-8	2.267	8-12	0.246

Total Area Contributing (ha) = 3.333

Total Pipe Volume (m³) = 507.931

Network Design Table for Storm - Main

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	14.953	0.577	25.9	0.059	5.00	0.0	0.600	o	150	Pipe/Conduit	⚠
S1.001	20.793	1.209	17.2	0.061	0.00	0.0	0.600	o	300	Pipe/Conduit	⚠
S1.002	52.148	1.499	34.8	0.053	0.00	0.0	0.600	o	300	Pipe/Conduit	⚠
S1.003	12.484	0.052	240.1	0.071	0.00	0.0	0.600	o	450	Pipe/Conduit	⚠
S1.004	28.609	0.095	301.1	0.090	0.00	0.0	0.600	o	450	Pipe/Conduit	⚠
S1.005	19.547	0.065	300.7	0.042	0.00	0.0	0.600	o	450	Pipe/Conduit	⚠
S2.000	18.782	0.774	24.3	0.159	5.00	0.0	0.600	o	300	Pipe/Conduit	⚠
S2.001	11.088	0.718	15.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	⚠
S1.006	52.961	0.619	85.6	0.150	0.00	0.0	0.600	o	450	Pipe/Conduit	⚠
S1.007	29.155	0.932	31.3	0.076	0.00	0.0	0.600	o	450	Pipe/Conduit	⚠
S1.008	37.366	2.625	14.2	0.066	0.00	0.0	0.600	o	450	Pipe/Conduit	⚠

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.13	20.566	0.059	0.0	0.0	0.0	1.99	35.1	8.0
S1.001	50.00	5.22	19.839	0.120	0.0	0.0	0.0	3.81	269.3	16.2
S1.002	50.00	5.54	18.630	0.173	0.0	0.0	0.0	2.67	189.1	23.4
S1.003	50.00	5.70	16.981	0.244	0.0	0.0	0.0	1.31	208.0	33.0
S1.004	50.00	6.11	16.929	0.334	0.0	0.0	0.0	1.17	185.5	45.2
S1.005	50.00	6.39	16.834	0.376	0.0	0.0	0.0	1.17	185.6	50.9
S2.000	50.00	5.10	18.411	0.159	0.0	0.0	0.0	3.20	226.5	21.5
S2.001	50.00	5.14	17.637	0.159	0.0	0.0	0.0	4.02	284.2	21.5
S1.006	50.00	6.79	16.769	0.685	0.0	0.0	0.0	2.20	349.7	92.8
S1.007	50.00	6.92	16.150	0.761	0.0	0.0	0.0	3.64	579.6	103.0
S1.008	50.00	7.04	15.218	0.827	0.0	0.0	0.0	5.41	860.5	112.0

JNP Group		Page 2
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A Drainage Strategy Check Angmering	
Date 09/03/2022 14:02 File C86473-JNP-92-XX-M2-C-1100 Drai...	Designed by BID Checked by CC	
Innovyze	Network 2020.1	

Network Design Table for Storm - Main

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S3.000	42.752	0.114	375.0	0.164	5.00	0.0	0.600	o	450	Pipe/Conduit	☺
S4.000	35.698	0.095	375.8	0.133	5.00	0.0	0.600	o	450	Pipe/Conduit	☺
S3.001	63.157	0.139	454.4	0.051	0.00	0.0	0.600	o	600	Pipe/Conduit	☺
S1.009	5.101	0.010	500.0	0.157	0.00	0.0	0.600	o	1200	Pipe/Conduit	☺
S5.000	13.653	1.035	13.2	0.191	5.00	0.0	0.600	o	225	Pipe/Conduit	☺
S5.001	20.793	0.793	26.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	☺
S1.010	61.539	0.123	500.0	0.140	0.00	0.0	0.600	o	1200	Pipe/Conduit	☺
S6.000	14.831	0.222	66.8	0.123	5.00	0.0	0.600	o	300	Pipe/Conduit	☺
S1.011	24.440	0.050	488.8	0.165	0.00	0.0	0.600	o	1200	Pipe/Conduit	☺
S1.012	39.205	0.078	500.0	0.085	0.00	0.0	0.600	o	1200	Pipe/Conduit	☺
S7.000	18.156	0.980	18.5	0.083	5.00	0.0	0.600	o	150	Pipe/Conduit	☺
S7.001	55.373	0.185	300.0	0.112	0.00	0.0	0.600	o	450	Pipe/Conduit	☺
S7.002	14.994	0.050	300.0	0.047	0.00	0.0	0.600	o	450	Pipe/Conduit	☺
S7.003	59.199	0.169	350.3	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	☺
S8.000	45.537	1.284	35.5	0.137	5.00	0.0	0.600	o	450	Pipe/Conduit	☺
S8.001	13.969	1.397	10.0	0.061	0.00	0.0	0.600	o	450	Pipe/Conduit	☺
S8.002	54.646	1.366	40.0	0.185	0.00	0.0	0.600	o	450	Pipe/Conduit	☺
S9.000	46.206	1.840	25.1	0.132	5.00	0.0	0.600	o	300	Pipe/Conduit	☺
S8.003	10.032	0.035	286.6	0.162	0.00	0.0	0.600	o	450	Pipe/Conduit	☺
S10.000	9.666	1.058	9.1	0.038	5.00	0.0	0.600	o	150	Pipe/Conduit	☺
S8.004	54.059	0.637	84.9	0.066	0.00	0.0	0.600	o	450	Pipe/Conduit	☺
S8.005	18.018	0.212	85.0	0.065	0.00	0.0	0.600	o	450	Pipe/Conduit	☺
S7.004	30.189	0.060	500.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	☺
S7.005	111.414	0.223	500.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	☺

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S3.000	50.00	5.68	12.847	0.164	0.0	0.0	0.0	1.04	166.0	22.2
S4.000	50.00	5.57	12.828	0.133	0.0	0.0	0.0	1.04	165.8	18.0
S3.001	50.00	6.61	12.583	0.348	0.0	0.0	0.0	1.14	321.2	47.1
S1.009	50.00	7.09	11.843	1.332	0.0	0.0	0.0	1.67	1884.5	180.4
S5.000	50.00	5.06	14.636	0.191	0.0	0.0	0.0	3.62	144.0	25.9
S5.001	50.00	5.20	13.601	0.191	0.0	0.0	0.0	2.57	102.0	25.9
S1.010	50.00	7.70	11.833	1.663	0.0	0.0	0.0	1.67	1884.5	225.2
S6.000	50.00	5.13	12.832	0.123	0.0	0.0	0.0	1.93	136.2	16.7
S1.011	50.00	7.95	11.710	1.951	0.0	0.0	0.0	1.69	1906.1	264.2
S1.012	50.00	8.34	11.660	2.036	0.0	0.0	0.0	1.67	1884.5	275.7
S7.000	50.00	5.13	14.437	0.083	0.0	0.0	0.0	2.35	41.5	11.2
S7.001	50.00	5.92	13.157	0.195	0.0	0.0	0.0	1.17	185.8	26.4
S7.002	50.00	6.13	12.972	0.242	0.0	0.0	0.0	1.17	185.8	32.8
S7.003	50.00	7.05	12.922	0.242	0.0	0.0	0.0	1.08	171.8	32.8
S8.000	50.00	5.22	17.684	0.137	0.0	0.0	0.0	3.42	544.4	18.6
S8.001	50.00	5.26	16.400	0.198	0.0	0.0	0.0	6.46	1027.0	26.8
S8.002	50.00	5.54	15.003	0.383	0.0	0.0	0.0	3.22	512.5	51.9
S9.000	50.00	5.24	15.627	0.132	0.0	0.0	0.0	3.15	222.7	17.9
S8.003	50.00	5.68	13.637	0.677	0.0	0.0	0.0	1.20	190.2	91.7
S10.000	50.00	5.05	14.960	0.038	0.0	0.0	0.0	3.35	59.3	5.1
S8.004	50.00	6.09	13.602	0.781	0.0	0.0	0.0	2.21	351.2	105.8
S8.005	50.00	6.22	12.965	0.846	0.0	0.0	0.0	2.21	350.9	114.6
S7.004	50.00	7.45	12.453	1.088	0.0	0.0	0.0	1.24	549.9	147.3
S7.005	50.00	8.94	12.393	1.088	0.0	0.0	0.0	1.24	549.9	147.3

JNP Group		Page 3
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG		Rev A Drainage Strategy Check Angmering
Date 09/03/2022 14:02 File C86473-JNP-92-XX-M2-C-1100 Drai...		Designed by BID Checked by CC
Innovyze		Network 2020.1



