Flood Risk Assessment

Badminton Road, Old Sodbury

For and on behalf of:
Clifton Homes

January 2021

andy clay consulting
flood risk and drainage

Report title:

Flood Risk Assessment

Site name:

Badminton Road, Old Sodbury

For and on behalf of:

Clifton Homes

Prepared by:

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APPENDICES

1 INTRODUCTION

1.1 This Flood Risk Assessment (FRA) has been prepared by Andy Clay Consulting (ACC) on behalf of Clifton Homes for a proposed residential development of the site. The FRA was issued in January 2021.

1.2 The site is a 1.504 ha land area located to the south of Badminton Road (A432) in Old Sodbury, South Gloucestershire. The site has a central post code of BS37 6LX and OS national grid reference of E: 375029 and N: 181562.

Background

1.3 The proposed development includes 36 residential dwellings with private gardens located off an internal road and with landscaped areas, notably within the south-western part where an attenuation basin is to be located.

1.4 This FRA has been based on the following appended information:

- **Appendix A** – details of the proposed development.
- **Appendix B** – the site topographical survey.
- **Appendix C** – the results of soil infiltration testing.
- **Appendix D** – consultation with Network Rail.
- **Appendix E** – information on the sewerage network from Wessex Water.
- **Appendix F** – consultation with the Environment Agency.
- **Appendix G** – consultation with South Gloucestershire Council (SGC) as the Lead Local Flood Authority (LLFA).
- **Appendix H** – the surface water drainage calculations and drainage schematic provided by Tumu Consulting Ltd.

Scope of the Assessment

1.5 This FRA has been produced to support the submission of an outline planning application for the proposed residential development of the site.

1.6 The FRA has been undertaken in accordance with the National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG) as well as the local planning policy of SGC.

1.7 The aim of this FRA is to demonstrate that the site can be developed safely, without exposing it to unacceptable risks from flooding or increasing the flood risk to third parties.

Limitations of the Assessment

1.8 The general limitations of this assessment are that:

- A number of sources have been used to compile this FRA. Whilst ACC believes them to be trustworthy; ACC is unable to guarantee the accuracy of the information provided by others.
- This FRA is based on information available at the time of preparation. Consequently, there is potential for further information to become available. This may lead to future alteration to the conclusions that have been drawn in this report, for which ACC cannot be held responsible.

2 SITE DESCRIPTION

2.1 The site is a land area to the south of Badminton Road (A432) in Old Sodbury, South Gloucestershire. It has a central post code of BS37 6LX and OS NGR of E: 375029 and N: 181562. A site location plan is included as **Figure 2.1**.

2.2 The site has an area of 1.504 ha and is roughly rectangular in shape, having an approximate maximum distance from east to west of 230m and from north to south of 60m. The current land use of the site is as a grassed field.

2.3 However, the site has recently seen use by Network Rail as a construction compound for local rail improvement and reinforcement works. This resulted in a large area of the site temporarily having a covered surface, but which has since been removed and with the area restored to a grassed field.

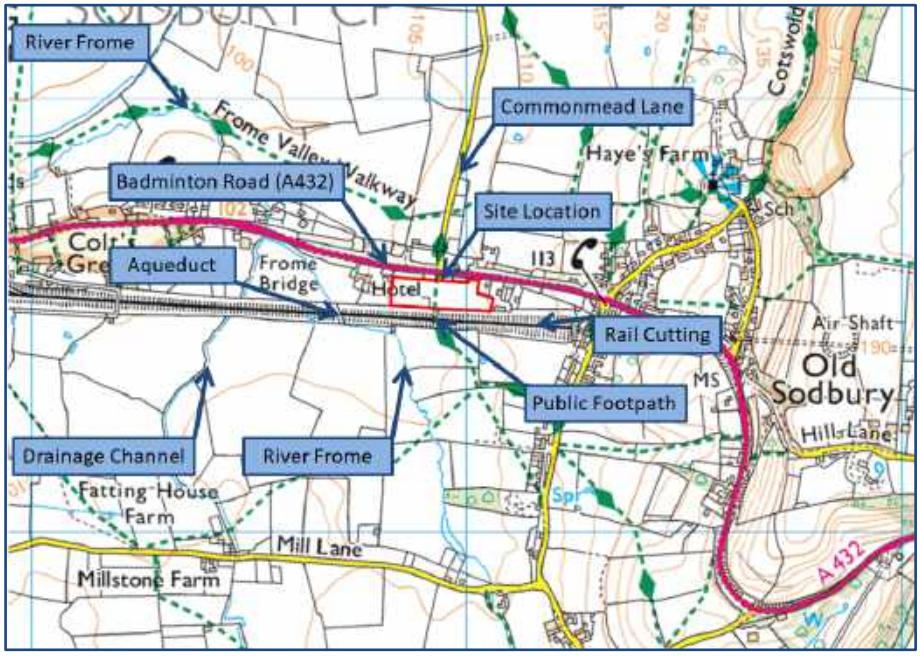


Figure 2.1 – Site Location Plan

2.4 The site is within the following setting:

- To the north between the site and Badminton Road (A432) is a strip of land with allotments and a gated access. Commonmead Lane is to the north which is also a public footpath, adjoining Badminton Road.

- To the east is an existing residential property and a farm yard with buildings.
- To the south is Network Rail land, which has a drainage channel adjacent to the majority of the site boundary and then a rail line within a cutting. Also to the south is a footbridge over the rail line, which the public footpath crosses. There is a foul sewer pipe attached to the side of this bridge which then crosses through the site, as described below.
- To the west is the building and associated grounds of the Sodbury House Hotel. Also to the west is the River Frome, which is a Main River.

Proposed Development

2.5 The proposed development layout is included as **Appendix A**. The proposed development would include 36 residential dwellings with private gardens located off an internal road and with landscaped areas, notably within the south-western part of the site where an attenuation basin is to be located.

Site Topography

2.6 A topographical survey of the site was completed by Alan Wade Site Engineering in August 2018, with this included as **Appendix B**. All surveyed levels were completed in accordance with an ordnance datum (m AOD).

2.7 Ground levels across the site tend to fall from the northern site boundary (adjacent to Badminton Road) to the south and to the west.

2.8 Ground levels are highest at the site entrance from Badminton Road, with a level of 109.22m (see green circle on **Figure 2.2**). Ground levels along the

centre of Badminton Road to the north of the site are 109.46m adjacent to the entrance, falling to the west but staying more elevated than the site.

2.9 Ground levels are lowest adjacent to the south-western site boundary, with a lowest level of 104.61m. Levels are low within the western part of the site with levels recorded around 105.20m and also adjacent to the footbridge across the rail line with a levels around 106.00m (see yellow circles on **Figure 2.2**).

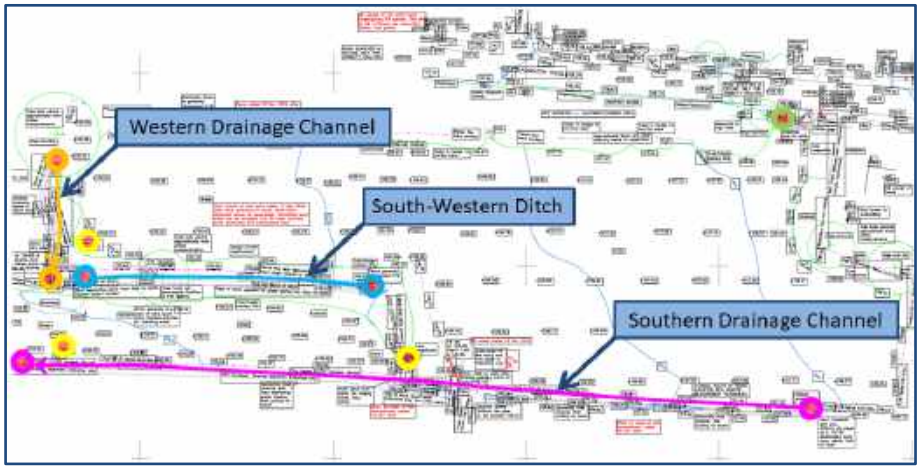


Figure 2.2 – Key Topographical Levels and Drainage Features

2.10 The topographical survey collected levels from a drainage channel adjacent to the western site boundary (orange line on **Figure 2.2**); with bed levels falling from 105.02m to the north down to 104.87m to the south (orange circles). There is also a shallow ditch from the west that joins it at the northern end.

2.11 Levels were collected from a ditch within the south-western part of the site (light blue line on **Figure 2.2**); with bed levels falling from 105.71m to the east down to 104.98m to the west (blue circles). However, it was not obvious if the whole length of this drainage channel drained to the west or to the east.

2.12 Some levels were also collected from a drainage channel adjacent to the southern site boundary (pink line on **Figure 2.2**); with bed levels falling from 107.58m to the east down to 102.51m to the west (pink circles). However, it was not possible to collect extensive levels of this drainage channel, given access restrictions (the drainage channel is within Network Rail owned land).

2.13 The fall in levels across the site would mean that surface water runoff would naturally drain into the southern drainage channel. The topographic survey also recorded drainage connections into the southern drainage channel.

2.14 There is a short section of ditch at the eastern end of the south-western ditch that drains into the southern drainage channel. There is a culvert at the southern end of the western drainage channel / western end of the south-western ditch that drains into the southern drainage channel. The invert level at the culvert inlet was recorded as 104.08m and at the outlet as 103.12m.

Geology and Hydrogeology

2.15 The British Geological Survey (BGS) map of the area (1:50,000 scale map series), which was accessed via online digital mapping, indicates that the site is underlain by the Charmouth Mudstone Formation (mudstone). The same BGS map indicated that there were no superficial deposits across the site.

2.16 According to the BGS Geoindex, the local hydrogeology is classified as rocks with essentially no groundwater. This is a largely mudstone sequence with limestone and marlstone rock forming local aquifers yielding small supplies.

Soils

2.17 The soils on the site will be influenced by the underlying geology, as described above, and also by the historical uses of the land. As the site is greenfield, variations resulting from anthropogenic activity would normally be limited. However, Network Rail needed to restore an area of the site after having previously covered it with a surface for use as a construction compound.

2.18 The Cranfield University Soilscapes is a simplified soils dataset that covers England and Wales, and provides a general understanding of the soils in an area. The eastern part of the site is classified with loamy and some clayey soils typically with slightly impeded drainage, whereas the western part of the site is classified with loamy and clayey soils typically with impeded drainage.

Soakaway Testing

2.19 Soakaway testing was completed by Hydrogeo in September 2019, with the results included as **Appendix C**. This was to determine the infiltration potential of water into the ground, and if possible provide an infiltration rate for the drainage strategy. In addition, trial pits logged the character of the soil profile.

2.20 Trial pits were excavated to depths of up to 2.30m, with soakaway tests conducted within trial pits of up to 1.40m. The location of the trial pits is shown in **Figure 2.3**.

2.21 Soils encountered with the excavation of the trial pits generally consisted of dark brown silty topsoil over brownish brown or blueish-grey firm to stiff clay from approximately 0.25 metre below ground level. This description of the soil profile is in agreement with the understanding from Soilscapes.

Figure 2.3 – Trial Pit and Soakaway Test Locations (Hydrogeo)

2.22 The soils encountered in most of the trial pits were predominantly clayey, and with only a small fall in the water levels recorded throughout the day. As a result, it was not possible to calculate a soil infiltration rate for these locations.

2.23 A summary of the infiltration rates is provided in **Table 2.1** below.

Trial Pit	Depth(m)	Test Result (m/sec)			Infiltration Rate (m/sec)
		Test 1	Test 2	Test 3	
TP1 C	0.45	1.06×10^{-4}	1.61×10^{-5}	Test not completed	1.61×10^{-5}
TP4 B	2.00	8.68×10^{-6}	Test not completed	Test not completed	8.68×10^{-6}

Table 2.1 – Summary of Soakaway Testing (Hydrogeo)

2.24 It was possible to determine an infiltration rate for TP4 B, a 2.00m deep trial pit located towards the centre of the site. However, because of the slow infiltration rate, only one test could be completed. The requirement for soakaway testing is for three consecutive tests to be completed. Two tests could be completed for TP1 C, a 0.45m deep trial pit located close to the footbridge, however again with this found to have a slow infiltration rate.

Hydrology

2.25 The site is within the hydrological catchment of the River Frome, with the channel located approximately 1.2km to the west and flowing to the north and then to the north-west.

2.26 As part of the electrification of the railway between London and Bristol, the aqueduct across the rail line needed to be raised. This work has been recently completed, and resulted in a re-alignment of the River Frome upstream (to the south) of the crossing as well as the new aqueduct itself. The re-aligned drainage channel is to the east of the old channel (i.e. closer to the site).

2.27 There is understood to be a drainage connection under the rail line, via a siphon on the northern side and into a channel. In terms of classification, the Main River (River Frome) is the section of channel after the siphon, as opposed to the drainage channel that crosses via the aqueduct. The location of these watercourses is shown on **Figure 2.1**. Whereas the sections of channel

that are classified by the Environment Agency as Main Rivers are shown in **Appendix F**.

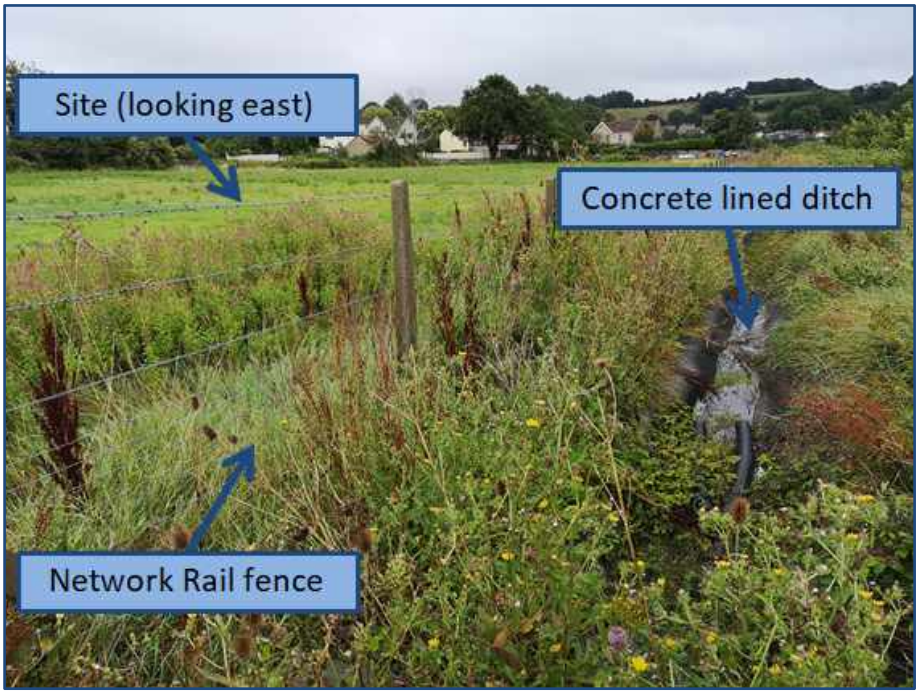
2.28 As described earlier with the site topography and also shown on **Figure 2.2**, there are drainage channels adjacent to the western, south-western and southern site boundaries. These drain into the southern drainage channel, which then drains west and discharges into the River Frome just downstream of the siphon under the rail line (but also just upstream from where the aqueduct across the rail line adjoins with the River Frome).

2.29 The drainage channel adjacent to the southern site boundary is located within Network Rail land. The site currently drains to this drainage channel through direct drainage channel connections and also as overland flow, given the fall in ground levels across the site. Consultation with Network Rail would need to be completed to agree a drainage connection.

2.30 The consultation with Network Rail is included as **Appendix D**. Recent improvement works have been completed on the drainage channel and also on the cutting embankment by Network Rail. The southern drainage channel is described by Network Rail as a concrete cloth lined crest drainage channel.

2.31 There is a culverted section o9f the southern drainage channel to the east of the site, with an outlet draining into the open channel adjacent to the site boundary. There is also a short culverted section of the channel within the site, with this required to pass under the public footpath, next to the footbridge.

2.32 The southern drainage channel drains west and discharges into the River Frome, further to the west.



Existing Drainage Infrastructure

2.33 Consultation with Wessex Water was completed to determine the type and location of public sewerage in the area, with this included as **Appendix E**.

2.34 There are no public surface water or combined sewers that cross or that are in the immediate vicinity of the site. However, there are foul sewers in the area.

2.35 There is a 225mm diameter foul sewer that enters the site from the southern boundary, from the footbridge, crossing in a north-westerly direction. This then adjoins a 225mm diameter foul sewer located in Badminton Road, and drains west. An extract from the Wessex Water sewer map is included as **Figure 2.4**.

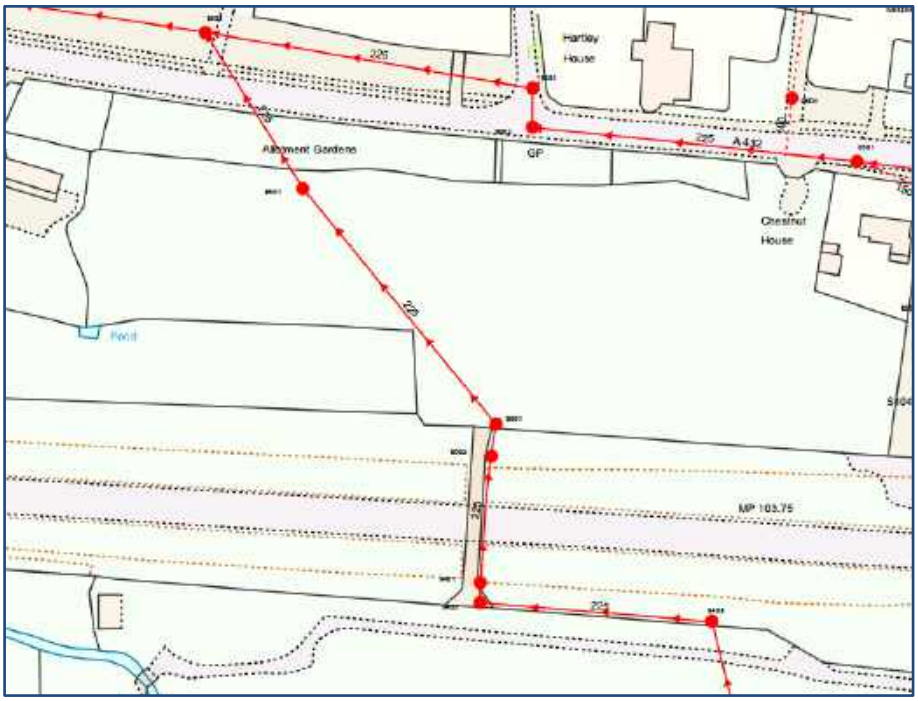


Figure 2.4 – Wessex Water Sewer Map

2.36 The LPA were contacted to determine if there was any other drainage infrastructure in the area, with this consultation included as **Appendix G**.

2.37 This consultation identified there to be highway drainage infrastructure in Badminton Road to the north of the site (from the junction at Cotswold and Chapel Lane and continuing past the Sodbury House Hotel), with this series of road gullies observed during the site visit.

2.38 However, the LPA advised that their drainage records do not confirm whether this series of gullies is a continuous connected highway drain or not. The LPA have suggested completion of a CCTV drainage survey to confirm the existence, extent, condition, capacity, sizing (and so on) of the highway drain.

3 PLANNING POLICY AND CONSULTATION

National Planning Policy

3.1 The revised NPPF was published in February 2019 and sets out the national policies for flood risk management in a land use planning context within England and how these are expected to be applied. This replaces the previous NPPF published in March 2012 and later revised in July 2018.

3.2 The NPPF states that developers and LPAs should try to locate development in zones with the lowest probability of flooding. This should be achieved using the Sequential Test, which aims for a sequential approach to be followed to steer new development to areas with the lowest probability of flooding.

3.3 The flood zones provide the basis for applying the Sequential Test. The aim is to steer new development to Sites located in Flood Zone 1 (areas with a low probability of river or sea flooding). Where there are no reasonably available Sites in Flood Zone 1, LPA's should consider reasonably available Sites located in Flood Zone 2 (areas with a medium probability of river or sea flooding) followed then by Sites in or partially in Flood Zone 3 (areas with a high probability of river or sea flooding), applying the Exception Test if required.

Planning Practice Guidance

3.4 The Planning Practice Guidance (PPG) accompanies the NPPF and defines how the planning policies should be applied. In the section on Flood Risk and Coastal Change, there are three key tables.

3.5 Table 1 of the PPG (Flood Zones) classifies each of the Flood Zones, which refer to the probability of river and sea flooding, ignoring the presence of flood defences. These are shown on the Flood Map for Planning (Rivers and Sea), available on the EA's web site.

3.6 Table 2 of the PPG (Flood Risk Vulnerability Classification) considers the vulnerability of the proposed use to flooding. Buildings that are to be used for residential purposes are classified as 'More Vulnerable'.

3.7 Table 3 of the PPG (Flood Risk Vulnerability and Flood Zone Compatibility) compares Tables 1 and 2, confirming that 'More Vulnerable' development is suitable for Flood Zones 1 and 2. However, for Flood Zone 3, the Sequential Test followed then by the Exception Test would need to be demonstrated.

Lead Local Flood Authority

3.8 South Gloucestershire Council (SGC) are the LLFA for the area. This means that SGC have a leadership and coordinating role for flood risk across the county resulting from surface water runoff, ordinary watercourses and groundwater.

3.9 SGC has produced and published a Local Flood Risk Management Strategy (LFRMS), with the most recent version for the period dated 2015 to 2020.

Core Strategy

3.10 The SGC Core Strategy is the key planning policy document for South Gloucestershire, setting out the general location of development, its type and scale, as well as protecting what is valued about the area. The SGC Core Strategy was adopted in December 2013 and is for the period 2006 to 2027.

3.11 Sections of the following policy from the SGC Core Strategy are of relevance:

- Policy CS1 – High Quality Design: development will only be permitted where the highest possible standards of design and site planning are achieved – including measures to manage flood risk and prepare surface water management plans.

- Policy CS5 – Location of Development: the Sequential and Exception Tests will be applied to direct development to areas with the lowest probability of flooding, taking account of the vulnerability of the type of development, its contribution to creating sustainable communities and achieving the sustainable objectives of the Core Strategy.

- Policy CS9 – Managing the Environment and Heritage: development will be expected to be located away from areas of flood risk. Also to

reduce and manage the impact of flood risk through location, layout, design, choice of materials and use of Sustainable Drainage Systems.

- Policy CS34 – Rural Areas: development proposals will demonstrate through the preparation of appropriate Flood Risk Assessments, surface water plans and drainage strategies, how flood risk will be managed.

Non-Statutory Technical Standards for Sustainable Drainage

3.12 The Non-Statutory Technical Standards (NTS) for sustainable drainage systems were produced by the Department for Environment, Food and Rural Affairs (DEFRA) in March 2015.

3.13 This states that for greenfield developments, the peak runoff rate to any highway drain, sewer or surface water body for the 1 in 1-year rainfall event and the 1 in 100-year rainfall event should never exceed the peak greenfield rate for the same event.

3.14 Similarly, where reasonably practicable, for greenfield sites, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100-year, 6 hour duration rainfall event should never exceed the greenfield runoff volume for the same event.

3.15 Surface water conveyance routes under exceedance conditions must also be planned for in order to ensure that life and property over the site and surrounding area are not put at risk in the event of drainage system failure or from storms in excess of design standards.

Sequential Test

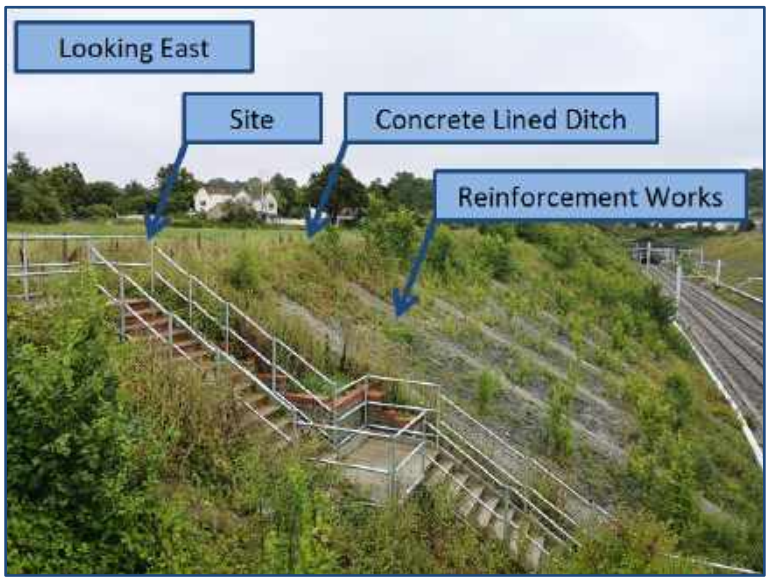
3.16 The Sequential Test aims to steer new development to areas with the lowest probability of flooding. As described earlier, NPPF advises that 'More Vulnerable' development can be included in Flood Zones 1 and 2.

3.17 The site is wholly within Flood Zone 1. As such, the proposed development is considered to be an appropriate land use and the Sequential Test does not need to be applied.

Network Rail Consultation

3.18 The consultation with Network Rail is included in **Appendix D**. This included a site visit on 2nd October 2019 with personnel from Network Rail, to discuss the development proposals and to help understand any particular requirements.

3.19 Network Rail advised that they have recently carried out major works to mitigate nuisance flooding on the rail line. This included works to reinforce the sloped banks of the rail line cutting as well as to the crest drainage channel at the top of the cutting through the use of a concrete cloth lining.



Summary

3.20 The approach taken with the management of flood risk and surface water drainage for the proposed development of the site will be consistent with the policies within the NPPF and practices of the PPG and also with the requirements of SGC as set out in the Core Strategy and in their role as LLFA.

4 ASSESSMENT OF FLOOD RISK

Fluvial and Tidal Flood Risk

4.1 An extract from the Flood Map for Planning is included as **Figure 4.1**. The dark blue areas are Flood Zone 3, light blue areas are Flood Zone 2 and areas with no colour are Flood Zone 1. This shows the site to be wholly located in Flood Zone 1, indicating a low level of flood risk from fluvial and tidal sources.

