DOCUMENT CONTROL SHEET

Issued by	Hydrock Consultants Limited 5th Floor Merchants House North Wapping Road Bristol BS1 4RW	Tel: 01454 619533 Fax: 01454 614125 www.hydrock.com
Client	Oakhill Group Limited	
Project name	Newbridge Road, Bath	
Title	Foul & Surface Water Drainage Strategy	
Doc ref	07716-HYD-XX-ZZ-RP-C-0001	
Project no.	C-07716	
Status	S2 - For Information	
Date	28/03/2019	

Document Production Record		
Issue Number	P03	Name
Prepared by		Evan Trower
Checked by		Roger Jack
Approved by		Roger Jack

Document Revision Record			
Issue Number	Status	Date	Revision Details
P01	S2	07.03.2019	For review
P02	S2	21.03.2019	For Planning
P03	S2	28.03.2019	For Planning

Hydrock Consultants Limited has prepared this report in accordance with the instructions of the above named client for their sole and specific use. Any third parties who may use the information contained herein do so at their own risk.

CONTENTS

Appendices

Introduction

Hydrock Consultants have been appointed by Oakhill Group Limited. to carry out a drainage strategy report for proposed development site on Newbridge Road, Bath

It is the intention that the proposed drainage strategy will be accordance with both local and national guidelines and will incorporate a 'best practice' approach in reducing the impact of the flooding caused by the new development.

The report will highlight the key stakeholders responsible in terms of ownership and maintenance to ensure the drainage system is kept well maintained and reduce the risk of failure. Should the network fail at any point, clearly defined ownership liabilities will ensure that problems can be quickly rectified thereby reducing the impact of potential damage caused by flooding.

The information received has been summarised within this report. In the event that the information is relied upon and is subsequently found to be incorrect, Hydrock Consultants Ltd accepts no responsibility for any direct and/or consequential loss that may occur as a result.

1. SITE INFORMATION

1.1 Site Referencing Information

Site Address	Hartwell Garage
	Newbridge Road
	Bath
	BA1 2PP

1.2 Existing Situation

The development boundary covers 1.38Ha and is located in Western Bath. The current/previous site use is a car dealership consisting of a 4-storey garage, car showroom, offices and ancillary buildings in an old quarry site. The south of the plot contains the route of a previous train line that would have linked Bath to Bristol. This train line has not been operating since the 1960s.

1.3 Topography

The site is split into to distinct levels. The main aspect of the site is to the south and is relatively flat at around 23.5m AOD this is the lower side of the site. It is also the part of the site where the old train track ran so the levels are fairly uniform from east to west. As the site heads east down the train route, the levels do begin to drop, either side there are steep banks rising up to vegetation and residential plots. The high point of the site is on Newbridge Road, the level here is approximately 30m AOD. Within the existing building is an old quarry face,

the height of this face is approximately 7m. The existing garage building currently hides the exact line of the cliff.

There is some vegetation, around the edges of the site, but the surfacing is primarily concrete slab and gravel.

See **Appendix A**: for Topographical layout.

1.4 Development Proposal

The project consists of the demolition of an existing 4-storey garage, car showroom, offices and ancillary buildings in an old quarry site. New residential apartments will then be constructed on the footprint of the demolished showroom and garage, with two new 5-storey student residential blocks proposed where the ancillary building are located.

Following the southern border there will be a cycleway, this follows the old train route. Parallel to this will be access for resident parking.

