Grey Towers Phase 9

Drainage Strategy

Fordy Farms (Ingleby) Ltd

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Revision:	B
Revision Date:	27 April 2023

Project title	Grey Towers Phase 9	**Job Number**
Report title	Drainage Strategy	1034104

Document Revision History

Revision Ref	Issue Date	Purpose of issue / description of revision
—	10/02/2022	Planning Issue
A	13/04/2023	Revised Layout
B	27/04/2023	Minor Amendments

Document Validation (latest issue)

Executiv Summary

Cundall have prepared this Drainage Strategy as part of the planning application for the proposed Grey Towers Phase 9 residential development of 8 houses located in Nunthorpe, Middlesbrough.

A previous Drainage Strategy for Phases 3 to 8 had been submitted on the 5th of July 2019 for a total development of 450 houses.

Cundall have made new pre-development enquiries to Northumbrian Water Ltd (NWL) regarding the disposal of surface and foul water and the Lead Local Flood Authority (LLFA) with regards to the disposal of surface water. At the time of writing, we are still awaiting a response.

It is proposed that the development's surface water will connect to the existing Phase 4 development. The Phase 4 system has associated attenuation pond have been designed to accommodate the flows for the Phase 9 development.

Due to the slightly increased impermeable area in the development, the scheme includes attenuation storage prior to the discharge from site.

Foul water flows are proposed to connect to the existing NWL sewer that runs through the proposed site towards the existing pumping station located within the wider Grey Towers development.

Contents

1.0 Introduction

1.0 Introduction

1.1 Reason for Report and Planning Context

Cundall have prepared this Drainage Strategy to support the planning application for the proposed Grey Towers residential development of 10 houses and is located in Nunthorpe, Middlesbrough. See **Figure 1** for a site location plan.

This report includes:

- An appraisal of the existing site and its current drainage pattern and allowances
- Surface water drainage proposals
- Foul water drainage proposals

Figure 1 - Site Location

2.0

The Site

2.0 The Site

The site is located within the jurisdiction of Middlesbrough Council, see **Figure 1**.

2.1 Site Description

The existing site within the planning boundary is approximately 0.7ha and consists of open greenfield areas. The site's approximate national grid reference is NZ530138, and is located south west of the Dixons Bank - A172 highway. The site slopes from the North with levels in the region of 88.5m to the south with levels around to 87.0m AOD. See **Figure 1** for site location.

The site is bounded to the North by Phases 2a and 2b, to the West by Phase 4 and to the South by existing houses. The existing Grey Towers farm is located to the East of the development.

2.2 Proposed Development

The proposed development includes the provision of 8 houses with associated roads and parking. The proposed site plan can be seen in **Figure 2** and **Appendix 1**.

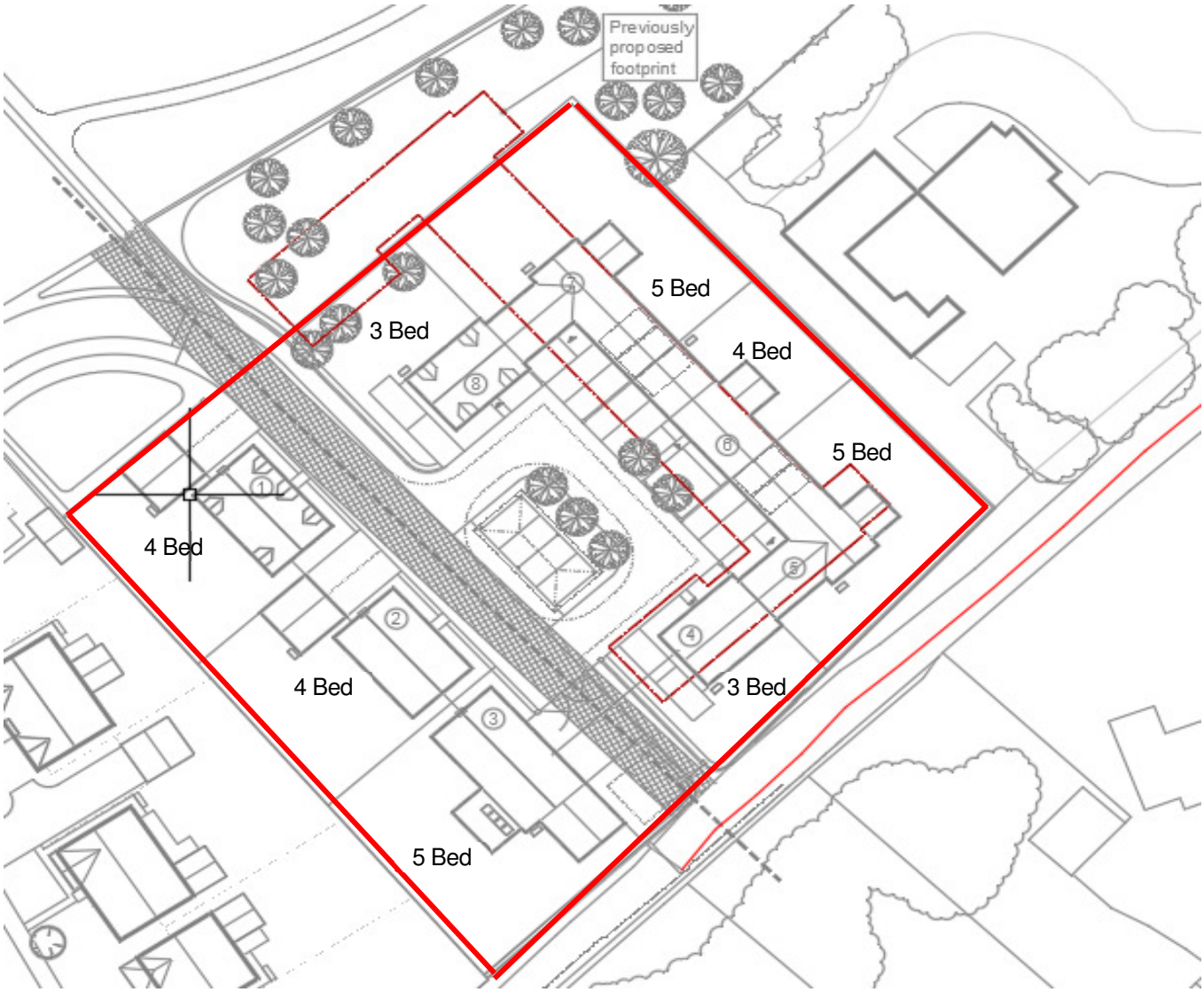


Figure 2 - Proposed Grey Towers Phase 9

3.0

Existing Drainage

3.0 Existing Drainage

The existing drainage within the proposed development can be seen in **Appendix 3**.

