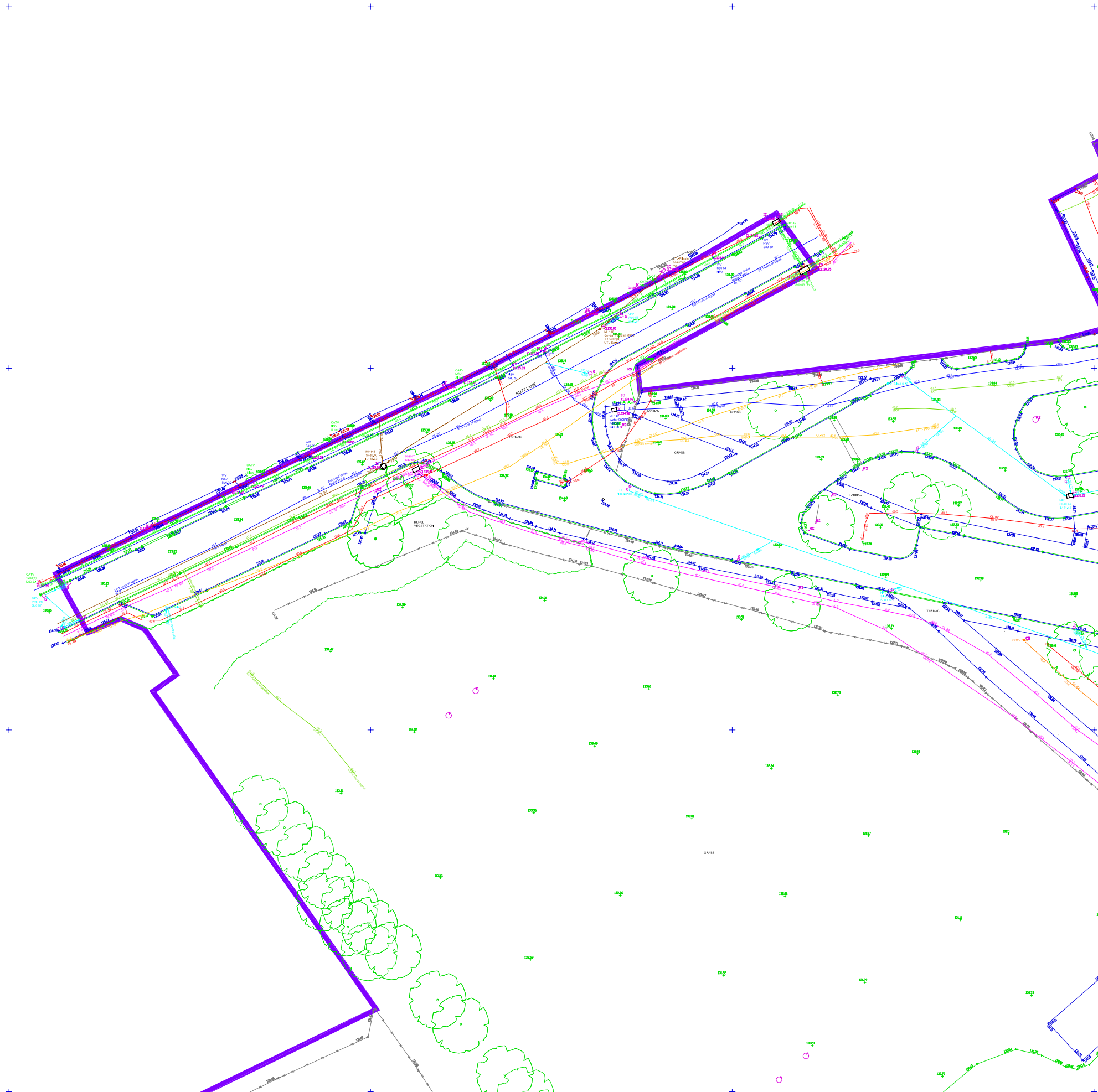


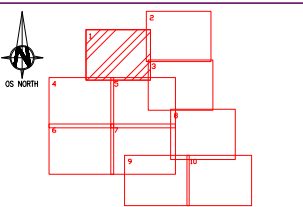


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3. LOCAL PLANE METRIC GRID RELATED TO ORDNANCE SURVEY GRID

ALPHABETIC		
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AJ	ALL	ALL
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AT	ALV	ALV
AU	ALW	ALW
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CN	AQT	AQT

LOCATION PLAN

HATCHED AREA SHOWN IN THIS DRAWING - BOLD LINE DEFINES SURVEY EXTENT



	*	*	*	*	*	*	*
A	FIRST APPROVED ISSUE	04/06/21	IS	OH	GP		
Rev	Description	Date	Iss	Chg	App		

Document Control

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GLEEDS

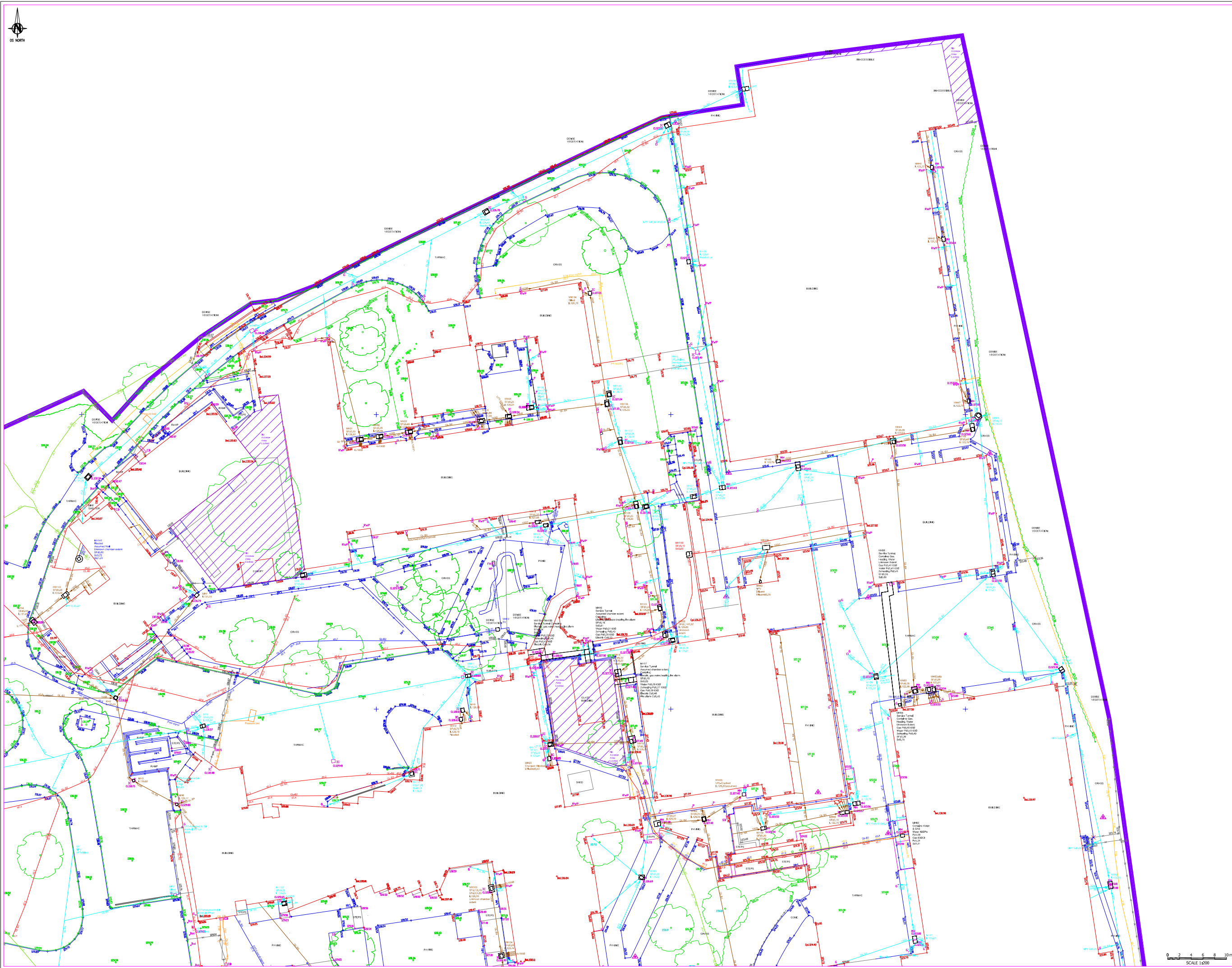
Project Name
Gleeds Schools - Hinckley Academy

CHINCKLEY ACADEMY
3D UTILITIES SURVEY
SHEET 1 OF 10

TTE Project Number	Drawn By	Date	Checked By	Date	Approved By	Date	Scale	AS	Subst
784-8026224	AR	15/09/21	GP	16/09/21	GP	16/09/21	1:200		S3

Proj	Project Number	Originator	Volume	System	Level	Location	Type	Code	Rule	Number	Revision
-	- TTE -	00 -	01 -	PL -	G -	00001					A

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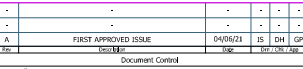


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LOCATION PLAN

HATCHED AREA SHOWN IN THIS DRAWING - BOLD LINE DEFINES SURVEY EXTENT



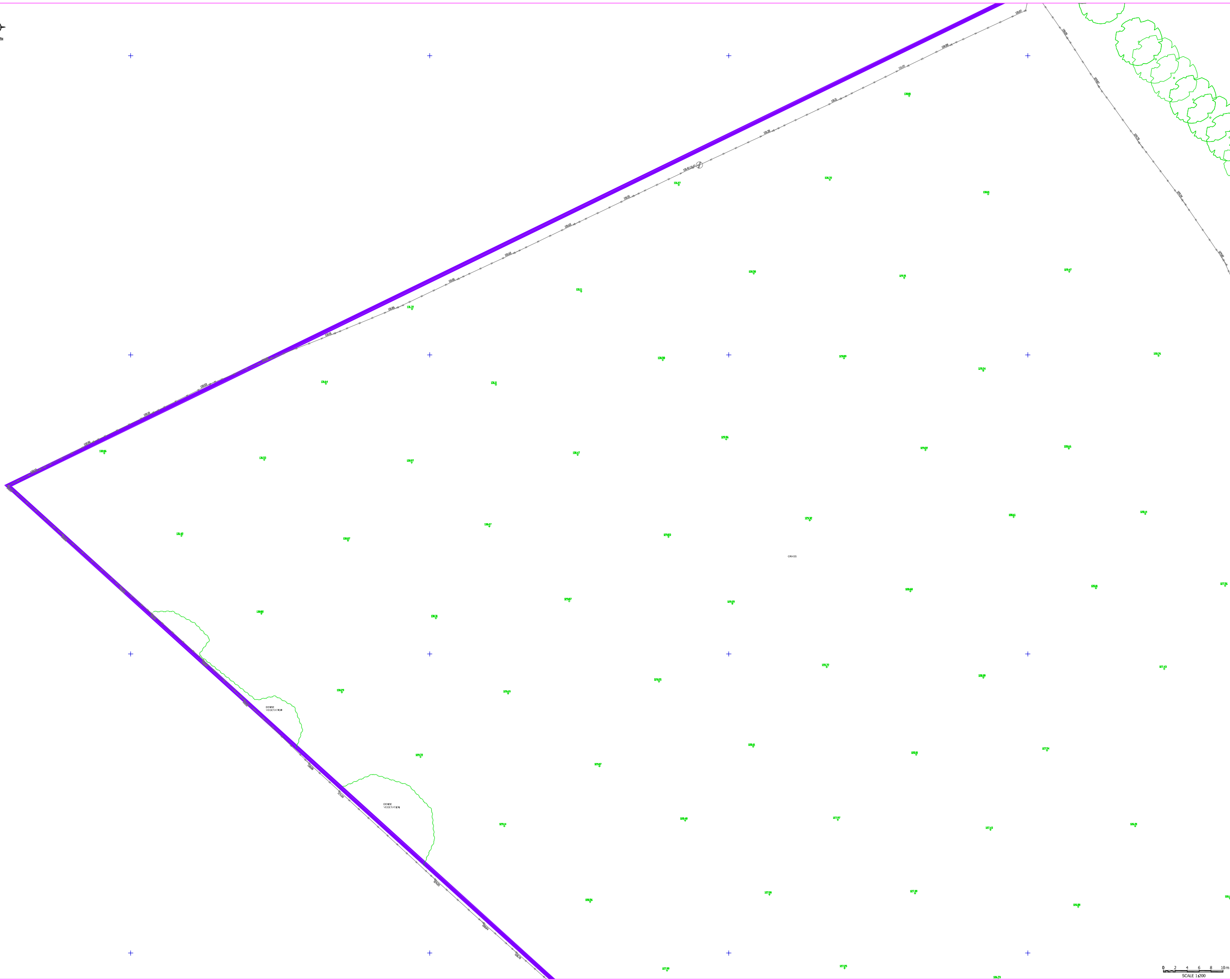
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 Leeds, United Kingdom, LS1 4ER
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GLEEDS

