



BRIGHT PLAN CIVILS

**LAND AT THISTLEWORTH FARM,
GRINDERS LANE, DIAL POST RH13 8NR**

RE-PROFILING OF AGRICULTURAL LAND

Drainage Strategy Report

Prepared on Behalf of

Alfie Hyatt

2020/D1867B/DS1.2

30 September 2020

DOCUMENT CONTROL


Project: Land at Thistleworth Farm, Grinders Lane, Dial Post RH13 8NR
Re-Profiling of Agricultural Land

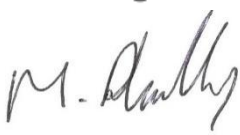
Document: Drainage Strategy Report

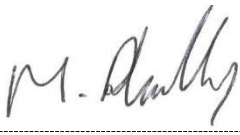
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1 INTRODUCTION

1.1 Background

- 1.1.1 Bright Plan Civils is instructed by Alfie Hyatt to prepare a Drainage Strategy Report to support a planning application for a Re-Profiling of Agricultural Land at the Land at Thistleworth Farm, Grinders Lane, Dial Post RH13 8NR.
- 1.1.2 The application for which this report refers is referred to as the application site within the report, and is situated within a wider area of land ownership of Thistleworth Farm. For the purposes of preparing a drainage strategy that uses best practice, the entire runoff catchment of which this application site is situated within has been assessed, in order to ensure that any proposed drainage system is not overwhelmed by greenfield runoff from the wider catchment.
- 1.1.3 This report has been undertaken in accordance with National Planning Policy Framework (NPPF) and The Planning Practice Guidance on the use of SuDS for achieving sustainable development.
- 1.1.4 The proposed application is for an area of raised land in order to improve the poor quality of agricultural land with excavated earth and clay from a neighbouring area of land under site ownership, as well as imported screened waste - as demonstrated within the preliminary site layout, contained within **Appendix A** of this report.
- 1.1.5 In preparing this report, Bright Plan Civils has referred to the following documents and information:
- Environment Agency Flood Maps for Planning
 - Long Term Flood Risk Information; Flood Risk Maps
 - Southern Water and Local Authority Drainage Records
 - British Geological Survey & Records
- 1.1.6 This document has been prepared to propose assess drainage constraints and propose a drainage strategy that is appropriate for the design life of the development, without causing offsite impacts from runoff in a design event.

1.1.7 This report has been prepared for the benefit of the named Client only.

1.2 Site Location and Description

- 1.2.1 The property is situated between the residential area and industrial area of Dial Post, situated just off the A24 between Horsham and Worthing, in West Sussex. The site is bounded by the A24 highway to the northwest, and agricultural land to the south and east.
- 1.2.2 A topographical survey of the site has been undertaken and provided by the client. It is included in **Appendix B** of this report.
- 1.2.3 The topographical survey shows that the site falls inwards towards the centre of the drainage catchment, and is enveloped by bunds to the north, east and west – as detailed in Drawing **100**.
- 1.2.4 The existing site is made up natural ground and imported soil, and is drained by a combination of

overland runoff and infiltration. There is no existing site drainage, however it will form part of the drainage assessment of a neighbouring application (screening site).

- 1.2.5 The nearest watercourse appears to be an ordinary watercourse northwest of the site, which runs northerly to the River Adur.
- 1.2.6 The nearest surface water feature is a pond at the head of the aforementioned ordinary watercourse, north of the site.
- 1.2.7 The existing application site has a total area of approximately 5,840m² (0.584 Ha), with no area existing or proposed to be hardstanding – as seen in Drawing **200**.

1.3 Ground Conditions

- 1.3.1 Two soakage holes were dug, one on the site and one on land also owned to the south. These were dug to approximately 2 metres deep. The excavated ground consisted of hardcore, gravel and topsoil to 1mbgl, with sandy clay to the depths of the boreholes.
- 1.3.2 Infiltration rates of 8.7x10⁻⁶ m/s, 9.1x10⁻⁶ m/s and 1.1x10⁻⁵ m/s were recorded at the two trial holes, with all three tests resulting in full emptying of water. This would indicate there is potential for the use of infiltration SuDS, however the infiltration may be in part to lateral drainage through the infill hardcore and other deposited soils, at the concern is that this would not be infiltrated into the underlying Clay through infiltration methods. The infiltration test results can be seen in **Appendix C**.
- 1.3.3 In addition to site-specific soakage testing, reference has been made to the British Geological Survey (BGS) website.
- 1.3.4 The BGS geology viewer states that the bedrock geology is likely to consist of 'Weald Clay Formation - Mudstone', as seen in **Figure 1**.



Figure 1. BGS website Bedrock geology

- 1.3.5 No Superficial Deposits are recorded at the site.

1.3.6 Historic borehole records from the Single Onshore Boreholes Index (SOBI) on the BGS website have also been reviewed in the absence of a site-specific geotechnical investigation, as depicted in **Figure 2**.

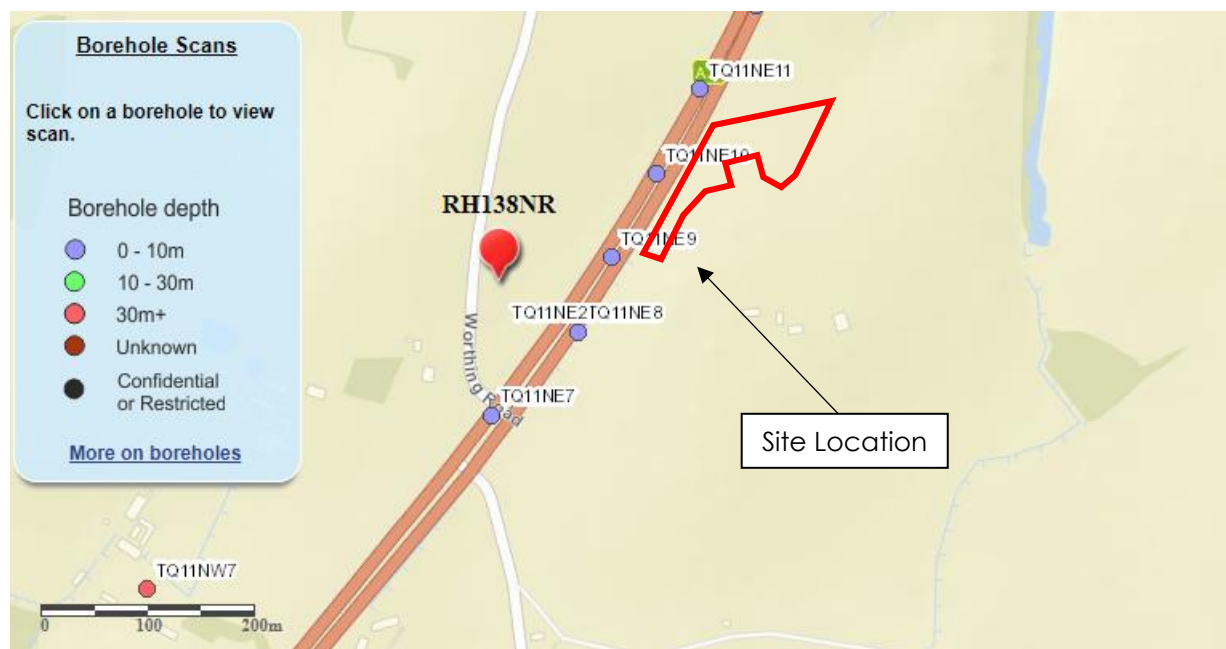


Figure 2. BGS website borehole locations

1.3.7 Two boreholes along the west boundary of the site were assessed in comparison to the site, as seen in **Figure 2**. These had similar geotechnical strata according to the BGS online mapping.

1.3.8 The logs stated that the geological composition encountered consisted of grey sandy silty clay for the depth of the boreholes.

1.3.9 A copy of the BGS records reviewed can be found within **Appendix D** of this report.

1.4 Groundwater

1.4.1 The excavated boreholes did not encounter groundwater, however there was seepage into one of the holes (within the screening site to the south). This was considered to be from an existing French Drain that intercepted the hole, and was partially the reason the holes were excavated deeper to extend beyond the depths of the French Drain and allow for soakage testing into the underlying Clay.

1.4.2 The recorded BGS boreholes did not encounter groundwater.

1.4.3 The Horsham District SFRA makes no mention of the settlement of Dial Post, and references to groundwater are limited to the southern extent of the study area.

1.4.4 Mapping managed by MAGIC (magic.defra.gov.uk) provides geographic information concerning the natural environment from across government. This mapping tool has been referred to in order to confirm whether the site is located within either any groundwater source protection zones or groundwater vulnerability zones.

1.4.5 The site is situated within a 'Unproductive' Aquifer for both Bedrock and Superficial Drift stratum, as seen in **Figure 3**. This refers to drift deposits and bedrock geology that are not considered to exhibit significant infiltration, and do not contribute significant groundwater to an aquifer or river supply.