3.1 Existing Phase 4 Surface Water Drainage

Figure 3 shows the existing Grey Towers Phase 4 development to the South-West of the proposed site. There is an existing pond located in the south-western corner of the site which collects the surface water runoff from the existing phase 4 with additional capacity for the current proposal and discharges to the watercourse that runs to the southwest boundary.

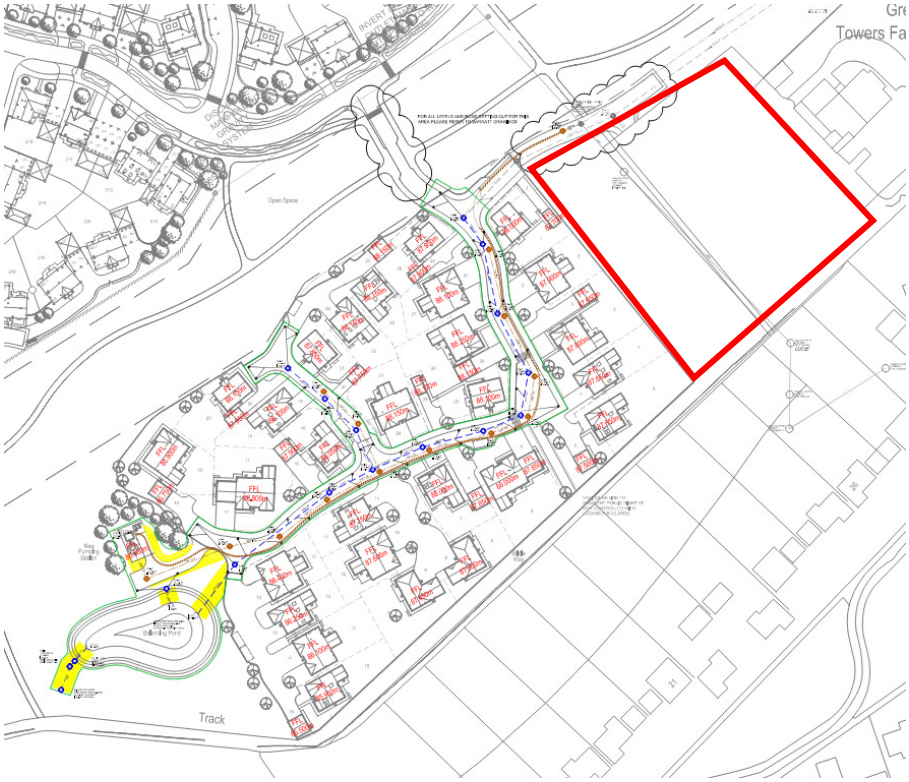


Figure 3– Existing Phase 4 Drainage

3.2 Sewers

Northumbria Water Limited (NWL) asset plans are included in **Appendix 3** and indicated the following:

Figure 4 shows the line of an NWL sewer running South to North through the proposed development. This sewer is believed to be no longer in use and investigations are underway to determine if there are any contributing flows upstream of the proposed development.

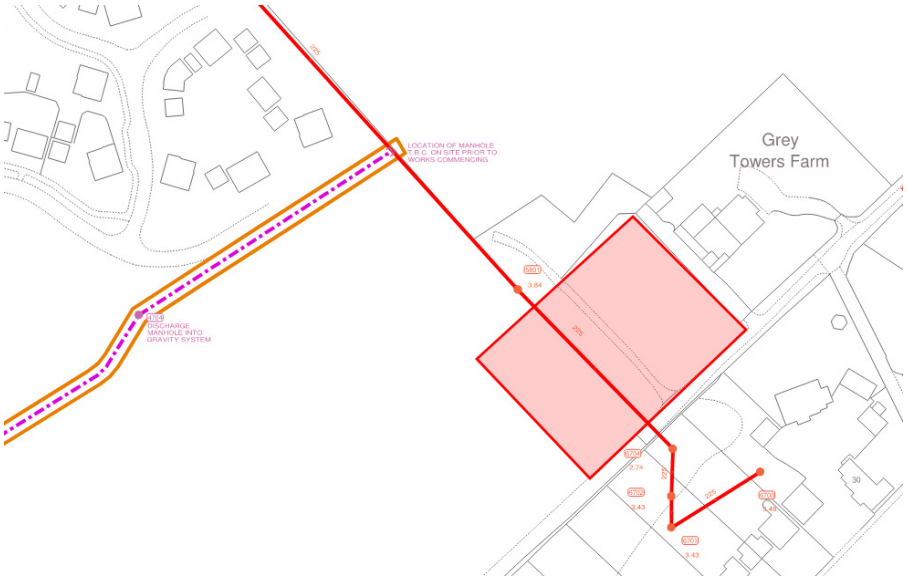


Figure 4 – Existing NWL Infrastructure

4.0

Proposed Drainage

4.0 Consultations

4.1 Middlesbrough Council – Lead Local Flood Authority Consultation

Contact was made with Middlesbrough Council LLFA to outline the strategy for the wider Grey Towers development area and the following items were discussed.

- The existing drainage network and existing outfall located to the South-west of the site is to be re-used for surface water discharge from the proposed development which will mean discharge offsite is not increased from the existing infrastructure. Due to slightly increased impermeable area, attenuation and restrictions will be used on site to balance any excess volume.
- Greenfield Runoff Rate will be used for the storm water discharge offsite.
- Attenuation will be sized for up to and including the 1 in 100 year plus 40% climate change design storm.

4.2 Northumbria Water Limited (NWL) – Sewerage Undertaker Consultation

A pre-development enquiry has been made to NWL regarding the disposal of foul and surface water, please see Appendix 6 for further details.