Network Design Table for Storm - Main

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S7.006	15.192	0.030	500.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	☑
S11.000	14.729	0.029	500.0	0.000	5.00	0.0	0.600	o	1200	Pipe/Conduit	☑
S7.007	34.278	0.070	489.7	0.060	0.00	0.0	0.600	o	1200	Pipe/Conduit	☑
S7.008	18.911	0.038	500.0	0.028	0.00	0.0	0.600	o	1200	Pipe/Conduit	☑
S1.013	13.584	0.027	500.0	0.058	0.00	0.0	1.000	o	1200	Pipe/Conduit	☑
S12.000	14.033	0.028	501.2	0.043	5.00	0.0	0.600	o	1200	Pipe/Conduit	☑
S1.014	14.565	0.029	500.0	0.020	0.00	0.0	0.600	o	1200	Pipe/Conduit	☑
S1.015	24.644	0.051	483.2	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	☑
S1.016	12.649	0.026	486.5	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	☑
S1.017	5.940	0.049	121.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	☑

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S7.006	50.00	9.15	12.170	1.088	0.0	0.0	0.0	1.24	549.9	147.3
S11.000	50.00	5.15	11.720	0.000	0.0	0.0	0.0	1.67	1884.5	0.0
S7.007	50.00	9.48	11.689	1.148	0.0	0.0	0.0	1.68	1904.4	155.5
S7.008	50.00	9.67	11.619	1.176	0.0	0.0	0.0	1.67	1884.5	159.2
S1.013	50.00	9.82	11.582	3.270	0.0	0.0	0.0	1.58	1781.3	442.8
S12.000	50.00	5.14	11.583	0.043	0.0	0.0	0.0	1.66	1882.2	5.8
S1.014	50.00	9.96	11.555	3.333	0.0	0.0	0.0	1.67	1884.5	451.3
S1.015	50.00	10.21	11.526	3.333	0.0	0.0	0.0	1.70	1917.2	451.3
S1.016	50.00	10.33	11.475	3.333	0.0	0.0	0.0	1.69	1910.6	451.3
S1.017	50.00	10.44	11.450	3.333	0.0	0.0	0.0	0.91	16.1	451.3

JNP Group		Page 4
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A Drainage Strategy Check Angmering	
Date 09/03/2022 14:02	Designed by BID	
File C86473-JNP-92-XX-M2-C-1100 Drai...	Checked by CC	
Innovyze	Network 2020.1	

Manhole Schedules for Storm - Main

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	21.781	1.215	Open Manhole	1200	S1.000	20.566	150				
S2	21.345	1.506	Open Manhole	1200	S1.001	19.839	300	S1.000	19.989	150	
S3	20.330	1.700	Open Manhole	1200	S1.002	18.630	300	S1.001	18.630	300	
S4	18.826	1.845	Open Manhole	1350	S1.003	16.981	450	S1.002	17.131	300	
S5	19.005	2.076	Open Manhole	1350	S1.004	16.929	450	S1.003	16.929	450	
S6	19.343	2.509	Open Manhole	1350	S1.005	16.834	450	S1.004	16.834	450	
S7	19.644	1.233	Open Manhole	1200	S2.000	18.411	300				
S8	19.465	1.828	Open Manhole	1200	S2.001	17.637	300	S2.000	17.637	300	
S9	19.124	2.355	Open Manhole	1350	S1.006	16.769	450	S1.005	16.769	450	
								S2.001	16.919	300	
S10	17.800	1.650	Open Manhole	1350	S1.007	16.150	450	S1.006	16.150	450	
S11	16.868	1.650	Open Manhole	1350	S1.008	15.218	450	S1.007	15.218	450	
S12	14.602	1.755	Open Manhole	1350	S3.000	12.847	450				
S13	14.192	1.364	Open Manhole	1350	S4.000	12.828	450				
S14	14.236	1.653	Open Manhole	1500	S3.001	12.583	600	S3.000	12.733	450	
								S4.000	12.733	450	
S15	15.820	3.976	Open Manhole	2100	S1.009	11.843	1200	S1.008	12.593	450	
								S3.001	12.444	600	
S16	15.870	1.234	Open Manhole	1200	S5.000	14.636	225				
S17	15.945	2.344	Open Manhole	1200	S5.001	13.601	225	S5.000	13.601	225	
S18	15.688	3.855	Open Manhole	2100	S1.010	11.833	1200	S1.009	11.833	1200	
								S5.001	12.808	225	
S19	14.263	1.431	Open Manhole	1200	S6.000	12.832	300				
S20	14.860	3.150	Open Manhole	2100	S1.011	11.710	1200	S1.010	11.710	1200	
								S6.000	12.610	300	
S21	14.439	2.779	Open Manhole	2100	S1.012	11.660	1200	S1.011	11.660	1200	
S22	15.809	1.372	Open Manhole	1200	S7.000	14.437	150				
S23	15.352	2.195	Open Manhole	1350	S7.001	13.157	450	S7.000	13.457	150	
S24	14.500	1.528	Open Manhole	1350	S7.002	12.972	450	S7.001	12.972	450	
S25	14.300	1.378	Open Manhole	1350	S7.003	12.922	450	S7.002	12.922	450	
S26	19.517	1.833	Open Manhole	1350	S8.000	17.684	450				
S27	18.486	2.086	Open Manhole	1350	S8.001	16.400	450	S8.000	16.400	450	
S28	18.154	3.151	Open Manhole	1350	S8.002	15.003	450	S8.001	15.003	450	
S29	17.550	1.923	Open Manhole	1200	S9.000	15.627	300				
S30	16.923	3.286	Open Manhole	1350	S8.003	13.637	450	S8.002	13.637	450	
								S9.000	13.787	300	
S31	16.502	1.542	Open Manhole	1200	S10.000	14.960	150				
S32	16.673	3.071	Open Manhole	1350	S8.004	13.602	450	S8.003	13.602	450	
								S10.000	13.902	150	
S33	14.797	1.832	Open Manhole	1350	S8.005	12.965	450	S8.004	12.965	450	
S34	14.436	1.983	Open Manhole	1800	S7.004	12.453	750	S7.003	12.753	450	
								S8.005	12.753	450	
S35	14.400	2.007	Open Manhole	1800	S7.005	12.393	750	S7.004	12.393	750	
S36	14.500	2.330	Open Manhole	1800	S7.006	12.170	750	S7.005	12.170	750	
S37 TANK	14.250	2.530	Open Manhole	2100	S11.000	11.720	1200				
S38	14.500	2.811	Open Manhole	2100	S7.007	11.689	1200	S7.006	12.139	750	
								S11.000	11.691	1200	
S39	14.177	2.558	Open Manhole	2100	S7.008	11.619	1200	S7.007	11.619	1200	
S40	14.144	2.562	Open Manhole	2100	S1.013	11.582	1200	S1.012	11.582	1200	
								S7.008	11.582	1200	
S41	14.100	2.517	Open Manhole	2100	S12.000	11.583	1200				
S42	14.063	2.508	Open Manhole	2100	S1.014	11.555	1200	S1.013	11.555	1200	
								S12.000	11.555	1200	
S43	13.968	2.442	Open Manhole	2100	S1.015	11.526	1200	S1.014	11.526	1200	
S44	13.968	2.493	Open Manhole	2100	S1.016	11.475	1200	S1.015	11.475	1200	
S45	13.968	2.519	Open Manhole	2100	S1.017	11.450	150	S1.016	11.449	1200	
S	14.100	2.699	Open Manhole	0		OUTFALL		S1.017	11.401	150	

JNP Group		Page 5
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A Drainage Strategy Check Angmering	
Date 09/03/2022 14:02 File C86473-JNP-92-XX-M2-C-1100 Drai...	Designed by BID Checked by CC	
Innovyze	Network 2020.1	

Manhole Schedules for Storm - Main

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	506721.740	105477.145	506721.740	105477.145	Required	
S2	506706.936	105479.248	506706.936	105479.248	Required	
S3	506687.458	105486.525	506687.458	105486.525	Required	
S4	506639.393	105466.297	506639.393	105466.297	Required	
S5	506633.462	105455.312	506633.462	105455.312	Required	
S6	506644.051	105428.736	506644.051	105428.736	Required	
S7	506651.860	105381.078	506651.860	105381.078	Required	
S8	506649.508	105399.713	506649.508	105399.713	Required	
S9	506643.754	105409.191	506643.754	105409.191	Required	
S10	506591.617	105399.883	506591.617	105399.883	Required	
S11	506564.424	105389.369	506564.424	105389.369	Required	
S12	506543.602	105448.921	506543.602	105448.921	Required	
S13	506471.501	105418.004	506471.501	105418.004	Required	
S14	506504.394	105431.876	506504.394	105431.876	Required	
S15	506530.251	105374.255	506530.251	105374.255	Required	
S16	506535.397	105339.601	506535.397	105339.601	Required	
S17	506534.128	105353.195	506534.128	105353.195	Required	
S18	506525.601	105372.159	506525.601	105372.159	Required	
S19	506473.361	105334.007	506473.361	105334.007	Required	
S20	506468.934	105348.162	506468.934	105348.162	Required	