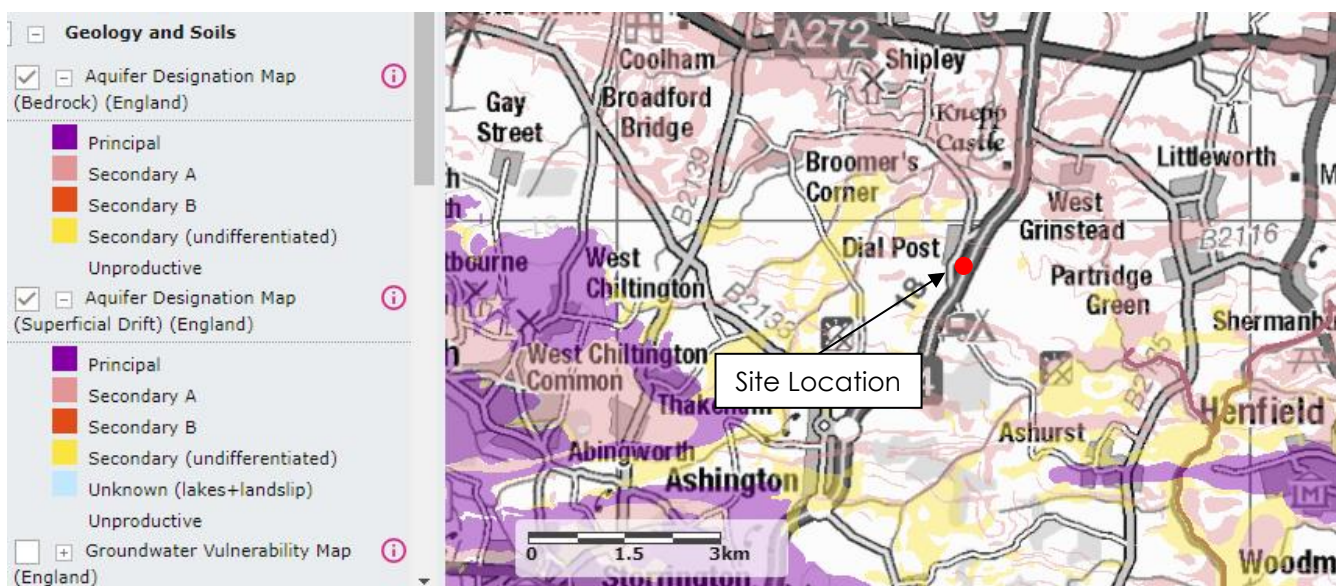


Figure 3. DEBRA Aquifer Designation Map

1.4.6 The Groundwater Vulnerability Map (Figure 4) confirms that the site falls within a 'Unproductive' groundwater vulnerability zone.



Figure 4. DEBRA Groundwater Vulnerability Map

1.4.7 The site is not indicated as within or in the vicinity of any Drinking Water Safeguard Zone or a Source Protection Zone.

1.5 Existing Drainage

1.5.1 The local Water Authority is Southern Water, who provide sewerage services within the area. Public sewer records have been obtained from Southern Water, as contained within this report in **Appendix E**.

1.5.2 Surface Water:

- The Southern Water public sewer records (**Appendix E**) show no public surface water sewers within the vicinity of the site.

- The existing site is made up natural ground and coarse hardcore, and is believed to be drained by a combination of overland runoff and infiltration. An existing French Drain was found running along the western boundary at the bottom of the bund within the screening site to the south, encountered during geotechnical investigations.
- The nearest watercourse appears to be an ordinary watercourse that runs adjacent to the site, before being culverted and re-appearing north of the site, which runs northerly to the River Adur.
- The nearest surface water feature is a pond at the re-issue of the aforementioned ordinary watercourse, north of the site.
- Greenfield runoff rate (Q_{bar}) for the drainage catchment has been calculated to be 10.88l/s, based on an area of 1.9Ha.

1.5.3 Foul Water:

- The Southern Water public sewer records (**Appendix E**) show that there are no public foul sewers in the vicinity of the site.
- At present, there is no confirmation of the foul water connection from the site, and investigation is required to establish connection arrangements should it be required for the proposed development.

1.5.4 Highway Drainage:

- The adjacent highway (private road) appears to be drained by overland runoff.

2 FLOOD RISK

2.1 Flood Maps and Modelling

2.1.1 The Environment Agency's on-line Flood Maps for Planning (rivers and sea) show that the site is located within Flood Zone 1, and not in the vicinity of any other flood zones.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

2.1.2 **Figure 5** also shows that the site is not at risk of flooding from rivers or sea.

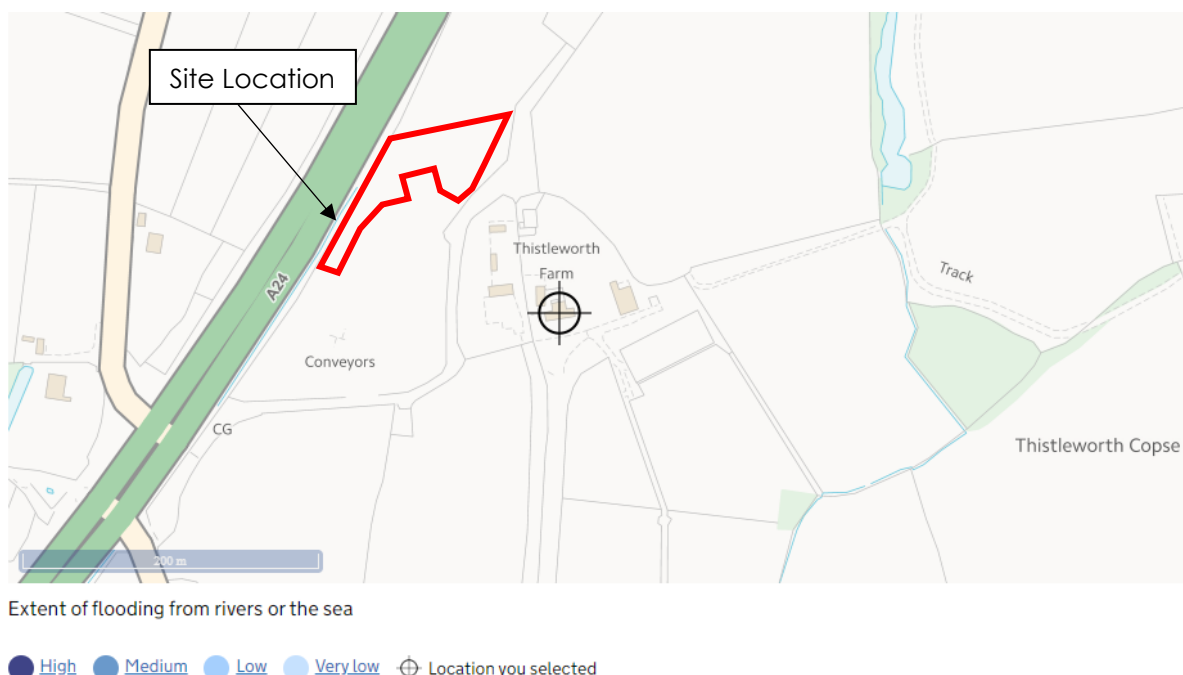
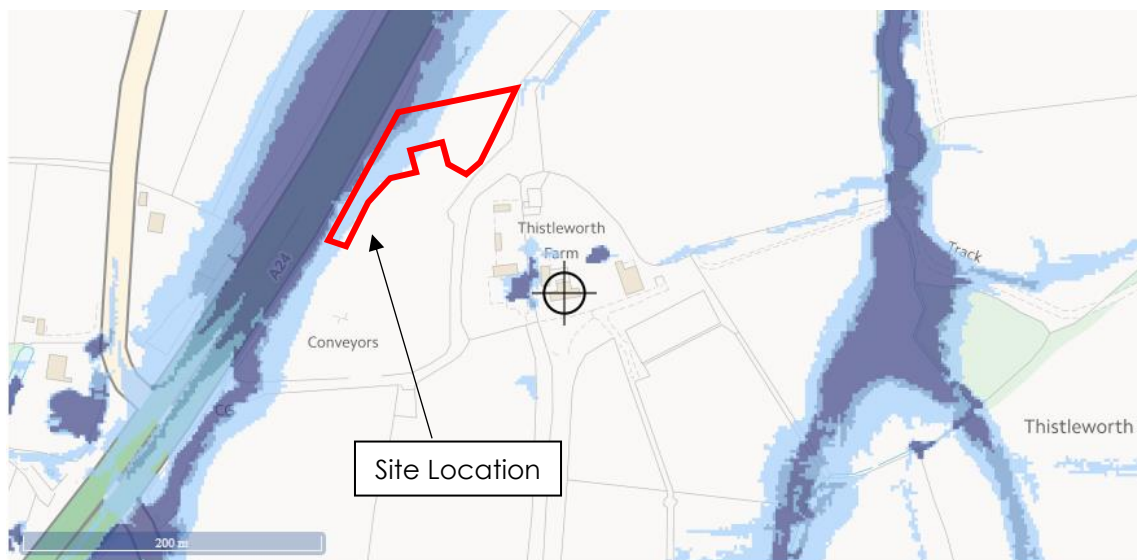


Figure 5. Long Term Flood Risk Map; Flood risk from rivers or the sea

2.1.3 **Figure 6** shows that the site at 'very low' to 'low' risk of surface water flooding, however the adjacent highway to the west is at 'high' risk of surface water flooding. The site is significantly elevated above the

highway with a large highway ditch and a boundary bund between the site and the highway, so it is not expected that the highway surface water flow path would affect the site. Depths along the access road to the site are shown to be between 300mm and 900mm in a low risk scenario however, which could affect access and egress.



Extent of flooding from surface water

● High ● Medium ● Low ○ Very Low ⊕ Location you selected

Figure 6. Long Term Flood Risk Map; Flood risk from surface water

2.1.4 **Figure 7** shows that the site is not at risk of flooding from reservoirs.



Extent of flooding from reservoirs

● Maximum extent of flooding ⊕ Location you selected

Figure 7. Long Term Flood Risk Map; Flood risk from reservoirs

2.2 Summary of Flood Risk

2.2.1 The potential sources of flooding are:

Source of Flooding	Level of Risk
Rivers and Coastal	Very Low The site is within Flood Zone 1 as is the surrounding area. The site is not in the vicinity of any watercourses or tidal sources.
Surface Water	Low The long-term flood risk for surface water is classified as 'low' along the west of the site. Although this area of the site is significantly raised above the adjacent highway, the access road may be susceptible to surface water flooding of up to 900mm inhibiting access and egress.
Groundwater	Low BGS records found the site to be situated above unproductive strata, and nearby borehole logs did not find any presence of shallow groundwater. The Horsham SFRA did not indicate the site area as susceptible to groundwater flooding.
Sewers	Low There are no surface water sewers within the area, and no reports of sewer flooding found. The site is significant raised by several metres above the highway and adjacent highway drainage ditch at risk of being surcharged. In view of this information the risk of flooding from this source is deemed to be 'Low'.
Artificial Sources	None The site is not shown to be at risk of flooding due to artificial sources.