The S104 agreement for the previous phase has not yet been signed off and therefore the foul and surface water sewers in question are currently unadopted and NWL are unable to give agreement to either connections at this point in time. However, providing the S104 agreement is signed then NWL have agreed that the foul flows could discharge without restriction into the 225mm foul water sewer via manhole 5803.

The surface water discharge from the site shall be through the Phase 4 development in the attenuation pond before discharge into the exitng sewer to the south of the development. No change in flows are anticipated from the Phase 4 development as a consequence of the connection of Phase 9.

5.0 Proposed Drainage

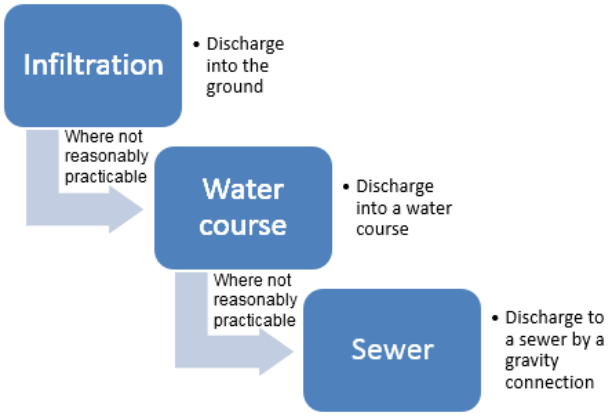
The proposed drainage strategy drawing can be seen in **Appendix 4**.

The proposed surface water drainage shall follow the strategy outlined for the previous development and include the following:

- Reuse of the existing drainage and attenuation pond, where practical.
- Limiting all runoff to QBAR runoff rate.
- All SuDS on site to match the existing development.
- Designing for a 1:100 yr storm + 40% climate change.

5.1 Proposed Surface Water

Building Regulations Approved Document H gives a hierarchy of how surface water should be disposed of, see hierarchy image to right. Firstly, surface water should be discharged into the ground. If this is not reasonably practicable, to a watercourse and where this is not reasonably practicable, to a surface water sewer and lastly to a combined water sewer.



The site is considered to be unsuitable for soakaways due to the low permeability of the underlying ground with mainly stiff brown sandy gravelly clay (as per the SOLMEK Laboratory report – Grey Towers for Dunelm Geotechnical & Environmental completed on the 9th of October 2012 as well as per the soakaway testing results from Dunelm Geotechnical & Environmental).

Following the hierarchy, Cundall propose that Phase 9 connects to the existing Phase 4 infrastructure which discharges to an attenuation pond and subsequently the NWL sewer running along the Southern Boundary.

This utilises the existing infrastructure and discharge into the existing attenuation pond located to the south-western corner of the site which then discharges to the existing watercourse to the west. The flow from the existing attenuation pond is via a flow control device currently limited to the equivalent greenfield run-off rate of 2.7 l/s which will be retained. This phase 4 infrastructure design included allowance for flows from future phase 9, although the contributing impermeable area from the new layout is slightly higher to ensure flow rate allowances are not exceeded, additional online attenuation storage and restrictions have been included.

5.1.1 Surface Water Restrictions & SuDS Strategy Overview

The new proposed surface water system and attenuation ponds will be designed to store flows up to and including the 1 in 100-year critical storm with a 40% allowance for climate change. The existing phase 4 site drainage system was originally designed to accommodate the flows from phase 9.

Due to the slight increase in impermeable area additional measures are proposed to further reduce the flows prior to reaching the existing phase 4 and downstream attenuation pond which provides overall betterment to the scheme.

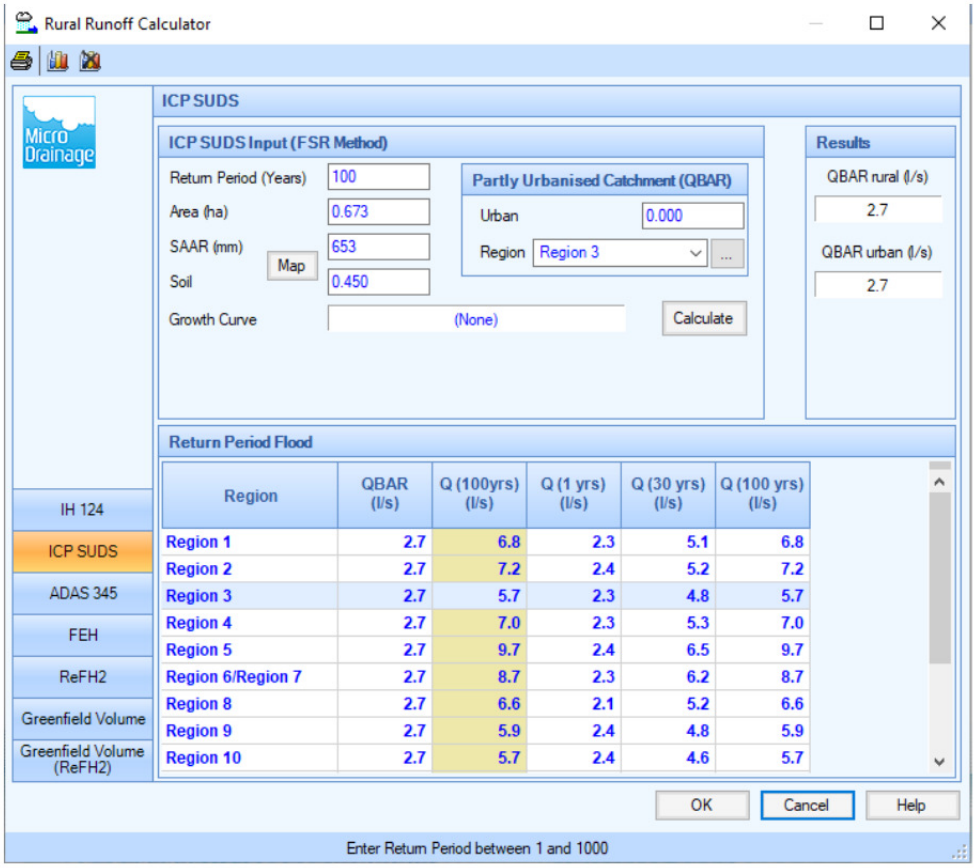
Ponds (Existing Phase 4) are most suitable as the main method of storage due to their biodiversity, amenity and water treatment qualities. The ponds would be used in conjunction with a flow control device, such as a vortex flow control.