JNP Group		Page 6
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A Drainage Strategy Check Angmering	
Date 09/03/2022 14:02 File C86473-JNP-92-XX-M2-C-1100 Drai...	Designed by BID Checked by CC	
Innovyze	Network 2020.1	

Manhole Schedules for Storm - Main

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S21	506444.751	105344.624	506444.751	105344.624	Required	
S22	506606.445	105237.298	506606.445	105237.298	Required	
S23	506609.102	105219.337	506609.102	105219.337	Required	
S24	506554.444	105210.468	506554.444	105210.468	Required	
S25	506539.643	105208.066	506539.643	105208.066	Required	
S26	506662.835	105349.079	506662.835	105349.079	Required	
S27	506668.575	105303.905	506668.575	105303.905	Required	
S28	506663.101	105291.054	506663.101	105291.054	Required	
S29	506603.159	105329.595	506603.159	105329.595	Required	
S30	506608.945	105283.752	506608.945	105283.752	Required	
S31	506602.467	105269.020	506602.467	105269.020	Required	
S32	506600.418	105278.466	506600.418	105278.466	Required	
S33	506547.126	105269.391	506547.126	105269.391	Required	
S34	506529.363	105266.366	506529.363	105266.366	Required	
S35	506524.121	105296.096	506524.121	105296.096	Required	
S36	506414.400	105276.749	506414.400	105276.749	Required	
S37 TANK	506397.229	105289.261	506397.229	105289.261	Required	
S38	506411.753	105291.709	506411.753	105291.709	Required	
S39	506405.652	105325.440	506405.652	105325.440	Required	
S40	506405.547	105344.351	506405.547	105344.351	Required	
S41	506404.780	105371.958	506404.780	105371.958	Required	

JNP Group		Page 7
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A Drainage Strategy Check Angmering	
Date 09/03/2022 14:02 File C86473-JNP-92-XX-M2-C-1100 Drai...	Designed by BID Checked by CC	
Innovyze	Network 2020.1	

Manhole Schedules for Storm - Main

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
s42	506405.203	105357.931	506405.203	105357.931	Required	
s43	506390.641	105357.630	506390.641	105357.630	Required	
s44	506374.000	105339.454	506374.000	105339.454	Required	
s45	506368.632	105328.000	506368.632	105328.000	Required	
s	506365.780	105322.789			No Entry	

JNP Group		Page 8
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A Drainage Strategy Check Angmering	
Date 09/03/2022 14:02	Designed by BID	
File C86473-JNP-92-XX-M2-C-1100 Drai...	Checked by CC	
Innovyze	Network 2020.1	

PIPELINE SCHEDULES for Storm - Main

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	21.781	20.566	1.065	Open Manhole	1200
S1.001	o	300	S2	21.345	19.839	1.206	Open Manhole	1200
S1.002	o	300	S3	20.330	18.630	1.400	Open Manhole	1200
S1.003	o	450	S4	18.826	16.981	1.395	Open Manhole	1350
S1.004	o	450	S5	19.005	16.929	1.626	Open Manhole	1350
S1.005	o	450	S6	19.343	16.834	2.059	Open Manhole	1350
S2.000	o	300	S7	19.644	18.411	0.933	Open Manhole	1200
S2.001	o	300	S8	19.465	17.637	1.528	Open Manhole	1200
S1.006	o	450	S9	19.124	16.769	1.905	Open Manhole	1350
S1.007	o	450	S10	17.800	16.150	1.200	Open Manhole	1350
S1.008	o	450	S11	16.868	15.218	1.200	Open Manhole	1350
S3.000	o	450	S12	14.602	12.847	1.305	Open Manhole	1350
S4.000	o	450	S13	14.192	12.828	0.914	Open Manhole	1350
S3.001	o	600	S14	14.236	12.583	1.053	Open Manhole	1500
S1.009	o	1200	S15	15.820	11.843	2.776	Open Manhole	2100
S5.000	o	225	S16	15.870	14.636	1.009	Open Manhole	1200
S5.001	o	225	S17	15.945	13.601	2.119	Open Manhole	1200
S1.010	o	1200	S18	15.688	11.833	2.655	Open Manhole	2100
S6.000	o	300	S19	14.263	12.832	1.131	Open Manhole	1200
S1.011	o	1200	S20	14.860	11.710	1.950	Open Manhole	2100
S1.012	o	1200	S21	14.439	11.660	1.579	Open Manhole	2100
S7.000	o	150	S22	15.809	14.437	1.222	Open Manhole	1200
S7.001	o	450	S23	15.352	13.157	1.745	Open Manhole	1350
S7.002	o	450	S24	14.500	12.972	1.078	Open Manhole	1350
S7.003	o	450	S25	14.300	12.922	0.928	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	14.953	25.9	S2	21.345	19.989	1.206	Open Manhole	1200
S1.001	20.793	17.2	S3	20.330	18.630	1.400	Open Manhole	1200
S1.002	52.148	34.8	S4	18.826	17.131	1.395	Open Manhole	1350
S1.003	12.484	240.1	S5	19.005	16.929	1.626	Open Manhole	1350
S1.004	28.609	301.1	S6	19.343	16.834	2.059	Open Manhole	1350
S1.005	19.547	300.7	S9	19.124	16.769	1.905	Open Manhole	1350
S2.000	18.782	24.3	S8	19.465	17.637	1.528	Open Manhole	1200
S2.001	11.088	15.4	S9	19.124	16.919	1.905	Open Manhole	1350
S1.006	52.961	85.6	S10	17.800	16.150	1.200	Open Manhole	1350
S1.007	29.155	31.3	S11	16.868	15.218	1.200	Open Manhole	1350
S1.008	37.366	14.2	S15	15.820	12.593	2.776	Open Manhole	2100
S3.000	42.752	375.0	S14	14.236	12.733	1.053	Open Manhole	1500
S4.000	35.698	375.8	S14	14.236	12.733	1.053	Open Manhole	1500
S3.001	63.157	454.4	S15	15.820	12.444	2.776	Open Manhole	2100
S1.009	5.101	500.0	S18	15.688	11.833	2.655	Open Manhole	2100
S5.000	13.653	13.2	S17	15.945	13.601	2.119	Open Manhole	1200
S5.001	20.793	26.2	S18	15.688	12.808	2.655	Open Manhole	2100
S1.010	61.539	500.0	S20	14.860	11.710	1.950	Open Manhole	2100
S6.000	14.831	66.8	S20	14.860	12.610	1.950	Open Manhole	2100
S1.011	24.440	488.8	S21	14.439	11.660	1.579	Open Manhole	2100
S1.012	39.205	500.0	S40	14.144	11.582	1.362	Open Manhole	2100
S7.000	18.156	18.5	S23	15.352	13.457	1.745	Open Manhole	1350
S7.001	55.373	300.0	S24	14.500	12.972	1.078	Open Manhole	1350
S7.002	14.994	300.0	S25	14.300	12.922	0.928	Open Manhole	1350
S7.003	59.199	350.3	S34	14.436	12.753	1.233	Open Manhole	1800

JNP Group		Page 9
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A Drainage Strategy Check Angmering	
Date 09/03/2022 14:02	Designed by BID	
File C86473-JNP-92-XX-M2-C-1100 Drai...	Checked by CC	
Innovyze	Network 2020.1	