2.2.2 The site is not considered to be vulnerable to flood risk from any of the above assessed sources, however the proposed drainage system for the proposed development should be designed in order to provide capacity up to the design event and provide consideration of potential exceedance routes, so as to not increase the risk of surface water flooding on or off the site.

3 PROPOSED DRAINAGE STRATEGY

3.1 Surface Water

3.1.1 The SUDS manual and Building Regulations set out a hierarchy of drainage methods to ensure that developments maximise the use of sustainable drainage techniques. The hierarchy favours infiltration methods of disposal over other methods such as watercourse and sewers, as detailed below;

- i. Utilise infiltration techniques
- ii. Attenuate rainwater in ponds or open water features for gradual release
- iii. Attenuate rainwater by storing in tanks or sealed water features for gradual release
- iv. Discharge rainwater direct to a watercourse
- v. Discharge rainwater to a surface water sewer/drain
- vi. Discharge rainwater to a combined sewer

SUDS Technique	Suitable	Comments
Living Roof	No	No significant building proposals.
Basins and Ponds (such as Wetlands, Balancing Ponds, Detention Basins, Retention Ponds)	Yes	Would provide attenuation as well as ecological benefits. No space available within screening site but surrounding land under same ownership.
Filter strips and swales	Yes	Would capture, filter and attenuate overland runoff.
Infiltration Devices - Soakaways - Infiltration trenches and basins	No	Underlying ground conditions are not indicated as permeable. Though site testing found some limited infiltration potential, there are concerns this is lateral soakage due to hardcore infill ground.
Permeable surfaces and filter drains (such as gravelled areas and porous block paving)	Yes	Permeable surfaces would also provide a source of treatment and shallow attenuation if tanked.
Tanked systems (such as oversized pipes or cellular tanks)	Yes	No initial constraints, would provide attenuation volume.

- 3.1.2 Despite the limited potential indicated by on-site soakage tests, it is not considered that infiltration measures are viable, given BGS borehole records in the vicinity which indicate underlying Clay from below the surface to bedrock level.
- 3.1.3 There are no hardstanding areas proposed within this application site, however the drainage strategy has been assessed in combination with the screening site to the south. This has been assessed and submitted under a separate drainage strategy, with pre-treatment of runoff from the industrial screening site prior to entering the shared pond.
- 3.1.4 Despite the land to the south not being part of this site planning application, this land is under the same ownership and also makes up part of the same drainage catchment. Appropriate capture and treatment of the runoff from the site has been considered in coordination with drainage of the catchment as a whole, given the area is landlocked by higher ground on all sides.
- 3.1.5 A balancing pond will therefore capture overland runoff from the catchment, as well as the proposed screening site of which there is 3,493m² of planned hardstanding areas, and discharge to the watercourse at a controlled rate of 8.0l/s, which is a betterment compared to the Greenfield rate of the catchment, as detailed in Drawing **PL300**.
- 3.1.6 Prior to connection to the watercourse, further information will be required to set out the details of the connection and approval of a Land Drainage Consent from WSCC will be required.
- 3.1.7 It is proposed that all captured runoff from the site is captured up to the 100-year event including 40% climate change without exceedance. Should the proposed drainage system be exceeded at the pond due to overland runoff from the catchment exceeding estimations, then the low-lying area around the pond would temporarily flood causing no significant flooding or access/egress issues to the screening site.
- 3.1.8 The strategy above will ensure that there is no increase in the rate of run-off leaving the site, therefore no increase in the risk of flooding from this source.

3.2 Treatment

- 3.2.1 In accordance with the CIRIA SuDS Manual C753 regarding methods for managing pollution risks, the risk posed by surface water runoff to the receiving environment depends on the pollution hazard at the site (the source), SuDS treatment techniques (the pathway), and the sensitivity of the environment (the receptor).
- 3.2.2 It is not considered that an assessment of treatment is needed for the proposed site, as this will remain Greenfield as previously, albeit raised due to imported ground.
- 3.2.3 As there is a risk of contamination from the screening site to the south, a separate planning application and drainage strategy has assessed the pre-treatment of runoff for the industrial screening site prior to its discharge to the shared pond.
- 3.2.4 This will form part of the on-site management regime for this site, separate to this application.

4 MAINTENANCE

4.1 Proposed Maintenance Regime

4.1.1 Maintenance is required to ensure the long-term operational performance of the proposed surface water drainage system.

4.1.2 The drainage system has been designed to minimise maintenance requirements; however a number of key tasks will need to be undertaken so that the system remains in optimal condition. These operations are summarised in the table below, along with the required frequency of works.

Drainage System feature	Proposed maintenance / remedial works	Required frequency of works
Pond & Filter Drain (surface)	Inspection, vegetation clearance and additional clearing/cleansing of potential surface blockages	At least once a year
	Inspection and clearance of blockages	After major storm events
Inlet, Outfall & Existing Watercourse	Inspection, vegetation clearance and additional clearing/cleansing of potential outfall blockages	At least once a year
	Desilting	Year 1, Year 3, then every 5 years
Pipework	Jetting to clear blockages	As required
Hydrobrake	As specified by manufacturer	As specified by manufacturer

4.1.3 The responsibility of maintenance regime will be determined by the Developer, by agreed appointment.

Pond

4.1.4 The pond will require additional maintenance measures to ensure they operate as designed. Failure in carrying out this maintenance, could increase the risk of flooding. The additional measures are as follows:

- Inspection, vegetation clearance and additional clearing/cleansing of potential surface blockages will be required on an annual basis.
- Inspection and clearance of blockages after major storm events.

Inlet, Outfall & Existing Watercourse

4.1.5 A proposed inlet and outfall will be required for the discharge from the pond into the Flow Control Chamber and out to the boundary ditch. It is recommended that maintenance of the inlet and outfall features and the existing ditch is carried out to ensure conveyance off the site and prevent the risk of blockages and flooding, with measures as follows:

- Inspection, vegetation clearance and additional clearing/cleansing of potential outfall blockages will be required on an annual basis.
- Desilting is recommended at least as follows: On completion of drainage works, Year 1, Year 3, then every 5 years.

HydroBrake (Flow Control Chamber)

- 4.1.6 The HydroBrake flow control system is self-activating, relying on upstream hydraulic head to generate an air-filled vortex within the centre of the casing. Once the vortex is initiated water drains down through a small opening in the back of the device at the designed restricted flow rate.
- 4.1.7 The flow control device has two measures encase of emergency (i.e. blockage). The first is a door situated in the front of the unit itself, this can be operated from the surface by a release cable situated just under the manhole cover which closes under its own weight and does not require any mechanism to operate. The second is a high-level overflow pipe situated with the flow control manhole. Both measures allow the system to drain down freely, until the blockage can be cleared.
- 4.1.8 The HydroBrake flow control chamber will require additional maintenance measures to ensure it operates as designed. The additional measures are as follows:
- The sump within the flow control chamber should be monitored for build-up of silts and should be emptied, as a minimum, on the same regime as specified for catchpits previously within this document
 - The drain down door located on the centre of the unit will require inspection and opening annually, to ensure it is operating as intended

Remedial/Repair Actions

- 4.1.9 Significant storm events may cause considerable damage to SuDS and their associated components. As such, it may be necessary to inspect and carry out essential recovery works to return the features to full working order.

Accidental Spillages

- 4.1.10 It is not envisaged that any materials are to be stored onsite once the development has been completed, which could cause major spills and potential pollution issues within the drainage system. If this situation alters in the future consultation with a specialist will be required in order to confirm if any upgrades to the existing system are necessary.
- 4.1.11 Minor spillages of fuels and oils will be dealt with by the channel drains and bypass separators, by collecting and bio-degrading the hydrocarbons.

Future Alterations to the Development

- 4.1.12 Any future alterations to the drainage system components should be confirmed by a specialist. Where possible any future services are to avoid being located through areas of drainage system components. If new services are required to run through areas of drainage system components, services should be installed below the depth of drainage system components with the permeable system reinstalled above. If new uses of the site require an assessment of runoff treatment, this should be made and include provision of new drainage components if necessary.

5 SUMMARY

- 5.1.1 This site-specific flood risk assessment is based on Flood Maps, the Local Authority's Strategic Flood Risk Assessment, Site Investigation, BGS Records and Public Sewer Records.
- 5.1.2 The existing site consists of agricultural land. The site that the site falls inwards towards the centre of the drainage catchment, and is enveloped by bunds to the north, east and west. The site is part of surrounding land under the same ownership, and part of a runoff catchment within the land ownership land-locked from a runoff perspective
- 5.1.3 The area of the proposed screening site for which this report serves is 0.584Ha, and will have an impermeable area of 0.349Ha as a result of the development. The runoff catchment of 1.9Ha has been assessed for the purpose of preparation of the proposed surface water drainage system.
- 5.1.4 The proposed development is for an area of raised land in order to improve the poor quality of agricultural land with excavated earth and clay from a neighbouring area of land under site ownership, as well as imported screened waste.
- 5.1.5 The development lies within Flood Zone 1, with low or very low risk of surface water flooding. The existing run-off from the site is assumed to drain via a combination of infiltration (possibly laterally through infill soils and hardcore) and overland flow in the absence of confirmed existing drainage infrastructure.
- 5.1.6 Post-development surface water run-off will be managed through sustainable drainage measures, with runoff attenuated via a pond, without causing surface water flooding on site. Runoff to the watercourse will be limited via flow control devices.
- 5.1.7 The completion of the development will not increase flood risk on or off the site.
- 5.1.8 In conclusion, this development is suitable with regards to flood risk and surface water drainage.