See **Appendix B** for Architect's layout

1.5 Ground Conditions

A GI was carried out by: *Ground Investigation (South West) Ltd* (29th January, 2016), the key factors associated with the drainage strategy are quoted below:

'*The results of the in-situ soil infiltration tests are presented in Appendix D and indicate very poor infiltration rates for the near-surface deposits of the Penarth Group. One of the tests (TP01) recorded an infiltration rate of 10-6 m/s, whilst the remaining two (TP03 and TP04) were abandoned after a period of at least 4 hours due to an imperceptible fall in groundwater level.*'

'*The presence of asbestos within the deposits of Made Ground, together with high concentrations of PAH compounds, TPH, arsenic, lead and zinc, could potentially classify the soils as hazardous waste in respect of off-site disposal.*'

1.6 Hydrology, Hydrogeology & Flood Risk

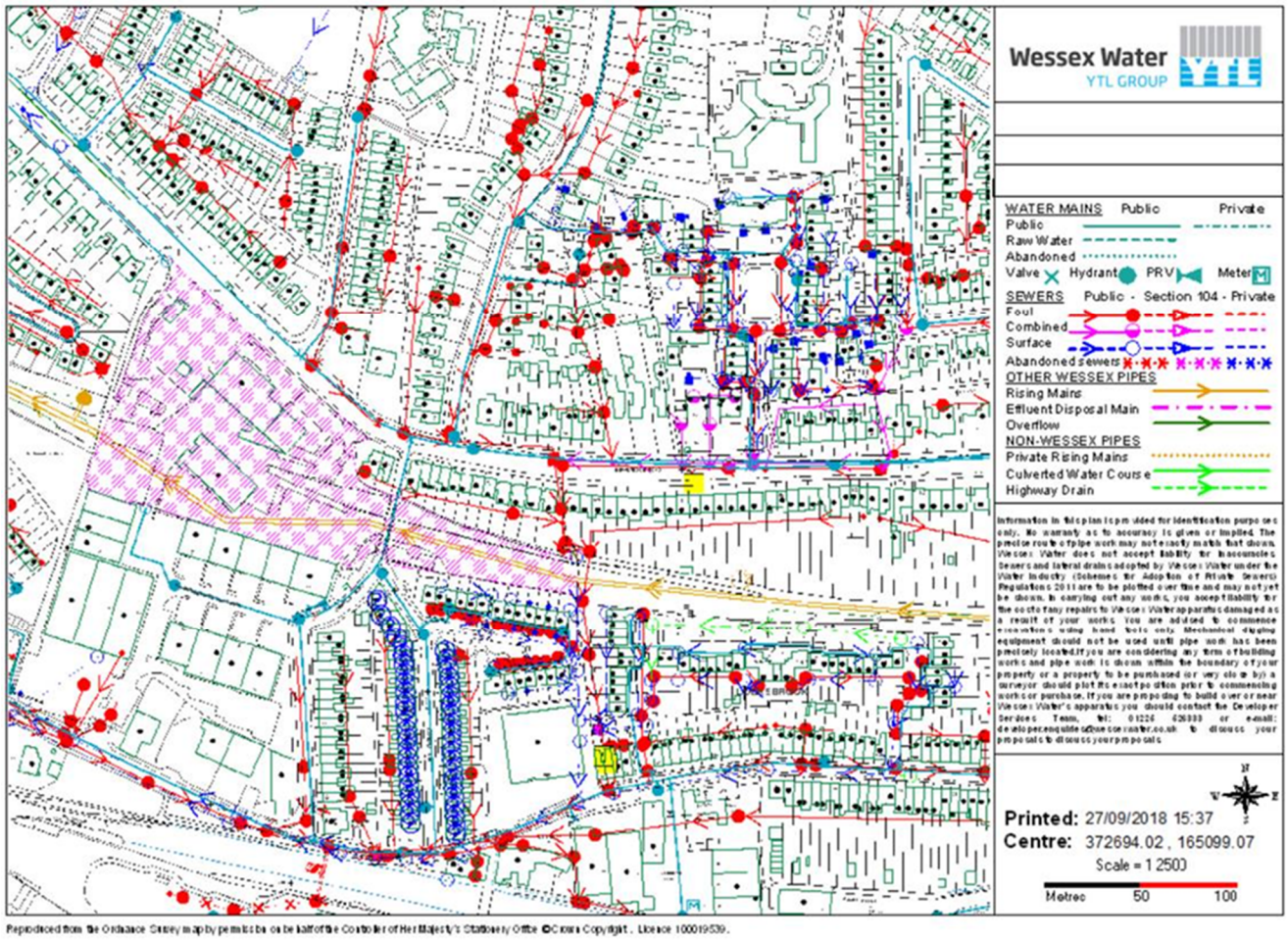
An FRA has been undertaken for the previous scheme to determine the flood risk. The report was carried out by Campbell Reith and is referenced: 11546 (August 2014).