4.2 These flood extents do not account for the impact of climate change over the development design life. However, given the distance of the site from the nearest flood zone and also the elevation, this is not likely to have an impact.

Figure 4.1 – Flood Map for Planning (Fluvial and Tidal Flooding)

4.3 Flood Zone 1 is described in the NPPF as an area of low fluvial and/or tidal flood risk, with the flood risk vulnerability of this area deemed to be compatible for all development types.

Surface Water Flood Risk

4.4 Surface water flooding is a result of overland flow and ponding due to saturated ground and overloaded drains or sewers that can follow a heavy rainfall event before the runoff enters a watercourse or sewer. This is shown on the Long Term Flood Map, with an extract of this included as **Figure 4.2**.

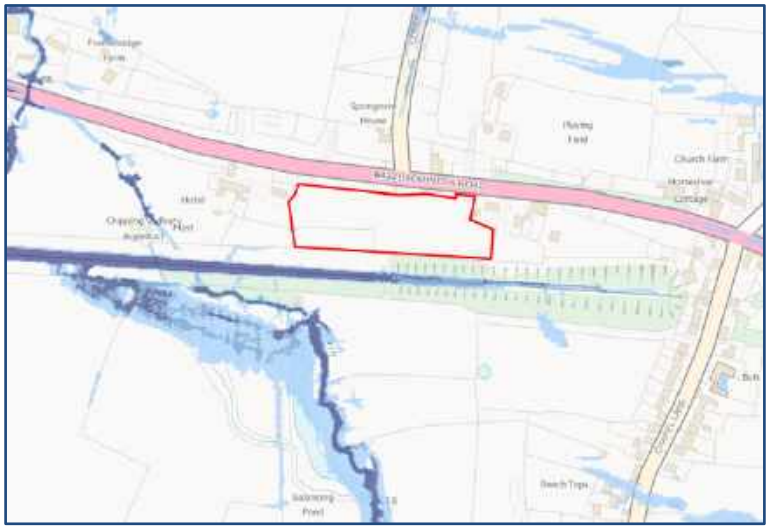


Figure 4.2 – Long Term Flood Risk Map Extract (Surface Water)

4.5 Dark blue areas indicate surface water flooding with a 1 in 30-year chance of occurrence (3.33% AEP); blue indicates surface water flooding with a 1 in 100-year chance of occurrence (1% AEP); and light blue indicates surface water flooding with a 1 in 1000-year chance of occurrence (0.1% AEP).

4.6 This shows the risk from surface water flooding across the whole site to be very low, with a less than 1 in 1000-year chance of occurrence.

4.7 There is surface water flooding shown along the rail line to the south of the site, presumably as a consequence of the rail line having been cut into the natural hillslope, resulting in the ponding of surface water and flooding.

Groundwater Flood Risk

4.8 Groundwater flooding can occur when the water table enter basements and cellars or rises above the ground surface. This type of flooding is more typically associated with low-lying areas underlain by permeable rocks, although it can occur where the groundwater table is perched. This is where groundwater is held within a porous media at an elevation that is higher than the local or regional groundwater table, such as with superficial floodplain deposits.

4.9 Based on the underlying geology and hydrogeology, groundwater flooding is not considered to be a risk for the proposed development of the site.

Drainage and Infrastructure Flood Risk

4.10 Drainage and infrastructure flooding can occur when sewers become overwhelmed and result in flooding, which may occur alone or be combined with other flood sources (e.g. fluvial or surface water).

4.11 A summary of the sewerage infrastructure is provided earlier, which describes there to be a foul sewer that crosses the site. This is a gravity system that drains a small number of dwellings on Chapel Lane to the east of the site. There is no known history of flooding with this foul sewer or a flooding concern.

4.12 There is also a foul sewer to the north of the site along Badminton Road, as well as highway drainage. The road is more elevated than the site. If these systems were to surcharge, then they could flood the site. However, there is no known history of flooding with the foul sewer or highway drain, plus if they were to surcharge then water would generally be contained within the kerbed road carriageway. As such, there is not considered to be a risk.

Other Sources of Flood Risk

4.13 Other sources of flooding include impounded waters, such as reservoirs, lakes and canals. However, there are no known impounded waters in the vicinity of the site, and as such no risk from other sources of flooding.

5 FLOOD MITIGATION

5.1 Following the assessment of flood risk, a series of mitigation and management measures are suggested for proposed development of the site.

Fluvial and Tidal Flooding

5.2 The site is wholly located in Flood Zone 1, with this classified as an area of low fluvial and tidal flood risk. The proposed development is considered to be an appropriate land use for this area.

5.3 From the assessment of fluvial and tidal flooding, there is no requirement for specific flood mitigation measures for the management of the identified risks.

Surface Water Flooding

5.4 The risk of surface water flooding across the site is very low, and would not therefore represent a flood risk to the proposed development.

5.5 However, there is currently some surface water flooding shown along the rail line to the south of the site. The site currently drains to the south towards the Network Rail land and also towards the western drainage channel. The concrete cloth lining of the southern drainage channel and the cutting reinforcement works have recently been completed by Network Rail.

5.6 From the assessment of surface water flooding, there is no requirement for specific flood mitigation measures for the management of the identified risks.

5.7 It will be important to ensure that there will be no adverse impacts resulting from the proposed development on the surface water flooding along the rail line. The key to this will be the measures to manage the surface water runoff from the developed site area, as described in the next section of this FRA.

Groundwater Flooding

5.8 From the assessment of groundwater flooding, there is no requirement for specific flood mitigation measures for the management of the identified risks.

Drainage and Infrastructure Flooding

5.9 From the assessment of drainage and infrastructure flooding, there is no requirement for specific flood mitigation measures for the management of the identified risks.

Other Sources of Flooding

5.10 From the assessment of other sources of flooding, there is no requirement for specific flood mitigation measures for the management of the identified risks.

Additional Mitigation Measures

5.11 All sources of flood risk to and resulting from the proposed development of the site have been identified as being low, and not requiring specific flood mitigation measures.

5.12 However, the finished floor levels (FFL) of buildings should be elevated above surrounding ground levels by at least 150mm in accordance with building regulations and to protect against the possibility of shallow ponding, which can sometimes occur after heavy or prolonged rainfall.

5.13 A surface water drainage strategy would be incorporated, to manage any adverse impacts on the surface water runoff resulting from the proposed development of the site. This is described in the next section of the FRA.

6 SURFACE WATER DRAINAGE STRATEGY

6.1 The NPPF states that flood risk to land and property must not be increased as a result of development, and would need to make an appropriate allowance for the projected impacts resulting from future climate change.

6.2 The national guidance in the NPPF and PPG, the technical design requirements of the NTS, and the local guidance of SGC as the LLFA have been taken into consideration in the surface water drainage assessment. These requirements form the basis of the surface water drainage strategy for the proposed development of the site as described below.

6.3 The key components of a surface water drainage strategy are to consider the potential for infiltration; to determine an appropriate and available discharge receptor; to define the conveyance routes across and from the site; and then, to assess the impact of the development on surface water runoff, and the mitigation measures required to manage these to an acceptable level.

Surface Water Discharge Receptor

6.4 The guidance in the NPPF and also the LLFA promotes the use of the sustainable drainage hierarchy for the discharge of surface water from a site.

6.5 The sustainable drainage hierarchy requires that the following preference should be given when identifying the discharge receptor:

1. Into the ground (infiltration); then
2. To a surface water body; then
3. To a surface water sewer; and then
4. To a combined sewer.

6.6 Surface water discharge options were investigated in the order of preference as specified in the sustainable drainage hierarchy. An infiltration-led drainage solution was not anticipated to be viable, based on the underlying soil type and geology. This was confirmed by the soakaway testing that was completed, included as **Appendix C**. An attenuation-led drainage strategy will therefore be required, draining to an appropriate discharge receptor.

6.7 There are no watercourses crossing or immediately adjacent to the site, with the nearest being the River Frome which is located to the west of the site.

6.8 There are drainage channels adjacent to the site, with these draining west to the River Frome. A connection to these drainage channels was initially proposed, with this towards the top of the sustainable drainage hierarchy.

6.9 The site currently drains to the southern drainage channel through direct drainage channel connections and also as overland flow, given the fall in ground levels across the site. However, Network Rail have indicated their preference for surface water drainage from proposed developments in the local area to not drain into this drainage channel.

6.10 Network Rail would prefer a surface water discharge to be made instead to the River Frome. Although the River Frome is not adjacent to the site, it is adjacent to land that is within the control of the landowner and client. As such, a drainage connection to the River Frome can be delivered if required.

6.11 A discharge to a watercourse is towards the top of the sustainable drainage hierarchy. Features would be included within the site to attenuate the surface water runoff from developed areas to an appropriate runoff rate and volume.

Surface Water Drainage Design

6.12 The greenfield runoff rates for the site were calculated in MicroDrainage. These calculations are included as **Appendix H**, and summarised in **Table 6.1**.

Return Period	Runoff Rate (Site Area)
1 in 1-year (Q_1)	5.8 l/sec
1 in 30 year (Q_{30})	14.2 l/sec
1 in 100-year (Q_{100})	18.1 l/sec
Mean Annual Flood Flow (Q_{BAR})	7.5 l/sec

Table 6.1: Greenfield Runoff Rates (MicroDrainage)

6.13 The surface water drainage strategy would be designed to achieve the Q_{BAR} greenfield runoff rate of 7.5 l/sec. The design rainfall event would be the 1 in 100-year rainfall event with a 40% allowance for future climate change.

6.14 This surface water runoff rate would be achieved through incorporation of the required volume of attenuation within the surface water drainage strategy.

6.15 It is proposed to use an attenuation basin, with the suggested location and conceptual design included as **Appendix H**. The basin would have a top of bank level of 105.05m and a base level of 103.70m (giving a maximum water depth of 1.05m). The basin would include a 0.30m freeboard and would have 1:3 side slope gradients. The basin design would provide 350m^3 of attenuation.

6.16 The attenuation basin would be a landscaped solution, as shown in **Figure 6.1**. Surface water runoff from the basin would be managed through the use of a flow control chamber (hydrobrake). This would provide a managed discharge rate to a swale or pipe which would then drain westwards to the River Frome. This discharge would therefore be agreed with the Environment Agency.

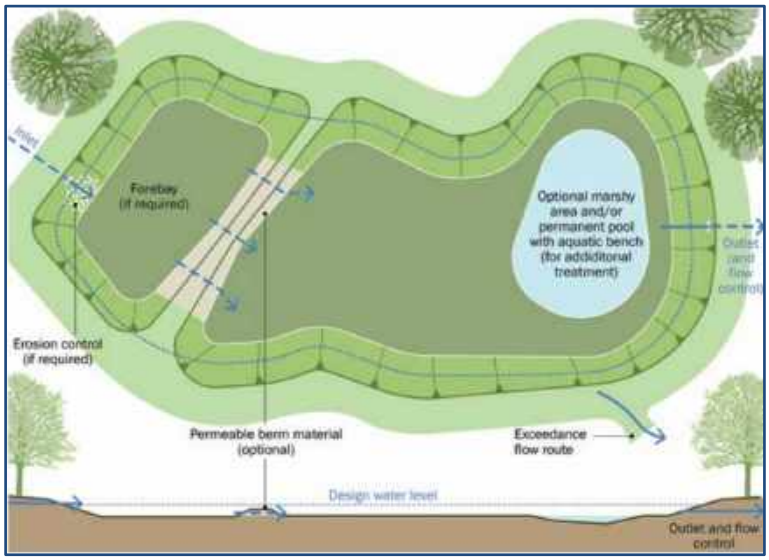


Figure 6.1: Vegetated Attenuation Basin Plan (SuDS Manual)

6.17 In addition to the management of surface water runoff, the attenuation basin would provide other environmental and community benefits (e.g. benefits to water quality, landscape, recreational amenity, ecology, biodiversity).

Conveyance of Surface Water Exceedance

6.18 The surface water drainage strategy has been designed to manage a 1 in 100-year rainfall event with a 40% allowance for future climate change. This

therefore provides additional attenuation for managing current rainfall events. Furthermore, the attenuation basin would include a 0.30m freeboard.

6.19 Rainfall events in excess of the design standard event could potentially flood surrounding areas. Exceedance events should be managed in conveyance routes across and from a site that minimise risk to people and property.

6.20 In an exceedance event, surface water runoff will follow the site topography and be influenced by the proposed layout. As site levels fall towards the south and south-west, this relates to the rail line and to The Sodbury House Hotel.

6.21 The surface water drainage strategy would redirect surface water runoff that currently drains to the southern drainage channel towards an attenuation basin that then discharges at a regulated rate to the River Frome. This is a betterment given the current drainage to the southern drainage channel.

6.22 In an exceedance event, excess water would drain in accordance with the topography to the south, and therefore into the southern drainage channel. Given the proposed discharge of surface water runoff from the attenuation basin to the River Frome, there would be a significant reduction in flow from the site into the southern drainage channel. As such, there would be spare capacity in this channel should it be needed for an exceedance event.

6.23 Whereas for the Sodbury House Hotel, the development proposals are likely to uplift ground levels in the adjacent part of the site, restricting flows from the site. In addition, the surface water drainage strategy would use a piped drainage network to convey surface water runoff from the developed area to the attenuation basin. This would as a consequence significantly reduce the amount of runoff draining from the site into the western drainage channel.

Water Quality

6.24 Water quality control features have been considered in accordance with the CIRIA SuDS Manual (C753). This advises that any proposed drainage scheme must demonstrate that the hazard index for the particular land use is less than the mitigation index of the proposed SuDS features.

6.25 It is considered that the SuDS provided as part of the surface water drainage strategy would offer sufficient water quality mitigation for the land use classification, as demonstrated in **Table 6.2** and **Table 6.3** (informed by Table 26.2 and Table 26.3 of the CIRIA SuDS Manual (C753), respectively).

Land Use	Pollution Hazard Indices		
	Total Suspended Solids	Metals	Hydrocarbons
Residential Roofs	0.20	0.20	0.05
Individual property driveways etc with infrequent change	0.50	0.40	0.40
Total	**0.70**	**0.60**	**0.45**

Table 6.2: Pollution Hazard Indices (SuDS Manual)

Mitigation Measure	Pollution Mitigation Indices		
	Total Suspended Solids	Metals	Hydrocarbons
Detention Basin	0.50	0.50	0.60
Swale	0.25	0.30	0.30
Total	**0.75**	**0.80**	**0.90**

Table 6.3: SuDS Mitigation Indices (SuDS Manual)

6.26 A factor of 0.5 has been applied to the pollution mitigation values typically associated with a swale to account for the reduced performance of secondary or tertiary components associated with already reduced inflow concentrations, as advised by the guidance in the CIRIA SuDS Manual (C753).

Operation and Maintenance

6.27 It is anticipated that the drainage infrastructure across and from the site would be maintained by the local sewerage authority, Wessex Water.

6.28 The site currently drains into a Network Rail maintained drainage channel. The attenuation basin would provide a regulated discharge instead into the River Frome. This would preferably be achieved through the use of a flow control chamber (hydrobrake) draining westwards into a swale or if not into a pipe.

6.29 Potentially following the changes with the implementation of Sewers for Adoption 8, Wessex Water may consider adopting the attenuation basin, to

be determined at detailed design. Whereas components of the surface water drainage strategy that are not adopted would be privately maintained.

6.30 The operation and maintenance requirements as suggested within the CIRIA SuDS Manual (C753) are replicated below as **Figure 6.2** for the attenuation basin and as **Figure 6.3** for the swale.

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Reprofile uneven surfaces and reinstate design levels	As required

Figure 6.2: Attenuation Basin Operation and Maintenance (SuDS Manual)

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Figure 6.3: Swale Operation and Maintenance (SuDS Manual)

Foul Drainage

6.31 The site would be served by a foul drainage network, with this connecting to the public foul sewer. The local sewer network and manhole levels as supplied by Wessex Water are included as **Figure 6.2**.

6.32 There is a foul sewer that crosses the site, and it is likely that this will be diverted as part of the development proposals. This will need to ensure that there is no adverse impact to the properties on Chapel Lane that drain to this foul sewer. Foul drainage connections to the diverted foul sewer may be possible, although this would need to be agreed with Wessex Water.

6.33 The conceptual design for the foul drainage strategy has been included as **Appendix H**. Initial consultation has been completed with Wessex Water, including an extension of the sewer diversion off-site beneath the allotments. This would achieve the same as the existing sewer gradient, as requested by Wessex Water and also would upsize the pipework to 300mm. Wessex Water responded advising that they could see no obvious issues with the proposal.

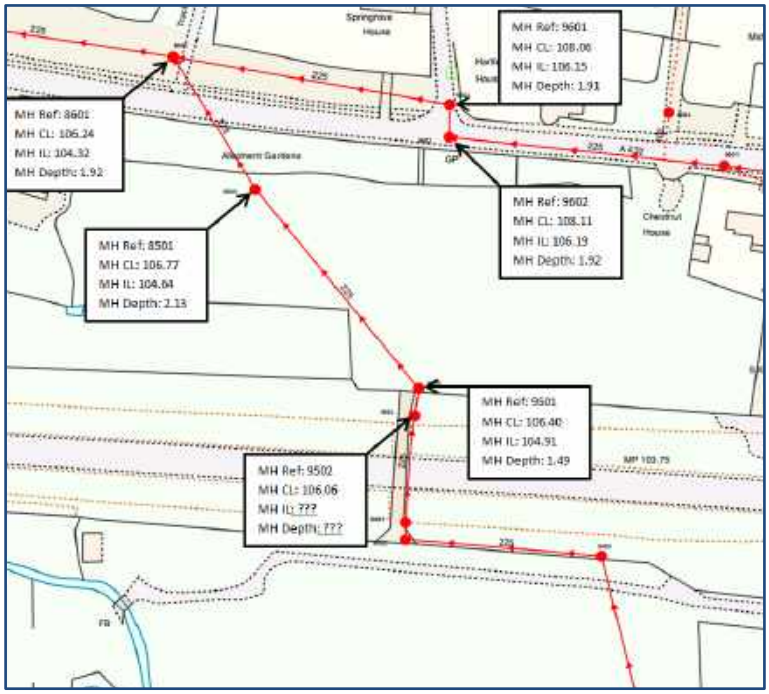


Figure 6.2 – Wessex Water Sewer Map and Supplied Manhole Levels

7 CONCLUSIONS

7.1 This Flood Risk Assessment has been prepared by Andy Clay Consulting on behalf of Clifton Homes for a proposed residential development of a site to the south of Badminton Road in Old Sodbury, South Gloucestershire.

7.2 The site is a roughly rectangular area of 1.504 ha. The current land use is as a grassed field. However, the site has recently seen use by Network Rail as a construction compound, but the area has been restored to a grassed field.

7.3 The proposed development would include 36 residential dwellings with private gardens located off an internal road and with landscaped areas, notably within the south-western part of the site where an attenuation basin is to be located.

7.4 Ground levels across the site tend to fall from the northern boundary to the south and west, and are lowest in the south-western part of the site.

7.5 The site is within the hydrological catchment of the River Frome. There are drainage channels adjacent to the western, south-western and southern site boundaries. These drain into the southern drainage channel, which itself drains westwards into the River Frome.

7.6 The site is wholly located in Flood Zone 1, indicating a low level of fluvial and tidal flood risk. The risk of surface water flooding is low. There are not considered to be any other sources of flooding that affect the site.

7.7 Given this assessment, the proposed development is an appropriate land use and no specific flood mitigation measures are required. However, the finished floor levels (FFL) of buildings should be elevated above surrounding ground levels by at least 150mm in accordance with building regulations. In addition, a surface water drainage strategy would be incorporated into the proposed development, to manage any adverse impacts on the surface water runoff.

7.8 Surface water discharge options were investigated in the order of preference specified in the sustainable drainage hierarchy. Based on the underlying soil type, geology and hydrogeology and following completion of soil infiltration testing, an infiltration-led drainage solution was not considered to be viable.

7.9 There are no watercourses immediately adjacent to the site. The southern drainage channel drains westwards into the River Frome, and would be an appropriate discharge receptor. However, this is within Network Rail land, who have indicated their preference for surface water drainage from proposed developments in the local area to not drain into this drainage channel.

7.10 Although the River Frome is not adjacent to the site, it is adjacent to land that is within the overall control of the landowner and client. As such, a drainage connection from the site to the River Frome can be delivered if required.

7.11 A surface water drainage strategy was developed using MicroDrainage, with runoff from the site draining at the Q_{BAR} runoff rate to the River Frome.

7.12 The attenuation would be achieved through the use of an attenuation basin located in the south-western part of the site and also through oversized pipes. A hydrobrake would control the runoff rate, discharging preferably into a swale or if not then a pipe than drains to the River Frome. Ground levels in the western part of the site would be raised for the conveyance of surface water.

7.13 The drainage strategy provides betterment over the existing runoff rates, and allows for climate change. Rainfall events that exceed the design standard would be managed to avoid adverse impacts on adjacent people and property, notably the rail line to the south and the Sodbury House Hotel.

7.14 It is considered that the SuDS provided as part of the surface water drainage strategy would provide additional community and environmental benefits, and offer sufficient water quality mitigation for the land use classification.

7.15 It is anticipated that the drainage infrastructure across and from the site would be adopted by Wessex Water. The surface water drainage strategy includes an attenuation basin and a hydrobrake, which Wessex Water may also consider adopting. A private management company would be used for maintaining any parts of the drainage strategy that were not adopted.

7.16 The site would be served by a foul drainage network, with this anticipated to connect to the public foul sewer. There is a foul sewer that crosses the site, and it is likely that this will be diverted as part of the development proposals.

This will need to ensure that there is no adverse impact to the properties on Chapel Lane that drain to this foul sewer.

7.17 Initial consultation has been completed with Wessex Water on the conceptual foul drainage strategy. An extension of the sewer diversion off-site would achieve the same as the existing sewer gradient, as requested by Wessex Water and also would upsize the pipework to 300mm. Wessex Water responded advising that they could see no obvious issues with the proposal.

7.18 In summary, the proposed development of the site is considered to be appropriate in terms of flood risk. A surface and foul water strategy would be incorporated to manage the drainage resulting from the proposed development of the site in an appropriate way.

Appendix A

Proposed Site Layout

OLD SODBURY **PLANNING LAYOUT**

13351/SCH001

Accommodation Schedule

REV - G

Redcliffe. HOMES

Site :	Badminton Road, Old Sodbury	DWG No:	13351/5000D	Date:	22/02/2021

House type Code	No of Unit	House Name	Open Market / Social	No of Storey	Apartment / House / FOG	No. of Beds	Net Sales Area ft²	Net Sales Area m²
A03	5	Axminster	Open Market	2	HOUSE	2	843ft²	78.3
-	2	Berkeley	Open Market	1	BUNG	2	867ft²	80.5
B03	3	Sherston	Open Market	2	HOUSE	3	1034ft²	96.1
B05	2	Dyrham	Open Market	2	HOUSE	3	1167ft²	108.4
B06	3	Foxham	Open Market	2	HOUSE	3	1183ft²	109.9
C02	3	York	Open Market	2	HOUSE	4	1306ft²	121.3
C17	5	Banbury	Open Market	2	HOUSE	4	1530ft²	142.1
HA- M4(3)	1	1B 2P	Social	1	MAISONETTE	1	758ft²	70.4m²
HA - APT	1	2B 4P	Social	1	MAISONETTE	1	828ft²	76.9m²
HA- A22	4	2B 4P	Social	2	HOUSE	2	864ft²	80.3m²
HA- B31	2	3B 5P	Social	2	HOUSE	3	1018ft²	94.6m²
HA- B33	3	3B 5P	Social	2	HOUSE	3	1038ft²	96.4m²
HA-C41	1	4B6P	Social	2	HOUSE	4	1163ft²	108.0m²

The percentage of the total land area that is affordable is:

Total Units

Total Open Market	23	66%
Total Social	12	34%
TOTAL NO OF UNITS	35	

Internal Areas

Open Market	26498ft²	**2461.8m²**
Affordable	11355ft²	1054.9m²
TOTAL INTERNAL AREA	37853ft²	3516.7m²

Key

- Application boundary
- Adoptable Highway (see Engineers details)
- Adoptable Footpath (see Engineers details)
- Private Path
- Private Drive
- Private Front gardens
- Public Verge/Landscape
- Existing Trees
- Proposed Trees
- Removed Trees
- Attenuation pond (see Engineers details)
- Rear gate
- Affordable Housing - Rented
- Affordable Housing - Shared Ownership
- Refuse and Recycling Bins
- Storage Shed
- Bin Collection Point
- Plot Number / Parking Number / Visitor Parking
- PROW Route

0 10 20 30 40 50 m

Amendments		By	Date
H	Additional rear access gates added as per DOCO comments.	LG	15/4/21
G	Roof material added.	LG	12/4/21
F	Substation added north of Plot 1. Additional landscape added based on LVIA report.	LG	6/4/21
E	Plot 35 moved west by 2m	LG	4/3/21
D	Plot 29 changed from 2B4P AH unit to Axminster. Plots 34 (Banbury) & 35 (Sherwood) replaced with Berkeley. Plot 36 - Sherwood omitted.	LG	22/2/21
C	Gas supply tanks added.	LG	28/1/21
B	Maisonette footprint amended.	LG	14/1/21
A	Turning head amended inline with consultant drawing.	LG	8/1/21

PLANNING

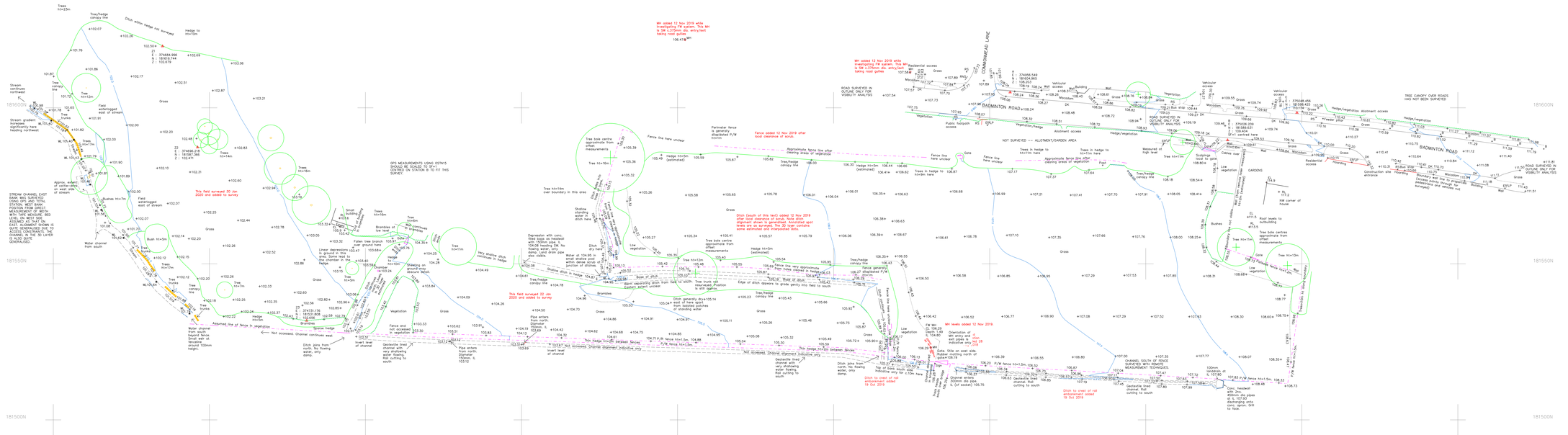
Job No/Drawing No	Job Title
13351/5000H	Badminton Road, Old Sodbury
Scale 1:500 @ A1 / Date 12/20 / Drawn LG	Drawing Title: Planning Layout

All Dimensions to be checked on site — OS Licence No: 100022432

pad Design Ltd - The Tobacco Factory - Raleigh Road - Bristol BS3 1TF - Tel. 0117 9530059 - www.pad-design.com

Appendix B

Topographical Survey



© Alan Wade Site Engineering Ltd.