Project Name
Gleeds Schools - Hinckley Academy

HINCKLEY ACADEMY
3D UTILITIES SURVEY
SHEET 2 OF 10

TTE Project Number	Drawn By	Date	Checked By	Date	Approved By	Date	Scale @ A2	Sheet No.
789-8026224	AR	24/08/21	GP	16/09/21	GP	16/09/21	1:200	53
Search Project Number	Discriminator	Volume/Sheet	Level/Location	Type/Code	Role	Number	Revision	
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NOTES

1. UNLESS NOTED OTHERWISE, ALL DIMENSIONS ON THIS DRAWING ARE IN METRES.
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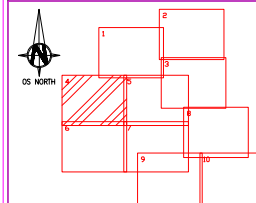
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AD	AIR BRICK	LPM	LAMP POST
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AM	BUILDING HENGE	MB	MECHANICAL FENCING
AN	BUILDING EYES LEVEL	MB	MORNING PILE
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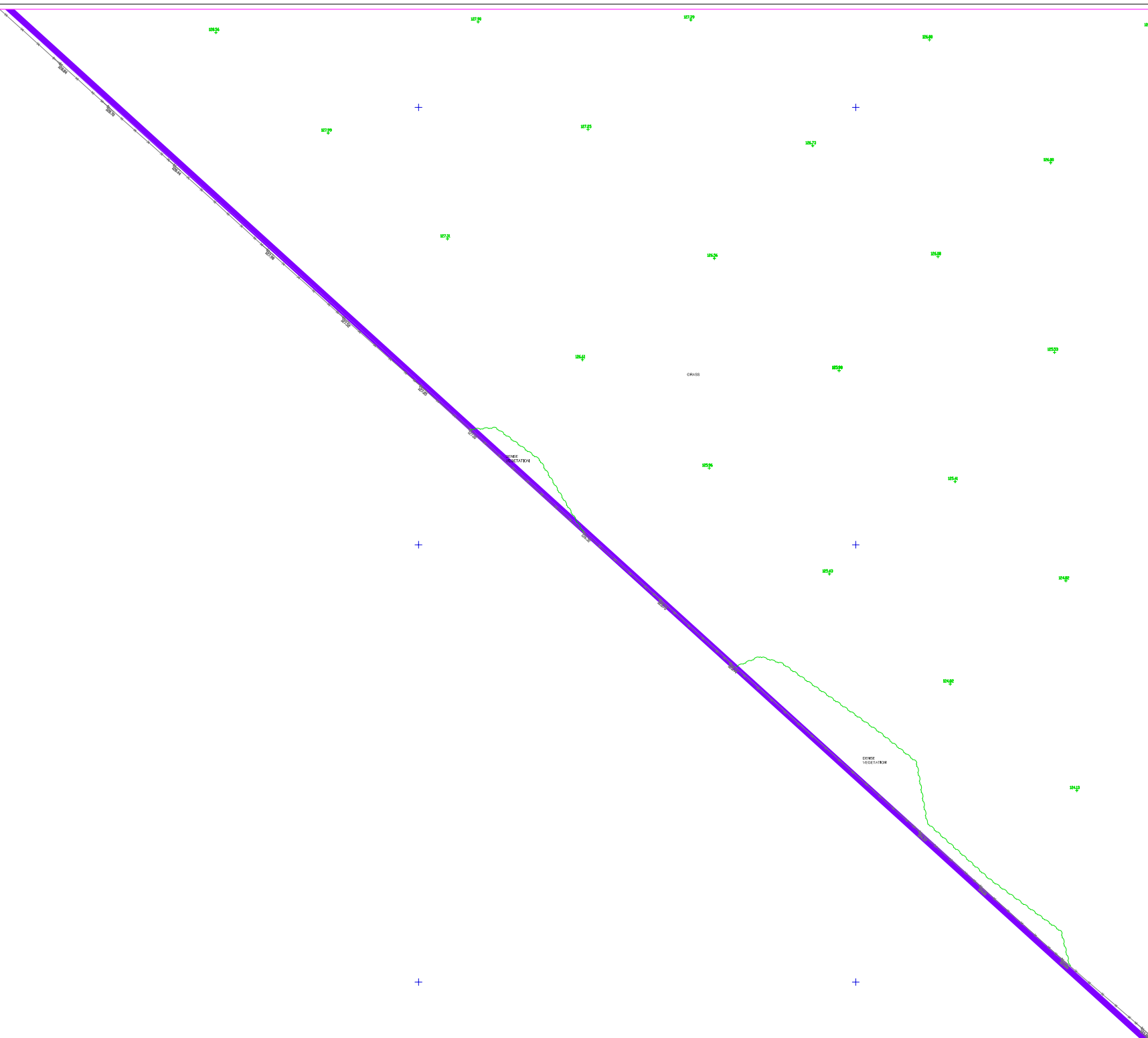
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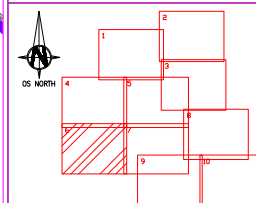
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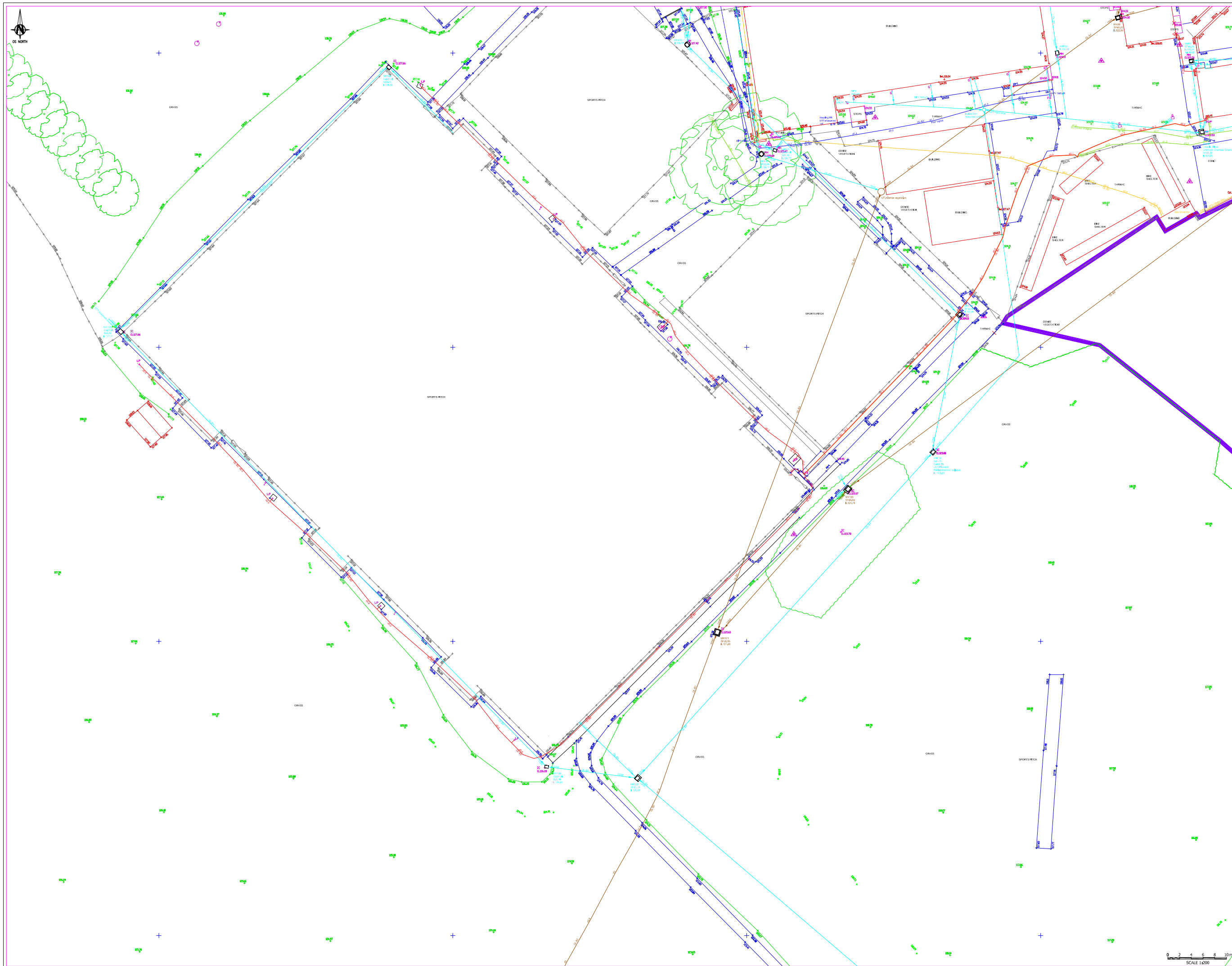
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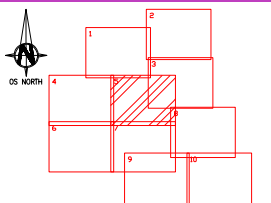
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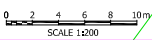
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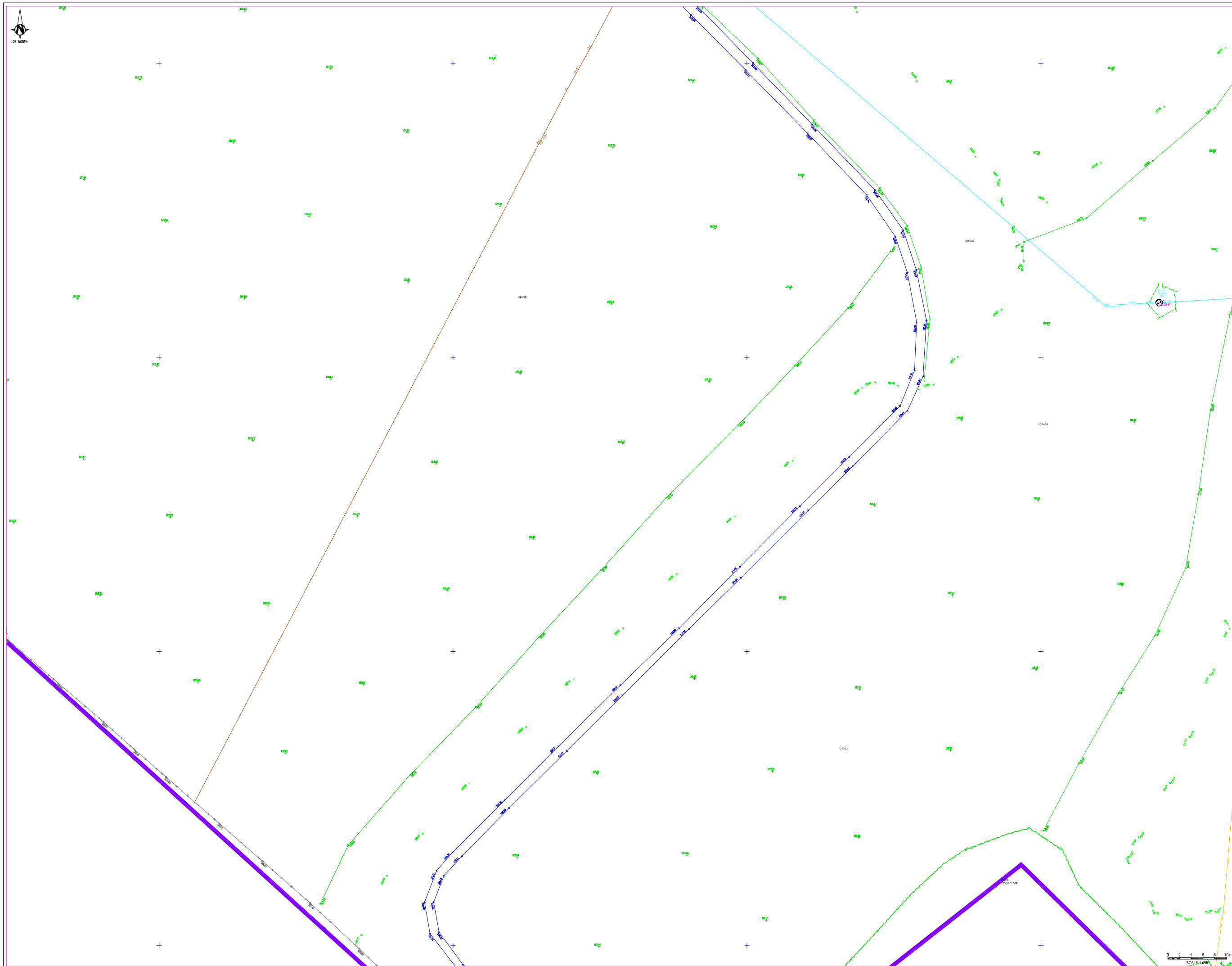
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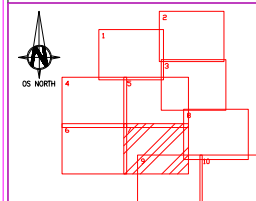
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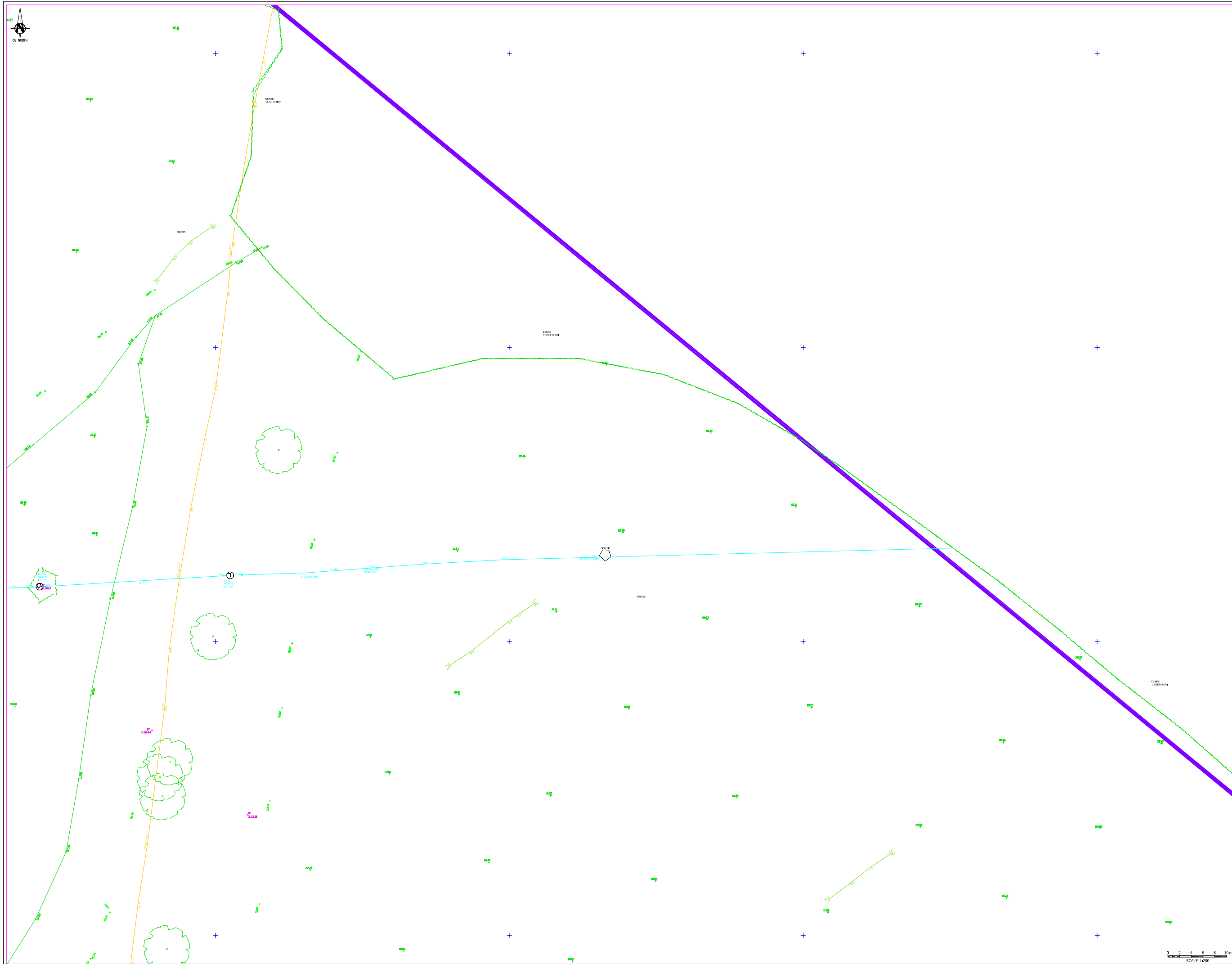
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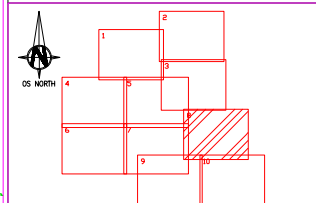
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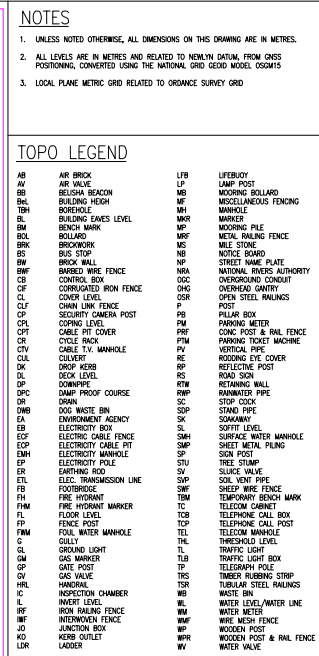
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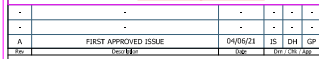
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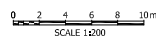
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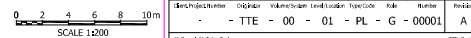
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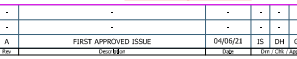