It should be noted that despite changes to the site proposals, the site as a whole has not changed. Therefore, certain statements and conclusions can still be drawn from the report and considered valid:

- The site is located within Flood Zone 1.
- The proposed development is considered to be at low risk of flooding from all sources and is therefore fully compliant with the NPPG.

1.7 Services and Utilities

The major services found within the site are a twin pumping main. This serves the Bath catchment and runs down to the Saltford Sewage Treatment Works. This is a sensitive asset and therefore there is a 6m easement from the outside of each pipe. Correspondence with Wessex Water has confirmed that the planned site arrangement is acceptable in regards to maintaining their access to the pipes.



Reproduced from the Ordnance Survey map by permission of the Controller of Her Majesty's Stationery Office © Crown Copyright. Licence 100019539.

1.8 Existing Drainage

The existing drainage is a separated storm and foul water system serving the current building demands. A survey has been carried out which highlights the route of the sewers, indicating levels and pipe sizes.

See **Appendix C** for Existing Drainage Survey

There is an existing surface water sewer that crosses the site from the West to East. It leaves the site on the southern boundary. Although the sewer is not currently shown as a public sewer on the Wessex Water sewer asset map, it is assumed, that once it leave the development site it is their asset. This follows from legislation in 2011 requiring water authorities to adopt sewers serving multiple properties, and resulted in a mass adoption of existing sewers. This requires confirmation from Wessex Water.

2. SURFACE WATER MANAGEMENT STRATEGY

It is intended that surface water run-off from the new development will be collected by way of rainwater pipes, gullies and drainage channels into a dedicated below ground surface water drainage system which will discharge to the 'public' sewer on site. The system will be split into 3 networks each with a controlled discharge rate, attenuated through individual methods of attenuation. The combined discharge rate from the site will be 9l/s.

It is intended to follow SuDS guidance principals in the design of this new system. However site constraints have meant it is not totally possible to achieve the most desirable methods of disposal. These constraints include the rising mains and associated easement, which 'sterilises' a large area of the lower section of the site. This is the downstream side of the site, which would typically be where SuDS features would be located.

Without knowing the demand on this sewer from the adjoining plots and downstream plots it is hard to know the capacity of this pipe.

The existing sewer pipe crossing the site is a 225mm diameter, where it leaves the site. No flow control devices were highlighted on the survey, it therefore can be assumed that a free discharge through the existing network leave the site.

As the existing networks allows for free discharge, limited only by the available capacity of the downstream network. There is insufficient information on the downstream sewer and therefore capacity cannot be accurately assessed.

However by implementing a flow control device and drainage management network containing SuDS - discharge rates from the site can be set to improve demand on the existing network.. It can also be proved that the strategy will reduce the overall volume leaving the site. This is critical as the Wessex Water network flows into the river Avon, and so the development will reduce the risk of major flooding in the Avon catchment.

The next stage of the report will highlight the design process and indicate the site constraints which lead to the formulation of the design. The process follows the SuDS hierarchy as defined in the CIRIA design manual.

See **Appendix D** for Drainage Strategy

2.1 Run-off Destinations

Within the available external space, it has been attempted to include areas of soft landscaping. These areas mark an improvement in permeable area, from the previous site use. Therefore the total volume of surface water leaving the site via positive drainage has been decreased. In areas where the existing ground is permeable (landscaping and gravel), and the surface water currently infiltrates directly to the ground, conditions will be replicated by using permeable surface systems.

See **Appendix E** for Existing areas.