PIPELINE SCHEDULES for Storm - Main

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S8.000	o	450	S26	19.517	17.684	1.383	Open Manhole	1350
S8.001	o	450	S27	18.486	16.400	1.636	Open Manhole	1350
S8.002	o	450	S28	18.154	15.003	2.701	Open Manhole	1350
S9.000	o	300	S29	17.550	15.627	1.623	Open Manhole	1200
S8.003	o	450	S30	16.923	13.637	2.836	Open Manhole	1350
S10.000	o	150	S31	16.502	14.960	1.392	Open Manhole	1200
S8.004	o	450	S32	16.673	13.602	2.621	Open Manhole	1350
S8.005	o	450	S33	14.797	12.965	1.382	Open Manhole	1350
S7.004	o	750	S34	14.436	12.453	1.233	Open Manhole	1800
S7.005	o	750	S35	14.400	12.393	1.257	Open Manhole	1800
S7.006	o	750	S36	14.500	12.170	1.580	Open Manhole	1800
S11.000	o	1200	S37 TANK	14.250	11.720	1.330	Open Manhole	2100
S7.007	o	1200	S38	14.500	11.689	1.611	Open Manhole	2100
S7.008	o	1200	S39	14.177	11.619	1.358	Open Manhole	2100
S1.013	o	1200	S40	14.144	11.582	1.362	Open Manhole	2100
S12.000	o	1200	S41	14.100	11.583	1.317	Open Manhole	2100
S1.014	o	1200	S42	14.063	11.555	1.308	Open Manhole	2100
S1.015	o	1200	S43	13.968	11.526	1.242	Open Manhole	2100
S1.016	o	1200	S44	13.968	11.475	1.293	Open Manhole	2100
S1.017	o	150	S45	13.968	11.450	2.368	Open Manhole	2100

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S8.000	45.537	35.5	S27	18.486	16.400	1.636	Open Manhole	1350
S8.001	13.969	10.0	S28	18.154	15.003	2.701	Open Manhole	1350
S8.002	54.646	40.0	S30	16.923	13.637	2.836	Open Manhole	1350
S9.000	46.206	25.1	S30	16.923	13.787	2.836	Open Manhole	1350
S8.003	10.032	286.6	S32	16.673	13.602	2.621	Open Manhole	1350
S10.000	9.666	9.1	S32	16.673	13.902	2.621	Open Manhole	1350
S8.004	54.059	84.9	S33	14.797	12.965	1.382	Open Manhole	1350
S8.005	18.018	85.0	S34	14.436	12.753	1.233	Open Manhole	1800
S7.004	30.189	500.0	S35	14.400	12.393	1.257	Open Manhole	1800
S7.005	111.414	500.0	S36	14.500	12.170	1.580	Open Manhole	1800
S7.006	15.192	500.0	S38	14.500	12.139	1.611	Open Manhole	2100
S11.000	14.729	500.0	S38	14.500	11.691	1.609	Open Manhole	2100
S7.007	34.278	489.7	S39	14.177	11.619	1.358	Open Manhole	2100
S7.008	18.911	500.0	S40	14.144	11.582	1.362	Open Manhole	2100
S1.013	13.584	500.0	S42	14.063	11.555	1.308	Open Manhole	2100
S12.000	14.033	501.2	S42	14.063	11.555	1.308	Open Manhole	2100
S1.014	14.565	500.0	S43	13.968	11.526	1.242	Open Manhole	2100
S1.015	24.644	483.2	S44	13.968	11.475	1.293	Open Manhole	2100
S1.016	12.649	486.5	S45	13.968	11.449	1.319	Open Manhole	2100
S1.017	5.940	121.2	S	14.100	11.401	2.549	Open Manhole	0

JNP Group		Page 10
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A Drainage Strategy Check Angmering	
Date 09/03/2022 14:02 File C86473-JNP-92-XX-M2-C-1100 Drai...	Designed by BID Checked by CC	
Innovyze	Network 2020.1	

Setting Out Information - True Coordinates (Storm - Main)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
s1.000	s1	1200		506721.740	105477.145	506721.740	105477.145	
s1.001	s2	1200		506706.936	105479.248	506706.936	105479.248	
s1.002	s3	1200		506687.458	105486.525	506687.458	105486.525	
s1.003	s4	1350		506639.393	105466.297	506639.393	105466.297	
s1.004	s5	1350		506633.462	105455.312	506633.462	105455.312	
s1.005	s6	1350		506644.051	105428.736	506644.051	105428.736	
s2.000	s7	1200		506651.860	105381.078	506651.860	105381.078	
s2.001	s8	1200		506649.508	105399.713	506649.508	105399.713	
s1.006	s9	1350		506643.754	105409.191	506643.754	105409.191	
s1.007	s10	1350		506591.617	105399.883	506591.617	105399.883	
s1.008	s11	1350		506564.424	105389.369	506564.424	105389.369	
s3.000	s12	1350		506543.602	105448.921	506543.602	105448.921	
s4.000	s13	1350		506471.501	105418.004	506471.501	105418.004	
s3.001	s14	1500		506504.394	105431.876	506504.394	105431.876	
s1.009	s15	2100		506530.251	105374.255	506530.251	105374.255	
s5.000	s16	1200		506535.397	105339.601	506535.397	105339.601	
s5.001	s17	1200		506534.128	105353.195	506534.128	105353.195	
s1.010	s18	2100		506525.601	105372.159	506525.601	105372.159	
s6.000	s19	1200		506473.361	105334.007	506473.361	105334.007	
s1.011	s20	2100		506468.934	105348.162	506468.934	105348.162	
s1.012	s21	2100		506444.751	105344.624	506444.751	105344.624	

JNP Group		Page 11
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A Drainage Strategy Check Angmering	
Date 09/03/2022 14:02 File C86473-JNP-92-XX-M2-C-1100 Drai...	Designed by BID Checked by CC	
Innovyze	Network 2020.1	

Setting Out Information - True Coordinates (Storm - Main)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
S7.000	S22	1200		506606.445	105237.298	506606.445	105237.298	
S7.001	S23	1350		506609.102	105219.337	506609.102	105219.337	
S7.002	S24	1350		506554.444	105210.468	506554.444	105210.468	
S7.003	S25	1350		506539.643	105208.066	506539.643	105208.066	
S8.000	S26	1350		506662.835	105349.079	506662.835	105349.079	
S8.001	S27	1350		506668.575	105303.905	506668.575	105303.905	
S8.002	S28	1350		506663.101	105291.054	506663.101	105291.054	
S9.000	S29	1200		506603.159	105329.595	506603.159	105329.595	
S8.003	S30	1350		506608.945	105283.752	506608.945	105283.752	
S10.000	S31	1200		506602.467	105269.020	506602.467	105269.020	
S8.004	S32	1350		506600.418	105278.466	506600.418	105278.466	
S8.005	S33	1350		506547.126	105269.391	506547.126	105269.391	
S7.004	S34	1800		506529.363	105266.366	506529.363	105266.366	
S7.005	S35	1800		506524.121	105296.096	506524.121	105296.096	
S7.006	S36	1800		506414.400	105276.749	506414.400	105276.749	
S11.000	S37 TANK	2100		506397.229	105289.261	506397.229	105289.261	
S7.007	S38	2100		506411.753	105291.709	506411.753	105291.709	
S7.008	S39	2100		506405.652	105325.440	506405.652	105325.440	
S1.013	S40	2100		506405.547	105344.351	506405.547	105344.351	
S12.000	S41	2100		506404.780	105371.958	506404.780	105371.958	
S1.014	S42	2100		506405.203	105357.931	506405.203	105357.931	

JNP Group		Page 12
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A Drainage Strategy Check Angmering	
Date 09/03/2022 14:02 File C86473-JNP-92-XX-M2-C-1100 Drai...	Designed by BID Checked by CC	
Innovyze	Network 2020.1	

Setting Out Information - True Coordinates (Storm - Main)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
s1.015	s43	2100		506390.641	105357.630	506390.641	105357.630	
s1.016	s44	2100		506374.000	105339.454	506374.000	105339.454	
s1.017	s45	2100		506368.632	105328.000	506368.632	105328.000	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
s1.017	s	0		506365.780	105322.789	

JNP Group		Page 13
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A Drainage Strategy Check Angmering	
Date 09/03/2022 14:02 File C86473-JNP-92-XX-M2-C-1100 Drai...	Designed by BID Checked by CC	
Innovyze	Network 2020.1	