The use of attenuation ponds has been selected for their high SuDS value, treatment quality and high attenuation volume potential. Ponds also create good habitat for wildlife (biodiversity), have low maintenance requirements and high community acceptability due to their amenity value. The ponds will be shallow with 1 in 4 side slopes.

A dry basin is proposed to provide storage and control the release of surface water. The feature will contribute to the SuDS strategy of the site and should boost the local biodiversity in conjunction with reducing the likelihood of surface water flooding. The dry basin consists of a depression in the ground with an approximate volume of 136 cubic metres which will host a variety of vegetations and be situated along the course of the surface water drainage network prior to the SW20 connection in the main sewer running along the northern boundary of the site. The dry basin should require relatively low maintenance but will be the responsibility of the owner and the regime / requirements shall be included in the Operation & Maintenance pack.

5.1.2 Greenfield Runoff Calculations

Using the ICP SUDS method, the greenfield runoff rates (GRR) from phase 9 has been calculated at:



Region	QBAR (l/s)	Q (100yrs) (l/s)	Q (1 yrs) (l/s)	Q (30 yrs) (l/s)	Q (100 yrs) (l/s)
Region 1	2.7	6.8	2.3	5.1	6.8
Region 2	2.7	7.2	2.4	5.2	7.2
Region 3	2.7	5.7	2.3	4.8	5.7
Region 4	2.7	7.0	2.3	5.3	7.0
Region 5	2.7	9.7	2.4	6.5	9.7
Region 6/Region 7	2.7	8.7	2.3	6.2	8.7
Region 8	2.7	6.6	2.1	5.2	6.6
Region 9	2.7	5.9	2.4	4.8	5.9
Region 10	2.7	5.7	2.4	4.6	5.7

Table 2– GRR Calculation Results for phase 9

The proposed drainage strategy drawing is shown in **Appendix 4** and the proposed Microdrainage results in **Appendix 5**.

5.1.3 Operation and Maintenance Plan

The following operation and maintenance schedules should be followed for the SuDS items with reference to the CIRIA SuDS Manual for additional guidance on each element.

5.1.4 Inlet, Outlet and Flow Control

Each inlets and outlets should be inspected monthly during the first year following installation and then every three months. As part of the inspection any debris is to be removed and any blockages cleared. Clearance of debris should ensure that materials are removed from the immediate site and not allowed to fall back into the inlet, outlet or flow control. Clearance of a Hydro Brake vortex flow control blockage is undertaken from ground surface level by the bypass orifice.

Dry detention basins must be inspected to ensure they are operating in good working condition and n accordance with the approved design and specifications. The **dry basin** will require the following maintenance:

Operation and maintenance requirements for detention basins		
Maintenance Schedule	**Required Action**	**Typical Frequency**
Regular Maintenance	Remove litter and debris	Monthly
	Cut grass – for spill ways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around the 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 psychical 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
Occasional Maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim and trees and remove cuttings	Every two 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 re-seeding or re-turfing	As required
	Realignment of riprap	As required
	Repair/rehabilitate inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

5.2 Proposed Foul Water Drainage

The proposed foul water drainage can be seen on the proposed drainage drawing in **Appendix 4**.

The peak foul water flow from the development is estimated at 0.4 l/s

A pre-development enquiry was submitted to NWL who have agreed the additional foul discharge rate and the new proposed connections.

5.3 Adoption and Implementation Arrangement

All highway gullies and leads are to be adopted and maintained by the Middlesbrough Council Highway Authority.

The inlets, outlets and hydrobrake manhole are to be maintained by the owner's private management company.

It is envisioned that the local sewerage authority NWL will adopt the sewer infrastructure.

NWL will also adopt the foul water sewerage infrastructure.

6.0 Conclusions

6.1 Surface Water

The drainage from Phase 9 will utilise the existing infrastructure, south west pond attenuation and existing flow restriction. The impermeable area from the proposed development has slightly increased so to mitigate the minor increase in flows and to improve water quality, additional flow restrictions and attenuation have been added.

The drainage from Phase 4 includes a flow restriction to 5 l/s with connections to the existing NWL sewer network. This shall remain unchanged by the proposed development.

Attenuation is designed to provide storage for all events up to and including the 1 in 100 year plus 40% climate change design storm event.