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AD	BUILDING HUNG	MAH	MAGNETICALLY FINDING
AE	BUILDING	MB	MAN
AF	BUILDING EYES LEVEL	MC	MACHINE
AG	BUILDING	MCB	MACHINE PILE
AH	BUILDING	MCN	MACHINE
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AS	BUILDING	MDP	MACHINE PILE
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AX	BUILDING	MDT	MACHINE PILE
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AZ	BUILDING	MDV	MACHINE PILE
BA	BUILDING	MDW	MACHINE PILE
BB	BUILDING	MDX	MACHINE PILE
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BE	BUILDING	MDA	MACHINE PILE
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EO	BUILDING	MDO	MACHINE PILE
EP	BUILDING	MDP	MACHINE PILE
EQ	BUILDING	MDQ	MACHINE PILE

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Appendix G – Sewer Sector Guidance

**Design and Construction Guidance for foul and
surface water sewers offered for adoption
under the Code for adoption agreements for
water and sewerage companies operating
wholly or mainly in England ("the Code")**

Approved Version 2.2

29 June 2022

Version Control

Version Number	Date	Change Purpose	Author
1.0	25 October 2019	Approved by Ofwat	Water UK
2.0	10 March 2020	Change to App C E2.21.1	Water UK
2.1	25 May 2021	Changes to Figs B3,18, 20, 21 and para B5.2.4(a)	Water UK
2.2	29 June 2022	Changes to C7.8.4 (d)	Water UK

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PART A – GENERAL

A1 INTRODUCTION

1. This guidance is for use by developers when planning, designing and constructing foul and surface water drainage systems (including pumping stations and rising mains) intended for adoption under an agreement made in accordance with Section 104 of the Water Industry Act 1991. It should be read in conjunction with the sewerage Sector Guidance published by the sewerage undertakers pursuant to the *Code for adoption agreements for water and sewerage companies operating wholly or mainly in England* ("the Code"), referred to in this document as the Sector Guidance.

2. Any reference to an Act of Parliament or other statutory provision shall include reference to any amendment, consolidation, modification, extension, re-enactment or replacement of that Act or provision.

3. At various places in this document, guidance is given on some of the legal terms used. This is without prejudice, as the true meaning of these terms can only be established by the courts.

A2 APPLICATION

1. Section 104 of the Water Industry Act 1991 (WIA) only applies to the adoption of assets predominantly used for drainage from buildings or paved areas belonging to buildings. Sewerage companies do not have a statutory duty to adopt or maintain assets where the main purpose of which is to deal with drainage of streets (see A8), land drainage runoff, or flows from watercourses or groundwater (see A9).

2. Where the proposal includes significant technical challenges (e.g., a bespoke in-situ reinforced concrete structure or a novel design), specialist technical vetting may be necessary by the sewerage company. Vetting may also be required by the highway authority if it is to be located in a future adoptable highway. In these cases, the designer is advised to consult with the sewerage company at the earliest opportunity.

3. This document covers new sewers and lateral drains which are being offered for adoption under S104 and should not be used as a definitive design manual for other sewerage-related construction such as rehabilitation, etc. In these cases, the appropriate industry reports, recommendations, guides, etc., should be used.

4. If pumping stations include any pump unit rated over 30 kW, different specifications may apply and detailed discussions should be held with the sewerage company at an early stage (see A2.11).

5. The successful design requires the designer to liaise with a variety of stakeholders from the earliest stages in the design of the development. Further details are given below.

6. A list of minimum requirements of information to support your application is set out in Appendix D of the Sector Guidance

7. This document applies only to sewerage companies operating wholly or mainly in England.

8. Compliance with this document is mandatory except in areas identified as being permitted Local Practices. See Section [2.6] of the Sector Guidance.

9. The developer may decide how much of the system is offered for adoption under the section 104 agreement, provided that the adopted system is a continuous network to an effective discharge point.

10. The local authority as planning authority has a role in approving the design of any surface water system. In this role, they are required to consult with others, including the lead local flood authority (LLFA) and, in some circumstances, the Environment Agency and any internal drainage board. The local authority is also required to clarify the long-term maintenance arrangements for the system. Further details of this can be found in C1.

A3 STRUCTURE OF THIS GUIDANCE

- **Part A** gives the scope of the document, definitions and other general guidance.
- **Part B** gives guidance for the design and construction of new gravity foul sewers and lateral drains.
- **Part C** gives guidance for the design and construction of new surface water drainage systems.
- **Part D** gives the industry recommendations for the design and construction of new pumping stations and rising mains.
- **Part E** gives the Civil Engineering Specification.
- **Part F** gives the Mechanical and Electrical Specification for pumping stations.

A4 DRAINAGE STRATEGY

1. Developers should engage early with the local authority (both the local planning authority (LPA) and the lead local flood authority (LLFA)) and the sewerage company to agree a drainage strategy and maintenance plan (for any size development, i.e., major and minor) prior to making any planning or S104 Application. Where the local authority is required to consult with other bodies (see A2.11), these bodies should also be consulted.

2. Surface water drainage proposals should fully explore the surface water hierarchy (see C3.12) and provide evidence to support alignment with national and local flood risk strategies and policies before connection to a sewer is considered. If connection to a sewer is required for surface water, sewerage companies will expect that upon making a S104 Application to adopt a sewer system, a developer will be able to present robust evidence discounting the discharge of surface water to ground via infiltration or to a watercourse for all or part of the site and that this evidence has been reviewed by the LLFA and accepted by the LPA.