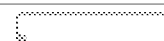
Area Summary for Storm - Main

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.059	0.059	0.059
1.001	-	-	100	0.061	0.061	0.061
1.002	-	-	100	0.053	0.053	0.053
1.003	-	-	100	0.071	0.071	0.071
1.004	-	-	100	0.090	0.090	0.090
1.005	-	-	100	0.042	0.042	0.042
2.000	-	-	100	0.159	0.159	0.159
2.001	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.150	0.150	0.150
1.007	-	-	100	0.076	0.076	0.076
1.008	-	-	100	0.066	0.066	0.066
3.000	-	-	100	0.164	0.164	0.164
4.000	-	-	100	0.133	0.133	0.133
3.001	-	-	100	0.051	0.051	0.051
1.009	-	-	100	0.157	0.157	0.157
5.000	-	-	100	0.191	0.191	0.191
5.001	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.140	0.140	0.140
6.000	-	-	100	0.123	0.123	0.123
1.011	-	-	100	0.165	0.165	0.165
1.012	-	-	100	0.085	0.085	0.085
7.000	-	-	100	0.083	0.083	0.083
7.001	-	-	100	0.112	0.112	0.112
7.002	-	-	100	0.047	0.047	0.047
7.003	-	-	100	0.000	0.000	0.000
8.000	-	-	100	0.137	0.137	0.137
8.001	-	-	100	0.061	0.061	0.061
8.002	-	-	100	0.185	0.185	0.185
9.000	-	-	100	0.132	0.132	0.132
8.003	-	-	100	0.162	0.162	0.162
10.000	-	-	100	0.038	0.038	0.038
8.004	-	-	100	0.066	0.066	0.066
8.005	-	-	100	0.065	0.065	0.065
7.004	-	-	100	0.000	0.000	0.000
7.005	-	-	100	0.000	0.000	0.000
7.006	-	-	100	0.000	0.000	0.000
11.000	-	-	100	0.000	0.000	0.000
7.007	-	-	100	0.060	0.060	0.060
7.008	-	-	100	0.028	0.028	0.028
1.013	-	-	100	0.058	0.058	0.058
12.000	-	-	100	0.043	0.043	0.043
1.014	-	-	100	0.020	0.020	0.020
1.015	-	-	100	0.000	0.000	0.000
1.016	-	-	100	0.000	0.000	0.000
1.017	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				3.333	3.333	3.333

Surcharged Outfall Details for Storm - Main

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.017	S	14.100	11.401	0.000	0	0
Datum (m)		11.000	Offset (mins)		0	

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1	0.600	20	0.600	39	0.600	58	0.600	77	0.600	96	0.600	115	0.600	134	0.600
2	0.600	21	0.600	40	0.600	59	0.600	78	0.600	97	0.600	116	0.600	135	0.600
3	0.600	22	0.600	41	0.600	60	0.600	79	0.600	98	0.600	117	0.600	136	0.600
4	0.600	23	0.600	42	0.600	61	0.600	80	0.600	99	0.600	118	0.600	137	0.600
5	0.600	24	0.600	43	0.600	62	0.600	81	0.600	100	0.600	119	0.600	138	0.600
6	0.600	25	0.600	44	0.600	63	0.600	82	0.600	101	0.600	120	0.600	139	0.600
7	0.600	26	0.600	45	0.600	64	0.600	83	0.600	102	0.600	121	0.600	140	0.600
8	0.600	27	0.600	46	0.600	65	0.600	84	0.600	103	0.600	122	0.600	141	0.600
9	0.600	28	0.600	47	0.600	66	0.600	85	0.600	104	0.600	123	0.600	142	0.600
10	0.600	29	0.600	48	0.600	67	0.600	86	0.600	105	0.600	124	0.600	143	0.600
11	0.600	30	0.600	49	0.600	68	0.600	87	0.600	106	0.600	125	0.600	144	0.600
12	0.600	31	0.600	50	0.600	69	0.600	88	0.600	107	0.600	126	0.600	145	0.600
13	0.600	32	0.600	51	0.600	70	0.600	89	0.600	108	0.600	127	0.600	146	0.600
14	0.600	33	0.600	52	0.600	71	0.600	90	0.600	109	0.600	128	0.600	147	0.600
15	0.600	34	0.600	53	0.600	72	0.600	91	0.600	110	0.600	129	0.600	148	0.600
16	0.600	35	0.600	54	0.600	73	0.600	92	0.600	111	0.600	130	0.600	149	0.600
17	0.600	36	0.600	55	0.600	74	0.600	93	0.600	112	0.600	131	0.600	150	0.600
18	0.600	37	0.600	56	0.600	75	0.600	94	0.600	113	0.600	132	0.600	151	0.600
19	0.600	38	0.600	57	0.600	76	0.600	95	0.600	114	0.600	133	0.600	152	0.600

JNP Group		Page 14
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A Drainage Strategy Check Angmering	
Date 09/03/2022 14:02	Designed by BID	
File C86473-JNP-92-XX-M2-C-1100 Drai...	Checked by CC	
Innovyze	Network 2020.1	

Rev A
Drainage Strategy Check
Angmering

Designed by BID
Checked by CC

Surcharged Outfall Details for Storm - Main

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
172	0.600	193	0.600	214	0.600	235	0.600	256	0.600	277	0.600	298	0.600	319	0.600
173	0.600	194	0.600	215	0.600	236	0.600	257	0.600	278	0.600	299	0.600	320	0.600
174	0.600	195	0.600	216	0.600	237	0.600	258	0.600	279	0.600	300	0.600	321	0.600
175	0.600	196	0.600	217	0.600	238	0.600	259	0.600	280	0.600	301	0.600	322	0.600
176	0.600	197	0.600	218	0.600	239	0.600	260	0.600	281	0.600	302	0.600	323	0.600
177	0.600	198	0.600	219	0.600	240	0.600	261	0.600	282	0.600	303	0.600	324	0.600
178	0.600	199	0.600	220	0.600	241	0.600	262	0.600	283	0.600	304	0.600	325	0.600
179	0.600	200	0.600	221	0.600	242	0.600	263	0.600	284	0.600	305	0.600	326	0.600
180	0.600	201	0.600	222	0.600	243	0.600	264	0.600	285	0.600	306	0.600	327	0.600
181	0.600	202	0.600	223	0.600	244	0.600	265	0.600	286	0.600	307	0.600	328	0.600
182	0.600	203	0.600	224	0.600	245	0.600	266	0.600	287	0.600	308	0.600	329	0.600
183	0.600	204	0.600	225	0.600	246	0.600	267	0.600	288	0.600	309	0.600	330	0.600
184	0.600	205	0.600	226	0.600	247	0.600	268	0.600	289	0.600	310	0.600	331	0.600
185	0.600	206	0.600	227	0.600	248	0.600	269	0.600	290	0.600	311	0.600	332	0.600
186	0.600	207	0.600	228	0.600	249	0.600	270	0.600	291	0.600	312	0.600	333	0.600
187	0.600	208	0.600	229	0.600	250	0.600	271	0.600	292	0.600	313	0.600	334	0.600
188	0.600	209	0.600	230	0.600	251	0.600	272	0.600	293	0.600	314	0.600	335	0.600
189	0.600	210	0.600	231	0.600	252	0.600	273	0.600	294	0.600	315	0.600	336	0.600
190	0.600	211	0.600	232	0.600	253	0.600	274	0.600	295	0.600	316	0.600	337	0.600
191	0.600	212	0.600	233	0.600	254	0.600	275	0.600	296	0.600	317	0.600	338	0.600
192	0.600	213	0.600	234	0.600	255	0.600	276	0.600	297	0.600	318	0.600	339	0.600

Simulation Criteria for Storm - Main

Volumetric Runoff Coeff 0.750 Manhole Headloss Coeff (Global) 0.500 Inlet Coefficient 0.800
 Areal Reduction Factor 1.000 Foul Sewage per hectare (l/s) 0.000 Flow per Person per Day (l/per/day) 0.000
 Hot Start (mins) 0 Additional Flow - % of Total Flow 0.000 Run Time (mins) 60
 Hot Start Level (mm) 0 MADD Factor * 10m³/ha Storage 2.000 output Interval (mins) 1

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

Synthetic Rainfall Details

Rainfall Model FEH Summer Storms Yes
 Return Period (years) 2 Winter Storms No
 FEH Rainfall Version 2013 Cv (Summer) 0.750
 Site Location GB 506538 105326 TQ 06538 05326 Cv (Winter) 0.840
 Data Type Point Storm Duration (mins) 30

JNP Group		Page 15
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A	
	Drainage Strategy Check Angmering	
Date 09/03/2022 14:02	Designed by BID	
File C86473-JNP-92-XX-M2-C-1100 Drai...	Checked by CC	
Innovyze	Network 2020.1	

Online Controls for Storm - Main

Hydro-Brake® Optimum Manhole: S45, DS/PN: S1.017, Volume (m³): 20.7

Unit Reference	MD-SHE-0138-1210-2400-1210	Sump Available	Yes
Design Head (m)	2.400	Diameter (mm)	138
Design Flow (l/s)	12.1	Invert Level (m)	11.450
Flush-Flo™	Calculated	Minimum outlet Pipe Diameter (mm)	225
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1500
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.400	12.1	Kick-Flo®	1.233	8.8
Flush-Flo™	0.599	11.2	Mean Flow over Head Range	-	10.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.0	0.600	11.2	1.600	10.0	2.600	12.6	5.000	17.1	7.500	20.8
0.200	9.3	0.800	11.0	1.800	10.6	3.000	13.4	5.500	17.9	8.000	21.5
0.300	10.3	1.000	10.5	2.000	11.1	3.500	14.5	6.000	18.7	8.500	22.1
0.400	10.9	1.200	9.2	2.200	11.6	4.000	15.4	6.500	19.4	9.000	22.7
0.500	11.1	1.400	9.4	2.400	12.1	4.500	16.3	7.000	20.1	9.500	23.3