Notes:
1.This drawing should only be used for its original intended purpose.
2.Critical dimensions, levels, clearances etc. should be checked on site before construction work commences.
3.Detail obscured at time of survey may not be recorded.
4.Grid and datum relate to OSGB36 National grid and OS datum Newlyn established using network RTK GPS (Leica Smartnet). OSTN15 and OSGM15 used. This has been scaled to SF=1.
5.Dimensions in metres unless otherwise stated.
6.Contours at 1.0m vertical intervals.

Legend

B	Bollard
BB	Belisha Beacon
BH	Borehole
BT	British Telecom cover
B/W	Barbed Wire
CATV	Cable television cover
C/B	Close Boarded
C/L	Chain Link
CL	Cover Level
CH	Ceiling Height
Conc.	Concrete
C/P	Chestnut Paling
DK	Drop Kerbs
EL	Eaves Level
Elec.	Electricity Inspection Cover
El.Sub.Sta.	Electricity Sub Station
EP	Electricity Pole
ER	Earth Rod
FH	Fire Hydrant
FW	Foul Water sewer
	Gate (Double)
	Gate (Single)
G	Gully
GV	Gas Valve
IC	Inspection Chamber
IL	Invert Level
LB	Letter Box
LP	Lamp Post
MH	Manhole
Mkr.	Marker
P/R	Post and Rail
P/W	Post and wire
RE	Rodding Eye
RL	Ridge Level
RNS	Road Name Sign
RW	Retaining Wall
RS	Road Sign
RSD	Roller Shutter Door
RWP	Rain Water Pipe
ST	Stop Tap
SV	Stop Valve
SVP	Soil & Vent Pipe
SW	Surface Water Sewer
	Survey Station
TCB	Telephone Call Box
TL	Traffic Light
TP	Telegraph Pole
UTL	Unable To Lift
WL	Water level
WM	Water Meter
WO	Wash out
WV	Water valve

Bank(top/bottom)
Tree Canopy
Edge of Surface
Edge of Hedge/ Vegetation
Fence
Kerbs, Walls etc.
Bank (No contours)

Revision	Comment	Date

ALAN WADE SITE ENGINEERING LIMITED

LAND SURVEYS AND VOLUMETRIC CALCULATIONS FOR EARTHMOVING OPERATIONS

surveys@awsel.co.uk

REGISTERED IN ENGLAND AND WALES COMPANY NO. 3238810. REGISTERED OFFICE: THE MEWS, KENNETS RD, CHIPPING SODBURY, BRISTOL BS37 6EZ

Project
LAND AT OLD SODBURY
PROPOSED HOUSING DEVELOPMENT

Client
CLIFTON HOMES

Drawing Title
TOPOGRAPHICAL SURVEY
EXTENDED TO WEST

Drawn Date	Surveyed Date
01/02/20	Jan 2020

Scale
1:500 (AT A0)

Drawing Number	Rev
GRP/040/02	–

Appendix C

Soil Infiltration Testing

Soakaway Test Results –
Old Sodbury, BS37 6LX

Hydrogeo attended site on 05/09/2019. Ten test pits were excavated by a tracked mini excavator. Additionally, eight of these pits were used to perform soakaway tests to assess the infiltration rates present on the site.

The location of the test pits is indicated on the Appended Trial Pit Location Plan.

Ground Conditions

Geological mapping of the site indicates that the property is underlain by the Charmouth Mudstone Formation, which presents as a dark grey laminated shale, and dark, pale and blueish grey mudstones.

Soils encountered during the fieldwork generally consisted of dark brown silty topsoil over brownish-brown or blueish-grey firm to stiff clay from approximately 0.25 metre below ground level. Full details of the soils encountered in each soakaway pit can be viewed on the Trial Pit Log sheet Appended to this letter.

Weather conditions were sunny with some cloud cover but dry during the fieldwork. The latest hydrological outlook for the UK, published by the Natural Environment Research Council (NERC) indicates that the nearest groundwater levels range between within normal ranges' and significantly below average' in August 2019. No seepages or groundwater inflows were noted in the excavated trial pits during the fieldwork.

Soakaway Tests

Trial test pits were excavated within the property boundaries to depths of up to 2.3m. Soakaway tests were conducted within pits up to 1.4m in depth.

Three consecutive tests were carried out in soakaway pit TP1 C at shallow depths, allowing a design soil infiltration rate to be calculated.

The soils encountered in most pits were predominantly clayey, and only a small drop in the water level was recorded throughout the day. As a result, it is not possible to calculate a design soil infiltration rate for these pits.

Soakaway Test Results

The soakaway test results are summarised in the table below. Full results and calculations are presented in the appended soakaway test spreadsheets.

Test Pit	Depth (m)	Test result (m/s)			Design soil infiltration rate (m/s)
		Test 1	Test 2	Test 3	
TP1 C	0.45	1.06×10^{-4}	1.61×10^{-5}	Test not completed	1.61×10^{-5}
TP4 B	2.00	8.68×10^{-6}	-	-	8.68×10^{-6}

All other test pits returned infiltration values too low to calculate an infiltration rate.

HYDROGEO
Groundwater and Environment

HYG668 Old Sodbury

Drawing 1

Trial Pit Locations

KEY

- Site Boundary
- Trial Pit and Soakaway Test Locations
- Trial Pit Locations

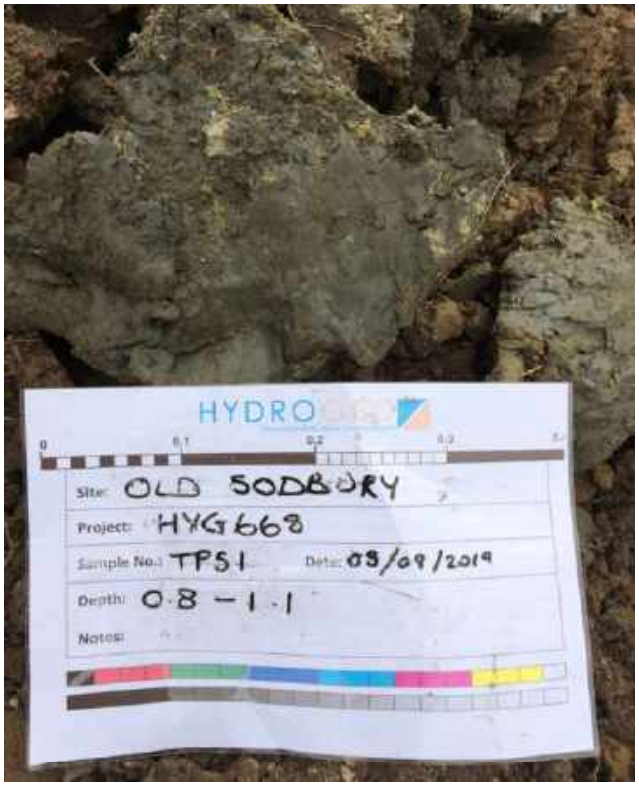
10 0 10 20 30 40 50 m

Date	By	Paper	Scale	Rev
09 2019	DD	A3	1:750	1

Old Sodbury Trial Pit Logs 05/09/2019
Logged by David Dascombe
Weather: Mainly dry, generally sunny or overcast

	Depth to Base (m)	Description
TP1 (TPD1)	0.0 - 0.2	Brown silty, slightly gravelly, clayey TOPSOIL with rootlets. Gravels range from fine to medium in size.
	0.2 - 0.65	Brown, slightly sandy, silty, clay SUBSOIL with few rootlets. No gravels seen.
	0.65 - 2.3	Brownish grey to bluish grey CLAY. Firm to stiff in consistancy. Brown discontinuous sandy band of discolouration observed between 0.6-1.1m.
	Notes:	Excavator struggling in stiff clay. Pit named TPD1 on photo board.

	Depth to Base (m)	Description
TP1 B (TPS1)	0.0 - 0.3	Brown silty, slightly gravelly, clayey TOPSOIL with rootlets. Gravels range from fine to medium in size.
	0.3 - 0.8	Brown, slightly sandy, silty, clay SUBSOIL with few rootlets. No gravels seen.
	0.8 - 1.1	Brownish grey to blueish grey, firm to stiff CLAY.
	Notes:	Excavator struggling in stiff clay. Pit named TPS1 on photo board.



	Depth to Base (m)	Description
TP1 C (TPS1 B)	0.0 - 0.3	Brown, slightly sandy, gravelly, clayey TOPSOIL with abundant rootlets. Fine to medium gravel inclusions.
	0.3 - 0.45	Brown, sandy, silty CLAY. Rare rootlets and fine to coarse gravel inclusions.
	Notes:	Pit named TPS1 B on photo board.

	Depth to Base (m)	Description
TP2	0.0 - 0.2	Brown, clayey, silty, slightly sandy TOPSOIL with abundant rootlets.
	0.2 - 0.6	Yellowish brown, slightly silty, firm CLAY.
	0.6 - 1.4	Grey stiff CLAY
	Notes:	Gradual transition between the yellowish and grey clays.

	Depth to Base (m)	Description
TP2 B	0.0 - 0.15	Brown, clayey, silty, slightly sandy TOPSOIL with abundant rootlets.
	0.15 - 0.65	Yellowish brown, slightly silty, firm CLAY.
	Notes:	Gravel filled trench at 0.2m. Includes medium to coarse gravels. The water shown within the trench is not groundwater.

	Depth to Base (m)	Description
TP2 C	0.0 - 0.18	Brown, clayey, silty, slightly sandy TOPSOIL with abundant rootlets.
	0.18 - 0.38	Brown, slightly silty, firm CLAY. Yellowish brown in places.
	Notes:	Gravel filled trench at 0.2m. Includes medium to coarse gravels.

	Depth to Base (m)	Description
TP3	0.0 - 0.2	Brown, slightly sandy, gravelly, clayey TOPSOIL with rootlets. Rare coarse gravel inclusions.
	0.2	Thin gravelly layer with gravells ranging from fine to medium, some plastics observed.
	0.2 - 0.6	Yellowish brown, sandy, silty CLAY subsoil. Few rootlet and some gravel inclusions ranging from fine to coarse. Gravells are crystalline in nature, probably a limestone, potentially Cotswald Stone.
	0.6 - 1.0	Light grey, sandy, silty CLAY subsoil. Some gravel inclusions ranging from fine to coarse.
	Notes:	Land-drain encountered at 0.4m. Transition between yellowish and grey clay is gradual.

	Depth to Base (m)	Description
TP4	0.0 - 0.3	Brown, sandy, gravelly, mostly clayey TOPSOIL with rootlets. Rare fine to coarse gravel inclusions.
	0.3 - 0.7	Yellowish brown, sandy, silty CLAY subsoil. Few rootlet and some gravel inclusions ranging from fine to coarse. Gravells are potentially Cotswald Stone.
	0.7 - 0.95	Light grey, sandy, silty CLAY. Some gravel inclusions ranging from fine to coarse.
	Notes:	Transition between yellowish and grey clay is gradual.

	Depth to Base (m)	Description
TP4 B	0.0 - 0.3	Brown, sandy, gravelly, mostly clayey TOPSOIL with rootlets. Rare fine to coarse gravel inclusions.
	0.3 - 0.42	Brown, yellowish in places, sandy, silty CLAY subsoil. Few rootlet and some gravel inclusions ranging from fine to coarse. Gravells are potentially Cotswald Stone.
	Notes:	

	Depth to Base (m)	Description
TP5	0.0 - 0.31	Brown, slightly sandy, gravelly, clayey TOPSOIL with abundant rootlets. Fine to medium gravel inclusions.
	0.31 - 0.47	Yellowish brown, sandy, silty CLAY. Rare rootlets and gravel inclusions of fine to coarse.
	Notes:	

TP1 B		Length (m)	3.00
Date	05/09/2019	Width (m)	0.56
Site	Old Sodbury	Depth (m)	1.10
Job Number	HYG668	Groundwater Level (mbgl)	

HYDROGEO Groundwater and Environment

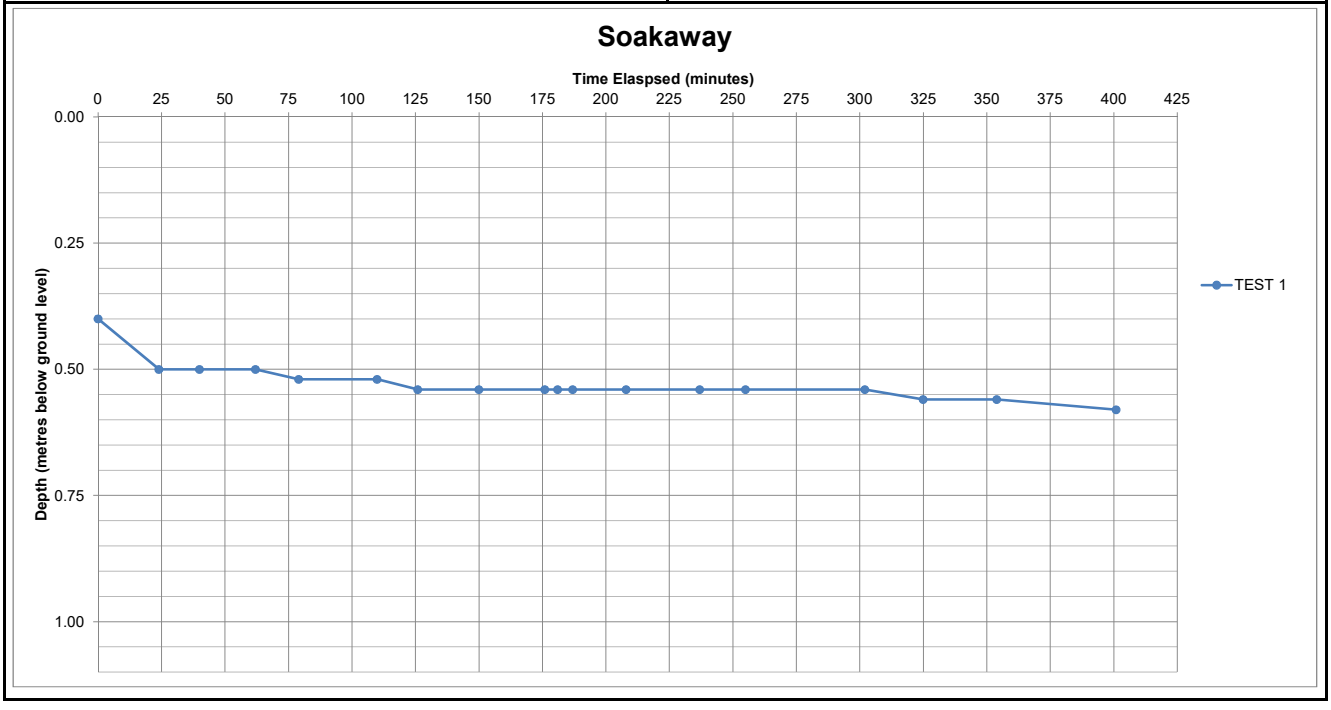
SOIL INFILTRATION RATE TEST

See B.R.E. Digest 365, 2016, Soakaway Design.

Remarks -

TEST 1		TEST 2		TEST 3	
Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
	0.00		0.00		0.00
0	0.40				
24	0.50				
40	0.50				
62	0.50				
79	0.52				
110	0.52				
126	0.54				
150	0.54				
176	0.54				
181	0.54				
187	0.54				
208	0.54				
237	0.54				
255	0.54				
302	0.54				
325	0.56				
354	0.56				
401	0.58				

Effective Storage Depth	**m**	1.10	1.10	1.10
75% Effective Storage Depth	**m**	0.83	0.83	0.83
(i.e. depth below GL)	**m**	0.28	0.28	0.28
25% Effective Storage Depth	**m**	0.28	0.28	0.28
(i.e. depth below GL)	**m**	0.83	0.83	0.83
Effective Storage Depth 75%-25%	**m**	0.55	0.55	0.55
Time to fall to 75% effective depth	**mins**	N/A		
Time to fall to 25% effective depth	**mins**	N/A		
V (75%-25%)	**m3**	0.9240	0.9240	0.9240
a (50%)	**m2**	5.5960	5.5960	5.5960
t (75%-25%)	**mins**	#VALUE!	0.0000	0.0000
SOIL INFILTRATION RATE	**m/s**	**Unable to Calculate - Infiltration too Low**	**Not Calculated**	**Not Calculated**
DESIGN SOIL INFILTRATION RATE, f	**m/s**	**Unable to Calculate - Infiltration too Low**		



TP1 C		Length (m)	3.00
Date	05/09/2019	Width (m)	0.55
Site	Old Sodbury	Depth (m)	0.45
Job Number	HYG668	Groundwater Level (mbgl)	

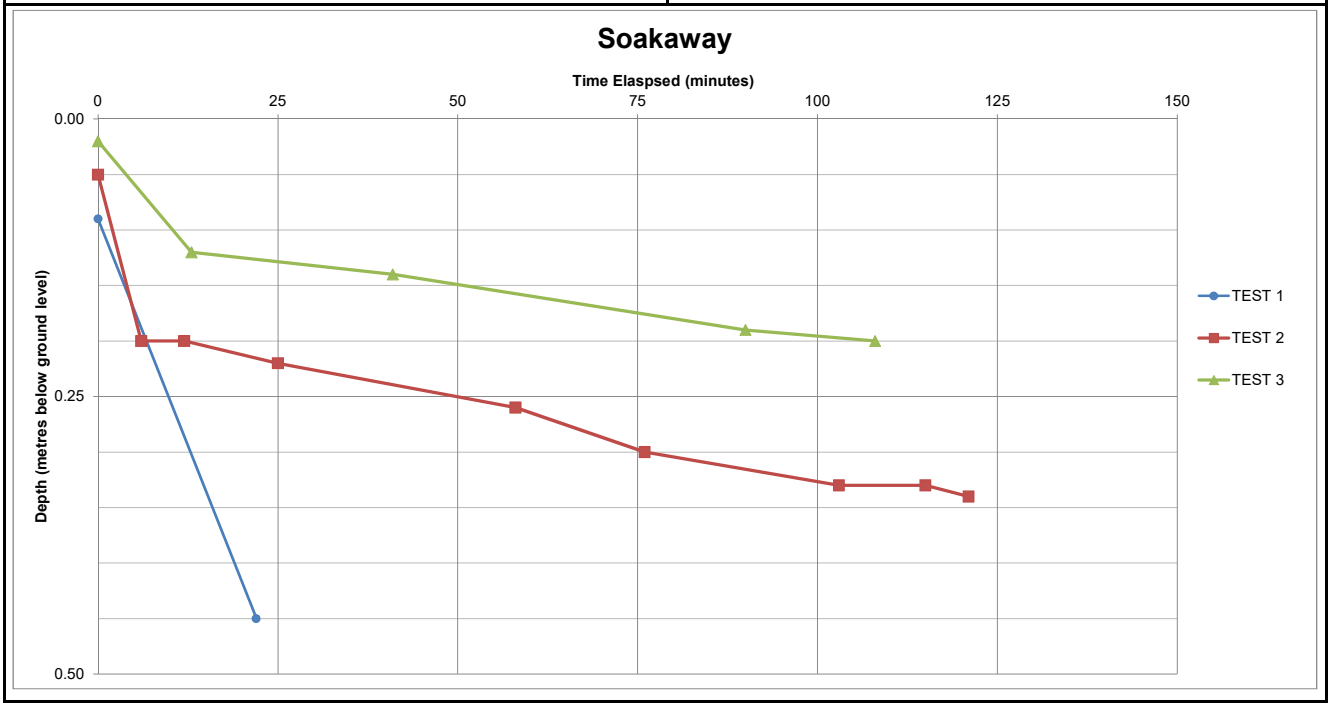
HYDROGEO Groundwater and Environment

SOIL INFILTRATION RATE TEST

See B.R.E. Digest 365, 2016, Soakaway Design.

Remarks -	TEST 1		TEST 2		TEST 3	
	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
		0.00		0.00		0.00
	0	0.09	0	0.05	0	0.02
	22	0.45	6	0.20	13	0.12
			12	0.20	41	0.14
			25	0.22	90	0.19
			58	0.26	108	0.20
			76	0.30		
			103	0.33		
			115	0.33		
			121	0.34		

Effective Storage Depth	m	0.45	0.45	0.45
75% Effective Storage Depth	m	0.34	0.34	0.34
(i.e. depth below GL)	m	0.11	0.11	0.11
25% Effective Storage Depth	m	0.11	0.11	0.11
(i.e. depth below GL)	m	0.34	0.34	0.34
Effective Storage Depth 75%-25%	m	0.23	0.23	0.23
Time to fall to 75% effective depth	mins	2	3	11
Time to fall to 25% effective depth	mins	20	121	N/A
V (75%-25%)	m3	0.3713	0.3713	0.3713
a (50%)	m2	3.2475	3.2475	3.2475
t (75%-25%)	mins	18.0000	118.0000	#VALUE!
SOIL INFILTRATION RATE	m/s	1.06E-04	1.61E-05	Unable to Calculate - Infiltration too Low
DESIGN SOIL INFILTRATION RATE, f	m/s	1.61E-05		



TP2		Length (m)	3.10
Date	05/09/2019	Width (m)	0.50
Site	Old Sodbury	Depth (m)	1.40
Job Number	HYG668	Groundwater Level (mbgl)	

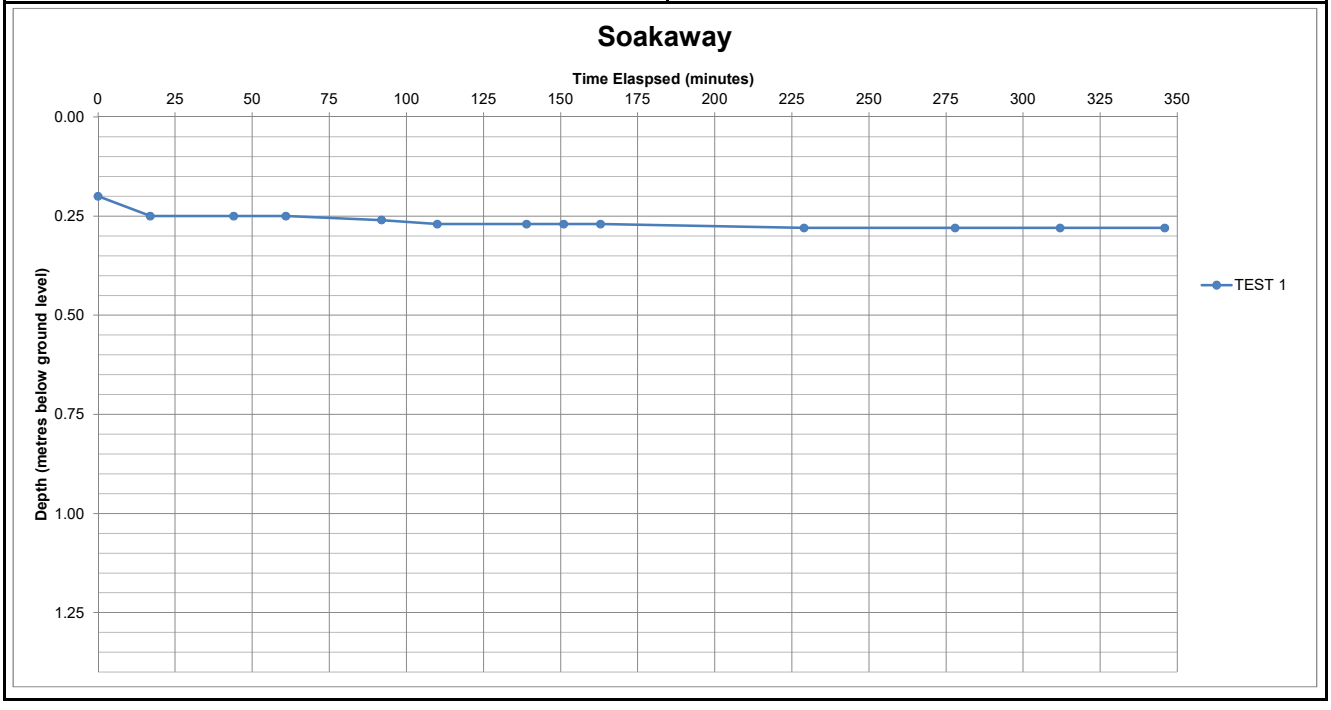
HYDROGEO
Groundwater and Environment

SOIL INFILTRATION RATE TEST
See B.R.E. Digest 365, 2016, Soakaway Design.