3. Where sewers proposed for adoption discharge into a watercourse, developers should consult with the relevant parties (see A7) regarding permission to discharge. Copies of any information submitted to these parties, and any design considerations required to meet their requirements, should be included with the S104 Application.

4. In some cases, temporary high-water levels in a groundwater body, watercourse or other surface water body can restrict the discharge of surface water from the adopted system. The design should take into account the likely frequency and duration of these conditions.

5. A successful drainage strategy should include considerations of future maintenance. Only certain types of SuDS components are sewers and are therefore adoptable. Early consultation with the sewerage company is recommended. Where SuDS components are used that are not sewers and therefore are not adoptable by sewerage companies, the sewerage companies would strongly encourage the adoption of those components by other bodies that will ensure that they are maintained in perpetuity. The designer should also consider the interaction of the components and any cross-linked maintenance requirements.

A5 DESIGN PRINCIPLES

1. Drainage design should be undertaken holistically with other aspects of design (e.g., the site's topography, geology, street layout, the location of any public open space, soil remediation and ecological considerations) in an integrated manner. It should, therefore, be considered at the early stages of design. For larger developments, this should be considered as part of the master planning phase.

2. During extreme weather, if the capacity of the drainage infrastructure becomes overloaded, water will flow across the surface of the site. In a holistic design, the layout of the whole development should take account of the potential risk of flooding to surrounding areas, not just the drainage layouts, and the effect of any overland flows from adjacent sites. The design should work with the contours of the land to manage exceedance flows safely.

3. Guidance on holistic design can be found in 'Building for Life 12', CIRIA Report C635 'Designing for Exceedance in Urban Drainage - Good Practice', CIRIA Report C723 'Water Sensitive Urban Design in the UK' and in CIRIA Report C753 'The SuDS Manual'. This applies equally to any system (foul or surface water) proposed for the site.

4. Developers are reminded of their duty to appoint a principal designer in accordance with the Construction (Design and Management) Regulations 2015. The principal designer is responsible for all the duties described in the Regulations.

5. The Regulations also require the principal designer to take into account (in addition to construction risks) the health and safety aspects over the whole life of the development. The developer's S104 Application must, therefore, include a management and maintenance plan (in addition to the health and safety file) to demonstrate that the designer has taken the health and safety considerations of future maintenance into account in preparing the design.

6. A management and maintenance plan should include the following items:

- a) the type of maintenance activities that are anticipated;
- b) the anticipated frequencies of those activities;
- c) the estimated duration of those activities;
- d) any large plant and equipment required to undertake those activities economically;
- e) the estimated costs to complete those activities;
- f) a site plan showing maintenance areas, access routes and the locations where maintenance activities are anticipated and

- g) a statement describing any secondary function (e.g., recreation area) above or within the SuDS component, and details describing how this function is to be managed and by whom.

7. Further details of the required contents of the health and safety file can be found in Appendix I.

8. The principal designer is reminded that any part of the drainage system could be considered to be a workplace, in accordance with the Regulations.

A6 DEFINITIONS

In this guidance:

1. **"access point"** means provision to access a sewer or drain for testing, inspection, maintenance and removal of debris, and includes any manhole or inspection chamber.
2. **"adoption"** in general terms means the process whereby assets are vested in the sewerage company or another body and subsequently maintained by that body at its expense.
3. **"Code"** means the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England, published by Ofwat in August 2018, as that document is amended from time to time.
4. **"curtilage"** means the area of land around a building, or group of buildings, which is for the private use of the occupants of the buildings.

Its meaning has been explored in case law, for example:

- a) detached, semi-detached and terraced houses can each be considered as a separate curtilage;
 - b) where a building contains a number of flats, the whole block of flats can be considered to be a single curtilage;
 - c) separate commercial properties sited on land privately-owned by a single body (e.g., a shopping centre, airport terminal, retail park, etc.) can be considered as a single curtilage if the commercial properties share the site access and facilities.
5. **"demarcation chamber"** means an inspection chamber placed near the boundary of the property at the upstream end of the lateral drain.
 6. **"developer"** means a Developer as defined in the Code.
 7. **"drain"** means a drain used for the drainage of one building or of any buildings or yards appurtenant to buildings within the same curtilage (see Water Industry Act 1991 Section 219).
 8. **"effective discharge point"** means point of discharge which has been specifically designed to discharge the foul sewage or surface water, and for which there is a legal right to discharge. This can be to another sewer or (provided that there is a legal right to discharge) to a natural watercourse, an area of land or an infiltration drainage component (see A7).

9. "**freeboard**" means the distance between the design water level and the top of a structure, provided as a precautionary safety measure against early system failure.

10. "**inspection chamber**" means a chamber on a drain or sewer with working space at ground level only, used to introduce equipment for testing, inspection and maintenance.

11. "**lateral drain**" means that part of the drain which is between the point of demarcation (e.g., demarcation chamber), or the boundary of the property it serves, and the sewer.

Guidance on whether pipes are lateral drains can be found 'Guide to Transfer of Private Sewers Regulations 2011' and this also provides guidance on whether pipes are potentially sewers or lateral drains.

12. "**local authority**" includes an authority acting in any capacity this can include a local planning authority (LPA) and lead local flood authority (LLFA). Further information on the relevant roles of local authorities can be found in Part C.

13. "**manhole**" means a chamber with working space at drain/sewer level used for entry of personnel and equipment.

14. "**pavement**" means a paved construction (including a yard or highway) and any underlying structure.

15. "**pavement structure**" comprises the sub-base and any membrane below it, together with the layers above, including, base course, surface course, binder course, laying course or paving layer.

16. "**public sewer**" means a sewer for the time being vested in a sewerage company in its capacity as sewerage undertaker (see Water Industry Act 1991 Section 219).

17. "**raised reservoir**" means a reservoir designed to hold, or capable of holding, water above the natural level of any part of the land adjoining the reservoir (see Reservoirs Act 1975 Section 1).

18. "**rising main**" means a sewer through which foul sewage and/or surface water is pumped.

19. "**sewer**" includes all sewers and drains (not being drains within the meaning above) which are used for the drainage of buildings and yards appurtenant to buildings in more than one curtilage (see A6.4) (see Water Industry Act 1991 Section 219).

Guidance on whether pipes are sewers can be found in a 'Guide to Transfer of Private Sewers Regulations 2011' and this is also applicable to determine whether SuDS components are potentially sewers or lateral drains (see A6.11).

20. "**Sewerage Sector Guidance**" means the document so entitled which is approved by Ofwat under the Code.

21. "**street**" means the whole or any part of any of the following, irrespective of whether it is a thoroughfare:

- a) any highway, road, lane, footway, alley or passage;
- b) any square or court; and
- c) any land laid out as a way whether it is for the time being formed as a way or not.

Where a street passes over a bridge or through a tunnel, the street includes that bridge or tunnel (see New Roads and Street Works Act 1991 Section 48).

22. "**surface component**" means a component of a surface water drainage system that is not buried underground.

23. "**vesting**" means the formal transfer of ownership and responsibility of sewers from the developer to the sewerage company or other body.

24. "**sewerage company**" means a sewerage undertaker appointed under the Water Industry Act 1991 and includes any agent appointed to act on its behalf.

25. "**works**" means the prospectively adoptable drainage systems described in the Section 104 Agreement.

26. "**yard**" means a paved area including a driveway, patio, hard standing or footpath.

A7 STATUTORY CONSENTS AND OTHER PERMISSIONS

1. The developer should, in liaison with the sewerage company, obtain all necessary statutory consents and other permissions before the agreement is signed. Relevant bodies can include:

- a) consent of the pollution control authority (the Environment Agency in England) for emergency overflows and contaminated waters;
- b) permission of the navigation authority (usually the Canal and River Trust) to discharge to waters under their control;
- c) permission of riparian owners will be required to discharge to a watercourse;
- d) landowner's permission to discharge water onto land;
- e) landowner's permission for construction of any part of the drainage system on third-party land;
- f) the Crown, Network Rail, airport authorities, or MOD, etc., where special permission may be required for land owned by them;
- g) the land drainage authority (Environment Agency, for main rivers, local land drainage authorities for non-main rivers) for consent for the construction of outfalls or works within close proximity to a watercourse;
- h) English Nature where any of the works will affect an environmentally-designated site (e.g., SSSI) or could affect protected species;
- i) the planning approval for the site from the Local Planning Authority.

2. Throughout any pre-application discussions (see Appendix D of the Sector Guidance) , the developer should be able to show progress in discussions with the relevant bodies and before formally making the S104 Application they should be able to show evidence that any conditions will not affect the design of the system..

3. Individual sewerage company requirements for easements for surface water discharges to watercourse, bodies of water, sewers within third party land and sewers which may form part of another feature are permitted as 'Local Practices' under the Sector Guidance. Details of these requirements are published on sewerage company websites.

A8 DRAINAGE OF STREETS

1. The sewerage company is not obliged to accept runoff from newly-constructed streets into the public sewer system. The developer should note that acceptance of this runoff into the works and, ultimately, the public sewer system, is only by agreement, which will not be unreasonably withheld.

2. Where the developer wishes to connect drainage from streets to a surface water sewer or a combined sewer, they should discuss this with the sewerage company as early as possible as the specific consent of the sewerage company will be required in advance. The connection of drainage from streets to a foul sewer will not be permitted.

3. The connection of runoff from publicly-adoptable highways to a public sewer is regulated by the Water Industry Act 1991 Section 115. Some sewerage companies may have a separate formal agreement for such discharges. This agreement is formally between the highway authority and the sewerage company but, prior to adoption of the highway, the developer as owner is party to the agreement. Section 115 also deals with connections of surface water to a highway drainage system.

4. It is particularly important to have an agreement in place which confirms the area of highway being drained to the public sewer, especially where there are issues regarding capacity, connection to a combined sewer or where only highway drainage is to be connected to the public sewer.

A9 LAND DRAINAGE

1. Sewerage companies have no duty to accept land drainage runoff, flows from natural watercourses or groundwater to the public sewer system, and this is not normally permitted.

A10 CONTROL OF POLLUTION DURING CONSTRUCTION AND PRIOR TO ADOPTION

1. The developer should maintain the integrity of separate surface water sewer systems and is responsible for any blockages, pumping station breakdown, cross-connections, etc., and any impact (e.g., flooding or pollution, etc.) up to the time the sewers are adopted.

2. The developer should include in their S104 Application a plan for approval by the sewerage company to demonstrate how sediment and other debris will be managed to avoid any sediment or debris being discharged into the proposed drainage system, any public sewer or a surface water body. The developer should comply with this plan at all times during construction and during any maintenance carried out prior to adoption.

A11 EXISTING PUBLIC SEWER AND LATERAL DRAINS WITHIN THE SITE

1. The developer should note that there could be existing public sewers and lateral drains within the site. Due to their nature, historic mapping of these features, particularly former private sewers transferred under Water Industry Act 1991 Section 105A, may not be available and the developer is encouraged to investigate the location and interconnection of any existing drainage assets on site.
2. Where the developer proposes to construct buildings over or near existing public sewers or lateral drains, they should consult the sewerage company at the earliest opportunity. In some cases, the sewer or lateral drain may need to be diverted.
3. As soon as a diversion of an existing public sewer is envisaged as part of the development, the developer should contact the sewerage company to agree if the diversion is feasible. A separate application may be required under Section 185 of the Water Industry Act 1991. It should be noted that since the private sewers transfer, many sewers that were previously private are now public sewers.
4. Where the developer wishes the sewerage company to abandon existing public sewers and lateral drains within their site in accordance with Section 116 of the Water Industry Act 1991, they should contact the sewerage company to agree the required arrangements.
5. Where any works are to be carried out in proximity to existing sewers or lateral drains, appropriate protection methods and mitigation plans should be agreed with the sewerage company to protect the assets. These details should also be retained within the health and safety documents.

PART B – DESIGN AND CONSTRUCTION OF NEW FOUL SEWERS AND LATERAL DRAINS

B1 SCOPE

1. This Part gives guidance on the design and construction of gravity, foul and lateral drains, and sewers. For guidance on surface water sewer systems see Part C, and for guidance on sewage pumping stations see Part D.