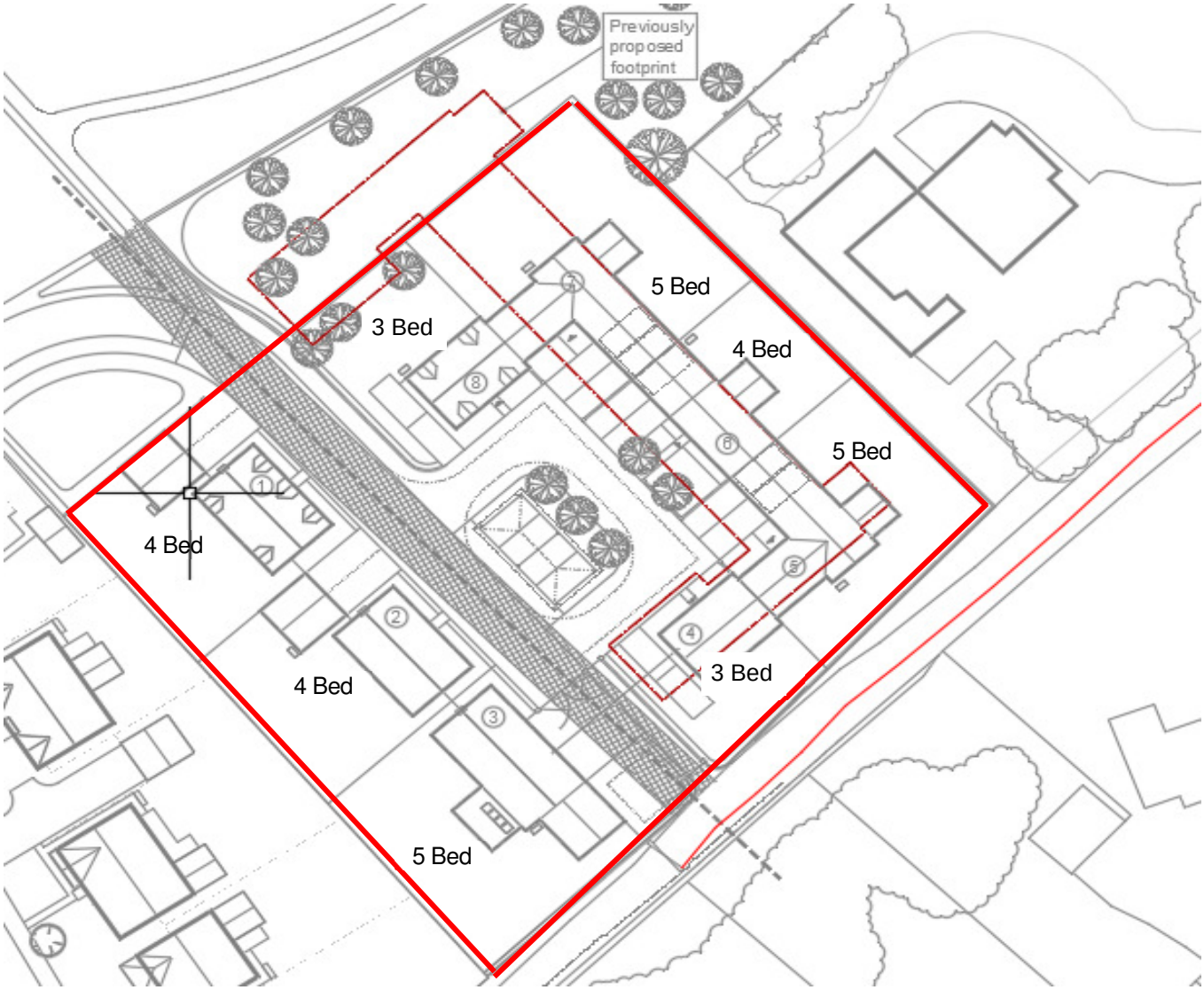
Maintenance schedules for all SuDS elements have been included.

6.2 Foul water

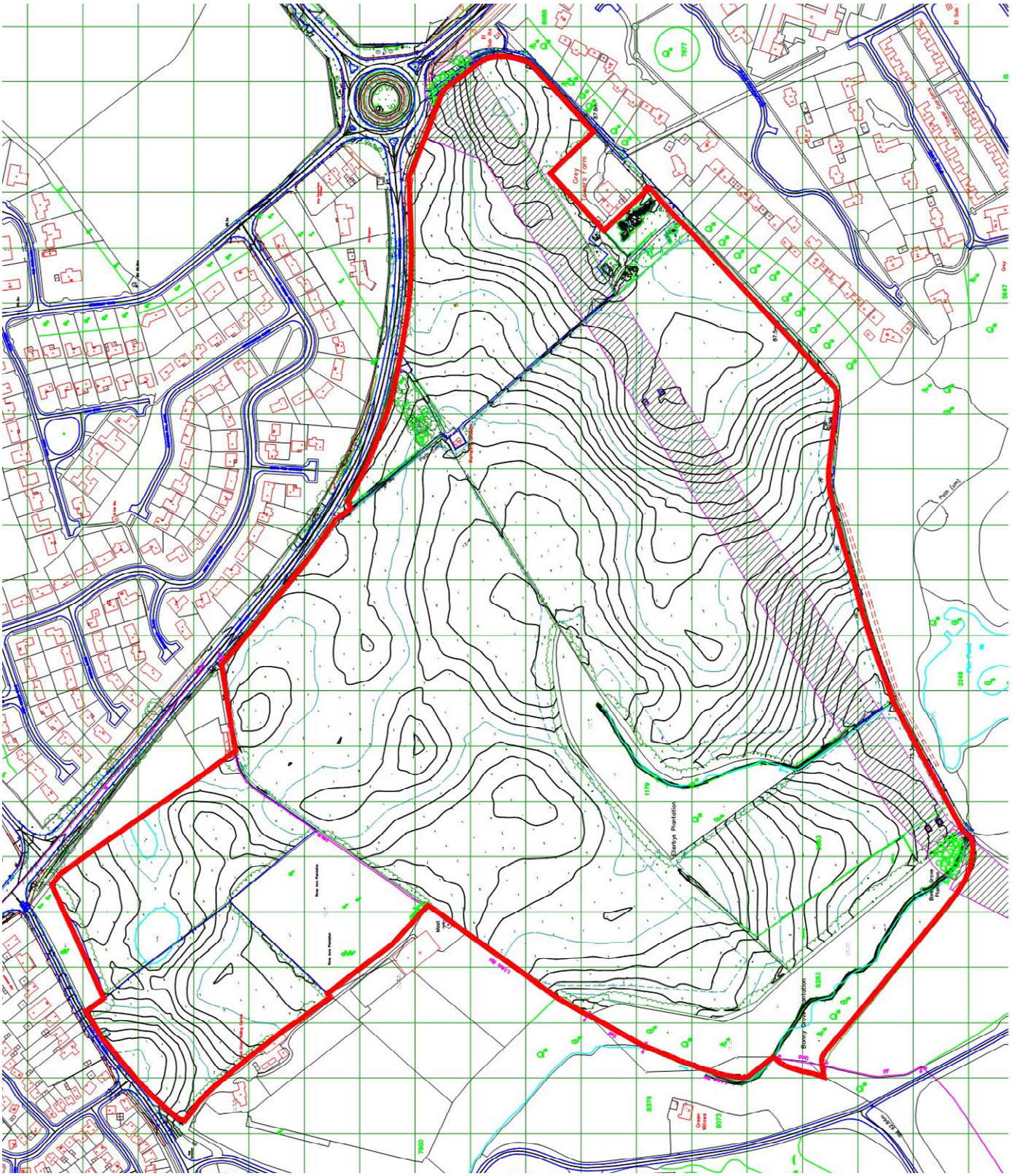
Foul water for Phase 9 is proposed to discharge to the existing NWL foul manhole located within the proposed development.