DRAWINGS

- 100** Existing Topography & Overland Flow Routes
- 200** Impermeable Areas Comparison
- 300** Conceptual Drainage Strategy

NOTES

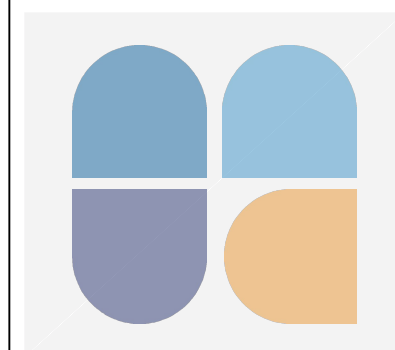
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BRIGHT PLAN CIVILS
 Transport Planning and Infrastructure Design Consultants
 2 West Barn, Norton Lane, Chichester, West Sussex PO20 3AF
 Tel: 01243 210418 Fax: 01483 861682
 www.brightplancivils.co.uk

Drawing Status **PLANNING**

Client **Alfie Hyatt**

Drawing Title **Existing Topography & Overland Flow Routes**

Project **Thistleworth Farm, Grinders Lane Dial Post RH13 8NR**

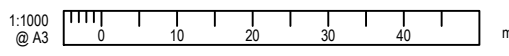
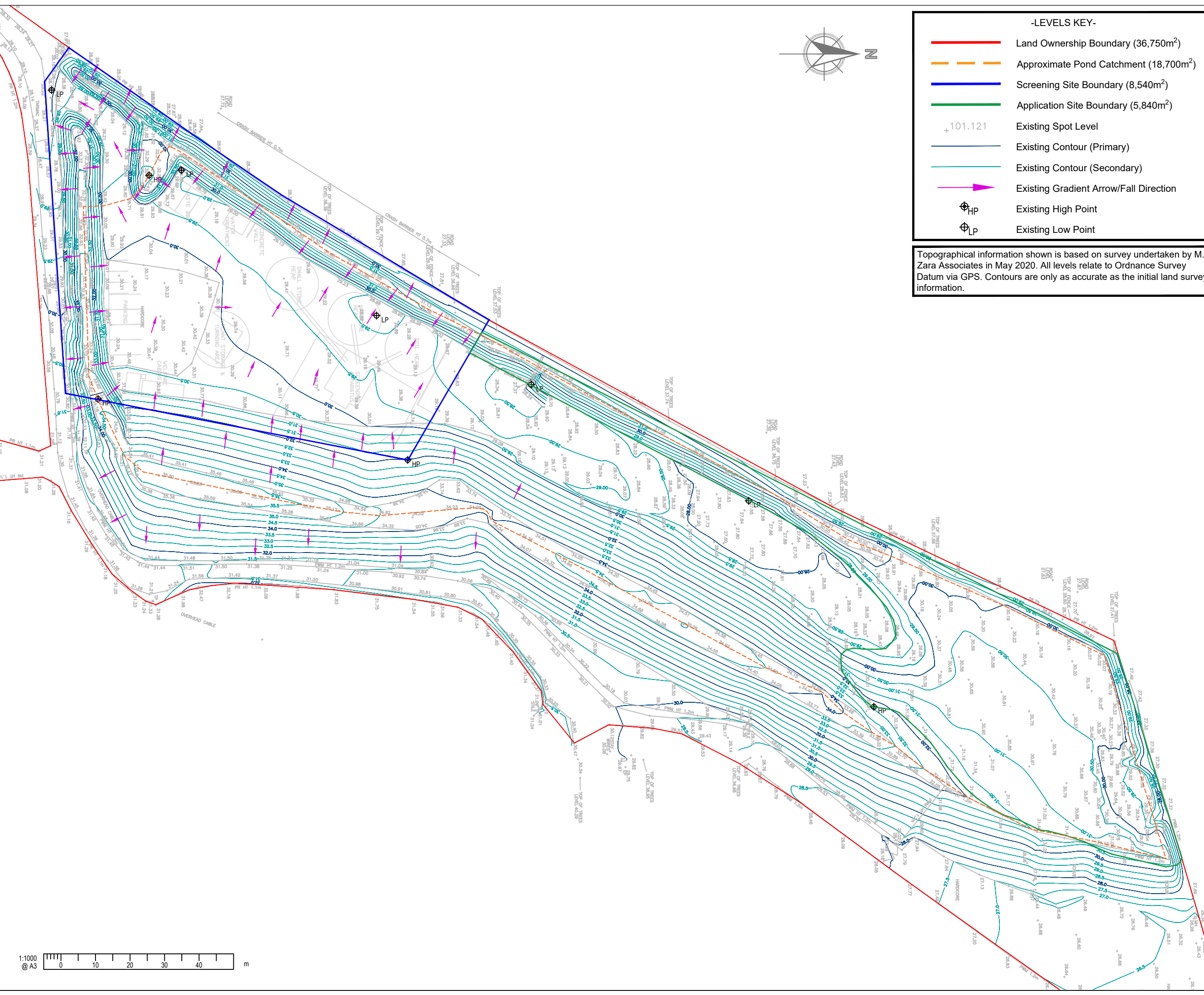
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-LEVELS KEY-

- Land Ownership Boundary (36,750m²)
- - - Approximate Pond Catchment (18,700m²)
- Screening Site Boundary (8,540m²)
- Application Site Boundary (5,840m²)
- +101.121 Existing Spot Level
- Existing Contour (Primary)
- Existing Contour (Secondary)
- ➔ Existing Gradient Arrow/Fall Direction
- ⊕HP Existing High Point
- ⊕LP Existing Low Point

Topographical information shown is based on survey undertaken by M.J. Zara Associates in May 2020. All levels relate to Ordnance Survey Datum via GPS. Contours are only as accurate as the initial land survey information.



NOTES

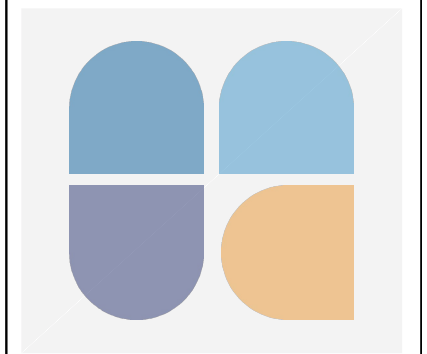
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 Transport Planning and Infrastructure Design Consultants
 2 West Barn, Norton Lane, Chichester, West Sussex PO20 3AF
 Tel: 01243 210418 Fax: 01483 861682
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Drawing Status **PLANNING**