B2 SEPARATE SYSTEMS

1. Separate foul and surface water systems should be provided.
2. If sewers are to discharge into an existing combined (single pipe) sewer system, the separate foul and surface water sewers should be combined at locations immediately upstream of the point where they discharge into the existing combined sewer system. The levels should be arranged to minimise the risk of foul sewage entering into the surface water system.
3. Natural watercourses, land drainage and groundwater are not permitted to be directly or indirectly connected to the public foul sewer system (see A9).

B3 HYDRAULIC DESIGN

B3.1 Foul Sewers and Lateral Drains

1. The peak design flow rates for dwellings should, at the discretion of the designer, be either:
 - a) calculated in accordance with BS EN 12056-2 System II (this method is recommended for this application in BS EN 16933-2); or
 - b) 4000 litres per dwelling per day (0.05 litres per second per dwelling). Note: This is a design peak flow rate not a daily average water usage, and represents the peak flow rate from a number of appliances. Reducing daily water usage does not necessarily reduce the peak flow rate.
2. Design flows for industrial and commercial developments can contain two elements: domestic flows (flows from toilets and kitchens, etc.) and trade effluent flow (wastewater from industrial processes¹). The total peak design flow is the sum of the domestic design flow and the trade effluent design flow.
 - a) The domestic design flow should be calculated in accordance with BS EN 12056-2 System II (see also BS EN 16933-2) or, in the absence of appropriate information, 0.6 litres per second per hectare of developable land;
 - b) The trade effluent design flow should be based on a metered discharge from premises similar to that proposed, or assumed as 0.5 litres per second per hectare for normal industry and 1 litre per second per hectare for wet industry. Where the proportion of wet industry is unknown, an average flow of 0.7 litres per second per hectare should be used.

¹ Developers are reminded that the occupier of the building will be required to make a separate application to discharge any trade effluent flows.

3. The Colebrook-White hydraulic roughness value (k_s) for foul gravity sewer design should be 1.5 mm for all sewer material types.
4. Foul sewers and lateral drains should be designed to run at no more than 75% of pipe full conditions.
5. The minimum pipe sizes specified in B6 may provide more capacity than the peak flow rates determined from B3.1 or B3.2.

B3.2 Protection Against Flooding

1. In designing the site sewerage and layout, developers should also demonstrate flow paths and the potential effects of flooding resulting from blockages, pumping station failure or surcharging in downstream combined sewers, by checking the ground levels around the likely points that flow would flood from the system to identify the flood routes.

B4 LAYOUT PRINCIPLES

1. The layout of the development can affect the existing drainage patterns and flood risk. The layout of the development, including landscaping and vegetation, should take account of the impact it may have on the layout of drains and sewers. (see B5.1). This should be addressed at the master planning stage.
2. Sewers and lateral drains should be laid in straight lines in both the vertical alignment (profile) and horizontal alignment (plan) unless agreed with the sewerage company.
3. The layout should ensure that sufficient access points are located so that they are accessible and apparent to the sewerage company at all times to provide access to every sewer and lateral drain (see B5.2).
4. Sewers and lateral drains should be located so that if there is a structural failure of the drain, sewer or rising main, or an excavation is carried out to repair the drain, sewer or rising main, the integrity of adjacent buildings or other infrastructure is not impaired. (see B5.1.3 to B5.1.6 and B5.1.8 to B5.1.9).

B5 LAYOUT AND ACCESS

B5.1 Layout

1. As far as practicable, sewers and lateral drains should be laid in highways or public open space where they are reasonably accessible and visible. Sewers should not be laid in enclosed private land. Where this is not practicable, sewers and lateral drains with a nominal internal diameter of 150 mm or less may be laid:
 - a) in shared rear yards or parking areas or other shared areas to which all the properties served by the sewers have right of access; or where this is not reasonably practicable
 - b) where the drain or sewer serves ten properties or less, in unfenced gardens; or where this is not reasonably practicable
 - c) in fenced private areas provided that the sewer is kept as far as is practicable from any point on a building where a future extension is likely.

2. Access points on sewers and lateral drains should not be laid in enclosed private land. Where this is not practicable, access points of sewers and lateral drains may be constructed:

- a) in shared rear yards or parking areas, provided there is free access at all times;
- b) in enclosed shared private areas provided that all those properties served by the sewers have right of access to the area at all times. Access control systems should include provision for access by the sewerage company;
- c) where the drain or sewer serves ten properties or less, in unfenced gardens; or
- d) on sewers serving no more than two properties, provided that access is also possible from the other property by another access point.

3. The external face of any new sewer or lateral drain should be at least 1.2 m from any building or structure (e.g., a wall), or a distance equivalent to the depth of the sewer below the foundation, whichever is greater; except that a sewer or lateral drain with a nominal internal diameter of 150 mm or less, with an invert level at least 150 mm above the base of the foundation and no more than 1100 mm deep, and should be greater than 100 mm from the foundations (see Figure B 1).

4. Where it is not possible to comply with B5.1.3 because another building/structure is in such close proximity that there are no permitted locations, new sewers or lateral drains may be located between buildings or structures provided that:

- a) there is at least 900 mm separating the buildings or structures where a single sewer or lateral drain is proposed and 1100 mm where dual systems are proposed;
- b) the depth of the invert of the sewer or lateral drain below the ground level is no greater than the distance between the buildings or structures;
- c) the sewers or lateral drains have a nominal internal diameter of 150 mm or less;
- d) the sewers or lateral drains have an invert level at least 150 mm above the base of the highest of the foundations of the two buildings;
- e) there is at least 350 mm cover above the pipe; and
- f) there is at least 100 mm between the pipe wall and the foundations (see Figure B 2).

5. For the purposes of B5.1.3 and B5.1.4, the foundation level of the building or structure with piled foundations should be taken as:

- a) for friction piles (or piles with a combination of friction and end bearing), from the underside of the capping beam; or
- b) for end bearing piles (with no allowance for side friction), the base of the pile.

Note: In B5.1.1, B5.1.3 and B5.1.4, the recommendations are intended to allow sufficient working space for hand excavation in proximity to the building or structure if repair is necessary in the future.

6. Foul sewers and lateral drains should not be constructed under any building, or any structure except that they may cross under a boundary wall not greater than 1.8 m high (see B7.4).

7. The minimum depth of cover to the crown of gravity pipes without protection should be as follows:

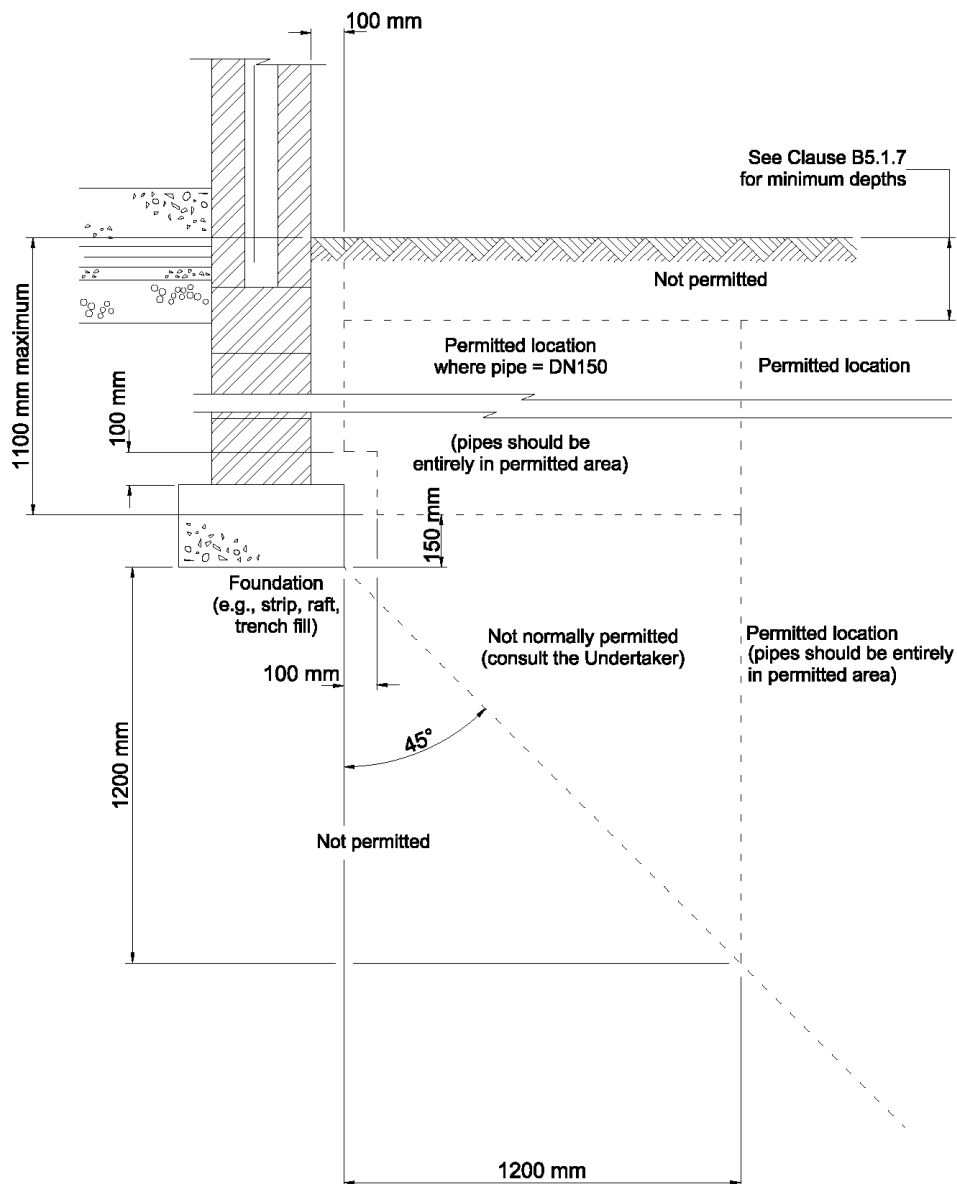
- a) domestic gardens and pathways without any possibility of vehicular access, 0.35 m;
- b) domestic driveways, parking areas and yards with height restrictions to prevent entry by vehicles with a gross vehicle weight in excess of 7.5 tonnes, 0.5 m;
- c) domestic driveways, parking areas and narrow streets without footways (e.g., mews developments) with limited access for vehicles with a gross vehicle weight in excess of 7.5 tonnes, 0.9 m;
- d) agricultural land and public open space, 0.9 m;
- e) other highways and parking areas with unrestricted access to vehicles with a gross vehicle weight in excess of 7.5 tonnes, 1.2 m.

8. Sewers and lateral drains may be laid through arches and other external openings through buildings or structures provided that they are laid as near to the centre of the opening as possible and:

- a) for vehicular entries with a minimum width of 4.0 m and minimum height of arch above ground level of 2.1 m, the maximum nominal internal diameter of the pipe should be 225 mm with a maximum depth to invert of the pipe of 2.0 m and the invert should be at least 150 mm above the foundation level; or
- b) for pedestrian access with a minimum width of 0.9 m and minimum height of 2.0 m, the maximum nominal internal diameter of the pipe should be 100 mm and should comply with B5.1.4.