JNP Group		Page 16
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A	
	Drainage Strategy Check Angmering	
Date 09/03/2022 14:02	Designed by BID	
File C86473-JNP-92-XX-M2-C-1100 Drai...	Checked by CC	
Innovyze	Network 2020.1	

Storage Structures for Storm - Main

Cellular Storage Manhole: S37 TANK, DS/PN: S11.000

Invert Level (m) 11.720 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	420.0	0.0	1.600	420.0	0.0	1.610	0.0	0.0

Tank or Pond Manhole: S45, DS/PN: S1.017

Invert Level (m) 12.128

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	759.9	1.840	1744.6

JNP Group		Page 17
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A Drainage Strategy Check Angmering	
Date 09/03/2022 14:02	Designed by BID	
File C86473-JNP-92-XX-M2-C-1100 Drai...	Checked by CC	
Innovyze	Network 2020.1	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
 FEH Rainfall Version 2013 Cv (Summer) 1.000
 Site Location GB 506538 105326 TQ 06538 05326 Cv (Winter) 1.000

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

Profile(s) summer and winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate change (%) 0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1	15 Summer	2	+0%	100/15 Summer				20.632	-0.084	0.000	0.40
S1.001	S2	15 Summer	2	+0%					19.904	-0.235	0.000	0.10
S1.002	S3	15 Summer	2	+0%	100/15 Summer				18.719	-0.211	0.000	0.19
S1.003	S4	15 Summer	2	+0%	30/15 Summer	100/15 Summer			17.165	-0.266	0.000	0.31
S1.004	S5	15 Summer	2	+0%	30/15 Summer				17.132	-0.247	0.000	0.40
S1.005	S6	15 Summer	2	+0%	30/15 Summer				17.050	-0.234	0.000	0.46
S2.000	S7	15 Summer	2	+0%	100/15 Summer				18.497	-0.214	0.000	0.18
S2.001	S8	15 Summer	2	+0%	100/15 Summer				17.719	-0.218	0.000	0.16
S1.006	S9	15 Summer	2	+0%	100/15 Summer				16.968	-0.251	0.000	0.40
S1.007	S10	15 Summer	2	+0%	100/15 Summer				16.313	-0.287	0.000	0.28
S1.008	S11	15 Summer	2	+0%					15.355	-0.314	0.000	0.20
S3.000	S12	15 Summer	2	+0%	100/120 Summer				12.998	-0.299	0.000	0.24
S4.000	S13	15 Summer	2	+0%	100/120 Summer				12.965	-0.313	0.000	0.20
S3.001	S14	15 Summer	2	+0%	100/120 Summer				12.788	-0.395	0.000	0.26
S1.009	S15	360 Winter	2	+0%	100/15 Winter				12.482	-0.561	0.000	0.05
S5.000	S16	15 Summer	2	+0%	100/15 Summer	100/15 Summer			14.726	-0.135	0.000	0.34
S5.001	S17	15 Summer	2	+0%	100/15 Summer				13.708	-0.118	0.000	0.45
S1.010	S18	360 Winter	2	+0%	100/60 Summer				12.481	-0.552	0.000	0.04
S6.000	S19	15 Summer	2	+0%	100/60 Summer				12.931	-0.201	0.000	0.24
S1.011	S20	480 Winter	2	+0%	30/960 Summer				12.469	-0.441	0.000	0.04
S1.012	S21	480 Winter	2	+0%	30/360 Summer				12.467	-0.393	0.000	0.04
S7.000	S22	15 Summer	2	+0%	30/15 Summer	100/15 Summer			14.510	-0.077	0.000	0.47
S7.001	S23	15 Summer	2	+0%	100/15 Summer				13.304	-0.303	0.000	0.22
S7.002	S24	15 Summer	2	+0%	100/15 Summer				13.148	-0.275	0.000	0.32
S7.003	S25	15 Summer	2	+0%	100/15 Summer				13.086	-0.287	0.000	0.28
S8.000	S26	15 Summer	2	+0%					17.757	-0.377	0.000	0.06
S8.001	S27	15 Summer	2	+0%	100/15 Summer				16.473	-0.377	0.000	0.06
S8.002	S28	15 Summer	2	+0%	100/15 Summer				15.125	-0.328	0.000	0.16
S9.000	S29	15 Summer	2	+0%	100/15 Summer				15.702	-0.225	0.000	0.14
S8.003	S30	15 Summer	2	+0%	30/15 Summer	100/15 Summer			14.014	-0.073	0.000	1.00
S10.000	S31	15 Summer	2	+0%	100/15 Summer	100/15 Summer			15.000	-0.110	0.000	0.16
S8.004	S32	15 Summer	2	+0%	30/15 Summer				13.821	-0.231	0.000	0.47
S8.005	S33	15 Summer	2	+0%	30/15 Summer				13.225	-0.190	0.000	0.63
S7.004	S34	15 Summer	2	+0%	100/15 Summer				12.819	-0.384	0.000	0.47
S7.005	S35	15 Summer	2	+0%	100/15 Summer				12.721	-0.421	0.000	0.36
S7.006	S36	15 Summer	2	+0%	30/960 Winter				12.578	-0.342	0.000	0.57
S11.000	S37 TANK	480 Winter	2	+0%	30/960 Winter				12.466	-0.454	0.000	0.00
S7.007	S38	480 Winter	2	+0%	30/480 Summer				12.466	-0.424	0.000	0.01
S7.008	S39	480 Winter	2	+0%	30/240 Summer				12.465	-0.354	0.000	0.01
S1.013	S40	480 Winter	2	+0%	30/240 Summer				12.465	-0.317	0.000	0.07
S12.000	S41	480 Winter	2	+0%	30/240 Summer				12.463	-0.320	0.000	0.00
S1.014	S42	480 Winter	2	+0%	30/240 Summer				12.463	-0.292	0.000	0.07
S1.015	S43	480 Winter	2	+0%	30/240 Summer				12.461	-0.265	0.000	0.05
S1.016	S44	480 Winter	2	+0%	30/120 Summer				12.455	-0.220	0.000	0.07
S1.017	S45	480 Winter	2	+0%	2/15 Summer				12.453	0.853	0.000	0.83

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1			13.0	OK	
S1.001	S2			24.4	OK	

JNP Group		Page 18
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A	
	Drainage Strategy Check Angmering	
Date 09/03/2022 14:02	Designed by BID	
File C86473-JNP-92-XX-M2-C-1100 Drai...	Checked by CC	
Innovyze	Network 2020.1	

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

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S3			33.9	OK	
S1.003	S4			46.8	OK	1
S1.004	S5			62.7	OK	
S1.005	S6			69.0	OK	
S2.000	S7			35.1	OK	
S2.001	S8			34.8	OK	
S1.006	S9			126.4	OK	
S1.007	S10			139.2	OK	
S1.008	S11			150.0	OK	
S3.000	S12			35.7	OK	
S4.000	S13			29.0	OK	
S3.001	S14			74.0	OK	
S1.009	S15			46.3	OK	
S5.000	S16			42.2	OK	1
S5.001	S17			41.8	OK	
S1.010	S18			57.3	OK	
S6.000	S19			27.1	OK	
S1.011	S20			50.6	OK	
S1.012	S21			51.3	OK	
S7.000	S22			18.3	OK	2
S7.001	S23			38.1	OK	
S7.002	S24			45.3	OK	
S7.003	S25			43.8	OK	
S8.000	S26			30.3	OK	
S8.001	S27			41.5	OK	
S8.002	S28			75.3	OK	
S9.000	S29			29.2	OK	
S8.003	S30			132.5	OK	1
S10.000	S31			8.4	OK	
S8.004	S32			152.0	OK	
S8.005	S33			162.9	OK	
S7.004	S34			202.2	OK	
S7.005	S35			182.6	OK	
S7.006	S36			161.7	OK	
S11.000	S37 TANK			3.7	OK	
S7.007	S38			9.2	OK	
S7.008	S39			7.8	OK	
S1.013	S40			56.4	OK	
S12.000	S41			1.0	OK	
S1.014	S42			56.3	OK	
S1.015	S43			55.3	OK	
S1.016	S44			53.7	OK	
S1.017	S45			11.2	SURCHARGED	