Run-off from the hard-standing areas will be collected via gullies and channels, which will allow the water to enter into the below ground drainage network. The run-off from the roofs will also be directed to the below ground drainage via rainwater pipes.

2.1.1 *Interception*

By adding vegetation and tree planters, the site will reduce the amount of water that reaches the ground. The vegetation can intercept, store and use this water, and reduce the risk of flooding caused by surface water. These are useful factors in the reduction of flood risk, however it has not been accounted for (or relied upon) in the drainage strategy design.

2.1.2 *Infiltration*

Infiltration rates are poor although the results of the GI did indicate a limited capacity for the soil to infiltrate. It is not therefore not considered as a viable option for the primary means of disposal for the site. There is also an issue with controlled waters in the area, and the GI shows high levels of contamination from various sources. It is therefore not appropriate to increase the amount of water entering the ground.

As part of the scheme a new cycle path is being created, this will have a small amount of run-off which will be directed into a filter trench which runs along its edge - viewed as a strip of grass. A filter trench will also be used to capture land-drainage running off the steep banks found within the eastern section of the site. Its considered that these small amounts of infiltration equate to the existing volumes that drain to ground. The shallow depth means that the risk of contaminating any groundwater is low.

See **Appendix** F for Proposed areas

2.1.3 *Surface water body*

Due to space constraints there is no opportunity to create new SW bodies, nor are there any existing to which to drain to.

2.1.4 *To dedicated surface water sewer (public, highways or otherwise)*

The main existing surface water sewer running through the site is considered a public sewer. This still needs to be confirmed. However through correspondence with Wessex Water - Planning Liaison - they have stated they could accommodate a 30% betterment on existing brownfield flows. The results from the Modified rational method give relatively high rate for the site, with 30% betterment on the 1 in 30 year event as: 90l/s

See **Appendix G** for Brownfield runoff calculations

This assessment of discharge rate has been superseded by the LLFA who has stated the site should aim to return discharge to a Greenfield Run-off rate (or as close as practically possible). This has been calculated as QBAR = 0.7l/s

See **Appendix H** for Greenfield run-off calculations

This rate is deemed too low to achieve through conventional flow control methods. Therefore the attempt has been made to keep discharge as close as possible.

By analysing the available attenuation space we are able to compare the possible storage against the required discharge volume.

Network 1 *(catchment draining through Flow control* FC-01*)*

Drained area = 4,812m^2

Available attenuation area (tank at depth 1.2m + porous paving) = 141m2 + 492m^2

Storage volume = 257m^3

Achievable discharge rate = 4.0l/s

Network 2 *(catchment draining through flow control* FC-02*)*

Drained area = 1,714m^2

Available attenuation area = 72m^2

Available storage volume = 72m^3

Achievable discharge rate = 3.0l/s

Network 3 *(southern hardstanding area through orifice 01)*

An oversized pipe will provide storage for the lower area and discharge into the existing sewer at 2l/s.

Preliminary MicroDrainage models for the whole site and individual networks 1, 2, and 3 confirms the storage volumes provided can contain the 100yr (with no allowance for climate change) flows at a combined discharge rate of:

9l/s. (*Lower rates are unachievable and cause flooding*.)

In order to manage 100 yr + 40% climate change, either a higher discharge rate must be allowed for, or otherwise measures will be put in place to manage exceedance volumes of 100m3 in the lower areas of the site, away from buildings. See sections 2.2/2.3 below.

2.1.5 *Summary*

It is considered that the drainage strategy report has demonstrated compliance with both the recommendations for the 'Non-Technical Standards for Sustainable Drainage' and has looked to comply with recommendations from the LLFA to achieve Greenfield Run-off or as close to Greenfield as practically possible.

2.2 Flood Storage Infiltration

The drainage system will be designed so that flooding does not occur during the 1 in 100-year rainfall event in any part of the site.

An allowance for 40% climate change is to be incorporated into the surface water drainage design and an excess flows will be managed via exceedance routes. Once flows have subsided into the system, flood volumes will drain back down into the network.