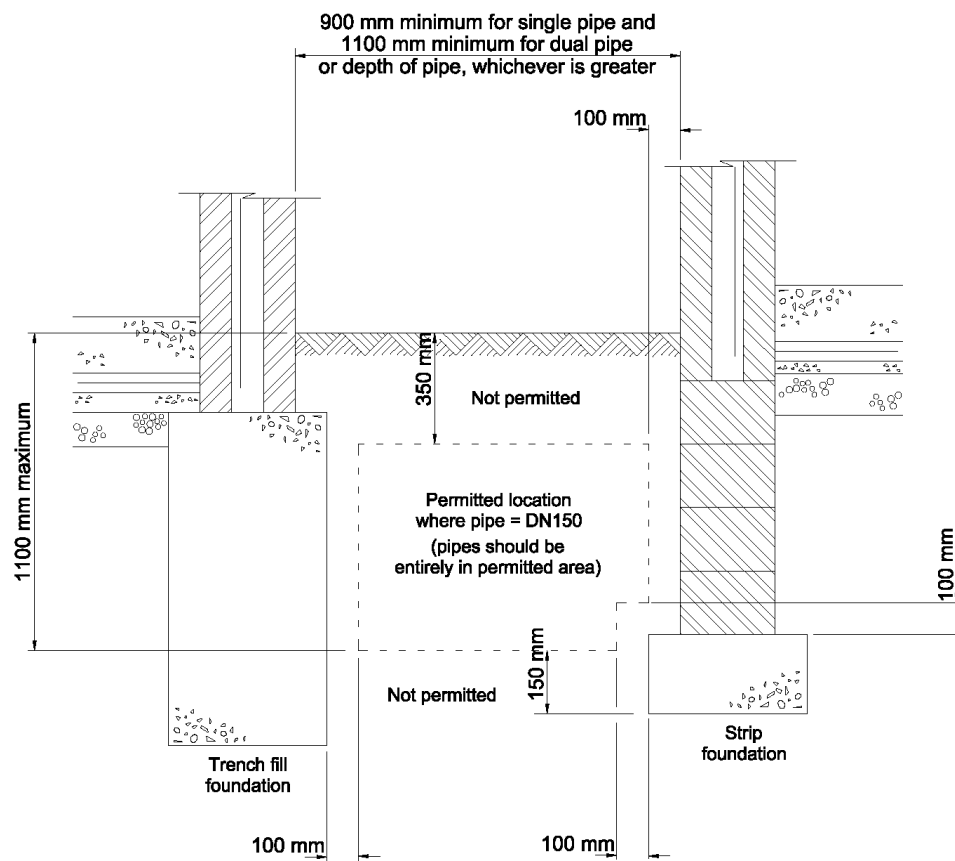
9. Sewers or lateral drains may pass through an opening in a property boundary wall provided that there is an arch or lintelled opening to give at least 50 mm space around the pipe (see B5.1.6).

Figure B 1
Illustration of the permitted locations of adoptable sewers and lateral drains in proximity to buildings



Not to scale

Figure B 2
Illustration of the permitted location of small diameter adoptable sewers and lateral drains between buildings



Not to scale

10. The design of landscaping should be undertaken at the same time as the design of the lateral drains and sewers so that the impact of tree roots on sewers and drains can be considered. A sewer or lateral drain should not be located closer to trees/bushes/shrubs than the canopy width at mature height, except where special protection measures are provided, in accordance with B7.6. A tree should not be planted directly over sewers or where excavation onto the sewer would require removal of the tree. The following shallow rooting shrubs are generally suitable for planting close to sewers and lateral drains:

- *Berberis candidula*; (paleleaf barberry)
- *Berberis julianae*; (wintergreen barberry)
- *Ceanothus burkwoodii*; (Californian lilac 'Burkwoodii')
- *Cotoneaster dammeri*; (bearberry cotoneaster)
- *Cotoneaster skogholm*; (*Cotoneaster x suecicus*, 'Skogholm')
- *Cytisus* varieties or *Sarothamnus*; ((common or Scotch) broom)
- *Euonymus japonicus*; (Japanese spindle)
- *Euonymus radicans*; Variety of *Euonymus* (fortune's spindle or winter creeper)
- *Mahonia* varieties; can be included in the genus *Berberis*, most common name is *M. aquifolium* (Oregon grape)
- *Potentilla* varieties; most varieties are types of cinquefoil. Also includes common tormentil, silverweed and barren strawberry
- *Skimmia japonica*; (Skimmia)
- *Spiraea japonica*; (Japanese spirea or Japanese meadowsweet)
- *Veronica* varieties; (Speedwell)
- *Viburnum davidii*; (David viburnum)
- *Viburnum tinus*; (Lauristinus)

11. To minimise the risk of root damage, tree planting should provide good growing conditions. Guidance can be found in 'Trees in Hard Landscapes: A Guide for Delivery'.

12. When constructed along the line of a highway, the sewer should be laid in the carriageway and, where practicable, at least 1m from the kerbline. The external faces of manholes (including any concrete surround) should be at least 0.5 m from the kerbline. This is to allow any subsequent excavation for a new connection or a repair to be made without interfering with other services sited in the footway.

13. Where it is proposed to lay pipes in third-party land, agreement should be obtained from the owner of the land surface as to acceptable levels of predicted settlement, prior to the construction. The construction techniques should be selected to ensure that the maximum settlement is within the agreed limits.

14. Where foul sewers are laid under some types of SuDS components (e.g., a swale or a rill), this can require decommissioning and reconstruction of the SuDS component if excavation is required to repair the foul sewer. The layout of both foul sewers and surface water drainage should minimise the length of foul sewer under SuDS components, for example, by ensuring that any crossings are at as near as possible to a right angle and are positioned under narrow SuDS components. Foul sewers should not be

laid under infiltration components. If necessary a short section of an infiltration component may be modified so that the foul sewer passes through a section where no infiltration takes place.

15. BS EN 752 provides further detail on the design of sewer systems including layout.

B5.2 Access

1. Access points, should be located so that they are accessible and apparent to the sewerage company at all times for use. They should avoid rear gardens or enclosed locations. Additional access points may be provided in other locations, as long as access is provided to the system from other access points, in accordance with the recommendations in B5.2.2 to B5.2.30.

2. Access points, and any inlets to drains or sewers, should be located so as to minimise the risk of damage to buildings or other critical infrastructure in the event of sewer flooding.

3. Access points and sewers should be sited with due regard to public utility services. An access point should be built:

- a) at every change of alignment or gradient (though this does not exclude the use of a backdrop at a manhole in accordance with B5.2.27);
- b) at the head of all branches;
- c) at every junction of two or more public sewers;
- d) wherever there is a change in the size of the sewer;
- e) at every junction of a public sewer with another sewer serving three or more properties; or
- f) at or within 1 m of the property boundary at the upstream end of each lateral drain (preferably inside the property boundary).

4. Manholes should be provided as the means of access to a pipe where:

- a) the depth from cover level to soffit is greater than 3 m; or
- b) where the diameter of the largest sewer is greater than or equal to 450 mm DN/ID;
- c) where the chamber contains equipment (e.g., penstock or flow control device) that will require maintenance; or
- d) where the chamber serves more than ten properties.

In other locations specified in B5.2.3, the access point may be an inspection chamber.

5. The flow diagram in Figure B3, used in conjunction with the access structure standard details will ensure that the sewerage system meets the required safety, operational and sustainability standards. Each junction, change of direction or change of status, is described here as a node. Unless otherwise required in accordance with B5.2.6, no access is required at a node if it connects less than three properties and there already is, or will be, sufficient access to carry out sewer maintenance.

6. Where access to a pipe is provided through an inspection chamber, no part of the pipe should be more than 22.5 m from the adjacent inspection chamber (i.e., the distance between adjacent inspection chambers should be no more than 45 m). Where access to a pipe is provided through a manhole, no part

of the pipe should be more than 45 m from the adjacent manhole (i.e., the distance between adjacent manholes should be no more than 90 m). Where the nearest adjacent node to a manhole is an inspection chamber, they should be no more than 45 m apart.

7. Manholes should be designed for safe access and egress. The minimum clear opening into any manhole less than or equal to 3 metres deep to the soffit of the lowest outgoing pipe should be 600 mm x 600 mm.

8. Inspection chambers should be designed to afford reasonable access for equipment to carry out testing, inspection and maintenance activities. Inspection chambers should be designed for personnel working at ground level.

9. Any pipe, and associated access upstream of the point of demarcation, is a private drain and should be constructed in accordance with the Building Regulations.

10. Figure B 4 to Figure B 17 show typical details of manholes for a variety of depths from cover level to soffit of pipe up to 6 m, including backdrops. No significant departure from these dimensions should be made without approval by the sewerage company.

11. In exceptional cases, where access is required at a greater depth than 6 m, the details should be agreed in advance with the sewerage company.

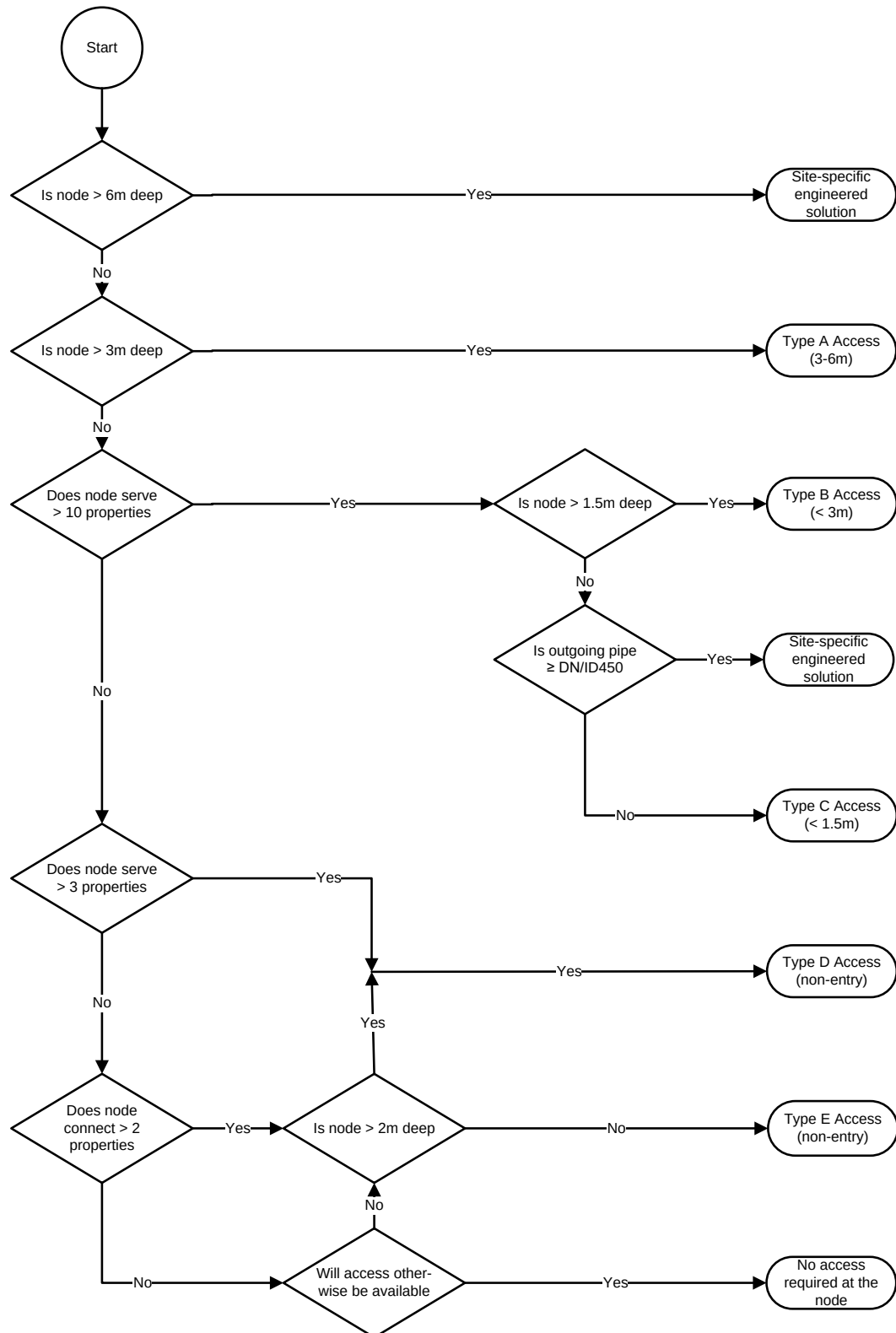
12. Minimum manhole diameters for Type A, B and C manholes should be in accordance with Table B 1. The minimum diameter should be increased, as necessary, to provide the minimum benching dimensions specified in Figures Figure B 4 to Figure B 12.

Table B 1
Manhole diameters

Nominal Internal Diameter of Largest Pipe in Manhole (mm)	Minimum Nominal Internal Dimension of Manhole (mm)
Less than 375	1200
375 – 450	1350
500 – 700	1500
750 – 900	1800
Greater than 900	Pipe diameter + 900

Figure B 3
Access type selection

All depths are from cover level to the soffit of highest outgoing pipe



13. The height of a Type A manhole (benching to slab soffit) should normally be in excess of 2000 mm. When this is impracticable, Type B manholes are preferred, subject to an absolute minimum height (benching to slab soffit) of 900 mm.

14. The internal dimensions quoted above are considered to be the minimum. Where two or more pipes enter the manhole, the internal dimensions should be increased, where necessary, to accommodate the minimum width of benching. Pipes of different diameters entering manholes should be installed with soffits at the same level.