JNP Group		Page 19
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A Drainage Strategy Check Angmering	
Date 09/03/2022 14:02	Designed by BID	
File C86473-JNP-92-XX-M2-C-1100 Drai...	Checked by CC	
Innovyze	Network 2020.1	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
 FEH Rainfall Version 2013 CV (Summer) 1.000
 Site Location GB 506538 105326 TQ 06538 05326 CV (Winter) 1.000

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

Profile(s) summer and winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate change (%) 0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1	15 Summer	30	+0%	100/15 Summer				20.676	-0.040	0.000	0.88
S1.001	S2	15 Summer	30	+0%					19.943	-0.196	0.000	0.26
S1.002	S3	15 Summer	30	+0%	100/15 Summer				18.781	-0.149	0.000	0.50
S1.003	S4	15 Summer	30	+0%	30/15 Summer	100/15 Summer			17.509	0.078	0.000	0.79
S1.004	S5	15 Summer	30	+0%	30/15 Summer				17.404	0.025	0.000	1.02
S1.005	S6	15 Summer	30	+0%	30/15 Summer				17.299	0.015	0.000	1.19
S2.000	S7	15 Summer	30	+0%	100/15 Summer				18.542	-0.169	0.000	0.39
S2.001	S8	15 Summer	30	+0%	100/15 Summer				17.762	-0.175	0.000	0.36
S1.006	S9	15 Summer	30	+0%	100/15 Summer				17.145	-0.074	0.000	0.99
S1.007	S10	15 Summer	30	+0%	100/15 Summer				16.431	-0.169	0.000	0.70
S1.008	S11	15 Summer	30	+0%					15.444	-0.224	0.000	0.49
S3.000	S12	15 Summer	30	+0%	100/120 Summer				13.082	-0.215	0.000	0.52
S4.000	S13	240 Winter	30	+0%	100/120 Summer				13.075	-0.203	0.000	0.08
S3.001	S14	240 Winter	30	+0%	100/120 Summer				13.072	-0.111	0.000	0.10
S1.009	S15	120 Summer	30	+0%	100/15 Winter				13.043	0.000	0.000	0.30
S5.000	S16	15 Summer	30	+0%	100/15 Summer	100/15 Summer			14.781	-0.080	0.000	0.74
S5.001	S17	15 Summer	30	+0%	100/15 Summer				13.804	-0.022	0.000	0.98
S1.010	S18	480 Winter	30	+0%	100/60 Summer				13.033	0.000	0.000	0.05
S6.000	S19	15 Summer	30	+0%	100/60 Summer				12.987	-0.145	0.000	0.52
S1.011	S20	960 Winter	30	+0%	30/960 Summer				12.923	0.013	0.000	0.04
S1.012	S21	960 Winter	30	+0%	30/360 Summer				12.923	0.063	0.000	0.04
S7.000	S22	15 Summer	30	+0%	30/15 Summer	100/15 Summer			14.603	0.016	0.000	1.01
S7.001	S23	15 Summer	30	+0%	100/15 Summer				13.405	-0.202	0.000	0.55
S7.002	S24	15 Summer	30	+0%	100/15 Summer				13.290	-0.132	0.000	0.80
S7.003	S25	15 Summer	30	+0%	100/15 Summer				13.261	-0.111	0.000	0.64
S8.000	S26	15 Summer	30	+0%					17.794	-0.340	0.000	0.14
S8.001	S27	15 Summer	30	+0%	100/15 Summer				16.515	-0.335	0.000	0.15
S8.002	S28	15 Summer	30	+0%	100/15 Summer				15.208	-0.245	0.000	0.42
S9.000	S29	15 Summer	30	+0%	100/15 Summer				15.741	-0.186	0.000	0.31
S8.003	S30	15 Summer	30	+0%	30/15 Summer	100/15 Summer			14.781	0.694	0.000	2.40
S10.000	S31	15 Summer	30	+0%	100/15 Summer	100/15 Summer			15.021	-0.089	0.000	0.35
S8.004	S32	15 Summer	30	+0%	30/15 Summer				14.474	0.422	0.000	1.12
S8.005	S33	15 Summer	30	+0%	30/15 Summer				13.663	0.248	0.000	1.48
S7.004	S34	15 Summer	30	+0%	100/15 Summer				13.203	0.000	0.000	1.07
S7.005	S35	30 Summer	30	+0%	100/15 Summer				13.027	-0.116	0.000	0.77
S7.006	S36	960 Winter	30	+0%	30/960 Winter				12.923	0.004	0.000	0.10
S11.000	S37 TANK	960 Winter	30	+0%	30/960 Winter				12.923	0.003	0.000	0.00
S7.007	S38	960 Winter	30	+0%	30/480 Summer				12.923	0.034	0.000	0.01
S7.008	S39	960 Winter	30	+0%	30/240 Summer				12.923	0.104	0.000	0.01
S1.013	S40	960 Winter	30	+0%	30/240 Summer				12.923	0.141	0.000	0.07
S12.000	S41	960 Winter	30	+0%	30/240 Summer				12.923	0.140	0.000	0.00
S1.014	S42	960 Winter	30	+0%	30/240 Summer				12.923	0.168	0.000	0.07
S1.015	S43	960 Winter	30	+0%	30/240 Summer				12.922	0.197	0.000	0.04
S1.016	S44	960 Winter	30	+0%	30/120 Summer				12.923	0.248	0.000	0.07
S1.017	S45	960 Winter	30	+0%	2/15 Summer				12.922	1.322	0.000	0.83

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1			28.5	OK	
S1.001	S2			61.3	OK	

JNP Group		Page 20
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A	
	Drainage Strategy Check Angmering	
Date 09/03/2022 14:02	Designed by BID	
File C86473-JNP-92-XX-M2-C-1100 Drai...	Checked by CC	
Innovyze	Network 2020.1	

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

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S3			89.3	OK	
S1.003	S4			120.6	SURCHARGED	1
S1.004	S5			161.6	SURCHARGED	
S1.005	S6			177.8	SURCHARGED	
S2.000	S7			76.8	OK	
S2.001	S8			76.2	OK	
S1.006	S9			315.0	OK	
S1.007	S10			347.3	OK	
S1.008	S11			375.5	OK	
S3.000	S12			77.4	OK	
S4.000	S13			11.5	OK	
S3.001	S14			30.1	OK	
S1.009	S15			282.2	OK	
S5.000	S16			92.2	OK	1
S5.001	S17			91.2	OK	
S1.010	S18			80.1	OK	
S6.000	S19			59.4	OK	
S1.011	S20			49.8	SURCHARGED	
S1.012	S21			50.5	SURCHARGED	
S7.000	S22			39.2	SURCHARGED	2
S7.001	S23			94.3	OK	
S7.002	S24			113.6	OK	
S7.003	S25			102.1	OK	
S8.000	S26			66.2	OK	
S8.001	S27			98.8	OK	
S8.002	S28			197.9	OK	
S9.000	S29			63.8	OK	
S8.003	S30			317.5	SURCHARGED	1
S10.000	S31			18.4	OK	
S8.004	S32			359.4	SURCHARGED	
S8.005	S33			384.0	SURCHARGED	
S7.004	S34			454.6	OK	
S7.005	S35			391.8	OK	
S7.006	S36			27.6	SURCHARGED	
S11.000	S37 TANK			2.5	SURCHARGED	
S7.007	S38			13.6	SURCHARGED	
S7.008	S39			13.9	SURCHARGED	
S1.013	S40			54.1	SURCHARGED	
S12.000	S41			1.0	SURCHARGED	
S1.014	S42			54.2	SURCHARGED	
S1.015	S43			53.2	SURCHARGED	
S1.016	S44			51.9	SURCHARGED	
S1.017	S45			11.2	SURCHARGED	

JNP Group		Page 21
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A Drainage Strategy Check Angmering	
Date 09/03/2022 14:02	Designed by BID	
File C86473-JNP-92-XX-M2-C-1100 Drai...	Checked by CC	
Innovyze	Network 2020.1	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
 FEH Rainfall Version 2013 CV (Summer) 1.000
 Site Location GB 506538 105326 TQ 06538 05326 CV (Winter) 1.000