Remarks -

TEST 1		TEST 2		TEST 3	
Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
	0.00		0.00		0.00
0	0.20				
17	0.25				
44	0.25				
61	0.25				
92	0.26				
110	0.27				
139	0.27				
151	0.27				
163	0.27				
229	0.28				
278	0.28				
312	0.28				
346	0.28				

Effective Storage Depth	**m**	1.40	1.40	1.40
75% Effective Storage Depth	**m**	1.05	1.05	1.05
(i.e. depth below GL)	**m**	0.35	0.35	0.35
25% Effective Storage Depth	**m**	0.35	0.35	0.35
(i.e. depth below GL)	**m**	1.05	1.05	1.05
Effective Storage Depth 75%-25%	**m**	0.70	0.70	0.70
Time to fall to 75% effective depth	**mins**	N/A		
Time to fall to 25% effective depth	**mins**	N/A		
V (75%-25%)	**m3**	1.0850	1.0850	1.0850
a (50%)	**m2**	6.5900	6.5900	6.5900
t (75%-25%)	**mins**	#VALUE!	0.0000	0.0000
SOIL INFILTRATION RATE	**m/s**	**Unable to Calculate - Infiltration too Low**	**Not Calculated**	**Not Calculated**
DESIGN SOIL INFILTRATION RATE, f	**m/s**	**Unable to Calculate - Infiltration too Low**		



TP2 C		Length (m)	2.65
Date	05/09/2019	Width (m)	0.60
Site	Old Sodbury	Depth (m)	0.38
Job Number	HYG668	Groundwater Level (mbgl)	

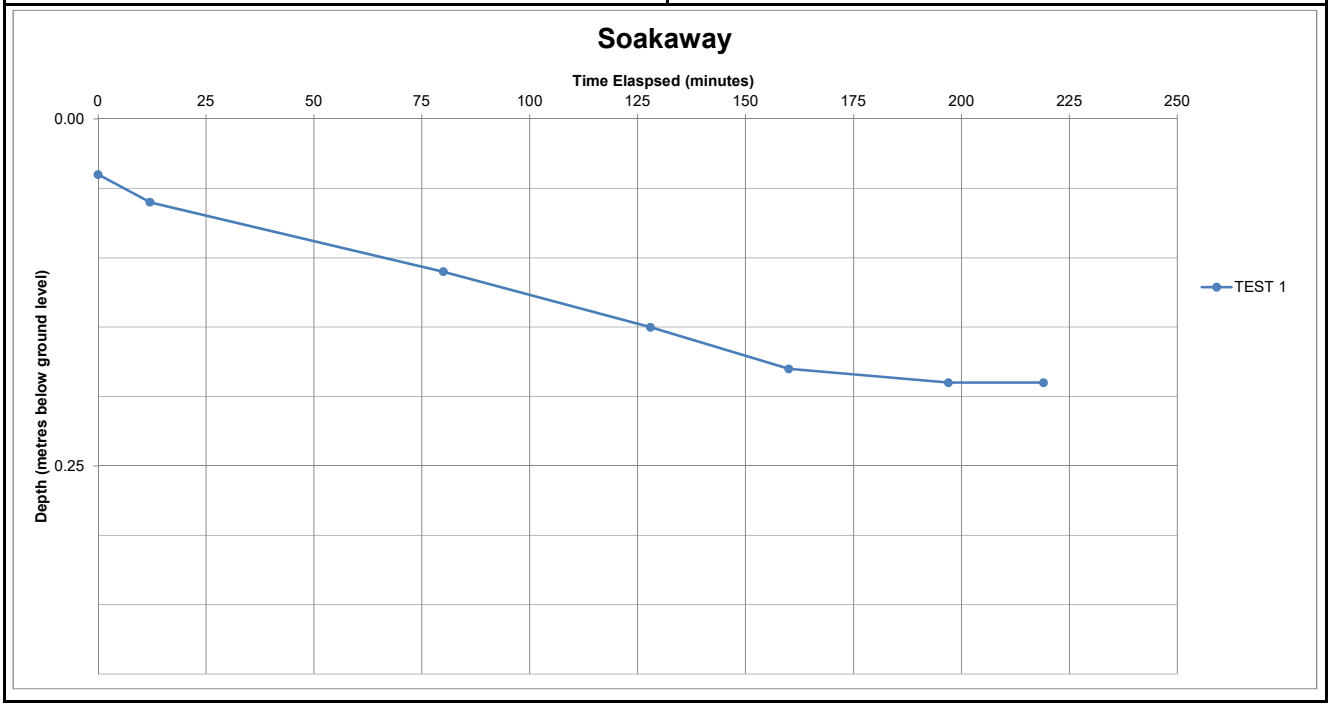
HYDROGEO Groundwater and Environment

SOIL INFILTRATION RATE TEST

See B.R.E. Digest 365, 2016, Soakaway Design.

Remarks -	TEST 1		TEST 2		TEST 3	
	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
		0.00		0.00		0.00
	0	0.04				
	12	0.06				
	80	0.11				
	128	0.15				
	160	0.18				
	197	0.19				
	219	0.19				

Effective Storage Depth	m	0.38	0.38	0.38
75% Effective Storage Depth	m	0.29	0.29	0.29
(i.e. depth below GL)	m	0.10	0.10	0.10
25% Effective Storage Depth	m	0.10	0.10	0.10
(i.e. depth below GL)	m	0.29	0.29	0.29
Effective Storage Depth 75%-25%	m	0.19	0.19	0.19
Time to fall to 75% effective depth	mins	68		
Time to fall to 25% effective depth	mins	N/A		
V (75%-25%)	m3	0.3021	0.3021	0.3021
a (50%)	m2	2.8250	2.8250	2.8250
t (75%-25%)	mins	#VALUE!	0.0000	0.0000
SOIL INFILTRATION RATE	m/s	Unable to Calculate - Infiltration too Low	Not Calculated	Not Calculated
DESIGN SOIL INFILTRATION RATE, f	m/s	Unable to Calculate - Infiltration too Low		



TP3		Length (m)	3.05
Date	05/09/2019	Width (m)	0.50
Site	Old Sodbury	Depth (m)	1.00
Job Number	HYG668	Groundwater Level (mbgl)	

HYDROGEO Groundwater and Environment

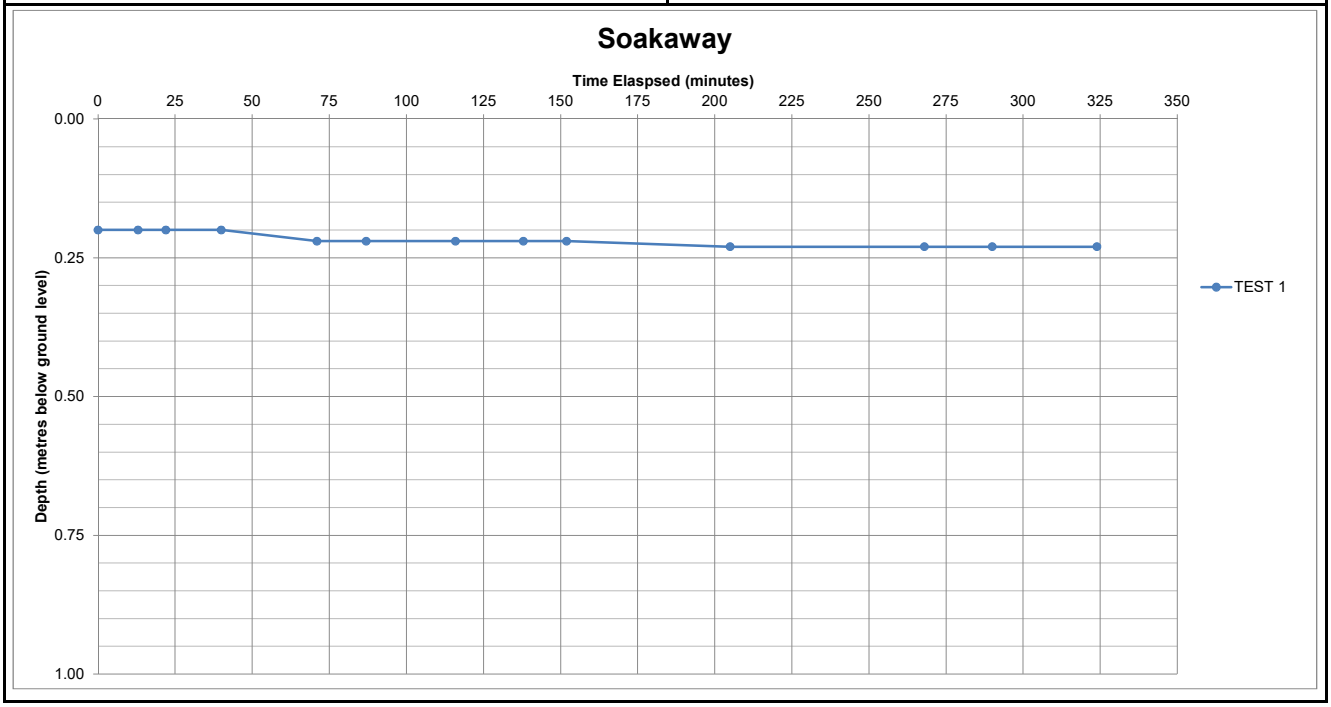
SOIL INFILTRATION RATE TEST

See B.R.E. Digest 365, 2016, Soakaway Design.

Remarks -

TEST 1		TEST 2		TEST 3	
Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
	0.00		0.00		0.00
0	0.20				
13	0.20				
22	0.20				
40	0.20				
71	0.22				
87	0.22				
116	0.22				
138	0.22				
152	0.22				
205	0.23				
268	0.23				
290	0.23				
324	0.23				

Effective Storage Depth	**m**	1.00	1.00	1.00
75% Effective Storage Depth	**m**	0.75	0.75	0.75
(i.e. depth below GL)	**m**	0.25	0.25	0.25
25% Effective Storage Depth	**m**	0.25	0.25	0.25
(i.e. depth below GL)	**m**	0.75	0.75	0.75
Effective Storage Depth 75%-25%	**m**	0.50	0.50	0.50
Time to fall to 75% effective depth	**mins**	N/A		
Time to fall to 25% effective depth	**mins**	N/A		
V (75%-25%)	**m3**	0.7625	0.7625	0.7625
a (50%)	**m2**	5.0750	5.0750	5.0750
t (75%-25%)	**mins**	#VALUE!	0.0000	0.0000
SOIL INFILTRATION RATE	**m/s**	**Unable to Calculate - Infiltration too Low**	**Not Calculated**	**Not Calculated**
DESIGN SOIL INFILTRATION RATE, f	**m/s**	**Unable to Calculate - Infiltration too Low**		



TP4		Length (m)	2.90
Date	05/09/2019	Width (m)	0.50
Site	Old Sodbury	Depth (m)	0.95
Job Number	HYG668	Groundwater Level (mbgl)	

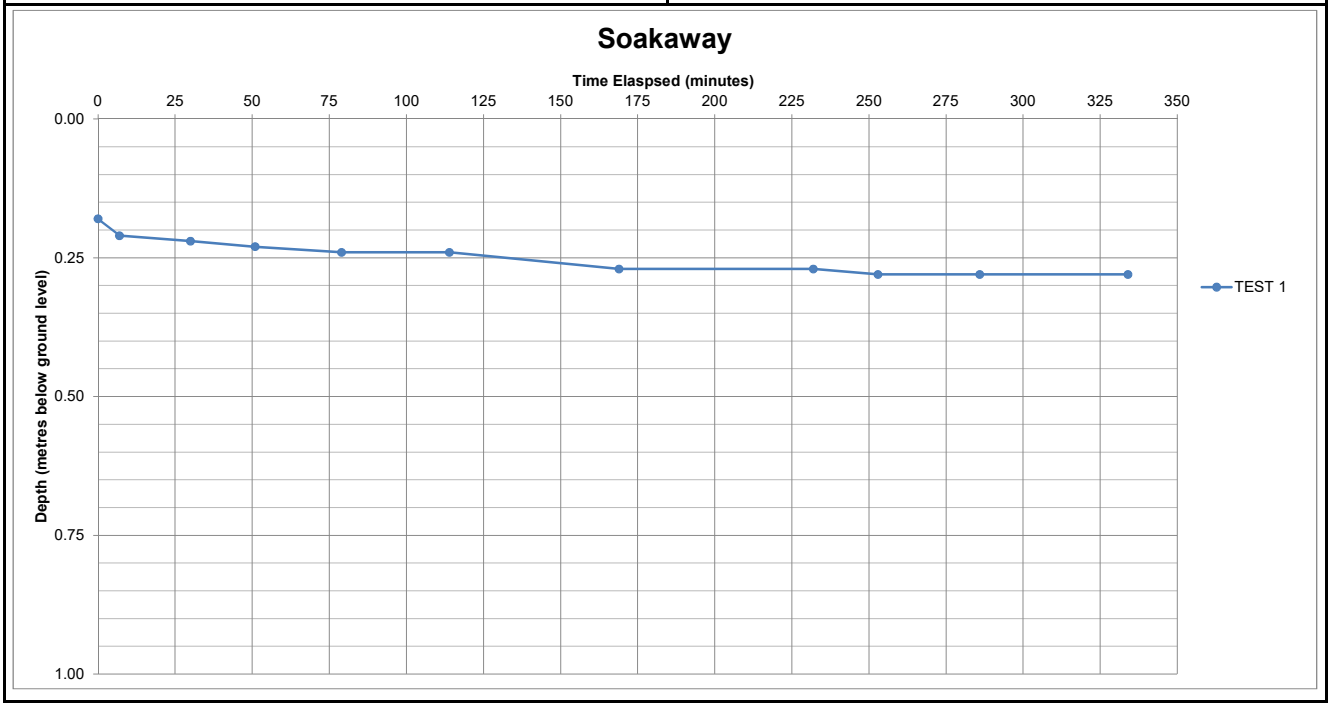
HYDROGEO Groundwater and Environment

SOIL INFILTRATION RATE TEST

See B.R.E. Digest 365, 2016, Soakaway Design.

Remarks -	TEST 1		TEST 2		TEST 3	
	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
		0.00		0.00		0.00
	0	0.18				
	7	0.21				
	30	0.22				
	51	0.23				
	79	0.24				
	114	0.24				
	169	0.27				
	232	0.27				
	253	0.28				
	286	0.28				
	334	0.28				

Effective Storage Depth	**m**	0.95	0.95	0.95
75% Effective Storage Depth	**m**	0.71	0.71	0.71
(i.e. depth below GL)	**m**	0.24	0.24	0.24
25% Effective Storage Depth	**m**	0.24	0.24	0.24
(i.e. depth below GL)	**m**	0.71	0.71	0.71
Effective Storage Depth 75%-25%	**m**	0.48	0.48	0.48
Time to fall to 75% effective depth	**mins**	79		
Time to fall to 25% effective depth	**mins**	N/A		
V (75%-25%)	**m3**	0.6888	0.6888	0.6888
a (50%)	**m2**	4.6800	4.6800	4.6800
t (75%-25%)	**mins**	#VALUE!	0.0000	0.0000
SOIL INFILTRATION RATE	**m/s**	**Unable to Calculate - Infiltration too Low**	**Not Calculated**	**Not Calculated**
DESIGN SOIL INFILTRATION RATE, f	**m/s**	**Unable to Calculate - Infiltration too Low**		



TP4 B		Length (m)	3.10
Date	05/09/2019	Width (m)	0.50
Site	Old Sodbury	Depth (m)	0.42
Job Number	HYG668	Groundwater Level (mbgl)	

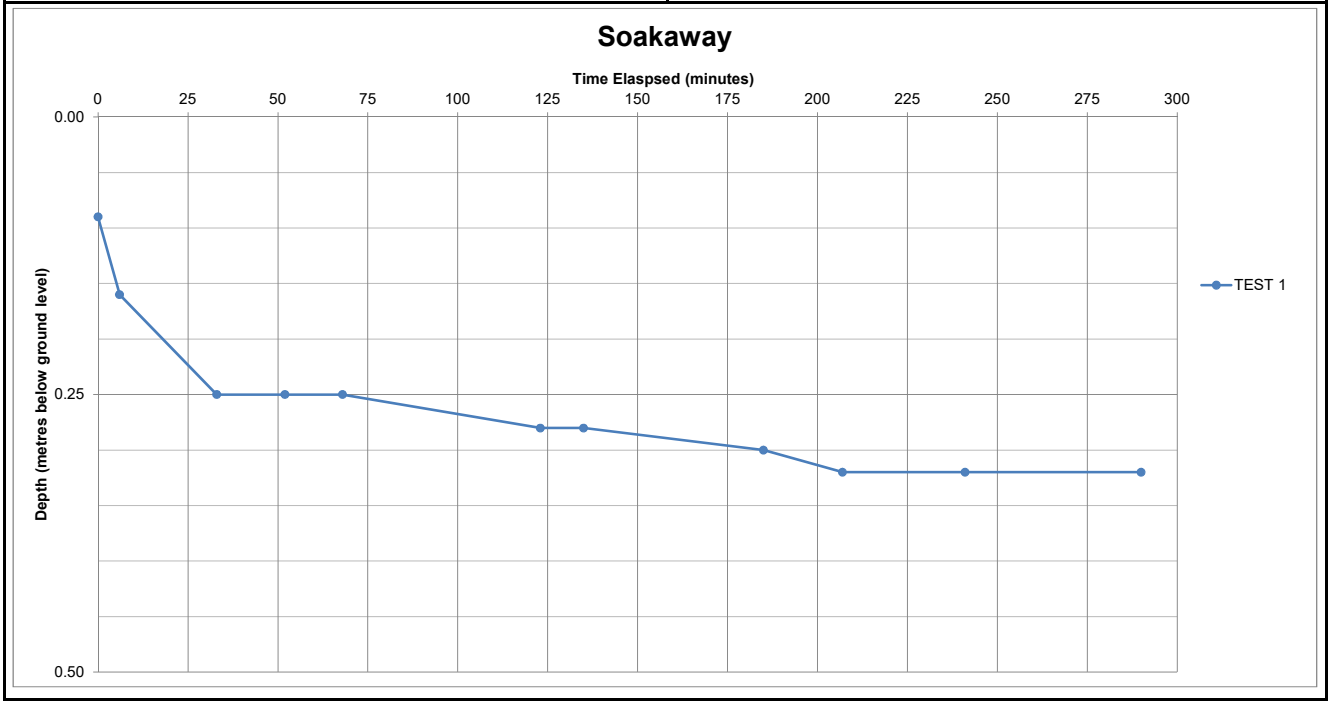
HYDROGEO Groundwater and Environment

SOIL INFILTRATION RATE TEST

See B.R.E. Digest 365, 2016, Soakaway Design.

Remarks -	TEST 1		TEST 2		TEST 3	
	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
		0.00		0.00		0.00
	0	0.09				
	6	0.16				
	33	0.25				
	52	0.25				
	68	0.25				
	123	0.28				
	135	0.28				
	185	0.30				
	207	0.32				
	241	0.32				
	290	0.32				

Effective Storage Depth	**m**	0.42	0.42	0.42
75% Effective Storage Depth	**m**	0.32	0.32	0.32
(i.e. depth below GL)	**m**	0.11	0.11	0.11
25% Effective Storage Depth	**m**	0.11	0.11	0.11
(i.e. depth below GL)	**m**	0.32	0.32	0.32
Effective Storage Depth 75%-25%	**m**	0.21	0.21	0.21
Time to fall to 75% effective depth	**mins**	3		
Time to fall to 25% effective depth	**mins**	207		
V (75%-25%)	**m3**	0.3255	0.3255	0.3255
a (50%)	**m2**	3.0620	3.0620	3.0620
t (75%-25%)	**mins**	204.0000	0.0000	0.0000
SOIL INFILTRATION RATE	**m/s**	**8.68E-06**	**Not Calculated**	**Not Calculated**
DESIGN SOIL INFILTRATION RATE, f	**m/s**	**8.68E-06**		



TP5		Length (m)	2.60
Date	05/09/2019	Width (m)	0.53
Site	Old Sodbury	Depth (m)	0.47
Job Number	HYG668	Groundwater Level (mbgl)	

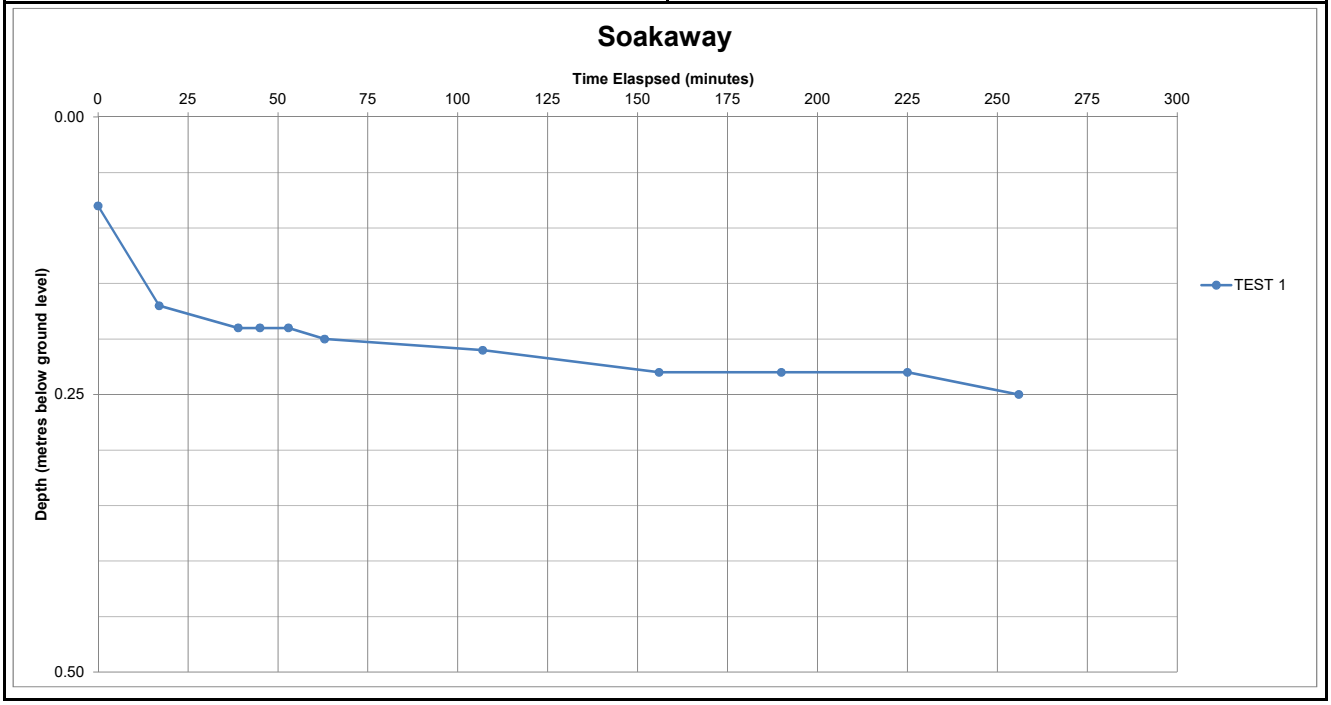
HYDROGEO
Groundwater and Environment

SOIL INFILTRATION RATE TEST
See B.R.E. Digest 365, 2016, Soakaway Design.

Remarks -

TEST 1		TEST 2		TEST 3	
Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
	0.00		0.00		0.00
0	0.08				
17	0.17				
39	0.19				
45	0.19				
53	0.19				
63	0.20				
107	0.21				
156	0.23				
190	0.23				
225	0.23				
256	0.25				

Effective Storage Depth	**m**	0.47	0.47	0.47
75% Effective Storage Depth	**m**	0.35	0.35	0.35
(i.e. depth below GL)	**m**	0.12	0.12	0.12
25% Effective Storage Depth	**m**	0.12	0.12	0.12
(i.e. depth below GL)	**m**	0.35	0.35	0.35
Effective Storage Depth 75%-25%	**m**	0.24	0.24	0.24
Time to fall to 75% effective depth	**mins**	10		
Time to fall to 25% effective depth	**mins**	N/A		
V (75%-25%)	**m3**	0.3238	0.3238	0.3238
a (50%)	**m2**	2.8491	2.8491	2.8491
t (75%-25%)	**mins**	#VALUE!	0.0000	0.0000
SOIL INFILTRATION RATE	**m/s**	**Unable to Calculate - Infiltration too Low**	**Not Calculated**	**Not Calculated**
DESIGN SOIL INFILTRATION RATE, f	**m/s**	**Unable to Calculate - Infiltration too Low**		



Appendix D

Consultation with Network Rail

Andy Clay

From: [redacted]
[redacted]y 2019 10:24
To: [redacted]
Cc: Asset Protection Western; Town Planning Western
Subject: 19-07-29 SWB 103m 56ch Land South of Badminton Road, Old Sodbury - Network Rail Drainage Advice
Attachments: Asset-Protection-Initial-Enquiry-Questionnaire WESTERN (003).docx; SWB 103m 56ch Land Ownership.pdf

Good morning Andy

NR ASPRO have passed your e-mail (26 July 2019 @ 11:56) onto me for comment

I make the ELR (Railway Location) SWB 103 miles 56 chains

Chipping Sodbury Tunnel is from SWB 101m 6.5ch to 103m 19ch

The area in question causes us major issues / concerns regarding flooding and potential risks to the safe operation of the railway

Can you complete the Development Questionnaire – Attached.

If you return it to AssetProtectionWestern@NetworkRail.co.uk - That will trigger our process for engaging with you to discuss the proposed works

We have carried out major works in the area to mitigate flooding issues and would not like any proposed development to import risk to the railway

I am assuming that the area in question is being developed for housing?

If you are not the correct person to complete the questionnaire, can you pass this onto the primary developer to complete the form please

Network Rail will not accept any surface water from the proposed development as it has the potential to compromise the safe operation of the railway

Have these proposals been submitted to our Town Planning Department via the Local Council Planning Department?