7.0 Appendices

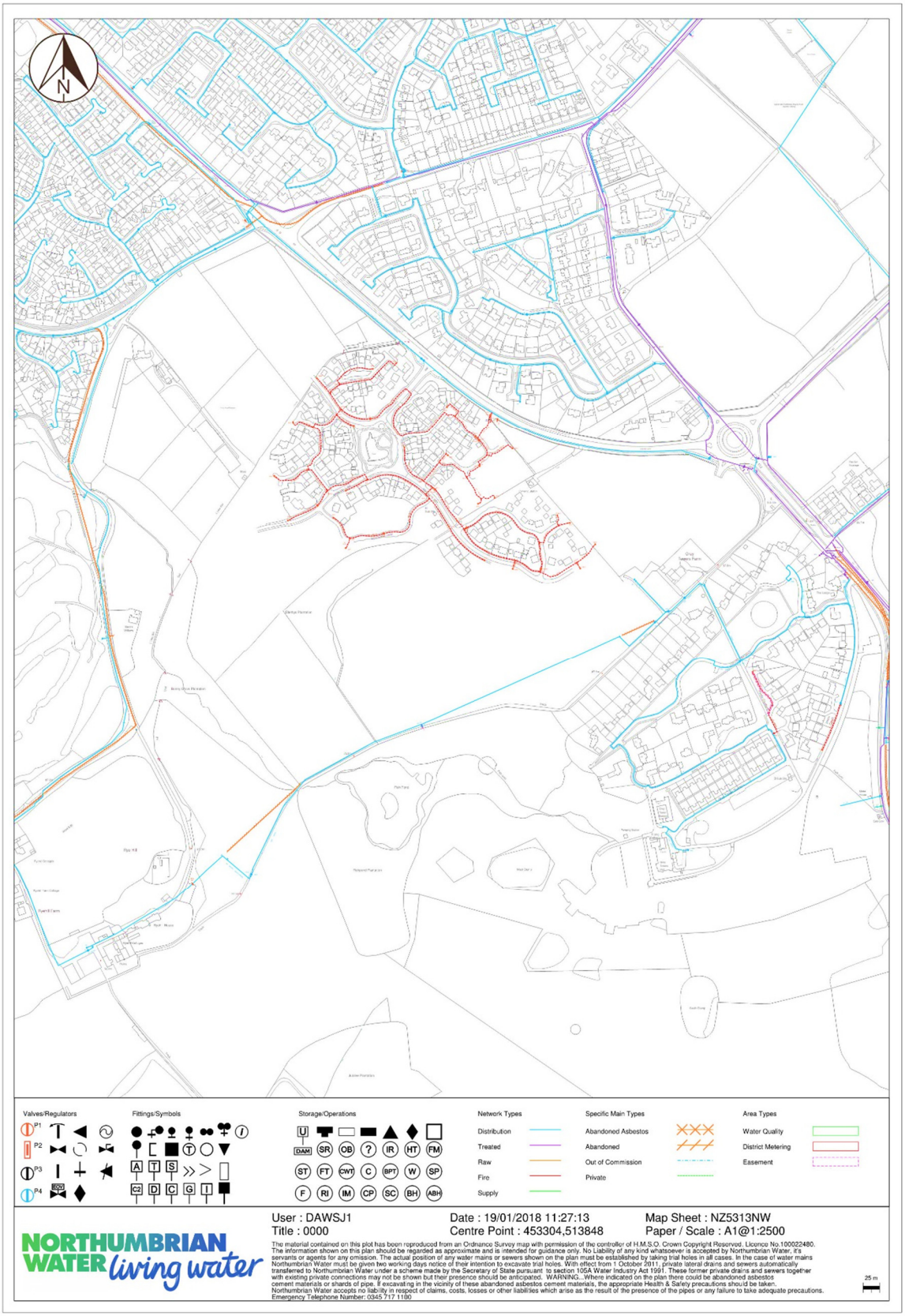
7.1 Appendix 1 – Proposed Site Plan

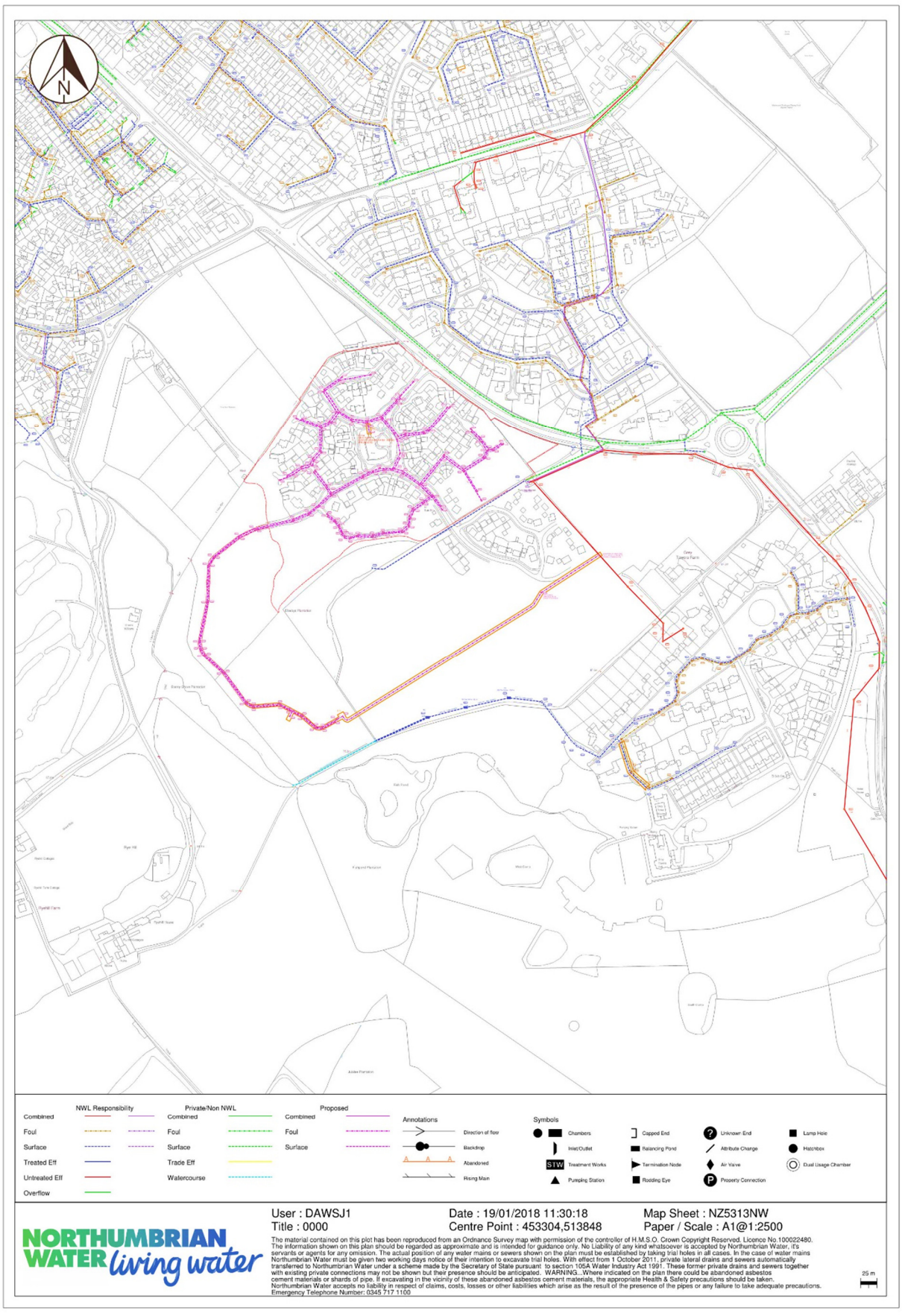


7.2 Appendix 2 – Topographical Survey (by Findlay Surveys)



7.3 Appendix 3 – NWL Sewer Plans

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NWL Responsibility
Combined
Foul
Surface
Treated Eff
Untreated Eff
Overflow
Private/Non NWL
Combined
Foul
Surface
Trade Eff
Watercourse
Proposed
Combined
Foul
Surface
Annotations
Direction of flow
Backdrop
Abandoned
Rising Main
Symbols
Chambers
Inlet/Outlet
STW Treatment Works
Pumping Station
Capped End
Balancing Pond
Termination Node
Rodding Eye
Unknown End
Attribute Change
Air Valve
Property Connection
Lamp Hole
Manhole
Dual Usage Chamber
NORTHUMBRIAN WATER living water
User : DAWSJ1
Title : 0000
Date : 19/01/2018 11:30:18
Centre Point : 453304,513848
Map Sheet : NZ5313NW
Paper / Scale : A1@1:2500
The material contained on this plot has been reproduced from an Ordnance Survey map with permission of the controller of H.M.S.O. Crown Copyright Reserved. Licence No.100022480.
The information shown on this plan should be regarded as approximate and is intended for guidance only. No Liability of any kind whatsoever is accepted by Northumbrian Water, it's servants or