2.3 Exceedance Flow Management

In the event that flows from rainfall exceed the 1 in 100-year rainfall event, surface water run-off will be directed via exceedance routes away from the buildings to localised areas e.g. car park, cycle path thereby not

increasing flood risk to critical infrastructure or buildings. This will drain through the gullies into the network. This flood exceedance area needs to be confirmed with client. If not possible, discharge rates may need to be increased.

See **Appendix I** for Flood Exceedance Route

2.4 Water Quality Treatment

Consideration will be given to both during construction and post-development water quality treatment to ensure that water quality is not impacted during the construction works.

2.4.1 *Quality of Surface Water Run-off: During Construction*

It is anticipated that during construction adequate provisions will be put in place to ensure the existing drainage is protected to prevent material which could have a negative impact on water quality entering the system.

2.4.2 *Quality of Surface Water Run-off: Post-Development*

Gully's and drainage channels will be specified with silt traps and catch pits will be incorporated in the drainage system to reduce the risk of silts / salts getting into the surface water network. By attenuating flows prior to discharge silts are allowed to settle, further reducing the risk.

2.5 Design Standards

All materials and products relating to the below ground drainage system shall be specified in accordance with their intended use and meet all relevant British Standards and BBA accreditations.

3. FOUL WATER STRATEGY

Foul drainage for the new development will be via conventional gravity pipe system which connects into an existing private sewer within the site.

'*ideally any private offsite sewers will be offered for adoption by Wessex Water under a S102 arrangement to avoid placing maintenance burden of third parties*' Daniel Parr LLFA.

It is anticipated that this is already the case and once the pipe leaves the site boundary it is a public sewer which was adopted under the mass adoption (as mentioned in section 1.8). We are awaiting confirmation on this point.

The drainage beyond the point of connection. i.e. the existing sewers will required further investigation to confirm the capacity and condition is acceptable for additional use. Wessex Water will be informed of the additional demand on their network and will shoulder the responsibility for any network improvements.

It is understood that foul drainage within the development boundary serves only the site and will be maintained by a management company. A schedule of maintenance activities, which ensures the drainage is kept in good working order will be produced and submitted as part of the 'Health & Safety' documentation.

The foul drainage system will be designed in accordance with Building Regulations Approved Document H and the relevant British Standards.

4. MAINTENANCE & OWNERSHIP

The key elements of the foul and surface water drainage system will require periodic maintenance to prevent failure of the system and/or a reduction in capacity of the networks as a whole and the following matrix therefore sets out the various drainage items to be maintained, identifies whose is responsible and the frequency of maintenance.

It is anticipated that the drainage within the development will be maintained privately by a management company appointed by the owner / occupier.

4.1 Responsibility Matrix

Responsibility	Feature	Maintenance	Frequency
Owner / Occupier Appointed Management Company	Private Drains	Inspection	CCTV survey every 5-10 years.
		Regular Maintenance	Jet clean system fully every 5-10 years. (Recommend prior to CCTV drainage survey)
		Remedial / Occasional Maintenance	Carry out remedial works as identified in CCTV survey.
	Permeable Paving *Reference should be made to manufacturers recommendation where applicable*	Inspection	Within 3months of installation, then annually
		Regular maintenance	Sweep surface to remove debris and contamination 1-2 times a year, typically after leaf fall in autumn
		Occasional Maintenance	Removal of weeds. As required
	Tank /	Remedial Measures	Remediate areas of rutting and depressions, as required. Replace broken/damaged blocks, as required. Rehabilitate surface with sweeping and reapplication of clean gritstone
		Regular Maintenance	Jet clean system fully every 5-10 years. (Recommend prior to CCTV drainage survey)
		Remedial / Occasional Maintenance	Carry out remedial works as identified in CCTV survey.
	Gullies / Drainage Channels	Inspection	Quarterly
		Regular Maintenance	Remove silt and debris as necessary to prevent build up.
		Remedial / Occasional Maintenance	Carry out remedial works as identified in CCTV survey.