I would strongly advise early engagement with Network Rail to avoid any unnecessary delays to the project

ASPRO – When a GW number is allocated, can I attend the initial site meeting with the ASPRO Construction Manager please

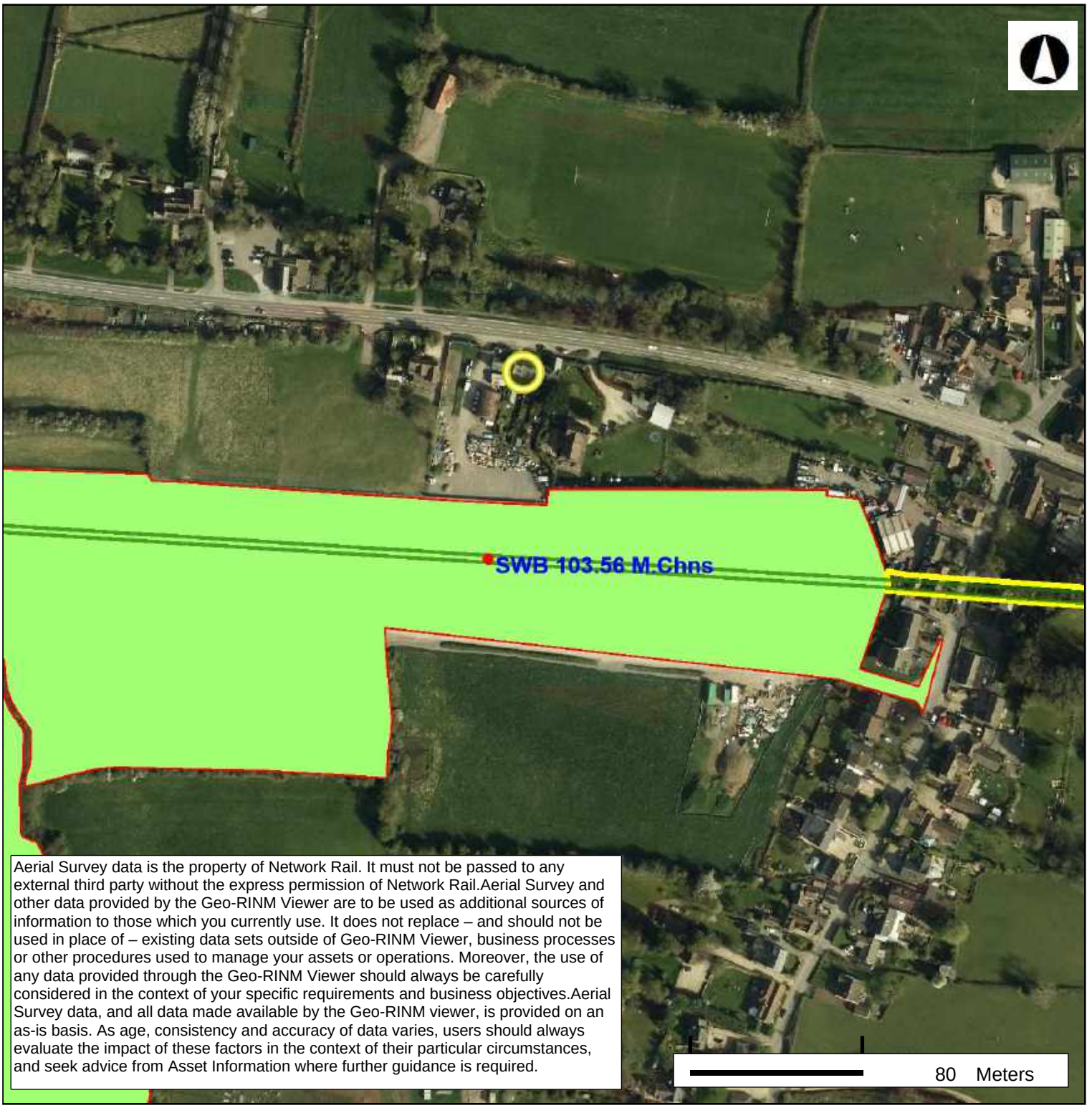
Town Planning – This on your radar? Have a lot of concerns if this is indeed a proposed housing developement

Nige

Asset Engineer (Drainage)
Western Route

From: A[redacted]
Sent: 26 July 2019 11:56

SWB 103m 56ch



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Please note that this map is not suitable for legally binding documents. If you require a map for a legally binding document, please contact the land information team: landinformation@networkrail.co.uk

NetworkRail

Land Ownership NR

Scale	1 : 2,500
Plot Date	26/07/19 14:54
Printed By	

Output created from GeoRINM Viewer

Andy Clay

From: [redacted]
Sent: 07 August 2019 14:56
To: Andy Clay
Subject: 19-08-07 SWB 103m 56ch Land South of Badminton Road, Old Sodbury - Network Rail Drainage Advice

Good afternoon Andy

We have a concrete cloth lined crest drainage ditch (300mm x 500mm x 450mm) and piped section through a previous failure on the Up Side crest at this location.

We have a 300mm I/D concrete pipe beneath the public bridleway/footpath at the accommodation O/B in addition to a small 100mm I/D twin wall land drainage discharging to the down stream end of our piped section of ditch (from the proposed area to be developed)

As it stands at present, the existing drainage system can't accept any additional water – An increase in surface water discharge would lead to potential flooding of the track, train delays with the associated financial implications which would entail Network Rail seeking appropriate recompense from any 3rd Party which caused the line to be blocked due to flooding

However, if the developer is willing to upsize our crest drainage ditch and the pipes at the crest line, then the Senior Drainage Engineer Western Route would be open to further discussions regarding this

The Environment Agency would also need to be involved in this as well.

I would strongly recommend the following:

1. Developer to engage with ASPRO at the earliest opportunity to discuss the overall proposals for the area, not just the drainage aspect
2. New surface water connection to the River Frome – Downstream of our aqueduct
3. Network Rail to get early visibility of the surface water drainage strategy

River Frome is an EA Main River so will require a FRAP (Flood Risk Activity Permit) plus EA involvement where required

Please can you advise the developer that from a Network Rail perspective, this is one of our high-profile sites which has been prone to line closures due to major flooding so early engagement with Network Rail is strongly advised

Just to confirm my comment above, the present drainage system can't handle any more surface water

Nige

From: [redacted]
Sent: 05 August 2019 12:41
To: [redacted]
Subject: RE: 19-07-29 SWB 103m 56ch Land South of Badminton Road, Old Sodbury - Network Rail Drainage Advice

Afternoon Nigel,
Thank you for the response and information provided to date.

Andy Clay

From: [redacted]
[redacted]
To: Andy Clay
Subject: 19-08-14 SWB 103m 56ch Land South of Badminton Road, Old Sodbury - Network Rail Drainage Advice
Attachments: SWB 103m 56ch to 73ch Drainage.pdf

Afternoon Andy

Had some spare time so have PDF'd info from our GeoRimin system

Appreciate that you have advised your client to contact ASPRO as a matter of urgency to start the process going

Due to the day job I can now, no longer allocate any additional time to this project until the Outside Party i.e. your Client, engages with NR ASPRO

They will appoint a DPE (Designated Project Engineer) who will be able to work with them in addressing any concerns / issues that Network Rail have which could compromise the safe operation of the railway

This area is high profile from a railway aspect i.e. major flooding which causes train delays with the associated financial implications

We have a number of jobs on the route where an Outside Party has left contacting NR to the latter part of their project.

If NR had been consulted at an earlier stage in their project, they would not be encountering any delays and have to carry out re design works

Just to confirm my earlier advice, we can't accept any additional surface water and would advise that the option of discharging surface water directly into the river is considered

Nige

From: [redacted]
Sent: 14 August 2019 08:26
To [redacted]
Subject: RE: 19-08-07 SWB 103m 56ch Land South of Badminton Road, Old Sodbury - Network Rail Drainage Advice

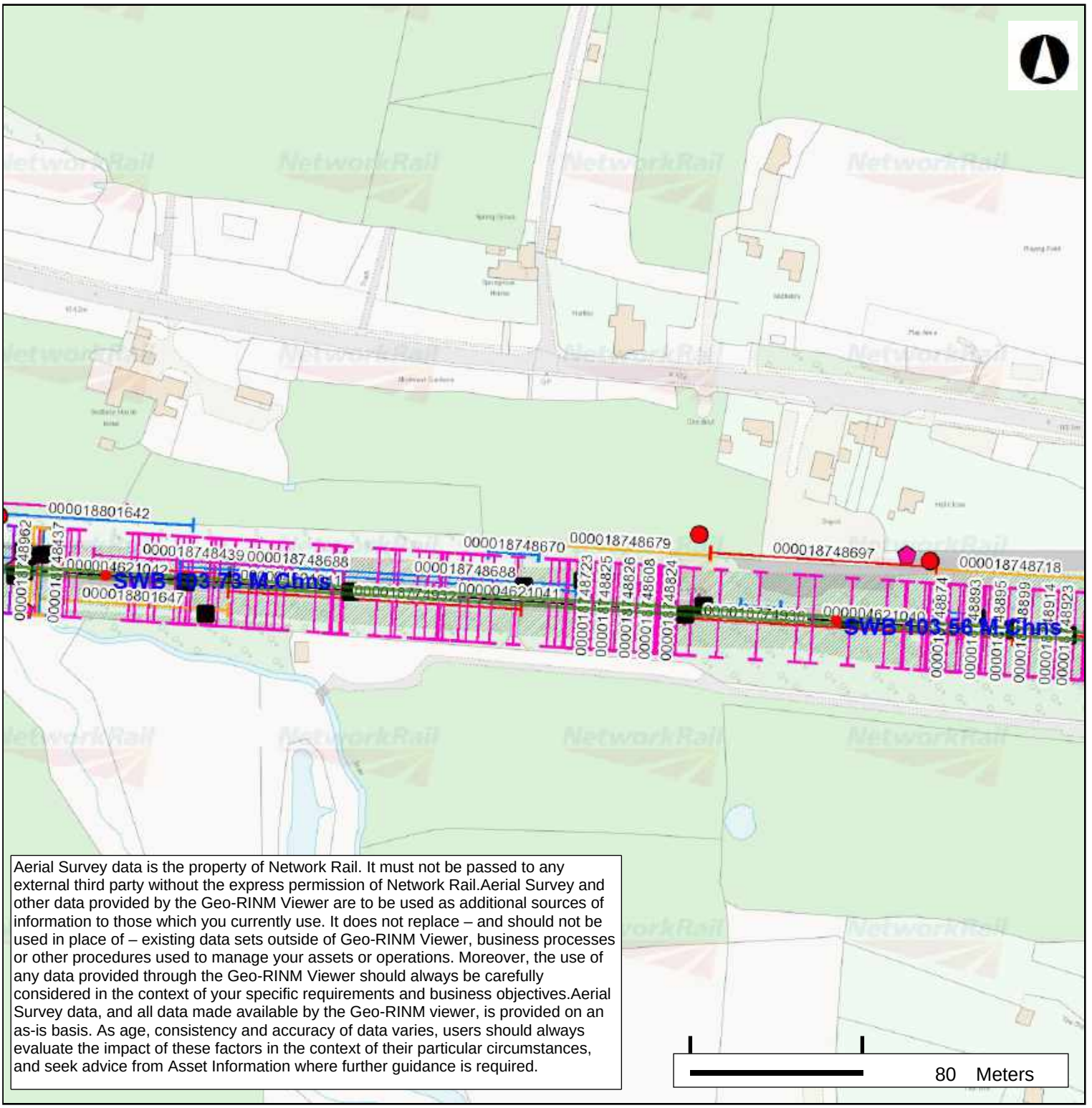
Morning Nige,
Just wondered about the plans of your existing drainage features, if you'd have time to find and send on please?

Many thanks, Andy

andy clay consulting
flood risk and drainage

From: [redacted]
[redacted]

SWB 103m 73ch to 56ch



Please note that this map is not suitable for legally binding documents. If you require a map for a legally binding document, please contact the land information team: landinformation@networkrail.co.uk

Drainage data GeoRimin

Scale	1 : 2,500
Plot Date	14/08/19 14:25
Printed By	

Output created from GeoRINM Viewer

Andy Clay

From: [redacted]
Sent:
To:
Cc:
Subject:
Attachments:

Good afternoon,
Attached is some data I have found on the site.

Some basic information on the site in question. The cutting as a whole was renewed in 2012 the works at this time consisted of the installing of a drainage blanket with granular wedge to the upper slop and counterfort drains to the lower section. In March 2015 a tension crack was observed in the granular fill, this was regraded. The tension crack was observed again in September2015 with the addition of a slump to the lower section. The size and depth of this crack and deterioration of the cutting continued to increase. Leading to full slip in 2016. In 2017 large rectification works were undertaken to protect the NWR asset. This was the addition of soil nails and netting to the lower slope and the upper slope being evacuated and the existing drainage layer checked and replaced with a new modular layer to aid in the drainage of the slope. The slope was also reinstated with a 28 degree profile and dressed to the existing crestline drainage.

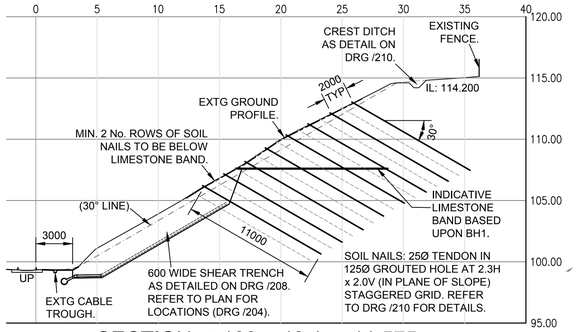
As built showing drainage detail is attached (208)
As built 205 and 206 give some basic site levels that you might find useful, you might find it worthwhile requesting a buried services and structural information this can be done via Mike

I hope this helps

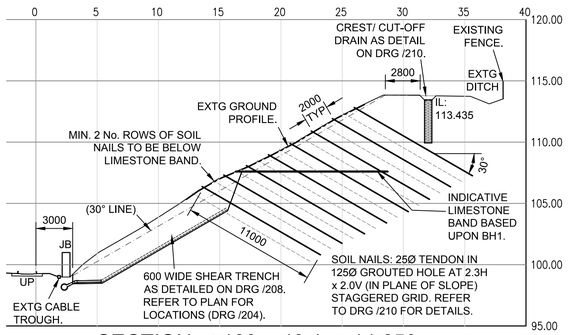
Rachel McDonnell
Asset Protection Engineer
[redacted]
NetworkRail
everyone home safe every day

[redacted]

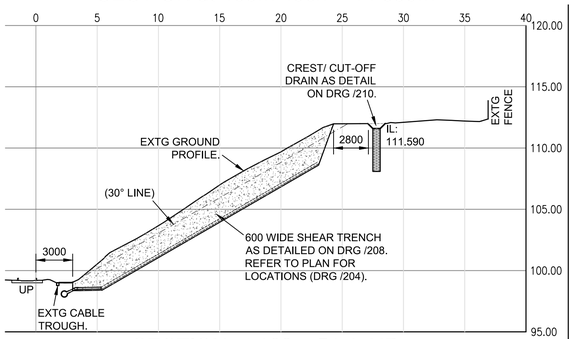
Good afternoon,



SECTION at 103m 48ch + 11.575m

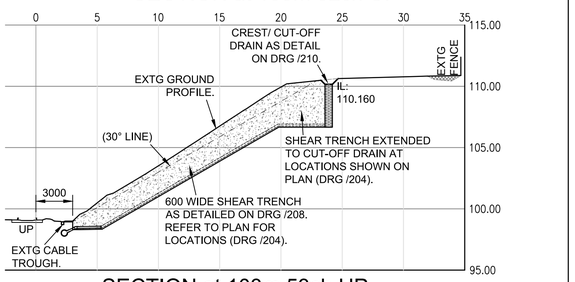


SECTION at 103m 49ch + 14.650m



SECTION at 103m 51ch UP

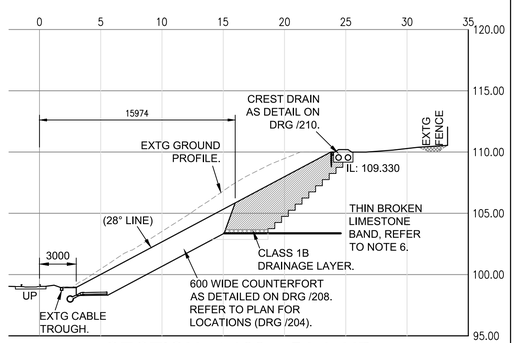
SECTION at 103m 52ch UP



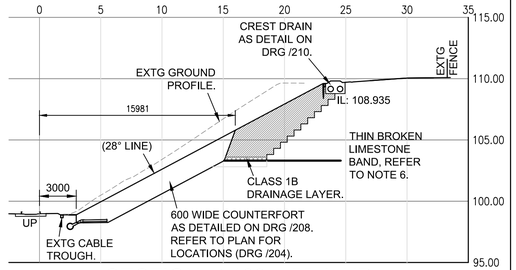
SECTION at 103m 53ch UP

SECTION at 103m 56ch + 12.100m UP

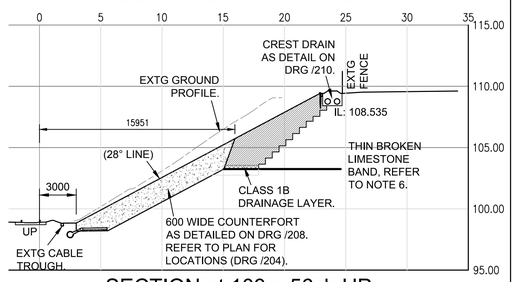
SECTION at 103m 57ch + 5.725m UP



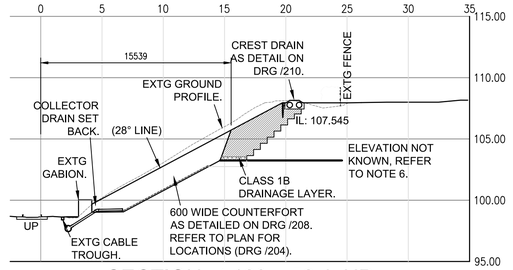
SECTION at 103m 58ch + 11.575m



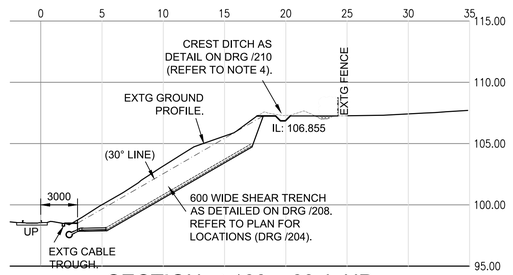
SECTION at 103m 55ch UP



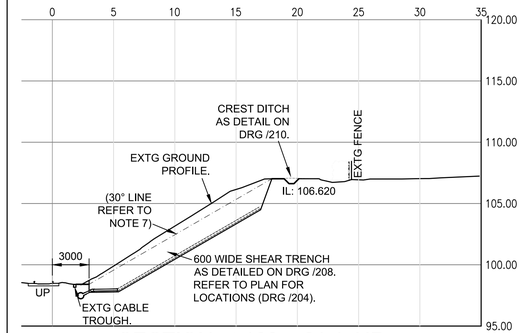
SECTION at 103m 56ch UP



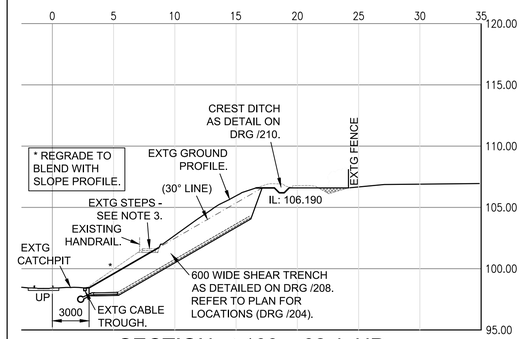
SECTION at 103m 59ch + 5.725m UP



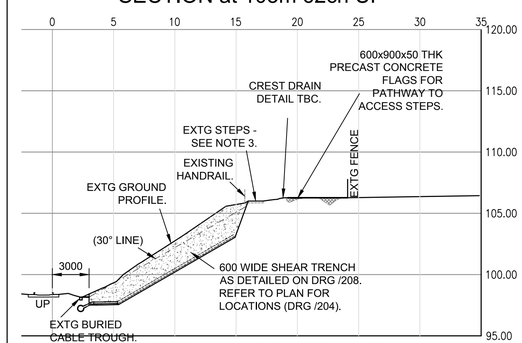
SECTION at 103m 60ch UP



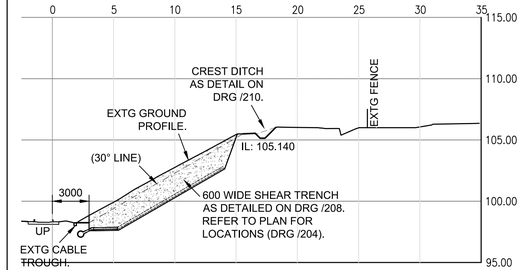
SECTION at 103m 61ch UP



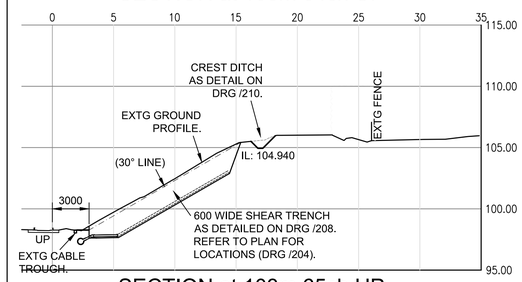
SECTION at 103m 62ch UP



SECTION at 103m 63ch UP



SECTION at 103m 64ch UP



SECTION at 103m 65ch UP

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES BASED UPON ORDNANCE SURVEY DATUM.
3. EXISTING ACCESS STEPS TO BE REMOVED. SEE DRG /207 FOR DETAILS OF NEW STEPS.
4. CREST DRAIN IS TO FOLLOW EXISTING DITCH AS FAR AS POSSIBLE.
5. SHEAR TRENCHES TO BE 2000 DEEP MIN BELOW 30 DEGREES SLOPE ANGLE FROM TOE REFER TO DRG /208.
6. THE EXCAVATION FOR THE GRANULAR BACKFILL IS TO BE TAKEN DOWN TO ROCK-HEAD. THIS IS DELINEATED BY A LIMESTONE BAND AT APPROX. 103.5m OD IN BH3. AT OTHER LOCATIONS ROCK-HEAD IS DELINEATED BY A MUDSTONE (V. WEAK TO WEAK). THE ELEVATION OF ROCK-HEAD MAY VARY, IF IN DOUBT CONTACT THE DESIGNER.
7. THE 30° LINE IS USED FOR THE DEPTH OF THE SHEAR TRENCHES EXCEPT BELOW THE INFILL ZONE WHERE IT IS 28°.

THIS DRAWING SUPERSEDES TONY GEE G111006/150 AND 180 SERIES DRAWINGS.

REV.	BY	CHK'D	APP'D	DATE	DESCRIPTION
Z	SLK	SHL	AW	02/10/14	AS BUILT
C	MJL	SLH	AW	31/07/13	FOR CONSTRUCTION
B	MJL	AW	AW	10/01/13	FOR CONSTRUCTION
A	OMJ	SHL	AW	01/11/12	FOR APPROVAL

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Consulting Civil, Structural and Geotechnical Engineers

ON BEHALF OF Network Rail

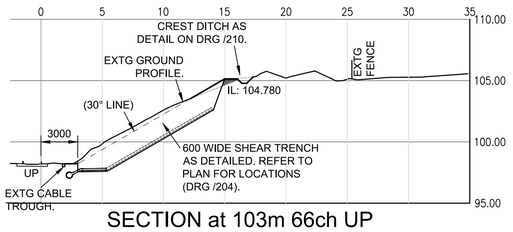
CHIPPING SODBURY WEST PORTAL CUTTING ELR: SWB 103m 48-75ch

PROPOSED SECTIONS

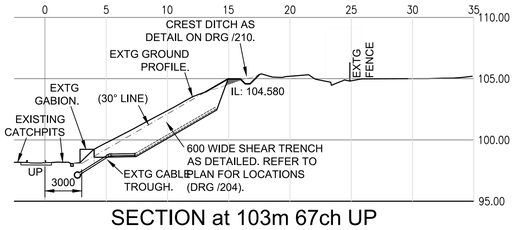
SHT 1 OF 2

DRG. No. G111006/205 REV. Z

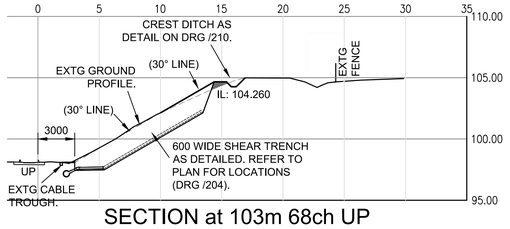
DRAWN : OMJ	DESIGNED : AW
SCALE : 1:250	ORIGINAL SIZE : A1



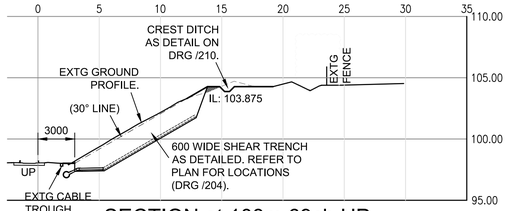
SECTION at 103m 66ch UP



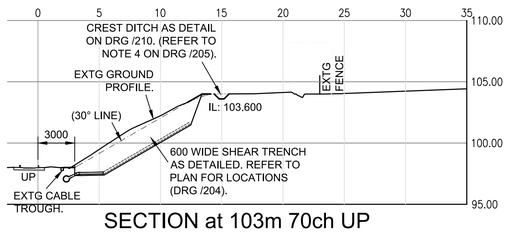
SECTION at 103m 67ch UP



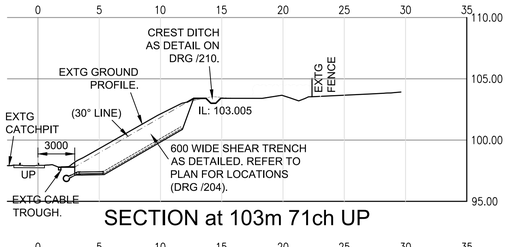
SECTION at 103m 68ch UP



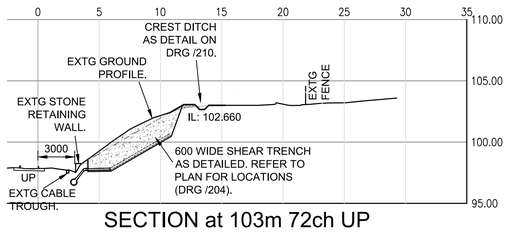
SECTION at 103m 69ch UP



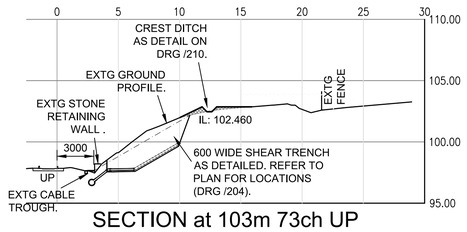
SECTION at 103m 70ch UP



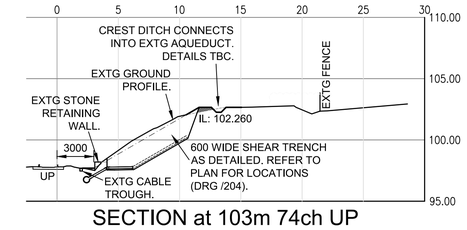
SECTION at 103m 71ch UP



SECTION at 103m 72ch UP



SECTION at 103m 73ch UP



SECTION at 103m 74ch UP

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES BASED UPON ORDNANCE SURVEY DATUM.
3. ALL GEOCOMPOSITES AND GEOTEXTILES TO BE APPROVED PRIOR TO USE. ALL JOINTS TO BE IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS AND SHALL BE CONSTRUCTED SO AS TO PREVENT INGRESS OF SOIL FINES INTO DRAINS.
4. ALL GEOTEXTILES TO COMPLY WITH NETWORK RAIL SPECIFICATION NR/SP/TRK/010.
5. ALL TOPSOIL, ORGANIC MATTER AND SOFT OR LOOSE MATERIAL TO BE REMOVED PRIOR TO FILLING.
6. HEADWALL AND PIPE BEDDING DETAILS ARE BASED UPON NETWORK RAIL STANDARD DETAIL DRAWING NR/CIV/SD/329.
7. A LIMITED NUMBER OF SHEAR TRENCHES EXTEND TO THE CUT-OFF DRAIN. AT THESE LOCATIONS THE MEMBRANE IS TO BE OMITTED.