15. The dimensions of Type C manholes should be as shown in Figure B 14 or Figure B 15.

16. Figure B 18 to Figure B 25 show typical details of Type D and Type E inspection chambers. No significant departure from these should be made without approval by the sewerage company.

17. The design of special manholes and other structures should be agreed with the sewerage company.

18. "In-fill" type covers should not be used unless the developer can demonstrate that the cover can be safely lifted by two persons using standard lifting keys and that the lateral forces applied by the in-fill will not deform the cover or frame, causing the cover to become stuck in the frame. Where a cover is located in an area of block paving, the minimum frame depth should be 150 mm.

19. Covers for manholes and inspection chambers should be in accordance with E2.32 of the Civil Engineering Specification.

20. Where covers are sited in NRSWA Road Types 0, 1, 2 or 3, the frames of manhole covers should be bedded using a mortar complying with the requirements of the Design Manual for Roads and Bridges 4.2 Part 5 HA/104/09 (e.g., a suitable polyester resin bedding mortar).

21. In situations where traffic loading is anticipated to be heavier (e.g., in industrial developments where large numbers of HGV movements are expected) than would occur on a typical residential estate distributor road, a cover with a higher specification than BS EN 124 D400 should be used. This should comprise either a Class E600 cover or a D400 of a type that has been assessed and approved by the sewerage company as having sufficient additional ruggedness to ensure durability.

22. Unless the chamber is designed to withstand the vertical load acting on it, a precast concrete slab or in-situ concrete slab, should be provided, to act as a collar to support the cover and frame. The collar should be separate from the chamber to ensure the loading from the cover and frame is not transferred to the chamber. The collar itself and the material below the collar should be designed to accommodate and distribute the loads acting on the collar and into the substrate without resulting in settlement.

23. The first manhole upstream from the connection to the (existing) public sewer should, when constructed, be fitted with a temporary screen in order to prevent debris entering the public sewer. The screen should not be removed until immediately prior to the occupation of premises to be served by the sewer.

24. Rocker pipes should be provided at entry to, and exits from, manholes when rigid pipes are used. Their length should be as shown in Table E 13 (see E6.6).

25. Where pipes serving a total of three properties or less connect to a pipe that has a nominal internal diameter less than or equal to 150 mm, the branch connections should be set so that the soffits of all the pipes are at the same level. In all other cases, branch connections should be set with the soffit levels no lower than that of the main pipe and with the invert level of the branch connection at least 50 mm above the invert of the main pipe.

26. The main channel should extend the whole length of the chamber, comprising a half-round section plus vertical benching from the top edge of the half round section to a height of not less than that of the soffit of the outlet, where it should be rounded off and sloped upwards to meet the wall of the chamber. The channel should not bend by more than 90 degrees (including any connecting pipe. Connecting pipes should be constructed from swept channels (see Figure B 13).

27. Steeper gradients are preferred to the use of backdrops. Where pre-formed manhole or inspection chamber bases are used, the angular displacement at the joints between the manhole base and the pipe comply with the requirements of E5.9.4. Where steeper gradients are impractical, backdrops should be constructed at manholes as shown in Figure B 16 or Figure B 17. Ramped backdrops should be used for manholes rather than vertical backdrops.

28. Where step rungs and ladders are to be used, the distance from the top rung to the surface should be a maximum of 675 mm (see E6.7) with a minimum of one course of brickwork. Where ladders are to be used, they should be positioned relative to the access so that the minimum clear opening is not obstructed.

29. At the foot of each ladder or set of step rungs, a minimum of 450 mm landing area should be provided from the outer edge of the step or rung. This may consist of:

- a) a single area adjacent to the foot of the ladder or steps; or
- b) where the channel is no more than DN450, one area of at least 225 mm adjacent to the foot of the ladder or steps with the remainder on the other side of the channel.

30. The minimum dimensions of inspection chambers are determined by the entry radius needed by the equipment as it passes into the pipe (see Figure B 25). The clear opening should, therefore, have a minimum diameter greater than 50% of the internal diameter of chamber, subject to a minimum of 90 mm.

31. BS EN 752 provides further detail on the design of sewer systems including provision of access.

Figure B 4
Typical manhole detail – Type A1

Depth from cover level to soffit of pipe 3 m to 6 m with ladder and reducing slab
Rigid material construction without concrete surround

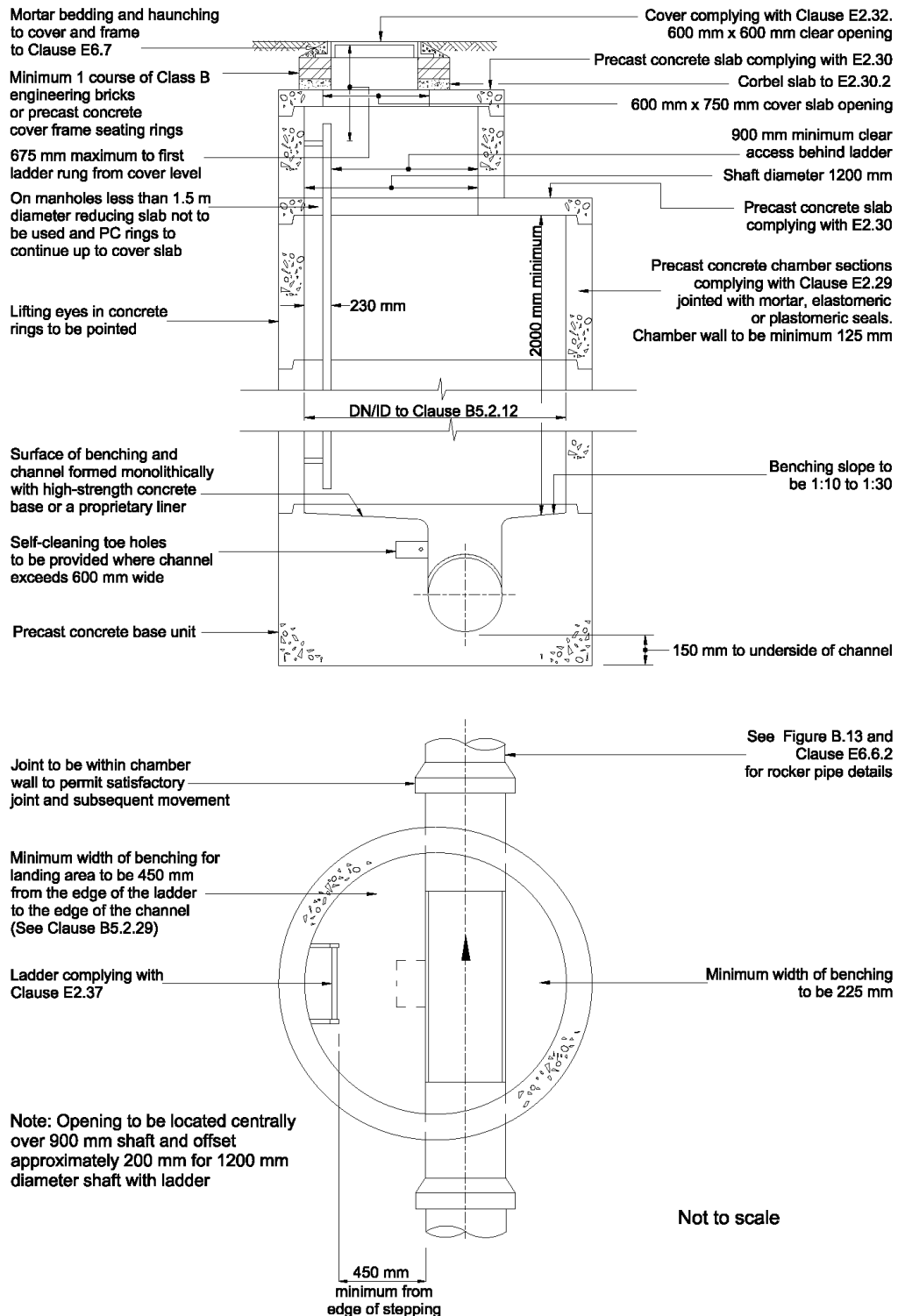


Figure B 5
Typical manhole detail – Type A1

Depth from cover level to soffit of pipe 3 m to 6 m with ladder and reducing slab
Rigid material construction with concrete surround

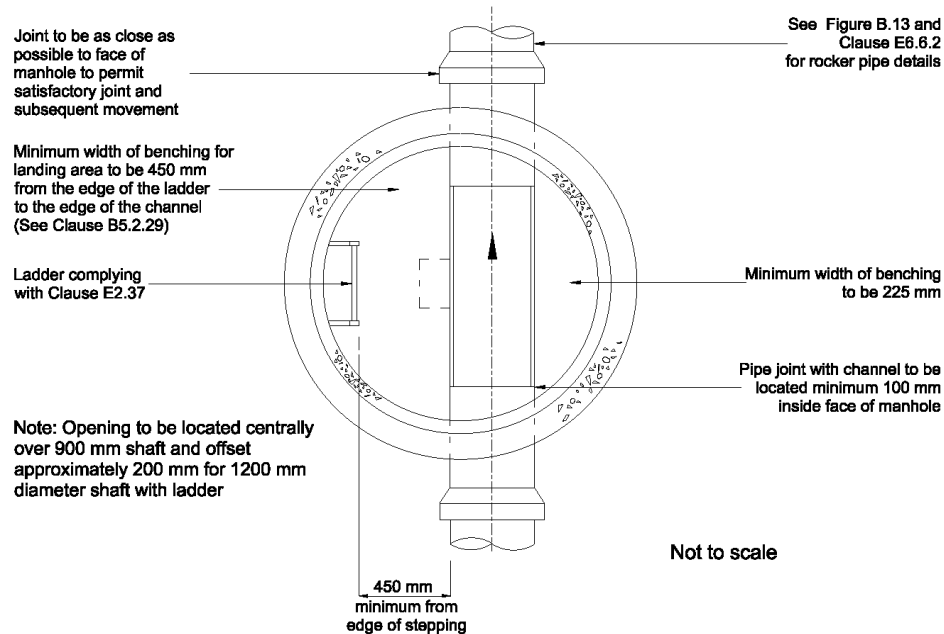
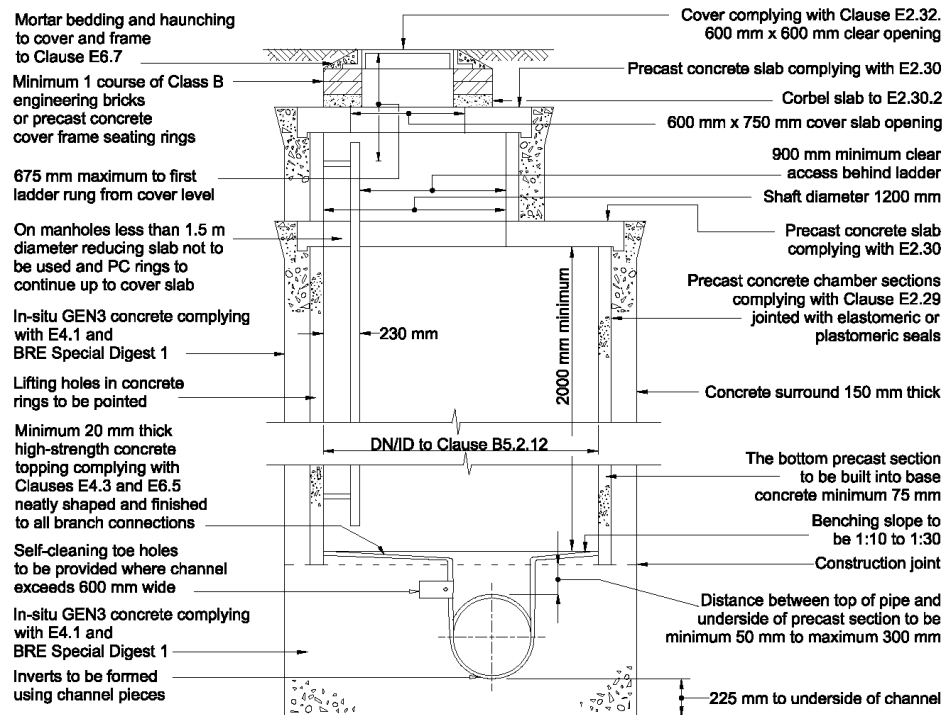