4.2 Risk Assessment and Health & Safety Information

The following information should be passed to the development operator to ensure that future maintenance is carried out in a safe and proper manner.

A formal review of the risks should be undertaken on an annual basis.

Operation	Risks	Mitigating Measures
Access to manholes for Inspection and Maintenance.	1. Confined spaces	1. Entry to confined space to be minimised and, where unavoidable, to be carried out by appropriately trained personnel
Removal of silt from outfall	1. Risk to members of the public 2. Open Water	1. Access to hazardous areas by members of the public to be prohibited. 2. To be carried out by appropriately trained personnel
Removal of silt from drainage channel	1. Risk to members of the public	1. Access to hazardous areas by members of the public to be prohibited

All inspection and maintenance works should take into consideration the implications of 'lone working'. An assessment should be carried out and the risks mitigated accordingly.

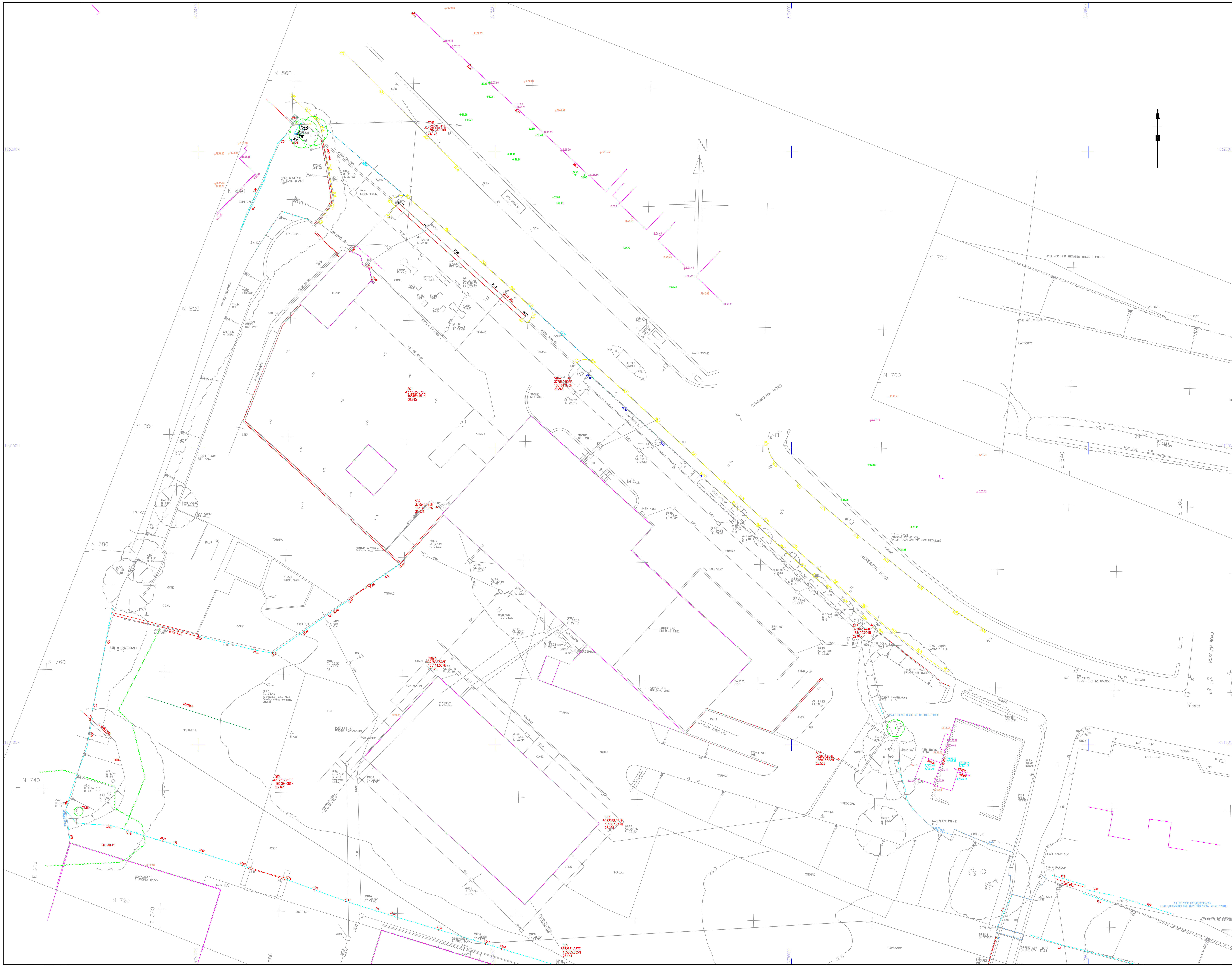
5. SUMMARY & CONCLUSION

The following conclusions have been based solely on the information assessed as part of this report.