THIS DRAWING SUPERSEDES TONY GEE G111006/150 AND 180 SERIES DRAWINGS.

REV.	BY	CHK'D	APP'D	DATE	DESCRIPTION
Z	SLK	SHL	AW	02/10/14	AS BUILT
C	MJL	SLH	AW	31/07/13	FOR CONSTRUCTION
B	MJL	AW	AW	10/01/13	FOR CONSTRUCTION
A	OMJ	SLH	AW	01/11/12	FOR APPROVAL

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Tel: 01453 826773

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Consulting Civil, Structural and Geotechnical Engineers

ON BEHALF OF Network Rail

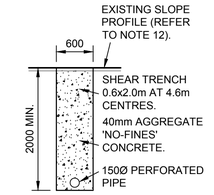
CHIPPING SODBURY
WEST PORTAL CUTTING
ELR: SWB 103m 48-75ch

PROPOSED SECTIONS

SHT 2 OF 2

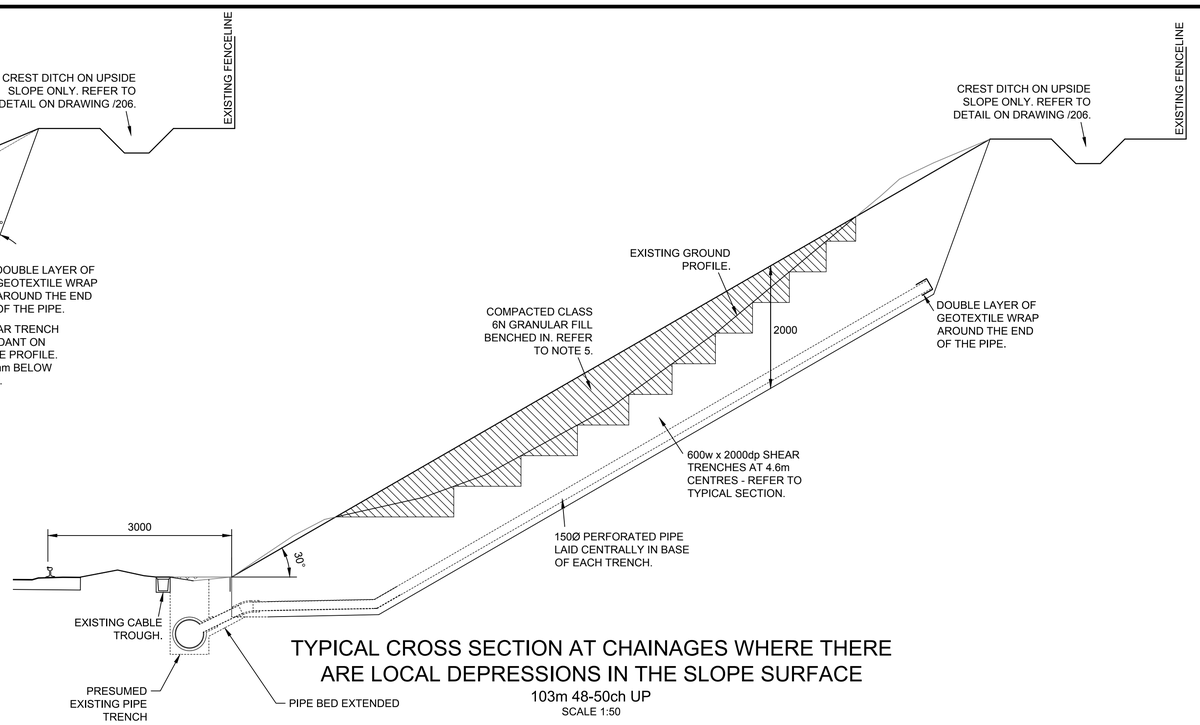
DRG. No. G111006/206 REV. Z

DRAWN : OMJ	DESIGNED : AW
SCALE : 1:250	ORIGINAL SIZE : A1



SECTION A-A
SCALE 1:25

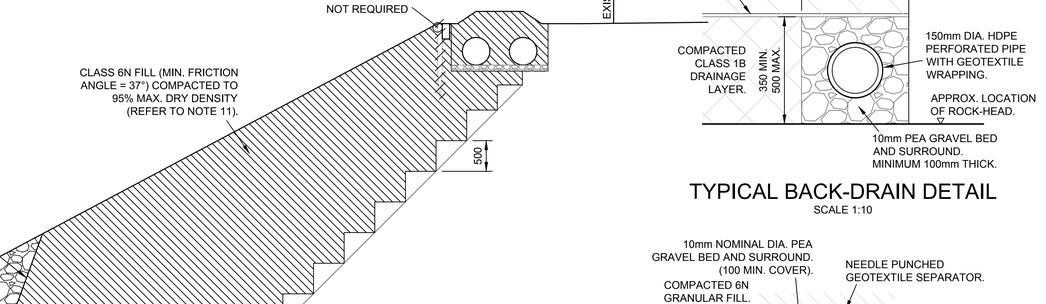
TYPICAL SHEAR TRENCH SECTION
SCALE 1:50



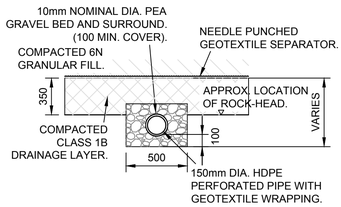
TYPICAL CROSS SECTION AT CHAINAGES WHERE THERE ARE LOCAL DEPRESSIONS IN THE SLOPE SURFACE
103m 48-50ch UP
SCALE 1:50

HIGH LEVEL SUPPORT DETAIL
UPSIDE SLOPE
SCALE 1:25

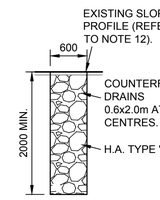
TYPICAL CROSS SECTION AT CHAINAGES WHERE SLIPPED SOIL HAS BEEN REMOVED
103m 54-58
SCALE 1:50



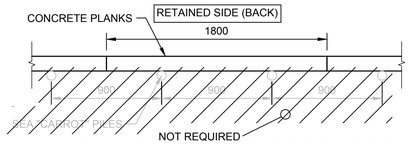
TYPICAL BACK-DRAIN DETAIL
SCALE 1:10



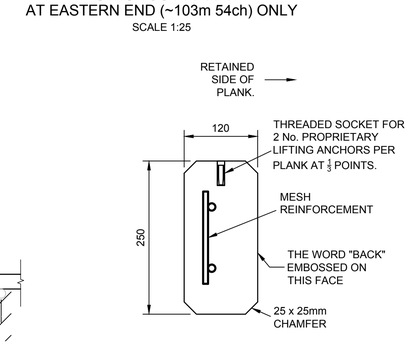
SECTION X-X
AT EASTERN END (~103m 54ch) ONLY
SCALE 1:25



SECTION B-B
SCALE 1:25



PLAN ON HIGH LEVEL SLOPE SUPPORT
SCALE 1:25



PRECAST PLANK DETAIL
250mm PC PLANK
SCALE 1:5

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES BASED UPON ORDNANCE SURVEY DATUM.
3. ALL GEOCOMPOSITES, GEOTEXTILES AND IMPERMEABLE MEMBRANES TO BE APPROVED PRIOR TO USE. ALL JOINTS TO BE IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS AND SHALL BE CONSTRUCTED SO AS TO PREVENT INGRESS OF SOIL FINES INTO DRAINS.
4. ALL GEOTEXTILES TO COMPLY WITH NETWORK RAIL SPECIFICATION NR/SP/TRK/010.
5. ALL TOPSOIL, ORGANIC MATTER AND SOFT OR LOOSE MATERIAL TO BE REMOVED PRIOR TO GRANULAR FILLING.
6. ~~THE STEEL TUBE PILES ARE NOT TO BE USED TO IMPROVE THE STABILITY OF THE EXISTING EMBANKMENT.~~ NOT REQUIRED
7. ~~S.E.A. "CARROT" PILE OR SIMILAR APPROVED 76mm OD AT TOP OF PILE, 5mm THICKNESS STEEL GRADE S275 IN ACCORDANCE WITH EN 1993-1 AND BSEN 10210 TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS GUIDELINES.~~ NOT REQUIRED
8. HOT DIP GALVANIZED TO BSEN ISO 1461 TO ACHIEVE COATING THICKNESS OF 85 MICRONS.
9. HOLLOW PILES GROUTED ON COMPLETION, INFILLING TO PREVENT WATER INGRESS.
10. CEMENTITIOUS GROUT FOR PILE INSTALLATION MINIMUM CUBE STRENGTH OF 40N/mm² (28 DAYS) WATER/CEMENT RATIO NOT TO EXCEED 0.45.
11. END PRODUCT TO STATED COMPACTION PERCENTAGE. MAXIMUM DRY DENSITY TO BS1377: PART 4 (VIBRATORY HAMMER METHOD).
12. DEPTH OF SHEAR TRENCH IS BELOW 28° OR 30° SLOPE ANGLE.
13. EXCAVATION AND BACKFILLING TO BE IN STAGES AND AS PER APPROVED METHOD STATEMENT.
14. NO SPOIL TO BE STOCKPILED AT THE CREST OF THE SLOPE.
15. REFER TO DRG /204 SAFETY OF PLANT ETC.
16. THIS DRAINAGE LAYER TO BE CLASS 1B BUT LIMESTONE AGGREGATE IS NOT ALLOWED.

THIS DRAWING SUPERSEDES TONY GEE G111006/150 AND 180 SERIES DRAWINGS.

REV.	BY	CHK'D	APP'D	DATE	DESCRIPTION
Z	SLK	SLH	AW	02/10/14	AS BUILT
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ON BEHALF OF Network Rail

CHIPPING SODBURY WEST PORTAL CUTTING ELR: SWB 103m 48-75ch

SHEAR TRENCH AND COUNTERFORT DETAILS

DRG. No. G111006/208 REV. Z

DRAWN : OMJ | DESIGNED : AW

SCALE : AS SHOWN | ORIGINAL SIZE : A1

Andy Clay

From: [redacted]
Sent:
To:
Cc:
Subject:

Good afternoon,
Following on from your email on the 20/12/2019, due to the substantial stability issue at the site and because of the works that have already been undertaken by Network Rail to correct this and to protect our assets.
As we now have a number of sites contacting Asset Protection regarding this area I have contacted the Network Rail Asset owner to make them aware, they are understandably concerned about their asset and the effect any works close to the boundary could have on Network Rail infrastructure. Therefore I have been asked to issue out a formal response on our current position, you will need to bare this in mind prior to presenting your option to planning:

SWB 103m 56ch Discharge of surface water from proposed developments into the Network Rail drainage system – Chipping Sodbury

After carrying out a full review of all available data associated with surface water discharge in this area, our Senior Drainage Engineer has declined to authorise connection to the Network Rail drainage system to allow the discharge of surface water from the proposed developments in the area.

Primary reasons are as follows:

1. Network Rail drainage system is at 100% capacity at present and any additional volumes would overload it potentially causing train delays with the associated financial impact to Network Rail
2. Area is prone to cutting instability and Network Rail do not wish to import any additional risk to the operational railway

There are alternative discharge routes e.g. pipe the surface water from the proposed development area directly into the River Frome, however, this will require the permission of the Lead Local Flood Authority / Environment Agency

If you require this as a formal letter please provide me with an address and I will send one out.
Regards

Rachel McDonnell
Asset Protection Engineer

[redacted]

NetworkRail | everyone home safe every day

****

Appendix E

Consultation with Wessex Water

Andy Clay

From: [redacted]
Sent:
To:
Subject:
Attachments:

Good afternoon Andy,

Many thanks for your email. Please review the attached and comments below as requested.

FW disposal,

- Capacity is generally limited within the catchment.
- The nearest and most adequate POC can be reviewed to the 225 mm dia to the north of the site (in the A432).
- Another 225 mm dia foul sewers crosses the site boundary. There is no capacity within this sewer to receive additional flows. Discussions on diverting these should be reviewed with Wessex water as the site progresses.

SW disposal

SW approach should be reviewed in line with catchment concerns and flood risk measures.

WW anticipate the NPPF and SUDs hierarchy will be considered in line with advise from the LLFA.

There are no public SW sewers. SW connections to the foul network will not be acceptable under any given site constraints.

I hope the above response is enough to proceed for now.

Kind regards

Teddy Takyi-Amuah

Wessex Water

Planning Liaison

[redacted]

Sorry – if you could please respond to this email address, rather than the previous.

Many thanks, Andy

Andy Clay

From: [redacted]
Sent:
To:
Subject:
Attachments:

Hello Andy,

Please see attached. They only serve the dwellings on Chapel lane, I believe topography does not permit them to go anywhere else.

Please review and let me know if anything else is required at this stage.

Kind regards

Teddy Amuah

Wessex Water
Planning Liaison

[redacted]

Afternoon Teddy – many thanks for the information.

Do you have an asset plan at a smaller scale please, to show where the foul sewer that crosses the site originates from – thanks?

Also do you have invert and cover levels of the foul sewer that crosses the site and also of the foul sewer to the north in the A432?

Many thanks, Andy

andy clay consulting
flood risk and drainage

[redacted]

Good afternoon Andy,

Many thanks for your email. Please review the attached and comments below as requested.

FW disposal,

Andy Clay

From: [redacted]
Sent:
To:
Cc:
Subject:

Hello Andy,

Many thanks for your email. Please review the asset/ cover info with our asset enquiries team.

I can provide covers for the POCs if required. I can also confirm that there although capacity is limited. There is capacity to accommodate 30 dwellings subject to details of the diversion.

We will be looking to ensure that capacity is not reduced due to loss of gradient etc upon any diversions. WW will be will to consider a POC to this 225 mm dia subject to this.

Jess: Can you please advise Andy on invert info surrounding the site.

Kind regards

Teddy Amuah

[redacted]

Afternoon Teddy,
Just a quick follow up – to see if you had any invert / cover levels for the foul sewers in this area (the northern and diagonal one please)?

Also in terms of the diagonal sewer – if there was capacity in this system given that it only serves the properties on Chapel Lane?

If this sewer needed to be diverted within the site area that we are looking at, would it benefit to also increase the dimeter?

Many thanks, Andy

andy clay consulting
flood risk and drainage

[redacted]

Hi Teddy – if this sewer only serves these properties, is it at capacity?

Andy Clay

From: [redacted]
Sent: [redacted]
To: [redacted]
Cc: [redacted]
Subject: [redacted]

Hello Andy,

Many thanks for your email. Please review the asset/ cover info with our asset enquiries team.

I can provide covers for the POCs if required. I can also confirm that there although capacity is limited. There is capacity to accommodate 30 dwellings subject to details of the diversion.

We will be looking to ensure that capacity is not reduced due to loss of gradient etc upon any diversions. WW will be will to consider a POC to this 225 mm dia subject to this.

Jess: Can you please advise Andy on invert info surrounding the site.

Kind regards

Teddy Amuah

[redacted]

Afternoon Teddy,
Just a quick follow up – to see if you had any invert / cover levels for the foul sewers in this area (the northern and diagonal one please)?

Also in terms of the diagonal sewer – if there was capacity in this system given that it only serves the properties on Chapel Lane?

If this sewer needed to be diverted within the site area that we are looking at, would it benefit to also increase the dimeter?

Many thanks, Andy

andy clay consulting
flood risk and drainage

[redacted]

Sent: 05 August 2019 13:12
To: 'Teddy Takyi-Amuah'
Subject: RE: WW CAP RESP : SG/ST78SW/ 350 Land South of Badminton Road, Old Sodbury

Hi Teddy – if this sewer only serves these properties, is it at capacity?

Andy Clay

From: [redacted]
[redacted]
To: Andy Clay
Subject: RE: WW CAP RESP : SG/ST78SW/ 350 Land South of Badminton Road, Old Sodbury

Hello Andy,

No bother, Please accept this as confirmation that the sewers in question are the ones crossing the site boundary.

Kind regards

Teddy Amuah

[redacted]

Afternoon Teddy – many thanks for the additional info, and for passing my query on to Mapping.

Just to confirm, the POC advice below relates to the diagonal foul sewer from Chapel Lane?

Many thanks, Andy

andy clay consulting
flood risk and drainage

[redacted]

Hello Andy,

Many thanks for your email. Please review the asset/ cover info with our asset enquiries team.

I can provide covers for the POCs if required. I can also confirm that there although capacity is limited. There is capacity to accommodate 30 dwellings subject to details of the diversion.

We will be looking to ensure that capacity is not reduced due to loss of gradient etc upon any diversions. WW will be will to consider a POC to this 225 mm dia subject to this.

Jess: Can you please advise Andy on invert info surrounding the site.

Kind regards

Teddy Amuah

Andy Clay

[redacted]

For the attention of Andy Clay

Hello Andy –

Please find attached our manhole data schedule for the area which was shown in the asset map sent to you by my colleague Teddy, as requested. I can confirm that we do not require any payment for the provision of manhole data.

Kind Regards,

Jessica Johnston
Asset Searches Administrator

Web: www.wessexwater.co.uk

[redacted]

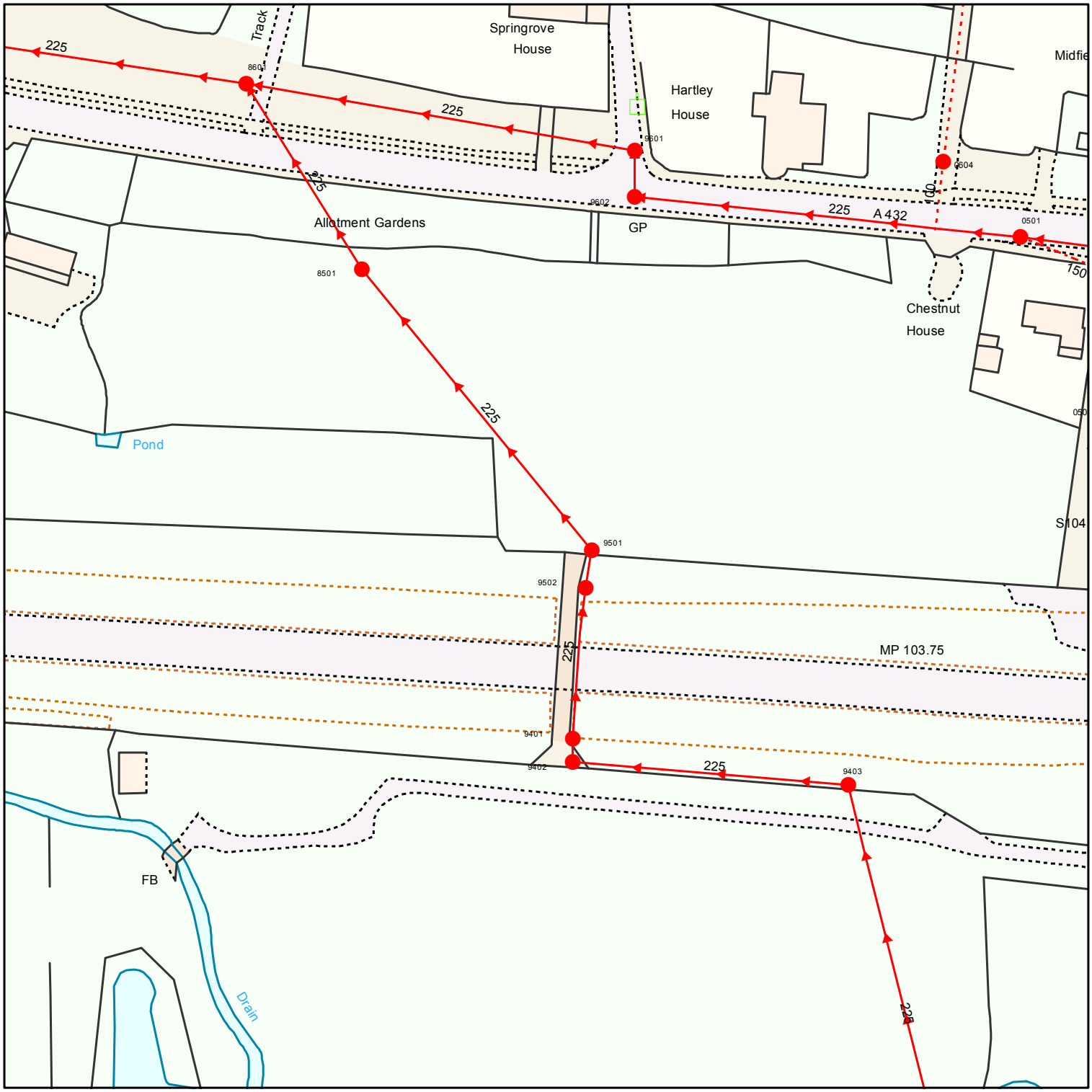
Morning Jessica,
I was wondering if you'd be able to supply the cover and invert levels of the manholes in this area?

I've attached the asset plan that was sent for reference.

Many thanks, Andy

MAN_REFNO	MAN_COVER_LEVEL	MAN_LOWEST_INVERT	MAN_DEPTH
ST74818601	106.24	104.32	1.92
ST74819403	106.74	105.46	1.28
ST74817601	104.68	102.94	1.74
ST74818501	106.77	104.64	2.13
ST74819602	108.11	106.19	1.92
ST74819401	104.3		0
ST74819402	105.53	105.22	0.31
ST74819501	106.4	104.91	1.49
ST74819502	106.06	0	
ST74819601	108.06	106.15	1.91
ST75810501	109.88	107.88	2
ST75810502	109.59		0
ST75810503	109.07		0
ST75810504	109.34		0
ST75810505	110.03		0
ST75810604	109.24		0

Wessex Water



PUBLIC SEWERS

- Foul Sewer
- Surface Water Sewer
- Combined Sewer
- Rising Main
- Syphon
- Overflow
- Use Unknown

NON-PUBLIC SEWERS, DRAINS & PIPELINES

- Private - Foul
- Private - Surface
- Private - Combined
- Highway Drain
- Culverted Watercourse
- Abandoned Sewer
- Status Unknown
- Section 104 - Foul
- Section 104 - Surface
- Section 104 - Combined
- Private Rising Main
- Effluent Disposal Main

OTHER STRUCTURES

- Attenuation Tank
- Storage Tank
- Chamber
- Tunnel
- Interceptor

Colours generally indicate the use of the sewer/drain (i.e Red - Foul, Dark Blue - Surface, Magenta - Combined/Dual Use, Light Green - Highway Drain, Mid Green - Overflow) styles of line are shown on the key in sample/typical colours.