Client **Alfie Hyatt**

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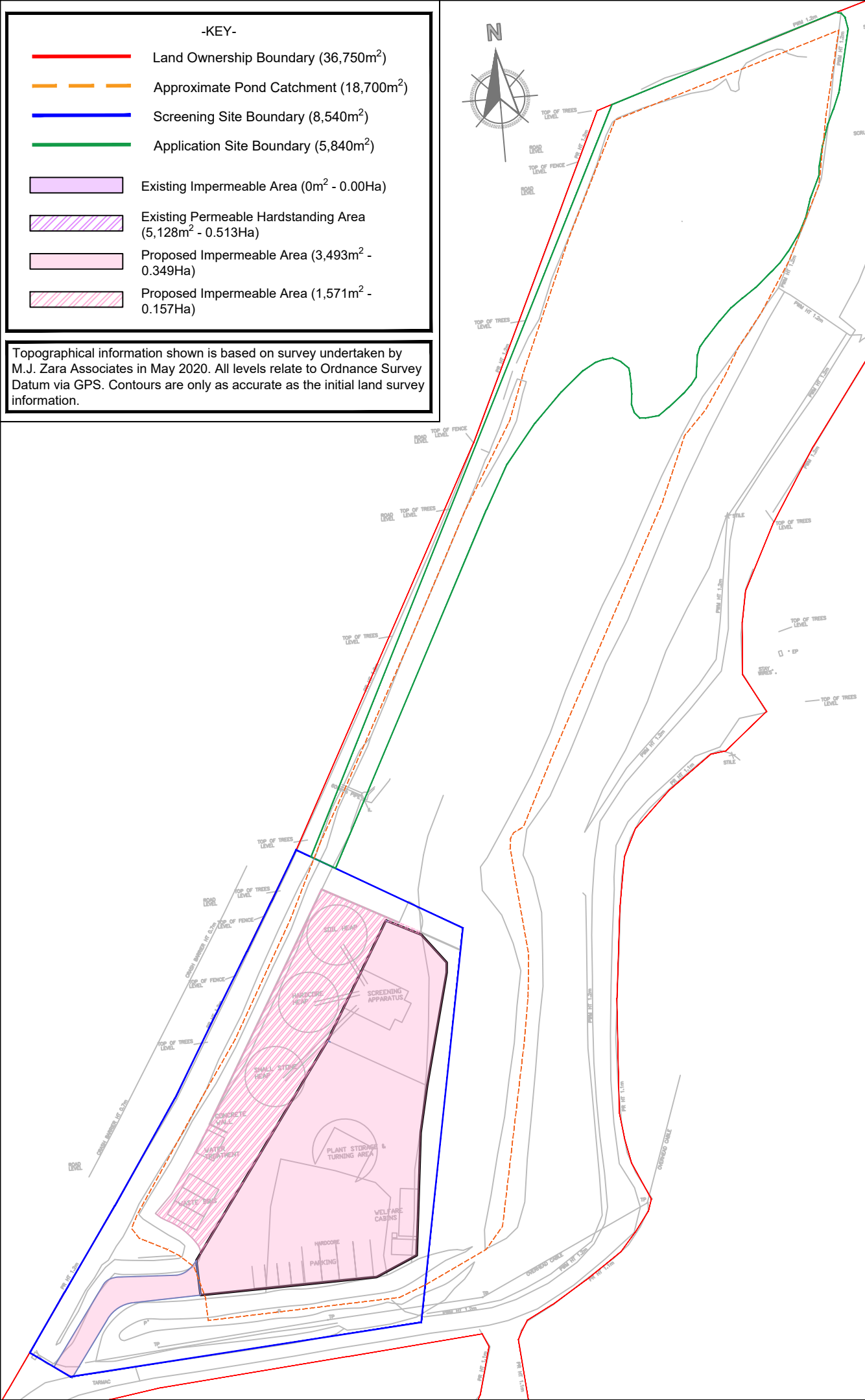
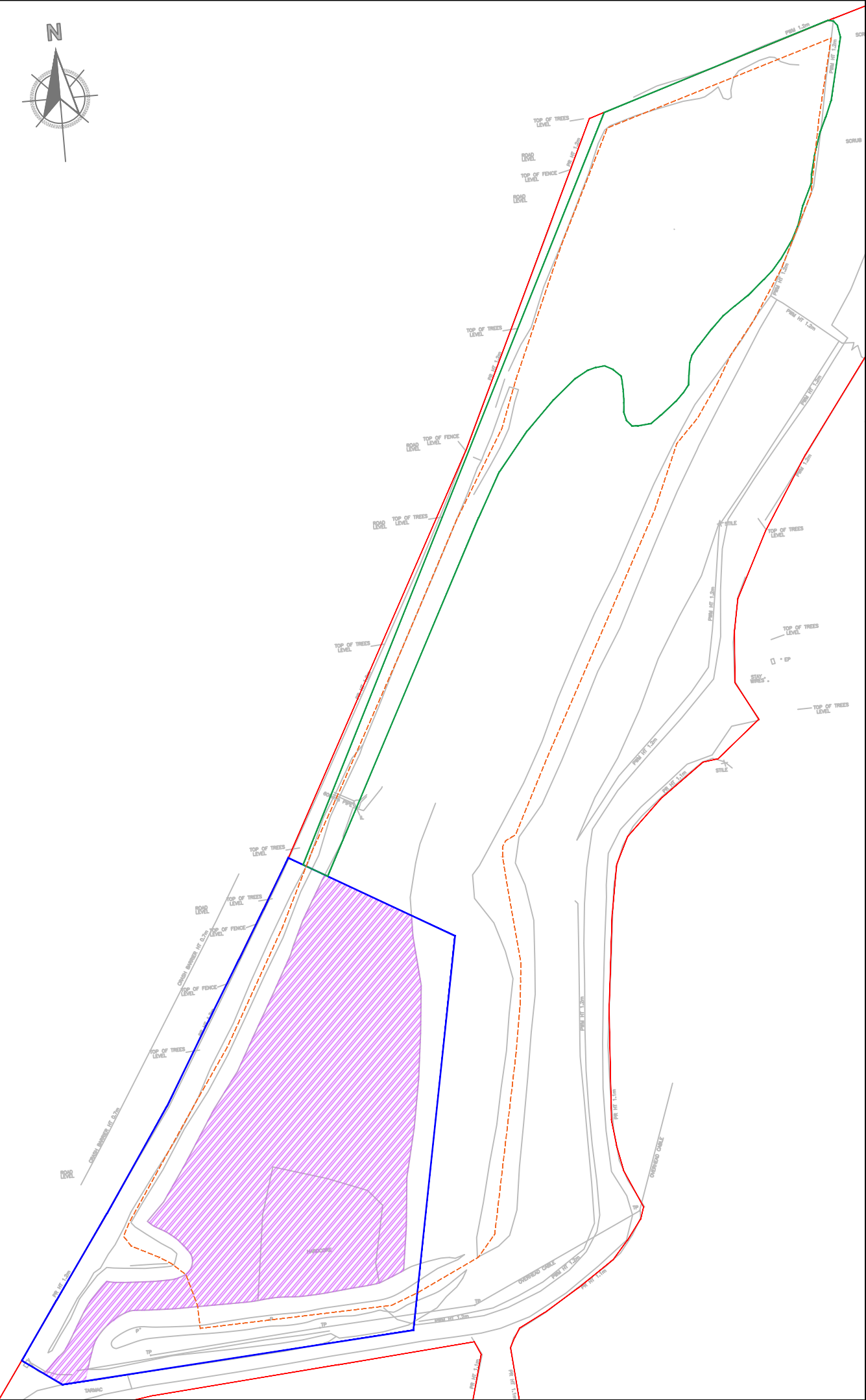
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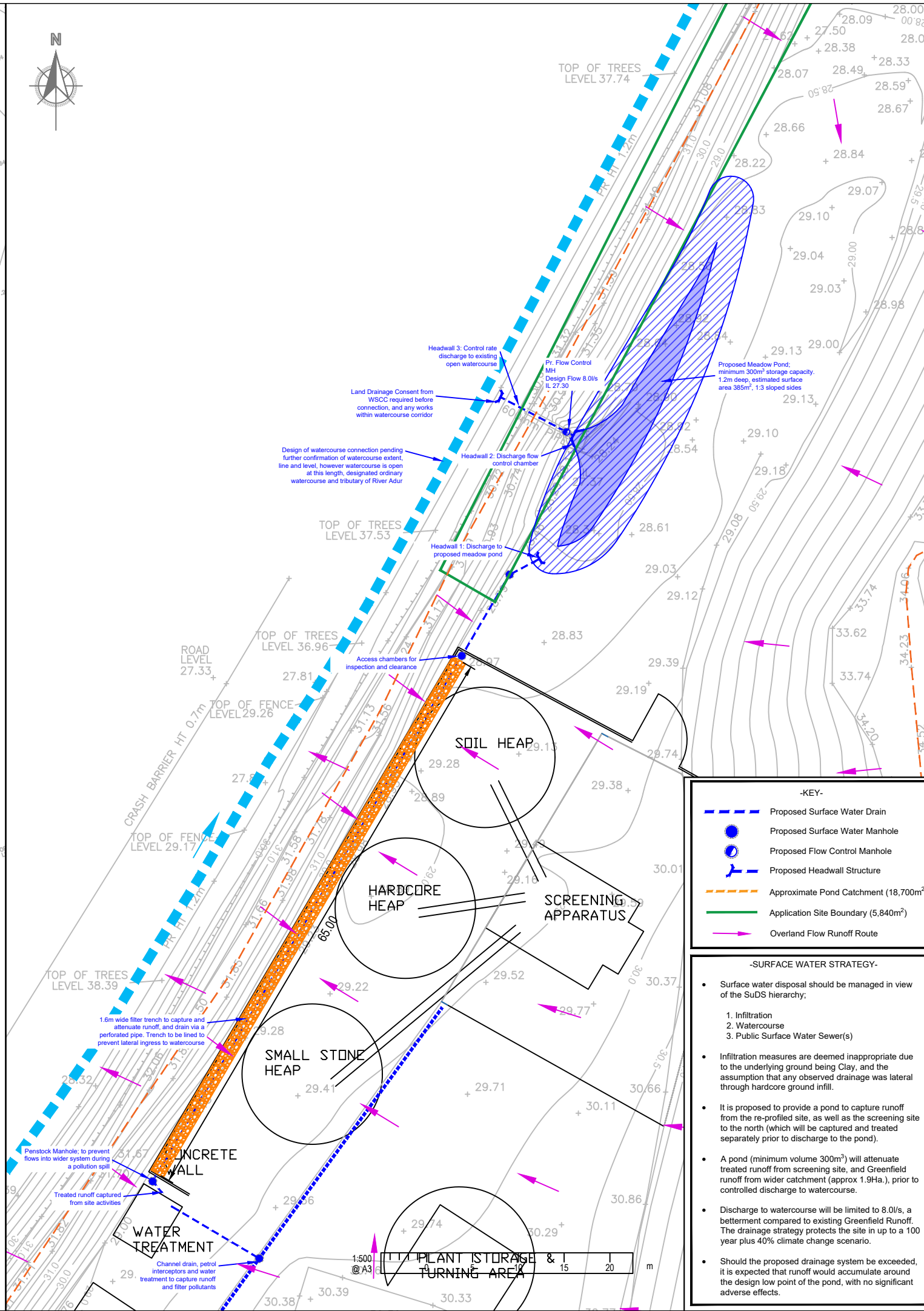
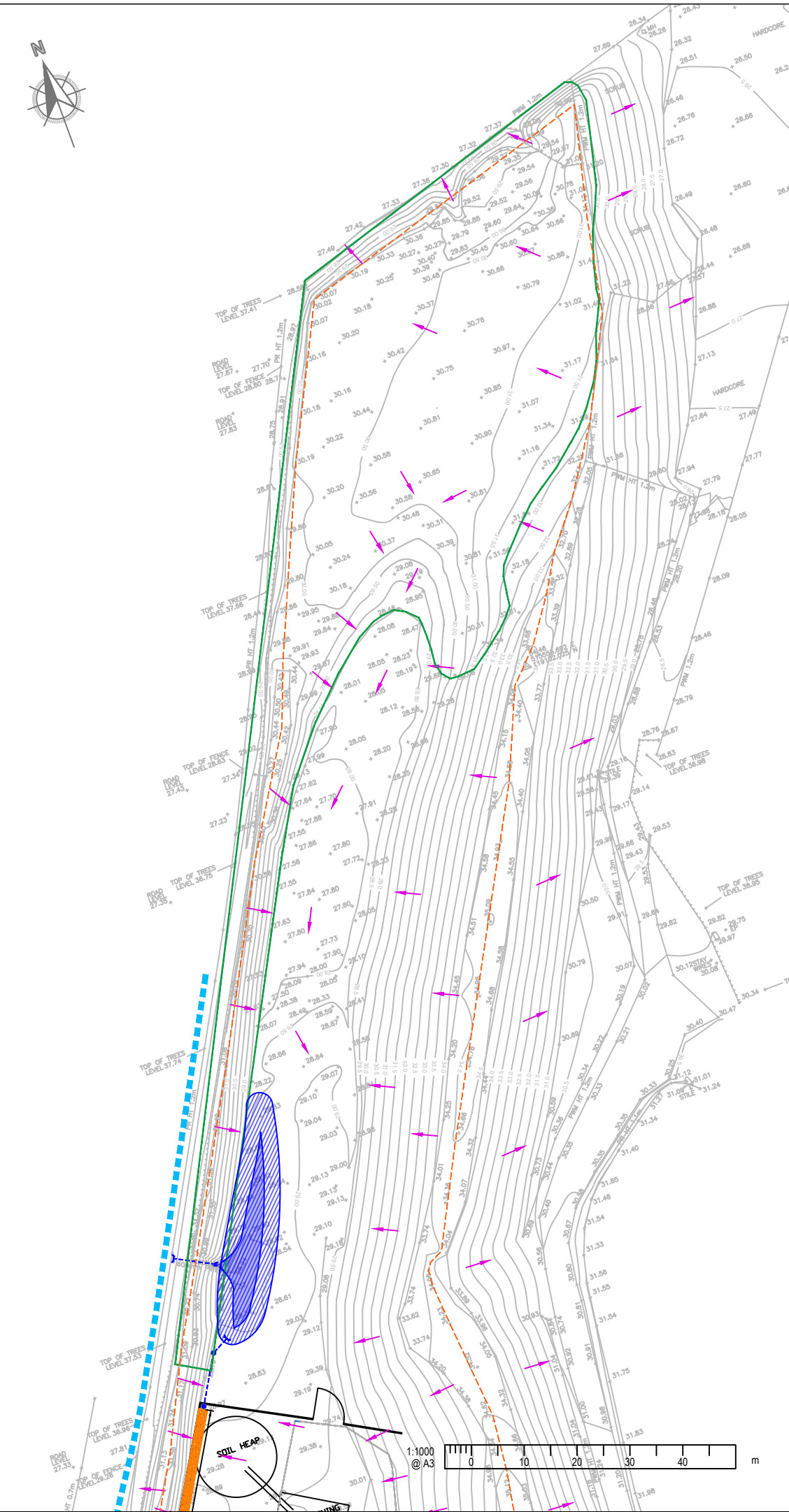
Drawing No. D1867-200	Rev. -
------------------------------	---------------