- Brownfield site with existing drainage - foul and surface sewers.
- The surface water drainage strategy will attenuate flows before discharge to the public network.
- Confirmation required from Wessex Water in regards to ownership of offsite foul and surface water sewers.
- Site wide surface water strategy incorporates a number of SuDS features to manage flows within the site.
- Overall discharge rate from the site equates to 9l/s - rate to be agreed with LLFA.
- Foul sewer requires investigation to confirm condition - may be Wessex Water's responsibility to confirm.
- It is anticipated that the drainage within the development will be maintained privately by a management company appointed by the owner / occupier.

Appendix A

Topographical layout

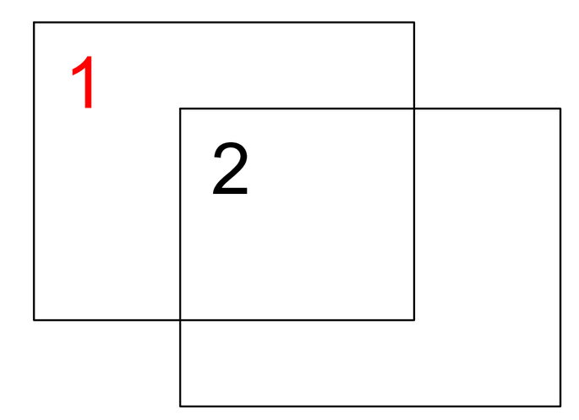


Survey Notes
Grid:
Levels:

Notes

Topographical Survey Legend

Sheet Index



Rev.	Date	Description

MALCOLM HUGHES
CHARTERED LAND SURVEYORS

2 Allen Road, Livingston, West Lothian
EH54 6TQ, Tel: 01506 467 910
www.malcolmhughes.co.uk
livingston@mhls.co.uk

Accreditations

RICS
THE SURVEY ASSOCIATION
chartered ices
RISQS QUALIFIED
bsi. ISO 9001 Quality Management FS 14126