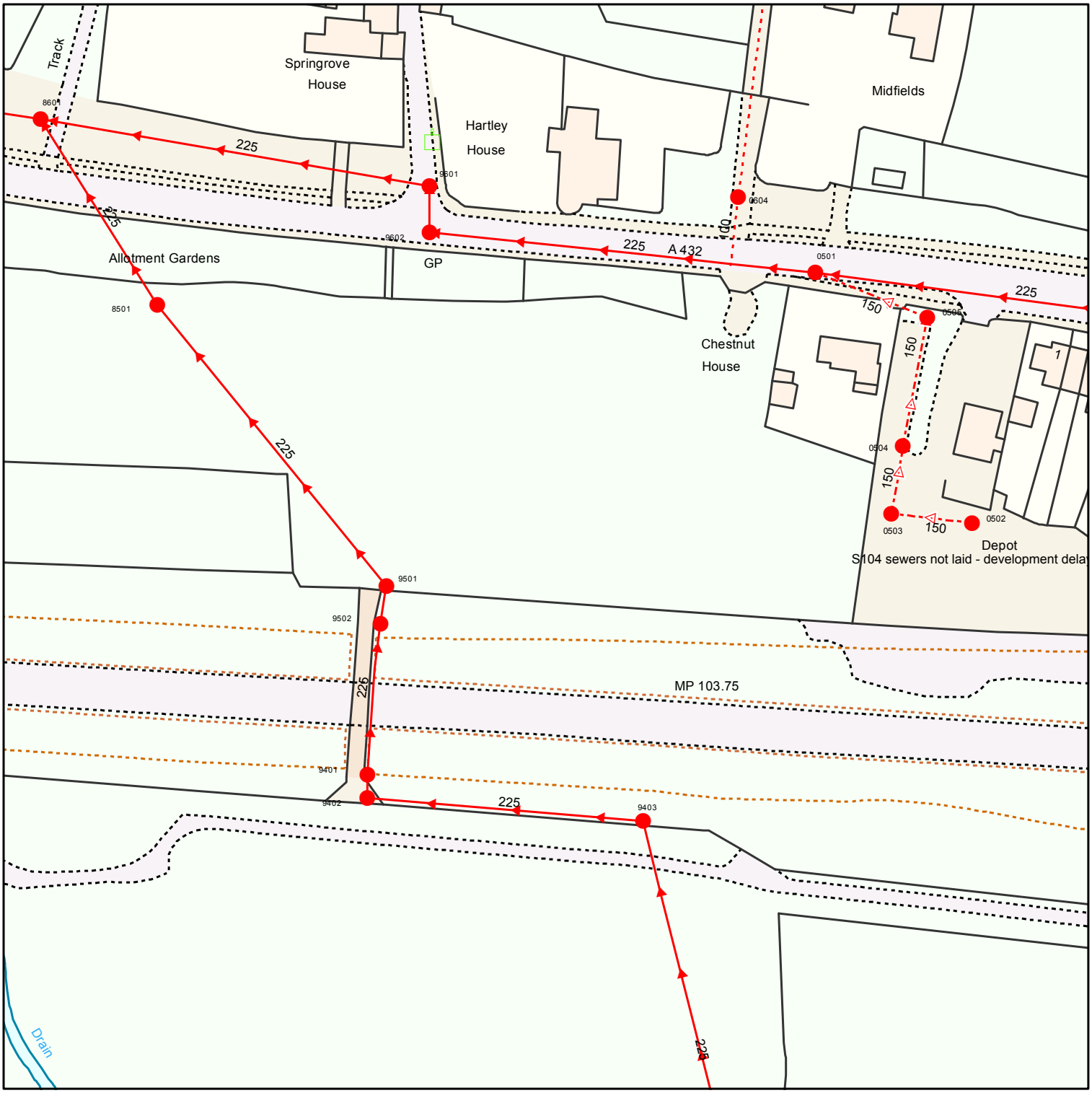
STRUCTURES

- Manhole - Foul
- Manhole - Surface
- Manhole - Combined
- Outfall
- Inlet
- Lamphole
- Bifurcation - Foul
- Bifurcation - Surface
- Bifurcation - Combined
- Combined Sewage Overflow
- Pumping Station - Surface
- Pumping Stn - Foul/Combined
- Gully
- Vent Column
- Rodding Eye
- Catchpit
- Flushing Chamber
- Soakaway
- Non Return Valve
- Air Valve
- Washout
- Hatch Box

Wessex Water a YTL company

Date: 05/08/2019
Scale: 1:1,250
Centre: 374,928 181,520

Wessex Water



PUBLIC SEWERS

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- Use Unknown

NON-PUBLIC SEWERS, DRAINS & PIPELINES

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- Highway Drain
- Culverted Watercourse
- Abandoned Sewer
- Status Unknown
- Section 104 - Foul
- Section 104 - Surface
- Section 104 - Combined
- Private Rising Main
- Effluent Disposal Main

OTHER STRUCTURES

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- Storage Tank
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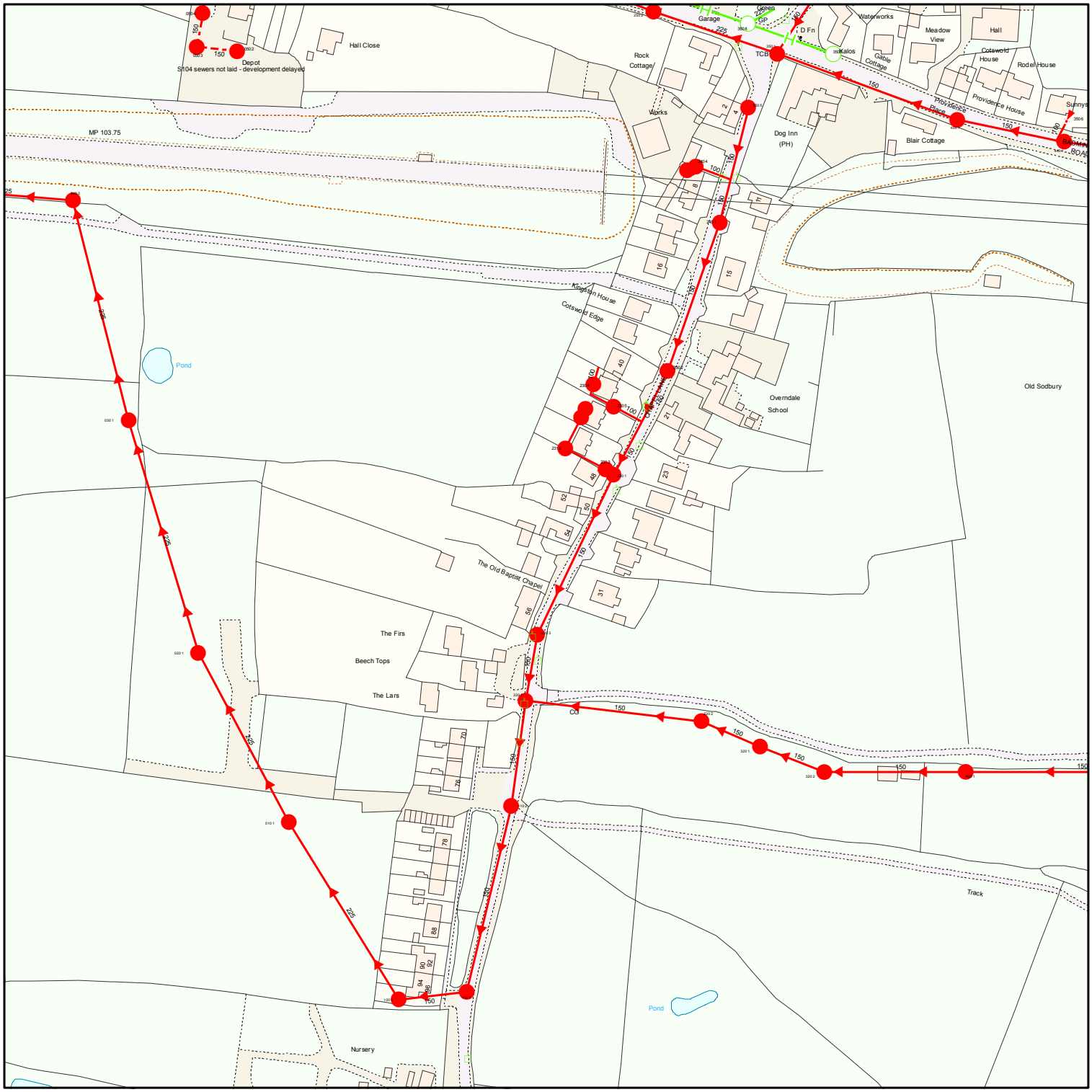
- Catchpit
- Flushing Chamber
- Soakaway
- Non Return Valve
- Air Valve
- Washout
- Hatch Box

Wessex Water a YTL company

Date: 05/08/2019
Scale: 1:1,250
Centre: 374,975 181,528

Wessex Water



PUBLIC SEWERS

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- Surface Water Sewer
- Combined Sewer
- Rising Main
- Syphon
- Overflow
- Use Unknown

NON-PUBLIC SEWERS, DRAINS & PIPELINES

- Private - Foul
- Private - Surface
- Private - Combined
- Highway Drain
- Culverted Watercourse
- Abandoned Sewer
- Status Unknown
- Section 104 - Foul
- Section 104 - Surface
- Section 104 - Combined
- Private Rising Main
- Effluent Disposal Main

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- Storage Tank
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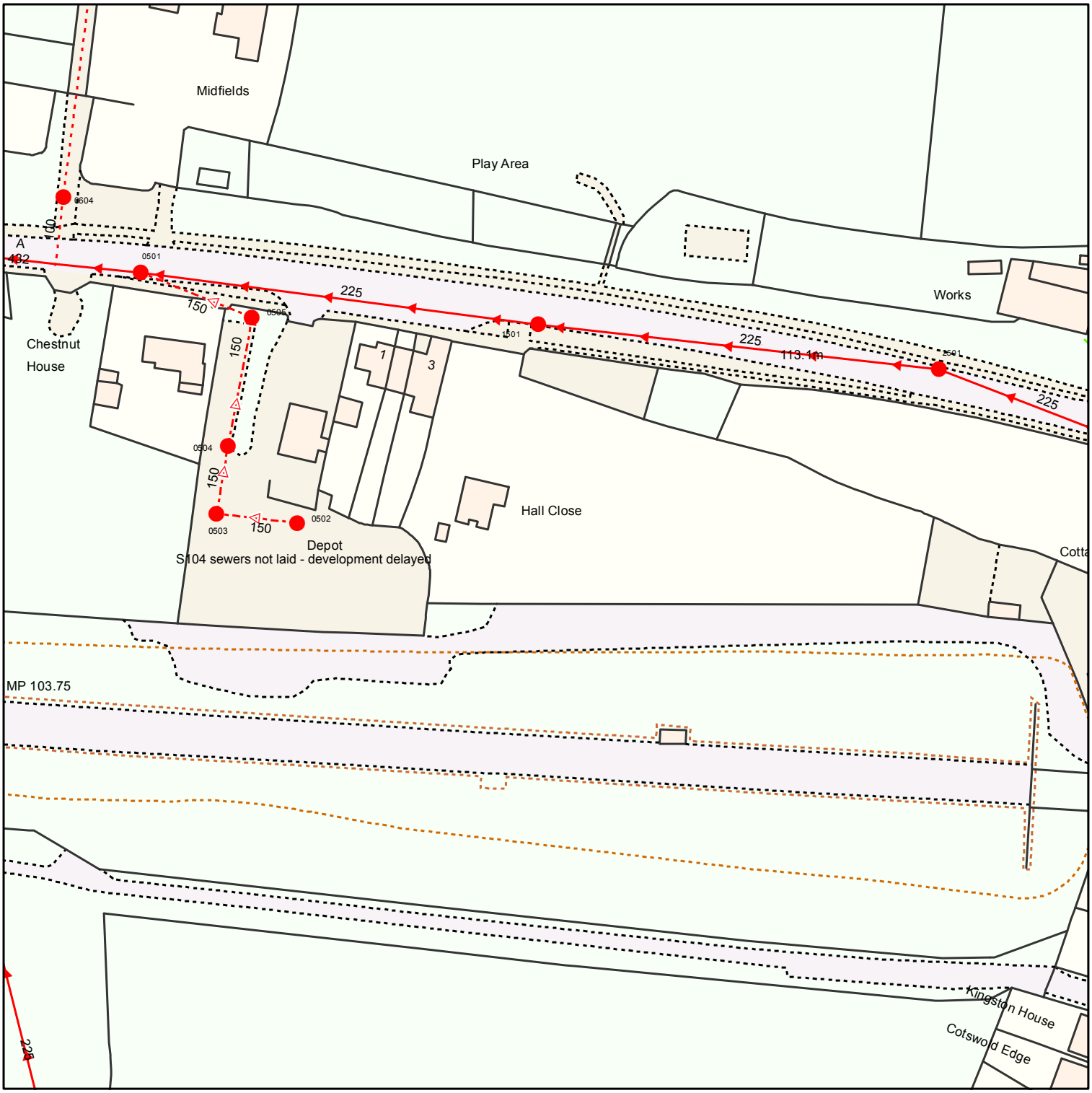
- Vent Column
- Rodding Eye
- Catchpit
- Flushing Chamber
- Soakaway
- Non Return Valve
- Air Valve
- Washout
- Hatch Box

Wessex Water
a YTL company

Date: 05/08/2019
Scale: 1:2,500
Centre: 375,215 181,306

Wessex Water



PUBLIC SEWERS

- Foul Sewer
- Surface Water Sewer
- Combined Sewer
- Rising Main
- Syphon
- Overflow
- Use Unknown

NON-PUBLIC SEWERS, DRAINS & PIPELINES

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- Private - Surface
- Private - Combined
- Highway Drain
- Culverted Watercourse
- Abandoned Sewer
- Status Unknown
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- Private Rising Main
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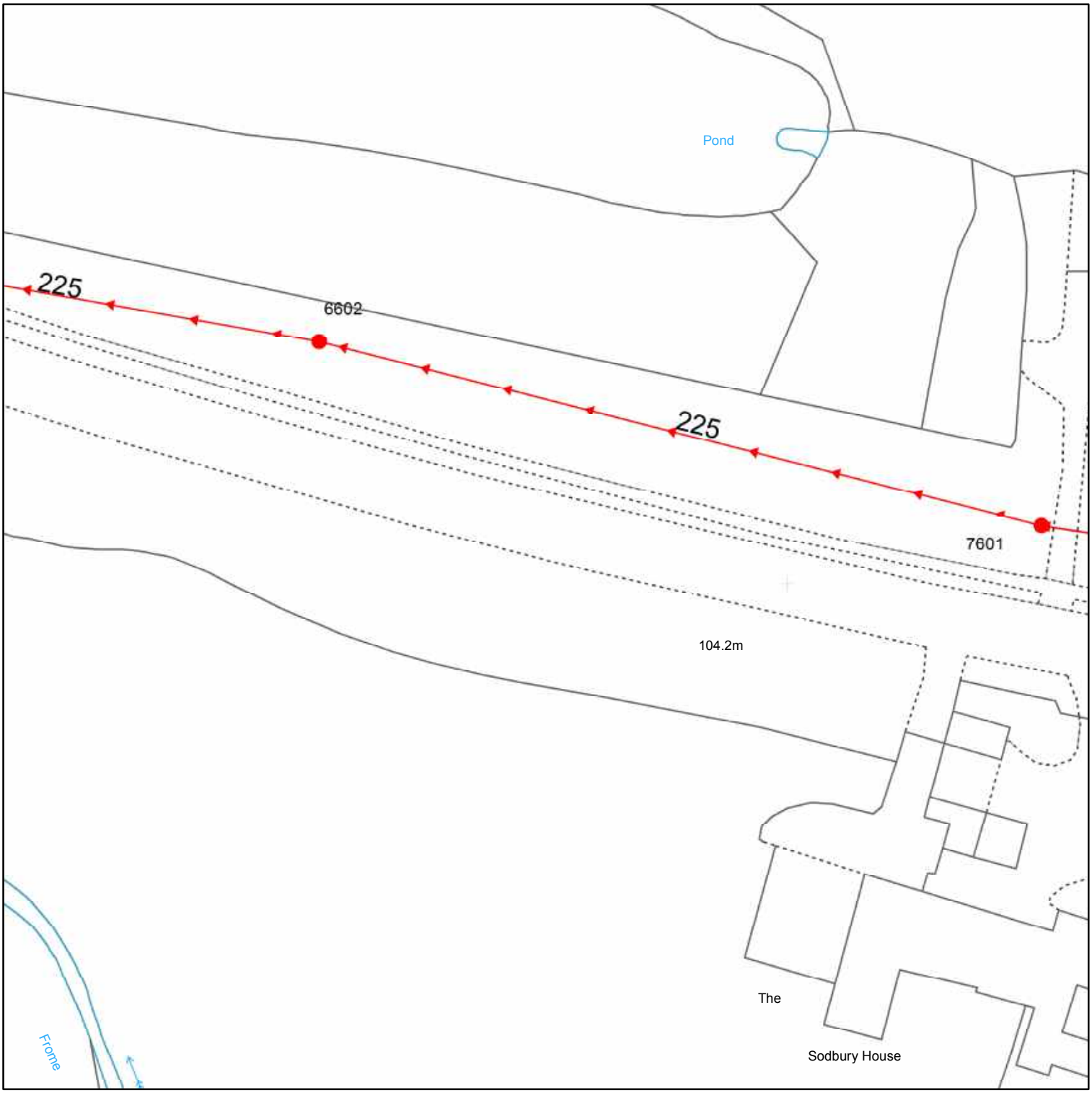
- Manhole - Surface
- Manhole - Combined
- Outfall
- Inlet
- Lamphole
- Bifurcation - Foul
- Bifurcation - Surface
- Bifurcation - Combined
- Combined Sewage Overflow
- Pumping Station - Surface
- Pumping Stn - Foul/Combined
- Gully
- Vent Column
- Rodding Eye
- Catchpit
- Flushing Chamber
- Soakaway
- Non Return Valve
- Air Valve
- Washout
- Hatch Box

Wessex Water
a YTL company

Date: 05/08/2019
Scale: 1:1,250
Centre: 375,130 181,528

Wessex Water Network Map



WATER MAINS
- Distribution
- Washout
- Raw Water
- Abandoned
- Private

FITTINGS
- Hydrant
- Other

SEWERS — STRATEGIC / PUBLIC / PRIVATE / SECTION 104
- Foul
- Surface
- Combined
- Abandoned

OTHER WESSEX PIPES
- Rising Mains
- EDM — Effluent Disposal
- Overflow
- S — Syphon

NON-WESSEX / UNKNOWN
- Private Rising Mains
- CW — Culverted Watercourse
- H — Highway Drain
- ? — Use Unknown
- SU — Status Unknown

Colours generally indicate the use of the sewer/drain (i.e Red - Foul, Dark Blue - Surface, Magenta - Combined/Dual Use, Light Green - Highway Drain, Mid Green - Overflow). Some styles of line and symbol are shown on the key in sample/typical colours.

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- Pumping Stn - Foul/Combined
- Gully
- Vent Column
- Rodding Eye
- Catchpit
- Flushing Chamber
- Soakaway
- Non Return Valve
- Washout
- Air Valve
- Hatch Box

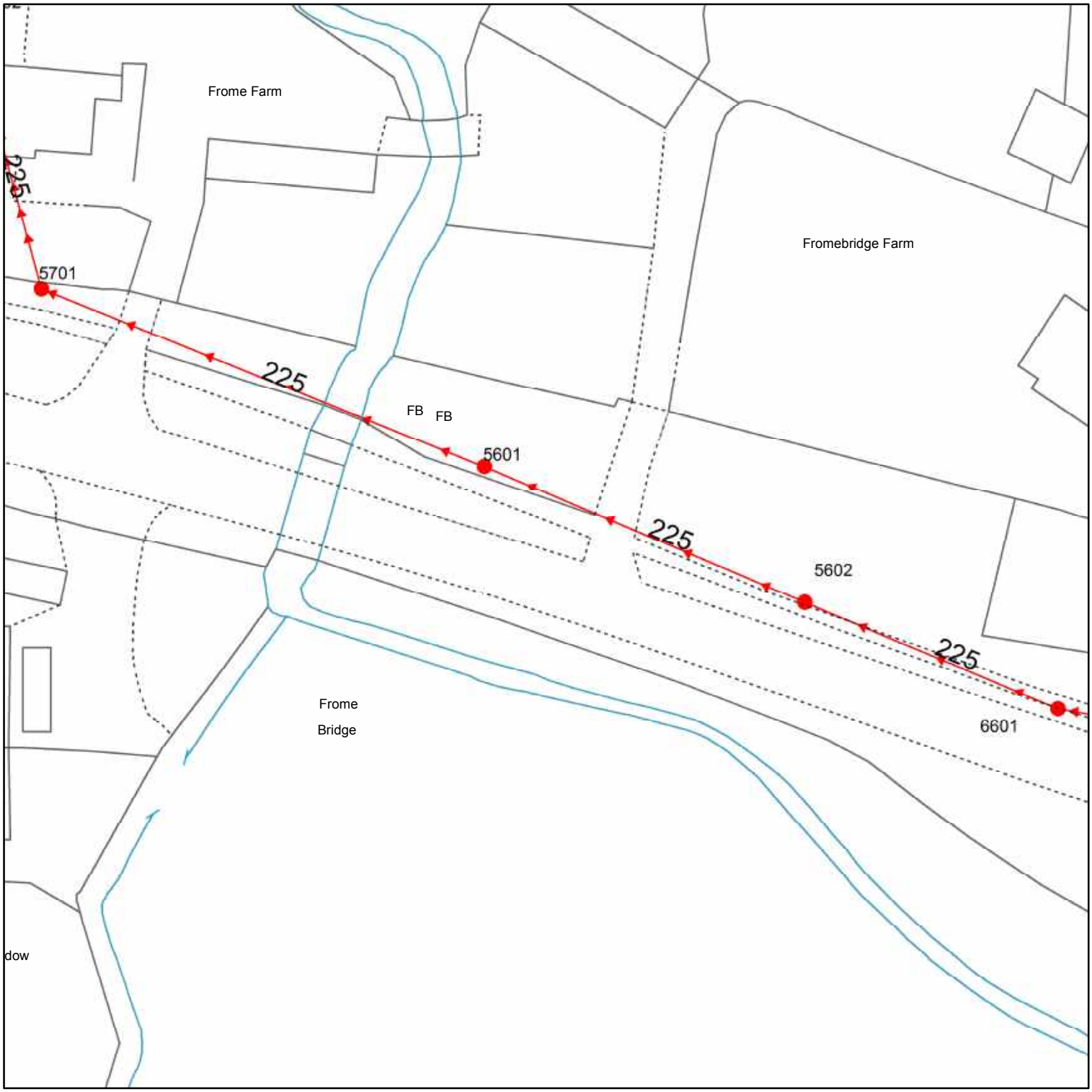
OTHER STRUCTURES
- Attenuation Tank
- Storage Tank
- Chamber
- Tunnel
- Interceptor

Wessex Water — YTL GROUP

Date: 24/01/2020
Centre: 374711, 181638
Scale: 1:625 (when printed at A4 size)

N W E S

Wessex Water Network Map



WATER MAINS
- Distribution
- Washout
- Raw Water
- Abandoned
- Private

FITTINGS
- Hydrant
- Other

SEWERS — STRATEGIC / PUBLIC / PRIVATE / SECTION 104
- Foul
- Surface
- Combined
- Abandoned

OTHER WESSEX PIPES
- Rising Mains
- EDM — Effluent Disposal
- Overflow
- S — Syphon

NON-WESSEX / UNKNOWN
- Private Rising Mains
- CW — Culverted Watercourse
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- Washout
- Air Valve
- Hatch Box

OTHER STRUCTURES
- Attenuation Tank
- Storage Tank
- Chamber
- Tunnel
- Interceptor

Wessex Water
YTL GROUP

Date: 24/01/2020
Centre: 374562, 181691
Scale: 1:625
(when printed at A4 size)

N
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S

Appendix F

Consultation with Environment Agency

creating a better place

Environment Agency

Mr Andy Clay
[redacted]

[redacted]
[redacted]:
Date: 25 February 2020

Dear Andy

Information request for **Aqueduct, Old Sodbury, BS37 6LX**

Thank you for your enquiry which was received on 05 February 2020.

Information	Upstream of the aqueduct and the aqueduct itself, is not classed as Main River. This is an ordinary watercourse that the lead local flood authority is responsible for. Once the watercourse opens up again, after the aqueduct, the River Frome becomes Main River. We do not hold any information about the structure of the aqueduct or the River Frome under the railway. South Gloucestershire Unitary Authority is the lead local flood authority (LLFA), who will have information on the river upstream and under the railway and the structures on the river. Network Rail can be contacted about their drainage channel and land accessibility. Their enquiries unit may be able to help with this.

Further Information
We advise that you also contact the Flood Risk Management Team, by email LeadLocalFloodAuthority@southglos.gov.uk , or by telephone, 01454 868000, at South Gloucestershire Council, Council Offices, Badminton Road, Yate, Bristol, BS37 5AF as they may be able to provide further advice with respect to localised flooding and drainage issues.

Further details about the Environment Agency information supplied can be found on our website: https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather

We hope you find this information helpful.

Yours sincerely

[redacted]

Chris Doyle
Customer & Engagement, Wessex
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS
Email: wessexenquiries@environment-agency.gov.uk
Telephone number: 03708 506 506

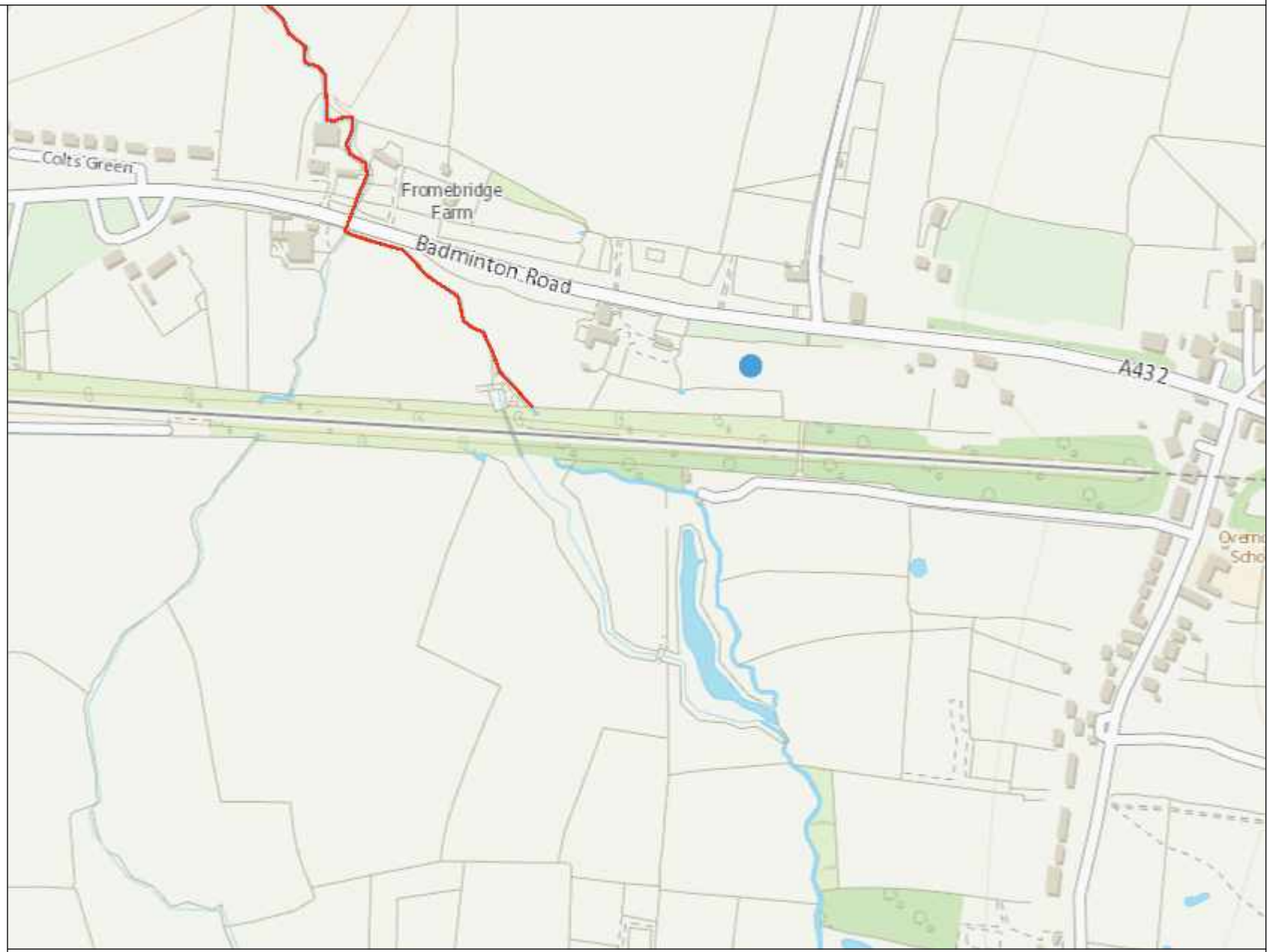
Enc 160264-WX Main River Map

Chipping Sodbury Aqueduct

Environment Agency

Legend

- Statutory Main Rivers
- Lead Local Flooding Authority



1: 5,000

0 125

Metres

N W E S

Appendix G

Consultation with South Gloucestershire Council

Andy Clay

From: [redacted]
Sent:
To:
Cc:
Subject:

Good Afternoon,

Please can you see below email and advise Andy Clay further?