agents for any omission. The actual position of any water mains or sewers shown on the plan must be established by taking trial holes in all cases. In the case of water mains Northumbrian Water must be given two working days notice of their intention to excavate trial holes. With effect from 1 October 2011, private lateral drains and sewers automatically transferred to Northumbrian Water under a scheme made by the Secretary of State pursuant to section 105A Water Industry Act 1991. These former private drains and sewers together with existing private connections may not be shown but their presence should be anticipated. WARNING...Where indicated on the plan there could be abandoned asbestos cement materials or shards of pipe. If excavating in the vicinity of these abandoned asbestos cement materials, the appropriate Health & Safety precautions should be taken. Northumbrian Water accepts no liability in respect of claims, costs, losses or other liabilities which arise as the result of the presence of the pipes or any failure to take adequate precautions.
Emergency Telephone Number: 0345 717 1100
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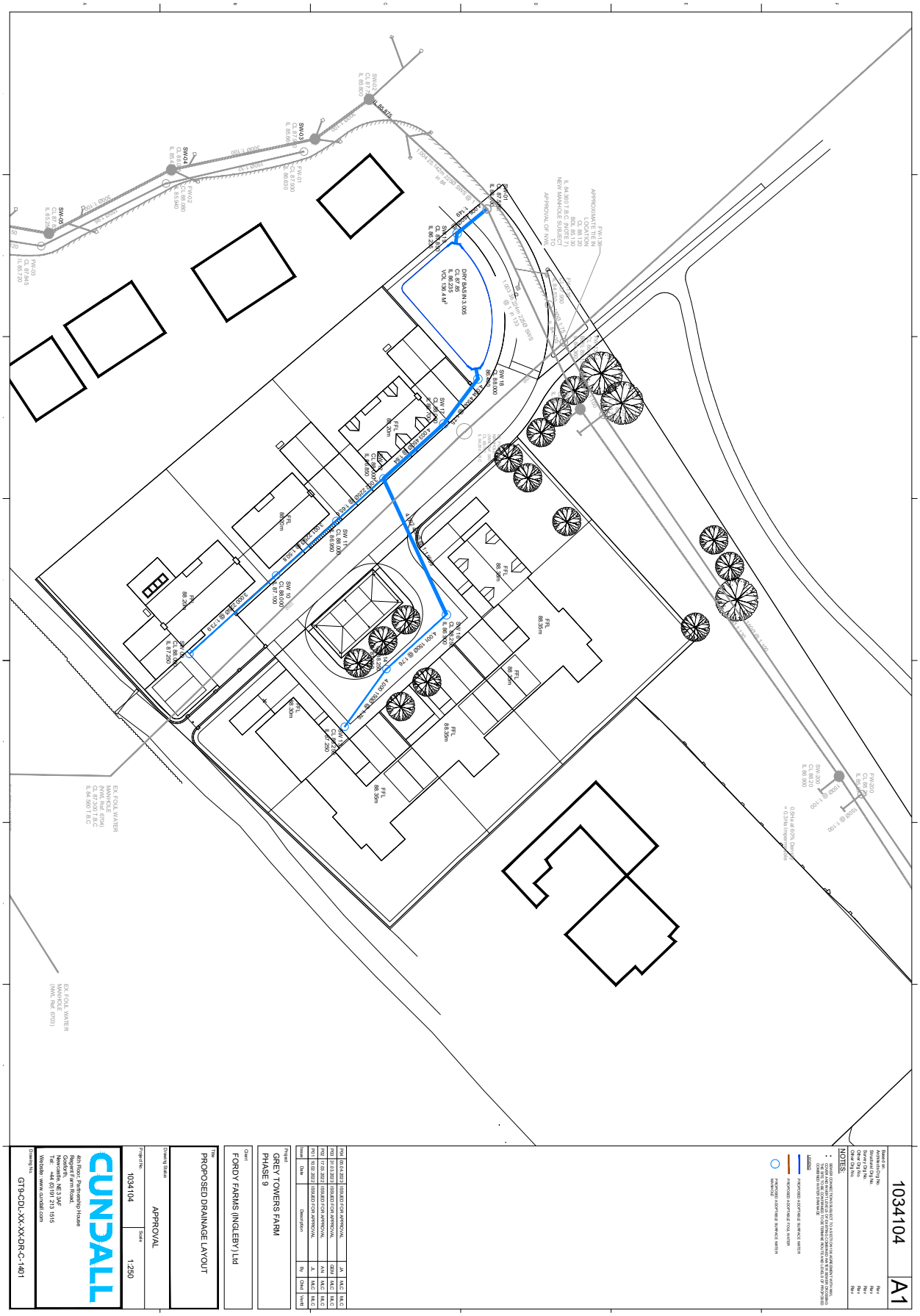
7.4 Appendix 4 – Proposed Drainage Strategy Drawing