-KEY-

- Land Ownership Boundary (36,750m²)
- - - Approximate Pond Catchment (18,700m²)
- Screening Site Boundary (8,540m²)
- Application Site Boundary (5,840m²)
- Existing Impermeable Area (0m² - 0.00Ha)
- Existing Permeable Hardstanding Area (5,128m² - 0.513Ha)
- Proposed Impermeable Area (3,493m² - 0.349Ha)
- Proposed Impermeable Area (1,571m² - 0.157Ha)

Topographical information shown is based on survey undertaken by M.J. Zara Associates in May 2020. All levels relate to Ordnance Survey Datum via GPS. Contours are only as accurate as the initial land survey information.





NOTES A3

- This drawing is to be read in conjunction with all other RGP drawings, and with all relevant Architect's and Engineer's drawings and specification. Any discrepancies found are to be reported immediately to the Engineer.
- RGP accepts no responsibility for inaccuracies in data provided by third parties such as topographic surveys or Ordnance Survey mapping.
- Do not scale, work to figured dimensions only. All dimensions are in millimeters unless noted otherwise and all levels are in metres from the topographic survey datum.
- Any information given regarding existing underground services is given in good faith after consultation with the relevant authority, however accuracy is not certain.

PLANNING

NOT FOR CONSTRUCTION

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A	Revised Drawing	12/06/2020
Rev.	Amendments	Date

BRIGHT PLAN CIVILS
Transport Planning and Infrastructure Design Consultants
2 West Barn, Norton Lane, Chichester, West Sussex PO20 3AF
Tel: 01243 210418 Fax: 01483 861682
www.brightplancivils.co.uk

Drawing Status	PLANNING
Client	Alfie Hyatt
Drawing Title	Conceptual Drainage Strategy
Project	Thistleworth Farm, Grinders Lane Dial Post, RH13 8NR
Scale	VARIES
Date	June '20
Drawn By	DJL
Checked By	MJA
Drawing No.	D1867B-300
Rev.	A

-KEY-

- Proposed Surface Water Drain
- Proposed Surface Water Manhole
- Proposed Flow Control Manhole
- └─┘ Proposed Headwall Structure
- Approximate Pond Catchment (18,700m²)
- Application Site Boundary (5,840m²)
- Overland Flow Runoff Route

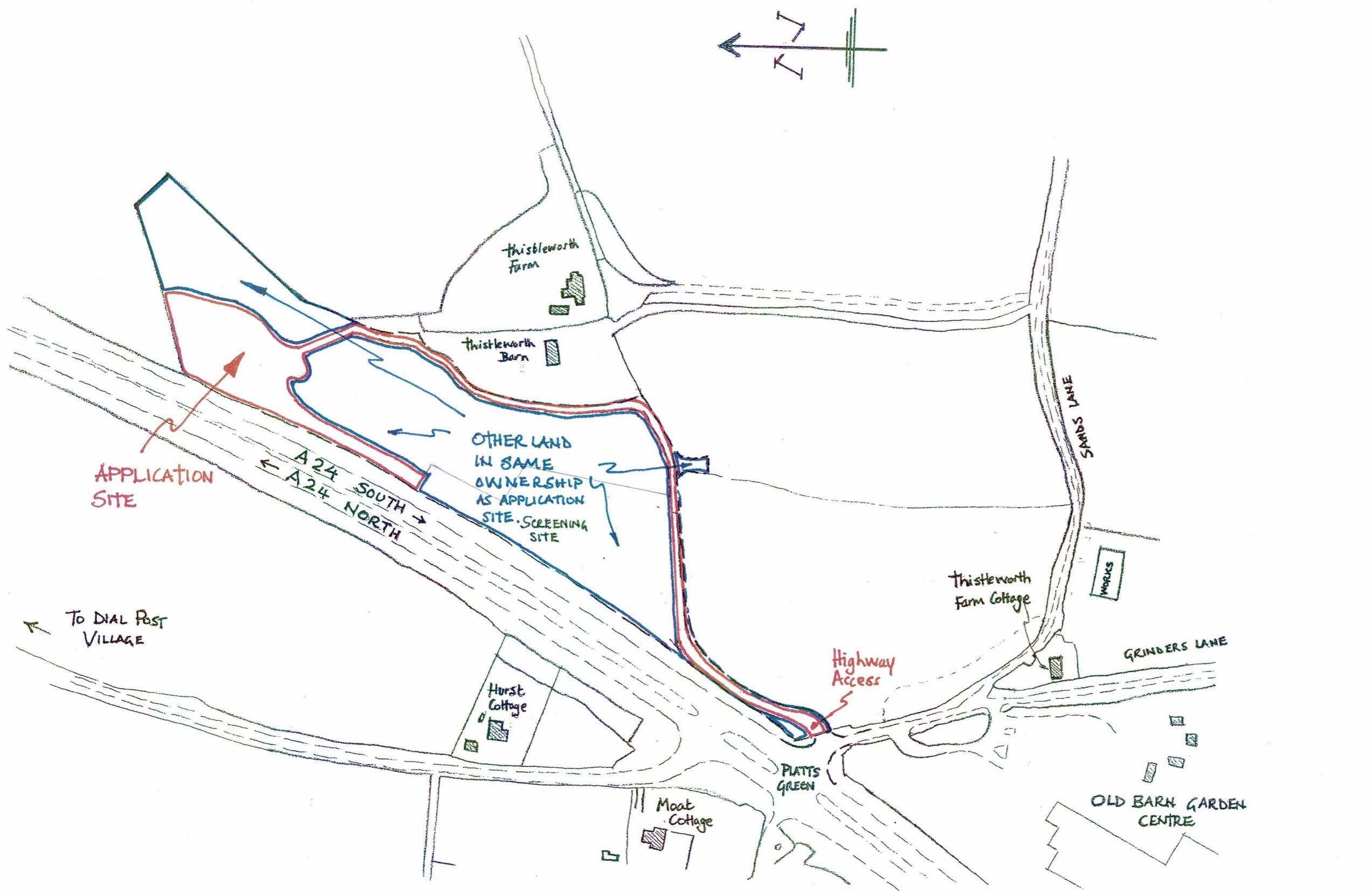
-SURFACE WATER STRATEGY-

- Surface water disposal should be managed in view of the SuDS hierarchy;
 1. Infiltration
 2. Watercourse
 3. Public Surface Water Sewer(s)
- Infiltration measures are deemed inappropriate due to the underlying ground being Clay, and the assumption that any observed drainage was lateral through hardcore ground infill.
- It is proposed to provide a pond to capture runoff from the re-profiled site, as well as the screening site to the north (which will be captured and treated separately prior to discharge to the pond).
- A pond (minimum volume 300m³) will attenuate treated runoff from screening site, and Greenfield runoff from wider catchment (approx 1.9Ha.), prior to controlled discharge to watercourse.
- Discharge to watercourse will be limited to 8.0l/s, a betterment compared to existing Greenfield Runoff. The drainage strategy protects the site in up to a 100 year plus 40% climate change scenario.
- Should the proposed drainage system be exceeded, it is expected that runoff would accumulate around the design low point of the pond, with no significant adverse effects.

APPENDICES

Appendix A Preliminary Site Layout

Notes
 All dimensions must be checked on site and not scaled from this drawing.
 If in doubt, please ask.
 This drawing to be read in conjunction with all engineers and consultants drawings and specifications etc



LOCATION PLAN
 1:2500

0 50 100 150
 METRES
 SCALE BAR 1:2500@A3

Project:
THISTLEWORTH FARM
GRINDERS LANE
DIAL POST
WEST SUSSEX RH13 8NR-
PROPOSED
LAND-RAISING

Drawing Title:
LOCATION PLAN
 @ 1:2500

Client:
A HYATT CONTRACTORS LTD


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DOUGLAS J. P. EDWARDS
 Chartered Building Surveyors
 employing
 Chartered Architects & Surveyors
 Tel: 01403 740034
 Email: info@douglaspedwards.co.uk