Thank you

Alison
Customer Service Officer
Corporate Contact Centre

[redacted]

[redacted]ng,
I'm providing preliminary flood and drainage advice for a land area on the edge of Old Sodbury (South Gloucestershire), south of Badminton Road and north of the rail line (see location plan below).

I was hoping that you could you please supply me with a map of the local highway drainage infrastructure, which I anticipate to be located to the north of the land area along Badminton Road?

Many thanks, Andy

Andy Clay

From: [redacted]
Sent: [redacted]
To: [redacted]
Subject: [redacted]esponse

Thank you for contacting the Lead Local Flood Authority. We have received your email and a member of the team will be in touch with you shortly.

You may wish to refer to our website and frequently asked questions (FAQs) for more information:

Website: http://www.southglos.gov.uk/environment/drainage-and-flood-risk-management/
FAQs http://www.southglos.gov.uk//documents/FAQ-final-review-060716.pdf.

Thank you for your understanding.

Best regards,
Drainage and Flood Risk Management Team

South Gloucestershire Council Achieving excellence for our residents and their communities, ensuring South Gloucestershire continues to be a great place to live and work

---

Andy Clay

From: [redacted]

Importance: High

Afternoon Mr Clay,

In response to your email request outlined below, firstly our apologies for the slight delay in responding. In order that we may be precise in the information which we will provide regarding your enquiry, please could you provide us with a legible plan indicating your area of interest as the outlay below does not allow for any identifiable land marks or reference points.

In regards to providing you with a plan / map of the area of interest, please note that we would not be able to provide you with a copy as we are under copyright license regulations to both the Ordnance Survey and Wessex Water.

We will be able to confirm the existence of drainage infrastructure and any corresponding apparatus, but in relation to hard copy plans you may always request copies from Wessex Water regarding their records which mirror what we hold also. I believe there may be a charge with Wessex Water for that service.

Sp. Note: South Gloucestershire Council does not accept surface water runoff or flows, other than from Adoptable Highway areas only.

Thanks and Regards

Lynton Seymour EngTech MICE
Snr. Drainage Technician
(Drainage and Flood Risk Management)
StreetCare, Transport & Waste
Department of Environment and Community Services

Tel:01454 86 3523
M: 07824-081080
E: Lynton.Seymour@southglos.gov.uk
E: leadlocalfloodauthority@southglos.gov.uk

Postal Address:
South Gloucestershire Council
PO BOX 1954
Drainage and Flood Risk Management Team
Bristol
BS37 0DD

http://www.southglos.gov.uk/environment/drainage-and-flood-risk-management/

From: Andy Clay [mailto:andy@andyclayconsulting.co.uk]
Sent: 26 July 2019 11:12
To: LeadLocalFloodAuthority <LeadLocalFloodAuthority@southglos.gov.uk>
Subject: Land South of Badminton Road, Old Sodbury - Flood and Draiange Advice

Good morning,
I'm providing preliminary flood and drainage advice for a land area on the edge of Old Sodbury (South Gloucestershire), south of Badminton Road and north of the rail line (see location plan below).

Andy Clay

From: [redacted]
Sent: [redacted]
To: [redacted]
Subject: [redacted]

Importance: High

Morning Andy,

Further to the updated plan of your area of interest outlined within your screenshot, I can confirm that within the **A432 Badminton Road Old Sodbury**, **Grid Ref ST 375017, 181581** from the junction at Cotswold & Chapel Lane all the way down past the site boundary at Chestnut house and continuing past The Sodbury House Hotel there exist Road Gullies on our mapping layers, however these do not appear as a continuous connected Highway Drain and are therefore considered to be unrecorded. In order to verify and confirm that bespoke Highway Drainage infrastructure is present a CCTV survey would have to be undertaken by any interested parties to confirm its existence, extents, condition, capacity sizing and so on.

Sp. Note: South Gloucestershire Council does not accept surface water runoff or flows, other than from Adoptable Highway areas only.

Once you have received your sewer records from Wessex you will no doubt be able to cross-reference the outlay I have described above. In relation to Flood Risk and Drainage advice for potential 'New Development' as we are required to be consistently impartial to all enquiries alike, I have therefore provided links to our website which will assist you with your required information.

https://www.southglos.gov.uk/environment/drainage-and-flood-risk-management/

http://www.southglos.gov.uk//documents/Developers-designers-030117.pdf

https://www.southglos.gov.uk/documents/pte110277.pdf

http://www.southglos.gov.uk/documents/WoE-Sustainable-Drainage-Developer-Guide.pdf

I trust you will find this information useful to assist with your enquiry.

Best Regards

Lynton Seymour **EngTech MICE**
Snr. Drainage Technician
(Drainage and Flood Risk Management)
StreetCare, Transport & Waste
Department of Environment and Community Services

Tel:01454 86 3523
M: 07824-081080
E: Lynton.Seymour@southglos.gov.uk
E: leadlocalfloodauthority@southglos.gov.uk

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South Gloucestershire Council
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Drainage and Flood Risk Management Team
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BS37 0DD

http://www.southglos.gov.uk/environment/drainage-and-flood-risk-management/

Appendix H

Surface Water Drainage Calculations and Strategy

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 821 Urban 0.000
Area (ha) 1.412 Soil 0.450 Region Number Region 8

Results l/s

QBAR Rural 7.5
QBAR Urban 7.5

Q100 years 18.1

Q1 year 5.8
Q30 years 14.2
Q100 years 18.1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes UKPartH Manhole Sizes UKPartH

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.800	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.900
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

« - 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	13.700	0.300	45.7	0.017	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	16.900	0.405	41.7	0.024	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	12.300	0.200	61.5	0.096	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	27.300	0.395	69.1	0.053	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.004	38.400	0.600	64.0	0.094	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.005	23.000	0.300	76.7	0.107	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.006	26.500	1.330	19.9	0.070	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.007	16.400	0.070	234.3	0.069	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.008	28.000	0.100	280.0	0.009	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.009	9.900	0.050	198.0	0.089	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.010	84.000	1.200	70.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.011	77.700	0.750	103.6	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)
S1.000	50.00	5.15	107.750	0.017	0.0	0.0	0.0	1.49	26.4	2.3
S1.001	50.00	5.33	107.450	0.041	0.0	0.0	0.0	1.56	27.6	5.6
S1.002	50.00	5.46	106.970	0.137	0.0	0.0	0.0	1.67	66.4	18.6
S1.003	50.00	5.74	106.770	0.190	0.0	0.0	0.0	1.58	62.6	25.7
S1.004	50.00	6.07	106.300	0.284	0.0	0.0	0.0	1.97	139.1	38.5
S1.005	50.00	6.28	105.700	0.391	0.0	0.0	0.0	1.80	127.1	52.9
S1.006	50.00	6.41	105.400	0.461	0.0	0.0	0.0	3.54	250.1	62.4
S1.007	50.00	6.61	103.920	0.530	0.0	0.0	0.0	1.32	210.6	71.8
S1.008	50.00	7.00	103.850	0.539	0.0	0.0	0.0	1.21	192.4	73.0
S1.009	50.00	7.11	103.750	0.628	0.0	0.0	0.0	1.44	229.2	85.0
S1.010	50.00	8.28	103.650	0.628	0.0	0.0	0.0	1.20	21.3«	85.0
S1.011	48.15	9.59	102.450	0.628	0.0	0.0	0.0	0.99	17.4«	85.0

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	108.800	1.050	Open Manhole	1200	S1.000	107.750	150				
S2	108.500	1.050	Open Manhole	1200	S1.001	107.450	150	S1.000	107.450	150	
S3	108.100	1.130	Open Manhole	1200	S1.002	106.970	225	S1.001	107.045	150	
S4	107.900	1.130	Open Manhole	1200	S1.003	106.770	225	S1.002	106.770	225	
S5	107.500	1.200	Open Manhole	1200	S1.004	106.300	300	S1.003	106.375	225	
S6	106.900	1.200	Open Manhole	1200	S1.005	105.700	300	S1.004	105.700	300	
S7	106.600	1.200	Open Manhole	1200	S1.006	105.400	300	S1.005	105.400	300	
S8	106.300	2.380	Open Manhole	1500	S1.007	103.920	450	S1.006	104.070	300	
S9	106.150	2.300	Open Manhole	1500	S1.008	103.850	450	S1.007	103.850	450	
S10	106.000	2.250	Open Manhole	1500	S1.009	103.750	450	S1.008	103.750	450	
S11	105.050	1.400	Open Manhole	1500	S1.010	103.650	150	S1.009	103.700	450	350
S12	103.500	1.050	Open Manhole	1200	S1.011	102.450	150	S1.010	102.450	150	
SRIVER FROME	102.000	0.300	Open Manhole	0		OUTFALL		S1.011	101.700	150	

PIPELINE SCHEDULES for Storm

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	108.800	107.750	0.900	Open Manhole	1200
S1.001	o	150	S2	108.500	107.450	0.900	Open Manhole	1200
S1.002	o	225	S3	108.100	106.970	0.905	Open Manhole	1200
S1.003	o	225	S4	107.900	106.770	0.905	Open Manhole	1200
S1.004	o	300	S5	107.500	106.300	0.900	Open Manhole	1200
S1.005	o	300	S6	106.900	105.700	0.900	Open Manhole	1200
S1.006	o	300	S7	106.600	105.400	0.900	Open Manhole	1200
S1.007	o	450	S8	106.300	103.920	1.930	Open Manhole	1500
S1.008	o	450	S9	106.150	103.850	1.850	Open Manhole	1500
S1.009	o	450	S10	106.000	103.750	1.800	Open Manhole	1500
S1.010	o	150	S11	105.050	103.650	1.250	Open Manhole	1500
S1.011	o	150	S12	103.500	102.450	0.900	Open Manhole	1200

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	13.700	45.7	S2	108.500	107.450	0.900	Open Manhole	1200
S1.001	16.900	41.7	S3	108.100	107.045	0.905	Open Manhole	1200
S1.002	12.300	61.5	S4	107.900	106.770	0.905	Open Manhole	1200
S1.003	27.300	69.1	S5	107.500	106.375	0.900	Open Manhole	1200
S1.004	38.400	64.0	S6	106.900	105.700	0.900	Open Manhole	1200
S1.005	23.000	76.7	S7	106.600	105.400	0.900	Open Manhole	1200
S1.006	26.500	19.9	S8	106.300	104.070	1.930	Open Manhole	1500
S1.007	16.400	234.3	S9	106.150	103.850	1.850	Open Manhole	1500
S1.008	28.000	280.0	S10	106.000	103.750	1.800	Open Manhole	1500
S1.009	9.900	198.0	S11	105.050	103.700	0.900	Open Manhole	1500
S1.010	84.000	70.0	S12	103.500	102.450	0.900	Open Manhole	1200
S1.011	77.700	103.6	SRIVER FROME	102.000	101.700	0.150	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.011	SRIVER FROME	102.000	101.700	101.620	0	0

Simulation Criteria for Storm

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

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

Synthetic Rainfall Details

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.800	Storm Duration (mins)	30
Ratio R	0.350		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S11, DS/PN: S1.010, Volume (m³): 3.8

Unit Reference	MD-SHE-0125-7500-1150-7500
Design Head (m)	1.150
Design Flow (l/s)	7.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	125
Invert Level (m)	103.650
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.150	7.5	Kick-Flo®	0.732	6.1
Flush-Flo™	0.336	7.5	Mean Flow over Head Range	-	6.5

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)
0.100	4.5	0.800	6.3	2.000	9.7	4.000	13.5	7.000	17.7
0.200	7.2	1.000	7.0	2.200	10.2	4.500	14.3	7.500	18.2
0.300	7.5	1.200	7.6	2.400	10.6	5.000	15.0	8.000	18.8
0.400	7.5	1.400	8.2	2.600	11.0	5.500	15.7	8.500	19.4
0.500	7.3	1.600	8.8	3.000	11.8	6.000	16.4	9.000	19.9
0.600	7.0	1.800	9.3	3.500	12.7	6.500	17.0	9.500	20.4

Storage Structures for Storm

Tank or Pond Manhole: S11, DS/PN: S1.010

Invert Level (m) 103.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	205.0	1.350	520.0

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm) 19.800 Cv (Summer)	0.750
Region England and Wales		Ratio R 0.350 Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.000	S1	15 Winter	1	+0%	100/15 Summer				107.781	-0.119
S1.001	S2	15 Winter	1	+0%	100/15 Summer				107.495	-0.105
S1.002	S3	15 Winter	1	+0%	100/15 Summer	100/15 Winter			107.051	-0.144
S1.003	S4	15 Winter	1	+0%	30/15 Summer	100/15 Winter			106.865	-0.130
S1.004	S5	15 Winter	1	+0%	100/15 Summer				106.401	-0.199
S1.005	S6	15 Winter	1	+0%	30/15 Summer				105.830	-0.170
S1.006	S7	15 Winter	1	+0%	100/15 Summer				105.497	-0.203
S1.007	S8	15 Winter	1	+0%	30/15 Summer				104.106	-0.264
S1.008	S9	15 Winter	1	+0%	30/15 Summer				104.041	-0.259
S1.009	S10	15 Winter	1	+0%	30/15 Summer				103.954	-0.246
S1.010	S11	120 Winter	1	+0%	1/15 Summer				103.914	0.114
S1.011	S12	120 Winter	1	+0%					102.519	-0.081

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.000	0.09		2.2	OK	
S1.001	S2	0.000	0.19		4.9	OK	
S1.002	S3	0.000	0.27		15.6	OK	1
S1.003	S4	0.000	0.37		21.5	OK	1
S1.004	S5	0.000	0.25		31.9	OK	
S1.005	S6	0.000	0.39		43.6	OK	
S1.006	S7	0.000	0.23		51.2	OK	
S1.007	S8	0.000	0.36		58.6	OK	
S1.008	S9	0.000	0.36		58.9	OK	
S1.009	S10	0.000	0.42		67.5	OK	

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.010	S11	0.000	0.35		7.4	SURCHARGED	
S1.011	S12	0.000	0.43		7.4	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm) 19.800 Cv (Summer)	0.750
Region England and Wales		Ratio R 0.350 Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	30	+0%	100/15 Summer				107.799
S1.001	S2	15 Winter	30	+0%	100/15 Summer				107.529
S1.002	S3	15 Winter	30	+0%	100/15 Summer	100/15 Winter			107.166
S1.003	S4	15 Winter	30	+0%	30/15 Summer	100/15 Winter			107.038
S1.004	S5	15 Winter	30	+0%	100/15 Summer				106.491
S1.005	S6	15 Winter	30	+0%	30/15 Summer				106.063
S1.006	S7	15 Winter	30	+0%	100/15 Summer				105.579
S1.007	S8	15 Winter	30	+0%	30/15 Summer				104.415
S1.008	S9	15 Winter	30	+0%	30/15 Summer				104.344
S1.009	S10	180 Winter	30	+0%	30/15 Summer				104.267
S1.010	S11	180 Winter	30	+0%	1/15 Summer				104.265
S1.011	S12	1440 Summer	30	+0%					102.519

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.101	0.000	0.23		5.5	OK	
S1.001	S2	-0.071	0.000	0.53		13.7	OK	
S1.002	S3	-0.029	0.000	0.79		44.8	OK	1
S1.003	S4	0.043	0.000	1.06		61.5	SURCHARGED	1
S1.004	S5	-0.109	0.000	0.71		91.3	OK	
S1.005	S6	0.063	0.000	1.11		125.2	SURCHARGED	
S1.006	S7	-0.121	0.000	0.65		146.4	OK	
S1.007	S8	0.045	0.000	1.00		164.1	SURCHARGED	
S1.008	S9	0.044	0.000	1.00		163.9	SURCHARGED	
S1.009	S10	0.067	0.000	0.31		48.7	SURCHARGED	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.010	S11	0.465	0.000	0.36		7.5	SURCHARGED	
S1.011	S12	-0.081	0.000	0.44		7.5	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm) 19.800 Cv (Summer)	0.750
Region England and Wales		Ratio R 0.350 Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	100	+40%	100/15 Summer				108.309
S1.001	S2	15 Winter	100	+40%	100/15 Summer				108.278
S1.002	S3	15 Winter	100	+40%	100/15 Summer	100/15 Winter			108.100
S1.003	S4	15 Winter	100	+40%	30/15 Summer	100/15 Winter			107.900
S1.004	S5	15 Winter	100	+40%	100/15 Summer				107.220
S1.005	S6	15 Winter	100	+40%	30/15 Summer				106.669
S1.006	S7	15 Winter	100	+40%	100/15 Summer				105.940
S1.007	S8	15 Winter	100	+40%	30/15 Summer				104.799
S1.008	S9	360 Winter	100	+40%	30/15 Summer				104.754
S1.009	S10	360 Winter	100	+40%	30/15 Summer				104.751
S1.010	S11	360 Winter	100	+40%	1/15 Summer				104.749
S1.011	S12	1440 Winter	100	+40%					102.519

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.409	0.000	0.43		10.5	SURCHARGED	
S1.001	S2	0.678	0.000	0.92		23.6	FLOOD RISK	
S1.002	S3	0.905	0.264	1.02		58.0	FLOOD	1
S1.003	S4	0.905	0.266	1.43		83.4	FLOOD	1
S1.004	S5	0.620	0.000	0.96		123.9	FLOOD RISK	
S1.005	S6	0.669	0.000	1.54		173.6	FLOOD RISK	
S1.006	S7	0.240	0.000	0.92		207.2	SURCHARGED	
S1.007	S8	0.429	0.000	1.45		238.0	SURCHARGED	
S1.008	S9	0.454	0.000	0.29		47.5	SURCHARGED	
S1.009	S10	0.551	0.000	0.35		55.0	SURCHARGED	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.010	S11	0.949	0.000	0.36		7.5	SURCHARGED	
S1.011	S12	-0.081	0.000	0.44		7.5	OK	

KEY

- 100.00 PROPOSED FINISHED FLOOR LEVEL
- EXISTING PUBLIC FOUL WATER SEWER (TRANSPOSED FROM WESSEX WATER SEWER RECORD)
- EXISTING DRAINAGE DITCH/WATERCOURSE
- SURFACE WATER DRAIN
- SURFACE WATER MANHOLE
- FOUL WATER DRAIN
- FOUL WATER MANHOLE
- EXCEEDANCE FLOW PATHWAY/ OVERLAND FLOOD FLOW ROUTE
- 3m SEWER EASEMENT

N

Track

Track

FW MH
REF: 7601
CL 104.68
IL 102.94 (TBC)

225Ø 1:54 (tbc)

FW MH
REF: 8601
CL 106.47
IL 104.55 (TBC)

F11
CL 106.30
IL 104.45

225Ø

225Ø 1:580 (TBC)

300Ø

COMMONMEAD LANE

FW MH (BURIED)
REF: 9601
CL 107.90
IL 105.99 (TBC)

225Ø

BADMINTON ROAD

FW MH (BURIED)
REF: 9602
CL 108.10
IL 106.18 (TBC)

225Ø

A 432

FW MH (BURIED)
REF: 0501
CL 109.65
IL 107.65 (TBC)

Allotment Gardens

GP

FW MH (BURIED)
REF: 8501
CL 106.00
IL 104.64 (TBC)

S1
CL 108.80
IL 107.75

S2
CL 108.50
IL 107.45

S3
CL 108.10
IL 106.97

S4
CL 107.90
IL 106.77

F10
CL 106.15
IL 104.58

S10
CL 106.00
IL 103.75

S8
CL 106.30
IL 103.92

S7
CL 106.60
IL 105.40

S6
CL 106.90
IL 105.70

F8
CL 106.30
IL 104.61

F7
CL 106.60
IL 104.67

F6
CL 106.90
IL 104.73

F5
CL 106.60
IL 104.78

F4
CL 106.30
IL 104.82

F3
CL 107.50
IL 105.85

F2
CL 107.90
IL 106.25

F1
CL 108.10
IL 106.45

S5
CL 107.50
IL 106.30

CL 106.15
IL 104.85

CL 106.15
IL 103.85

ATTENUATION BASIN
TOP OF BANK LEVEL 105.05
BASE LEVEL 103.70
MAX. WATER DEPTH - 1.05m
FREEBOARD - 0.3m
SIDE SLOPES - 1:3
STORAGE VOLUME - 350m³
(1:100 YEAR STORM + 40% CC)

SW OUTLET TO THE RIVER FROME, SUBJECT TO LAND DRAINAGE CONSENT AGREEMENT
IL 101.70

RIVER FROME

150Ø

S13
CL 102.30
IL 101.85

PROVIDE CONCRETE PROTECTION TO PIPE WHERE IT CROSSES BENEATH EXISTING DITCH

S12
CL 103.33
IL 102.28

150Ø

FLOW CONTROL CHAMBER (S11)
CL 105.05
IL 103.65 (150Ø)
TYPE - HYDROBRAKE
REF: - MD-SHE-0124-7500-1250-7500
DISCHARGE RATE - 7.5 L/S UP TO THE 1:100 YEAR STORM + 40% CC

ABANDONED PIPEWORK TO BE EXCAVATED & BACKFILLED

FW MH
REF: 9501
CL 106.29
IL 104.80

300Ø

225Ø

EXISTING PUBLIC FOUL SEWER TO BE DIVERTED TO RUN BENEATH PUBLIC FOOTPATH AND PROPOSED HIGHWAY. MIN. PIPE GRADIENT APPROX. 1:463 DIVERSION ROUTE AND DETAILED TO BE APPROVED BY WESSEX WATER UNDER S185 AGREEMENT. FULL CCTV SURVEY OF DIVERTED PIPEWORK & VERIFICATION OF LEVELS AT BOTH ENDS TO BE UNDERTAKEN.

MP 103.75

NOTES:

1. ALL BUILDING DRAINAGE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE CURRENT BRITISH/EUROPEAN STANDARDS BSEN752, THE CURRENT BUILDING REGULATIONS AND THE LOCAL AUTHORITY BUILDING CONTROL SPECIFICATIONS AND REQUIREMENTS.
2. ALL DRAINAGE WORKS TO BE CONSTRUCTED FROM THE OUTFALL TOWARDS THE HEAD OF RUN TO ENSURE THE OUTFALL CAN BE ACHIEVE
3. CONTRACTOR TO VERIFY LOCATIONS OF ALL EXISTING SERVICES PRIOR TO COMMENCEMENT AND ARRANGE FOR ANY NECESSARY PROTECTION, DIVERSION OR LOWERING WORKS AS REQUIRED.
4. CONTRACTOR TO VERIFY LINE AND LEVEL OF EXISTING PUBLIC SEWERS PRIOR TO COMMENCEMENT AND TO ARRANGE FOR CCTV SURVEY OF PROPOSED SEWER DIVERSION TO BE UNDERTAKEN.
5. NO WORKS TO PUBLIC SEWER TO BE UNDERTAKEN WITHOUT PRIOR APPROVAL BY WESSEX WATER.
6. ALL WORKS IN VICINITY OF EXISTING RAILWAY LINE AND EMBANKMENT MAY BE SUBJECT TO PRIOR APPROVAL BY NETWORK RAIL.
7. ALL WORKS OUTSIDE OF SITE BOUNDARY WILL BE SUBJECT TO AGREEMENT WITH RELEVANT LANDOWNER. IT IS UNDERSTOOD THAT THESE WORKS HAVE ALREADY BEEN AGREED IN PRINCIPLE.

REV.	DESCRIPTION	Date	BY	CHK
F	DIVERTED SEWER GRADIENT AMENDED TO 1:463	22.02.21	PS	PS
E	DIVERTED FOUL SEWER INCREASED TO 300mm	17.02.21	PS	PS
D	FURTHER AMENDMENT TO SITE LAYOUT	08.01.21	PS	PS
C	SITE LAYOUT REVISED	07.01.21	PS	PS
B	OUTLET LOCATION AMENDED	03.03.20	PS	PS
A	FIRST ISSUE	28.02.20	AB	PS

DESIGN BY: tumu CONSULTING

DRAWING STATUS: PLANNING APPLICATION

andy clay consulting
flood risk and drainage

CLIENT: CLIFTON HOMES

PROJECT: BADMINTON ROAD, OLD SODBURY

TITLE: OUTLINE DRAINAGE STRATEGY

SCALE @ A1: 0 1:500 25 metres

PROJECT No: 19204

DRAWING No: D01

REV: F