7.5 Appendix 5 – InfoDrainage Results

See separate file for InfoDrainage calculations.

7.6 Appendix 6 – NWL Pre-development Response

NORTHUMBRIAN WATER living water

Northumbrian Water
Developer Services
Leat House
Pattinson Road
Washington
NE38 8LB

Ext: 36603
Direct Line: 0191 419 6603
Email: developmentenquiries@nwl.co.uk
Our Ref: 542671019731
Your Ref:

Friday, 02 October 2020

Cundall
4th Floor Partnership House
Regent Farm Road
Gosforth
Newcastle upon Tyne
NE3 3AF

Dear Tom Blanden,

Re: Pre-Planning Enquiry – Grey Towers Farm, Middlesbrough

Further to the Point of Connection Application for the above site, received 15th September 2020, we are now able to provide the following response.

We have based our response on the information in your application and accompanying correspondence. Therefore, should any of the information now be different, then you must ensure that you inform us of any changes as further Network Modelling may be required and our response may also change, leading to this response being invalid.

Northumbrian Water assesses the impact of the proposed development on our assets and assesses the capacity within our network's to accommodate and treat the anticipated flows arising from the development. We do not therefore offer comment on aspects of planning applications that are outside of our area of control.

Enclosed in this response is a scaled plan showing the **approximate** position of the water and sewerage networks within the vicinity of this site.

We have changed the way contractors and developers can access our assets.

Historically only our own staff and framework contractors could access our sewerage network. As of 1st January 2018, we are allowing third party contractors to access our sewer network on a site by site basis, subject to certain conditions.

Further information (including how to apply) is available from our web site - https://www.nwl.co.uk/services/developers/developer-sewerage-services/

Also enclosed is our extract showing locations within the approximate vicinity of this site that have, from our records, experienced flooding. This has been provided to demonstrate the known flood risks within the vicinity which have been considered as part of our assessment on this enquiry.

We have also carried out a review of your application and can confirm the following:

Sewerage and Sewage Treatment

Northumbrian Water would ask that you please separate the foul and surface water flows in accordance with Part H of the Building Regulations prior to the final connection to the public sewer.

All new connections to the public sewerage system must first be approved through the Section 106 of the Water Industry Act 1991 process prior to construction.

Should you decide to proceed with this development, a fully completed Sewer Connection application form will be required. These are available to download from the following link:

https://www.nwl.co.uk/services/developers/developer-sewerage-services/new-sewer-connections-s106/

- Foul Water and Surface Water Discharge

The S104 agreement for the previous phase has not yet been signed off and therefore the foul and surface water sewers in question are currently unadopted and NW are unable to give agreement to either connections at this point in time.

However, providing the S104 agreement is signed then the foul flows could discharge without restriction into the 225mm foul water sewer via manhole 5803.

As this is part of a wider development please can you get in touch with Steve Somerville steve.somerville1@nwl.co.uk to discuss this further in relation to the current proposed S104 agreement.

- Surface Water Discharge

No surface water flow from the proposed development will be allowed to connect into the existing public sewerage system unless it is proven that the alternative options which are listed within Part H of the Building Regulations 2003 are not available:

Rainwater from a system provided pursuant to sub-paragraphs (1) or (2) shall discharge to one of the following, listed in order of priority –

(a) an adequate soakaway or some other adequate infiltration system; or, where that is not reasonably practicable,

(b) a watercourse; or, where that is not reasonably practicable,

(c) a sewer.

As this surface water sewer ultimately discharges to a watercourse, we suggest that you contact either the Environment Agency or Lead Local Flood Authority, as appropriate, to discuss this in further detail.

Written approval for all individual connections (direct or indirect) to the public sewerage system should be obtained through the Section 106 process, following completion of the detailed drainage design and before the commencement of any drainage works on site.

- Protection of Existing Sewerage Assets

We wish to draw your attention to the existing sewer which passes through the site. This sewer could be diverted, protected or accommodated within your site layout with an appropriate easement.

Part H of the Building Regulations also details the reasons why Northumbrian Water does not permit buildings to be built over or near to its sewerage network:

- Undue risk in the event of failure of the drain or sewer
- Maintaining access
- Protection of the drain or sewer during construction
- Protection from settlement
- Protection against piling

To discuss the diversion of this asset in further detail, please contact:

Steve Somerville
0191 419 6648
steve.somerville1@nwl.co.uk

To discuss the protection of this asset in further detail, please contact:

Niki Mather
0191 419 6510
07764 359220

- Sewage Treatment Capacity

The Sewage Treatment Works to which this development finally discharges to is able to accept the additional flows.

Please note that this response is valid for 1 year only and you should resubmit your proposals should this period lapse prior to your development beginning.

Should you require any further assistance or information, then please do not hesitate to contact me at developmentenquiries@nwl.co.uk or alternatively on 0191 419 6603, please quote our reference number above in any future correspondence.

Yours sincerely,

Jill Leitch
Technical Support Advisor (2)
Developer Services (Asset Protection)