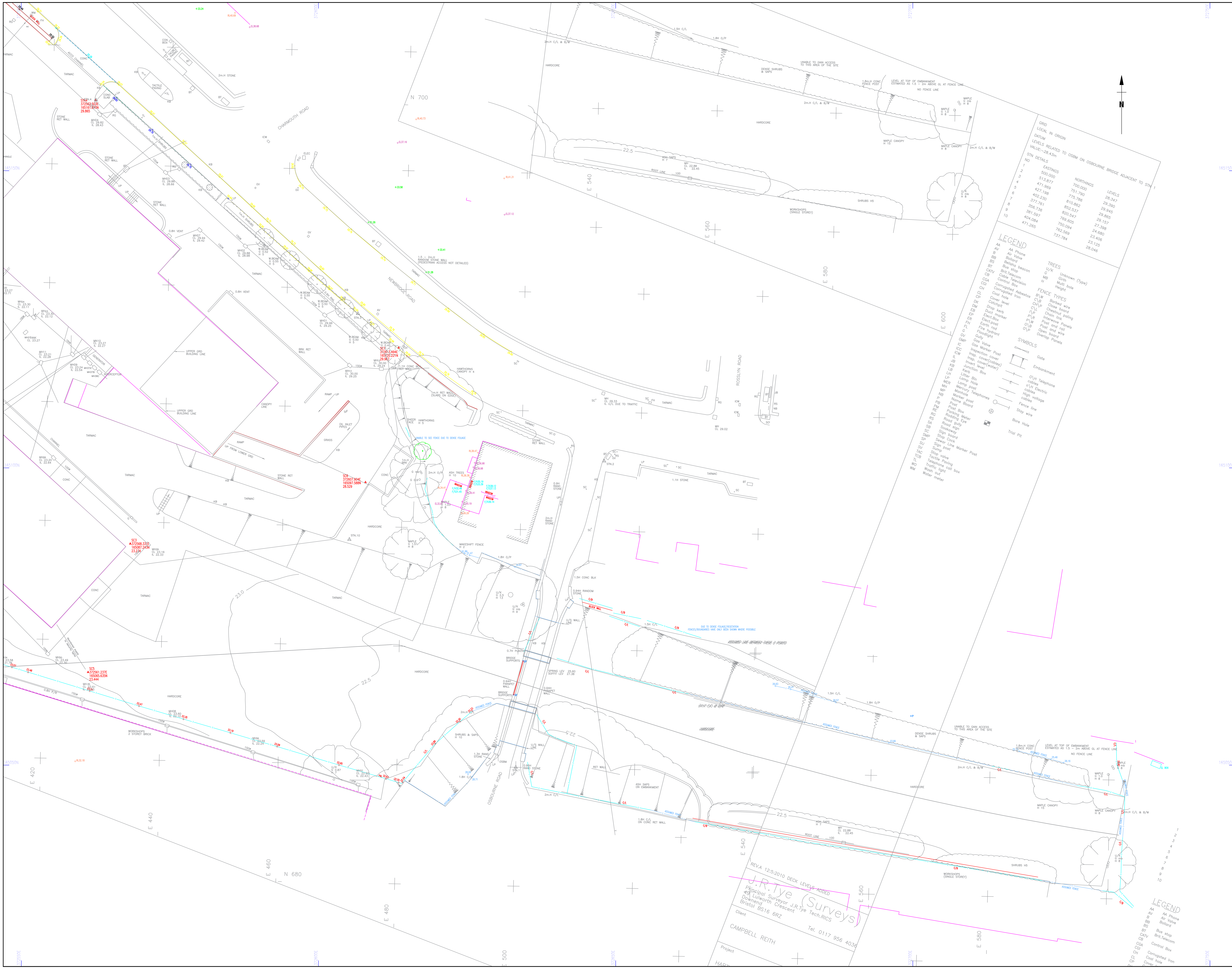
Client
Hartwell
1st Floor, 2 Chawley Park
Cumnor Hill, Oxford, OX2 9GG

Project
Newbridge Road
Bath, BA1 2PP

Drawing Title
Topographical Survey Overlay

Drawn By	YM	28/11/17	Survey Date	November 2017
Checked by	MP	23/01/18	Scale	1:200 @ A0

Drawing No: 50099_03_01
Revision:



Survey Notes
Grid:
Levels:

Notes

Topographical Survey Legend

Sheet Index

1 2

Rev.	Date	Description

MALCOLM HUGHES
CHARTERED LAND SURVEYORS

2 Allen Road, Livingston, West Lothian
EH54 6TQ, Tel: 01506 467 910
www.malcolmhughes.co.uk
livingston@mhls.co.uk

Accreditations

Client

Hartwell
1st Floor, 2 Chawley Park
Cumnor Hill, Oxford, OX2 9GG

Project

Newbridge Road
Bath, BA1 2PP

Drawing Title

Topographical Survey Overlay

Drawn By YM 28/11/17
Checked by MP 23/01/18
Survey Date November 2017
Scale 1:200@A0Scale

Drawing No 50099_03_02
Revision

Appendix B

Architect's layout