Scale:
 1:2500 @ A3 size
 Date:
 September 2020
 Drawing No:
 20-08-01

Project:
THISTLEWORTH FARM
GRINDERS LANE
DIAL POST
WEST SUSSEX RH13 8NR-
PROPOSED
LAND-RAISING

Drawing Title:
SITE PLAN @ 1:1000

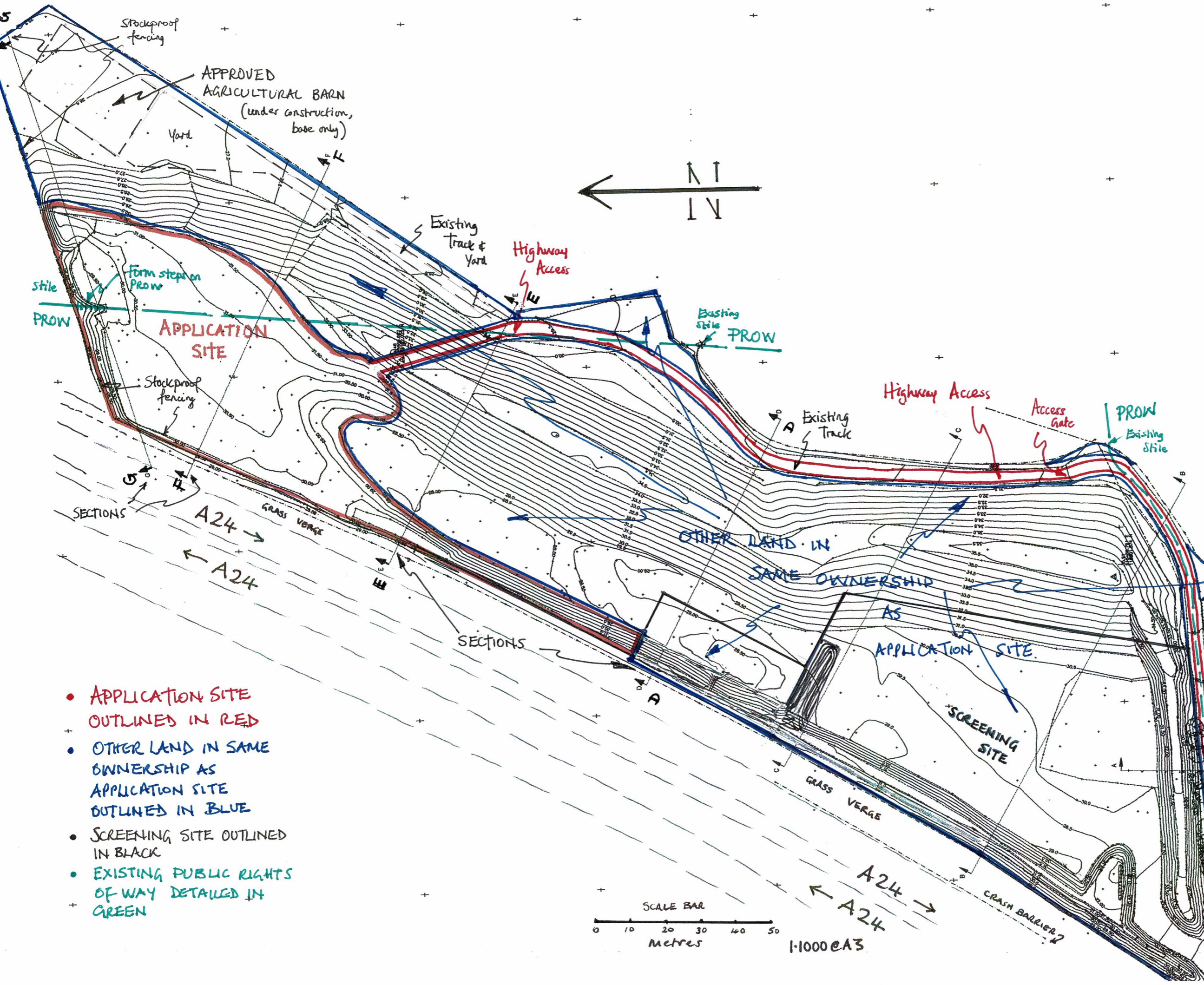
Client:
A HYATT CONTRACTORS LTD

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 Chartered Architects & Surveyors
 Tel: 01403 740034
 Email: info@douglasjpedwards.co.uk


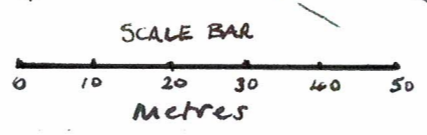
Scale:
1:1000 @ A3 size

Date:
September 2020

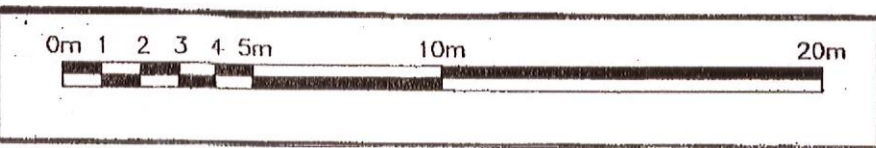
Drawing No:
20-08-02



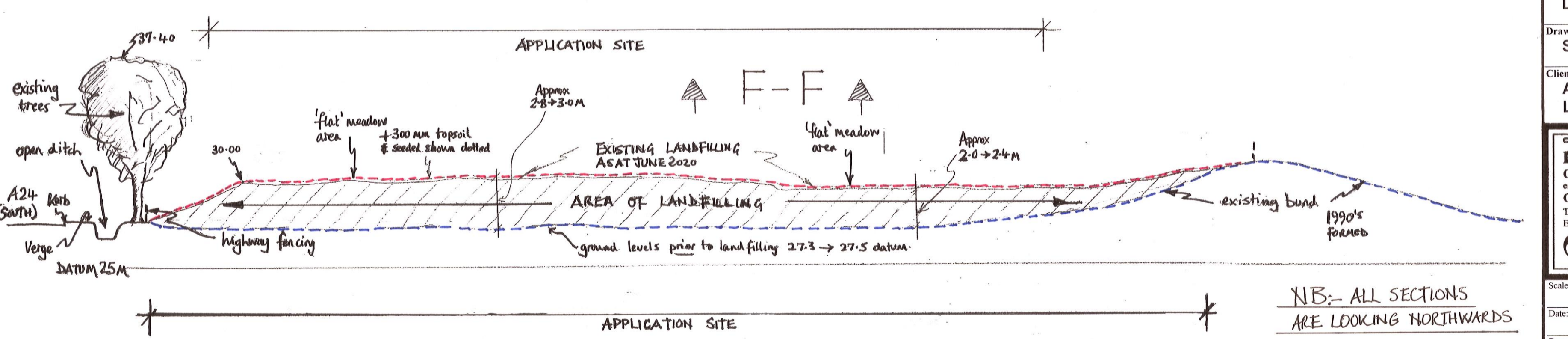
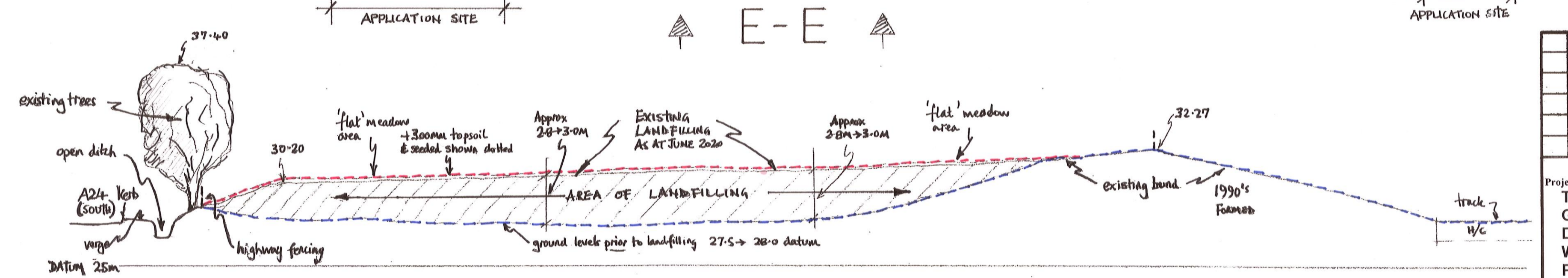
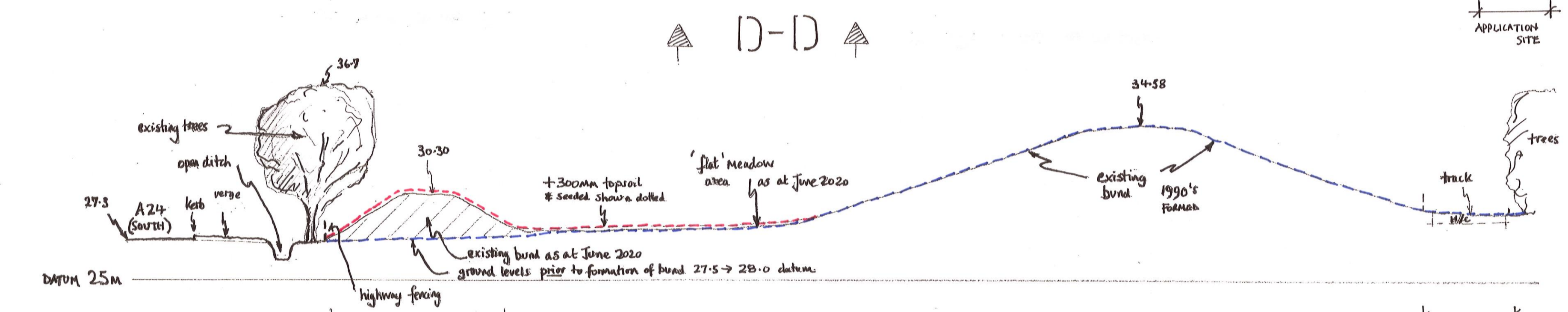
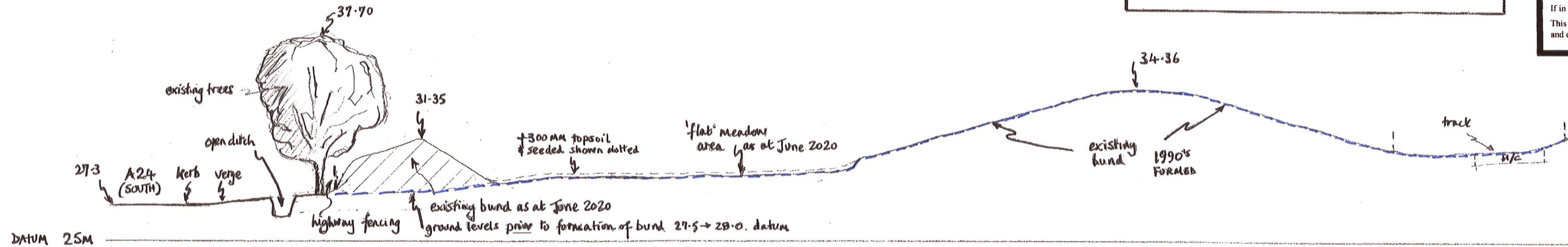
- APPLICATION SITE OUTLINED IN RED
- OTHER LAND IN SAME OWNERSHIP AS APPLICATION SITE OUTLINED IN BLUE
- SCREENING SITE OUTLINED IN BLACK
- EXISTING PUBLIC RIGHTS OF WAY DETAILED IN GREEN



1:1000 @ A3



Notes
 All dimensions must be checked on site and not scaled from this drawing.
 If in doubt, please ask.
 This drawing to be read in conjunction with all engineers and consultants drawings and specifications etc.