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

Profile(s) summer and winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate change (%) 0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1	15 Summer	100	+40%	100/15 Summer				21.355	0.639	0.000	1.43
S1.001	S2	15 Summer	100	+40%					19.978	-0.161	0.000	0.43
S1.002	S3	15 Summer	100	+40%	100/15 Summer				19.630	0.700	0.000	0.74
S1.003	S4	15 Summer	100	+40%	30/15 Summer	100/15 Summer			18.826	1.395	0.021	1.20
S1.004	S5	15 Summer	100	+40%	30/15 Summer				18.725	1.346	0.000	1.53
S1.005	S6	15 Summer	100	+40%	30/15 Summer				18.499	1.215	0.000	1.82
S2.000	S7	15 Summer	100	+40%	100/15 Summer				18.832	0.121	0.000	0.67
S2.001	S8	15 Summer	100	+40%	100/15 Summer				18.536	0.599	0.000	0.59
S1.006	S9	15 Summer	100	+40%	100/15 Summer				18.265	1.046	0.000	1.54
S1.007	S10	15 Summer	100	+40%	100/15 Summer				16.757	0.157	0.000	1.08
S1.008	S11	15 Summer	100	+40%					15.517	-0.152	0.000	0.75
S3.000	S12	1440 Winter	100	+40%	100/120 Summer				13.830	0.533	0.000	0.04
S4.000	S13	1440 Winter	100	+40%	100/120 Summer				13.830	0.552	0.000	0.03
S3.001	S14	1440 Winter	100	+40%	100/120 Summer				13.830	0.647	0.000	0.04
S1.009	S15	1440 Winter	100	+40%	100/15 Winter				13.830	0.786	0.000	0.05
S5.000	S16	15 Summer	100	+40%	100/15 Summer	100/15 Summer			15.871	1.010	1.196	1.08
S5.001	S17	15 Summer	100	+40%	100/15 Summer				14.696	0.870	0.000	1.45
S1.010	S18	1440 Winter	100	+40%	100/60 Summer				13.830	0.797	0.000	0.04
S6.000	S19	1440 Winter	100	+40%	100/60 Summer				13.830	0.698	0.000	0.04
S1.011	S20	1440 Winter	100	+40%	30/960 Summer				13.830	0.920	0.000	0.06
S1.012	S21	1440 Winter	100	+40%	30/360 Summer				13.830	0.970	0.000	0.05
S7.000	S22	15 Summer	100	+40%	30/15 Summer	100/15 Summer			15.810	1.223	0.693	1.45
S7.001	S23	15 Summer	100	+40%	100/15 Summer				13.906	0.299	0.000	0.86
S7.002	S24	1440 Winter	100	+40%	100/15 Summer				13.831	0.408	0.000	0.06
S7.003	S25	1440 Winter	100	+40%	100/15 Summer				13.830	0.458	0.000	0.06
S8.000	S26	15 Summer	100	+40%					17.833	-0.301	0.000	0.24
S8.001	S27	15 Summer	100	+40%	100/15 Summer				17.649	0.799	0.000	0.24
S8.002	S28	15 Summer	100	+40%	100/15 Summer				17.365	1.912	0.000	0.55
S9.000	S29	15 Summer	100	+40%	100/15 Summer				17.362	1.435	0.000	0.50
S8.003	S30	15 Summer	100	+40%	30/15 Summer	100/15 Summer			16.923	2.836	0.176	3.49
S10.000	S31	15 Summer	100	+40%	100/15 Summer	100/15 Summer			16.495	1.385	0.004	0.59
S8.004	S32	15 Summer	100	+40%	30/15 Summer				16.286	2.234	0.000	1.63
S8.005	S33	15 Summer	100	+40%	30/15 Summer				14.542	1.127	0.000	2.18
S7.004	S34	1440 Winter	100	+40%	100/15 Summer				13.830	0.627	0.000	0.09
S7.005	S35	1440 Winter	100	+40%	100/15 Summer				13.830	0.688	0.000	0.08
S7.006	S36	1440 Winter	100	+40%	30/960 Winter				13.830	0.911	0.000	0.14
S11.000	S37 TANK	1440 Winter	100	+40%	30/960 Winter				13.830	0.910	0.000	0.00
S7.007	S38	1440 Winter	100	+40%	30/480 Summer				13.830	0.941	0.000	0.03
S7.008	S39	1440 Winter	100	+40%	30/240 Summer				13.830	1.011	0.000	0.04
S1.013	S40	1440 Winter	100	+40%	30/240 Summer				13.830	1.048	0.000	0.15
S12.000	S41	1440 Winter	100	+40%	30/240 Summer				13.829	1.046	0.000	0.00
S1.014	S42	1440 Winter	100	+40%	30/240 Summer				13.829	1.075	0.000	0.15
S1.015	S43	1440 Winter	100	+40%	30/240 Summer				13.829	1.103	0.000	0.09
S1.016	S44	1440 Winter	100	+40%	30/120 Summer				13.829	1.154	0.000	0.15
S1.017	S45	1440 Winter	100	+40%	2/15 Summer				13.828	2.228	0.000	0.90

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1			46.2	SURCHARGED	
S1.001	S2			100.8	OK	

JNP Group		Page 22
The Innovation Centre Queens Meadow Business Park Hartlepool, TS25 5TG	Rev A	
	Drainage Strategy Check Angmering	
Date 09/03/2022 14:02	Designed by BID	
File C86473-JNP-92-XX-M2-C-1100 Drai...	Checked by CC	
Innovyze	Network 2020.1	

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

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S3			131.4	SURCHARGED	
S1.003	S4			183.7	FLOOD	1
S1.004	S5			242.3	FLOOD RISK	
S1.005	S6			271.5	SURCHARGED	
S2.000	S7			131.5	SURCHARGED	
S2.001	S8			124.6	SURCHARGED	
S1.006	S9			491.8	SURCHARGED	
S1.007	S10			536.7	SURCHARGED	
S1.008	S11			571.1	OK	
S3.000	S12			5.9	SURCHARGED	
S4.000	S13			4.8	SURCHARGED	
S3.001	S14			12.5	SURCHARGED	
S1.009	S15			48.0	SURCHARGED	
S5.000	S16			135.0	FLOOD	1
S5.001	S17			134.2	SURCHARGED	
S1.010	S18			59.9	SURCHARGED	
S6.000	S19			4.4	SURCHARGED	
S1.011	S20			70.3	SURCHARGED	
S1.012	S21			73.3	SURCHARGED	
S7.000	S22			56.3	FLOOD	2
S7.001	S23			145.9	SURCHARGED	
S7.002	S24			8.7	SURCHARGED	
S7.003	S25			8.7	SURCHARGED	
S8.000	S26			117.4	OK	
S8.001	S27			160.6	SURCHARGED	
S8.002	S28			256.4	SURCHARGED	
S9.000	S29			103.4	FLOOD RISK	
S8.003	S30			462.4	FLOOD	1
S10.000	S31			31.2	FLOOD	
S8.004	S32			524.5	SURCHARGED	
S8.005	S33			566.1	FLOOD RISK	
S7.004	S34			39.2	SURCHARGED	
S7.005	S35			39.2	SURCHARGED	
S7.006	S36			39.2	SURCHARGED	
S11.000	S37 TANK			2.6	SURCHARGED	
S7.007	S38			41.4	SURCHARGED	
S7.008	S39			41.1	SURCHARGED	
S1.013	S40			113.2	SURCHARGED	
S12.000	S41			1.5	FLOOD RISK	
S1.014	S42			114.1	FLOOD RISK	
S1.015	S43			113.5	FLOOD RISK	
S1.016	S44			112.4	FLOOD RISK	
S1.017	S45			12.0	FLOOD RISK	



JNP GROUP

CONSULTING ENGINEERS

Brighouse

Woodvale House
Woodvale Road
Brighouse
West Yorkshire
HD6 4AB

telephone

01484 400691

email

brighouse@jnpgroup.co.uk

Hartlepool

The Innovation Centre
Venture Court
Queens Meadow Business Park
Hartlepool
TS25 5TG

telephone

01429 239539

email

hartlepool@jnpgroup.co.uk

Chesham (HQ)

Link House
St Mary's Way
Chesham
Buckinghamshire
HP5 1HR

telephone

01494 771221

email

chesham@jnpgroup.co.uk

Leamington Spa

Marlborough House
48 Holly Walk
Leamington Spa
Warwickshire
CV32 4XP

telephone

01926 889955

email

leamingtonspa@jnpgroup.co.uk

Glasgow

Oxford House
71 Oxford Street
Glasgow
G59 5P

telephone

0141 378 0808

email

glasgow@jnpgroup.co.uk

Sheffield

MBP2 Meadowhall Business Park
Carbrook Hall Road
Sheffield
South Yorkshire
S9 2EQ

telephone

0114 244 3500

email

sheffield@jnpgroup.co.uk