Figure B 6
Typical manhole detail – Type A2
Depth from cover level to soffit of pipe 3 m to 6 m with ladder
Rigid material construction without concrete surround

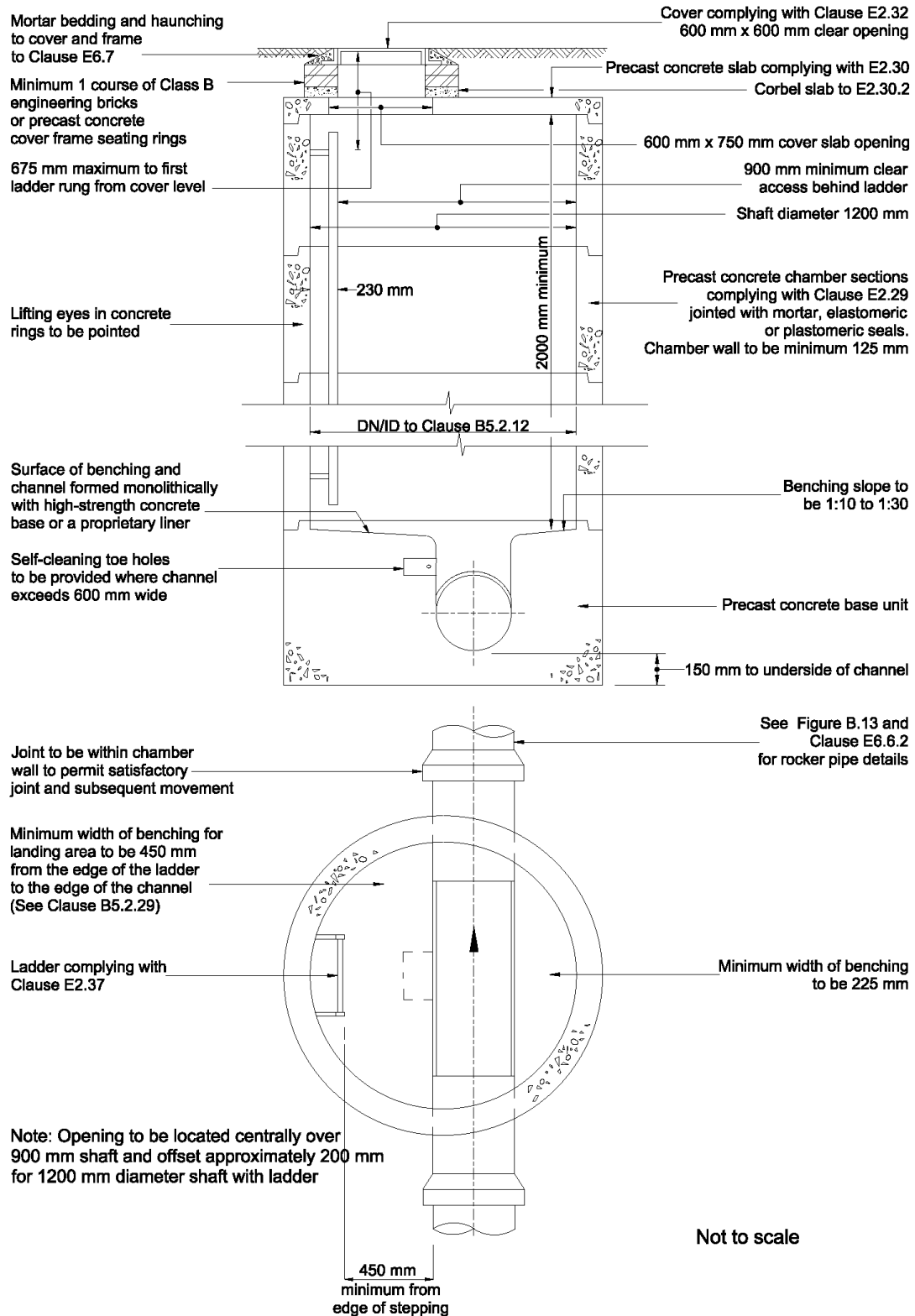


Figure B 7
Typical manhole detail – Type A2
 Depth from cover level to soffit of pipe 3 m to 6 m with ladder
 Alternative rigid material construction with concrete surround

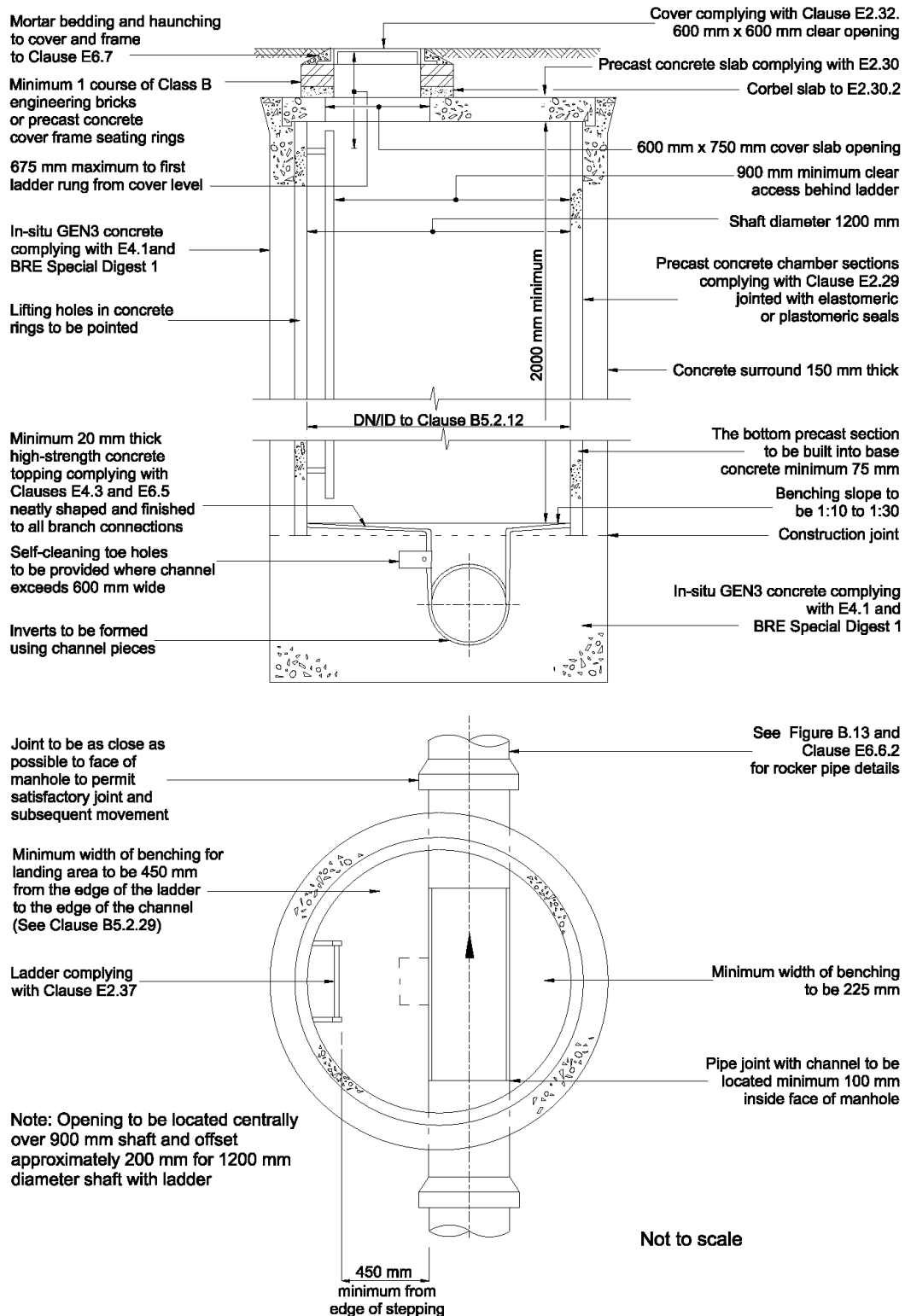


Figure B 8
Typical manhole detail – Type A2
Depth from cover level to soffit of pipe 3 m to 6 m with ladder
Flexible material construction

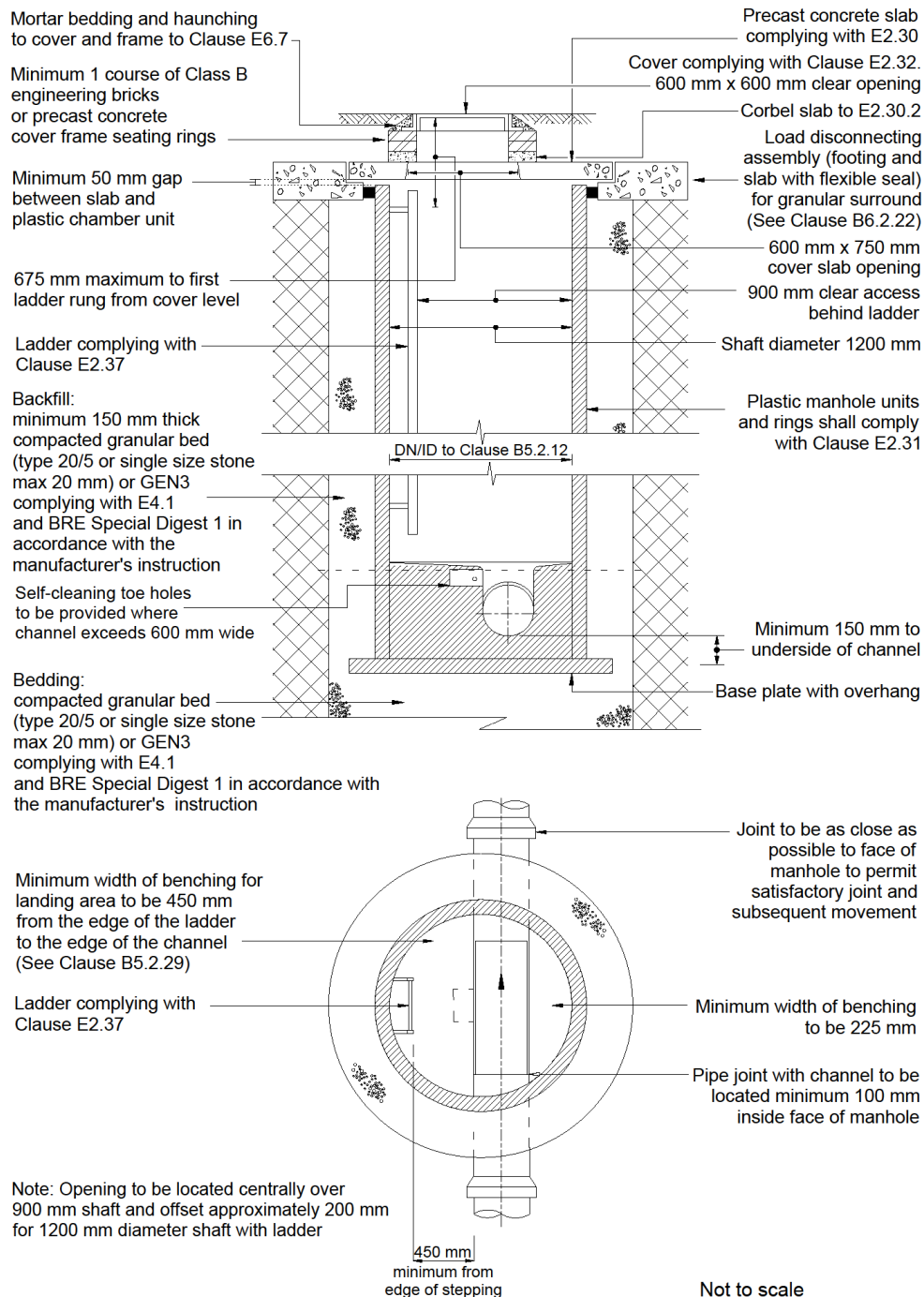


Figure B 9
Typical manhole detail – Type B
Depth from cover level to soffit of pipe 1.5 m to 3 m
Rigid material construction without concrete surround