LEGEND

- EXISTING GROUND LEVELS (blue dashed line)
- PROPOSED GROUND LEVELS (red dashed line)
- FILLED AREAS (hatched box)

Project:
**THISTLEWORTH FARM
 GRINDERS LANE
 DIAL POST
 WEST SUSSEX RH13 8NR-
 PROPOSED
 LAND-RAISING**

Drawing Title:
SECTIONS D, E, F & G (part)

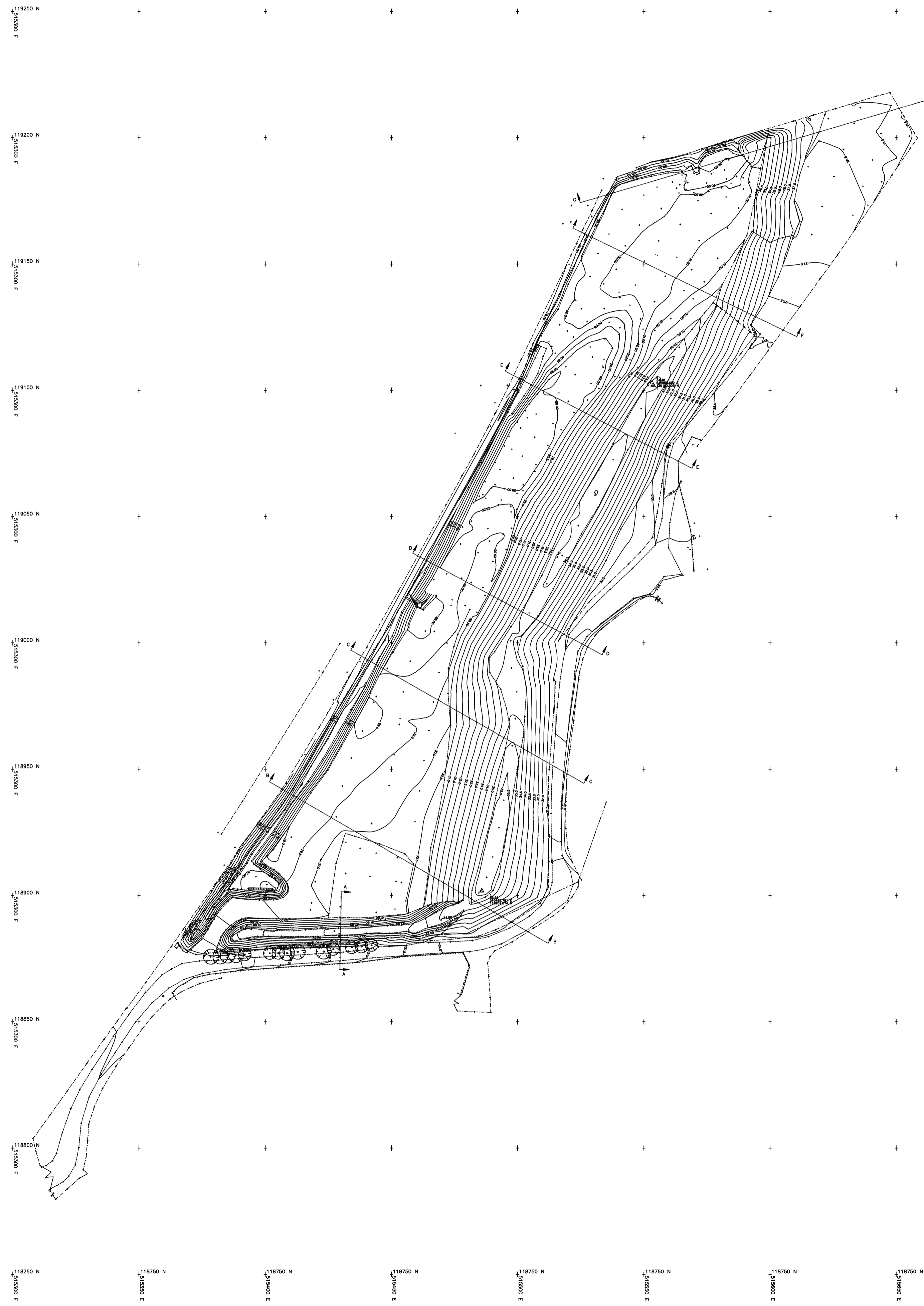
Client:
A HYATT CONTRACTORS LTD

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 Chartered Architects & Surveyors
 Tel: 01403 740034
 Email: info@douglasjedwards.co.uk

Scale: **1:200 @ A2 size**
 Date: **September 2020**
 Drawing No: **20-08-03**

**NB:- ALL SECTIONS
 ARE LOOKING NORTHWARDS**

Appendix B Topographic Survey



LAYER INFORMATION

0	EMPTY
BORDER	TITLEBLOCK & BORDER
BTLECOM	BRITISH TELECOM MYS ETC.
BTLECOM	BRITISH TELECOM ROUTES
BUILDING	BUILDING OUTLINE
CABLETV	CABLE TV COVERS
CONTOURS	CONTOURS
CONTOURS	POINT MARKERS
DRAINAGE	MYS GULLYS ETC.
ELECTRIC	ELECTRICAL MYS ETC.
FENCES	FENCE LINES
FOLIAGE	FOLIAGE MYS ETC.
FURNITURE	FOLIAGE MYS ETC.
GAS	GAS MYS, VALVES ETC.
GAS	GAS ROUTING
GRID	GRID
LEVELS	LEVELS
ROADS	ROAD OUTLINE
ROADS	SURFACE EDGES
STATIONS	SURVEY STATIONS
STORM	STORM WATER MYS, GULLYS ETC.
SURFACES	SURFACE EDGES
TEXT	TEXT
TREES	TREE OUTLINE & FOLIAGE
UNKNOWN	UNKNOWN SERVICES
WALLS	WALLS
WATER	WATER OUTLINE
WATERPACES	WATER METERS, STOP VALVES ETC.

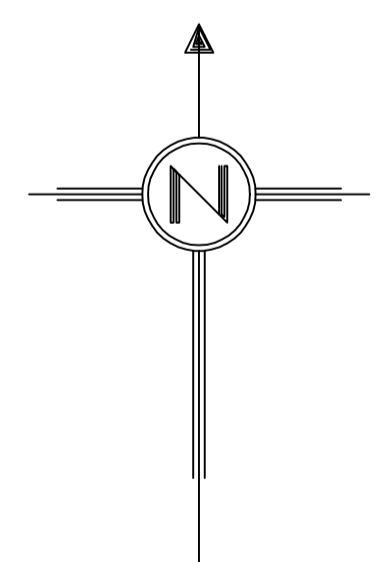
LINETYPES & SYMBOLS

	BUILDING OUTLINE
	KERB LINE
	FENCE
	SURFACE EDGE
	FOUL DRAINAGE
	STORM DRAINAGE
	GAS PIPES
	WATER SERVICE PIPES
	BRITISH TELECOM CABLES
	ELECTRICITY CABLES
	OVERHEAD CABLES
	FOLIAGE OUTLINE
	SURVEY STATION
	GATES
	TREE CANOPY
	SLOPE SYMBOL

LEGEND

AV	AIR VALVE	NP	NAME PLATE
B	BOLLARD	OB	OPEN BOARD FENCE
BB	BELSHAM BEACON	OP	OPEN PAULING FENCE
BM	BENCH MARK	P	POST
BS	BUS STOP	PC	POST & CHAIN FENCE
BTB	BRITISH TELECOM BOX	PCB	PUBLIC CALL BOX
BW	BAMB WIRE FENCE	PH	PUBLIC HOUSE
CB	CLOSE BOARD FENCE	PL	PAVEMENT LIGHT
CH	CHIMNEY	PM	PARKING METER
CHY	CHAIN LINK FENCE	PR	POST & RAIL FENCE
CI	CORRUGATED IRON FENCE	PW	POST & WIRE FENCE
CM	CELLAR MANHOLE	RE	ROAD SIGN
CM	CHESTNUT PALING FENCE	RE	ROAD SIGN
CP	CABLE TELEVISION POINT	RS	ROAD SIGN
CIV	DRAINAGE CHANNEL	RTW	RETAINING WALL
DC	ELECTRICITY SUB	SP	STOP VALVE
DK	DROP KERB	SV	SERVICE INDICATOR POST
ELEC SUB	ELECTRICITY SUB	TSB	STOP VALVE
STN.	STATION	TS	TELEGRAPH POLE
FB	FOOT BRIDGE	TS	TELEPHONE CALL BOX
FE	FIRE ESCAPE	UL	UNSAFE SIGNAL
FE	FIRE ESCAPE	UL	UNSAFE SIGNAL
FE	FIRE HYDRANT	US	VENT FTD LIFT
FP	FOOTPATH	WB	WASTE BIN
FS	FLAUGHT	WM	WATER METER
G	GULLY	WO	WASH OUT
GR	GRATING		
GV	GAS VALVE		
H	HYDRANT		
IC	INSPECTION COVER		
I	INVERT LEVEL		
IR	IRON RAILINGS		
KD	KERB OUTLET (GULLY)		
LP	LAMP POST		
LB	LETTER BOX		
MISC	MIXED CONSTRUCTION FENCE		
MH	MANHOLE		
MHBT	BRITISH TELECOM		
MHE	ELECTRICAL		
MHG	GAS		
MHC	MERCURY		
MP	MILE POST		
NB	NOTICE BOARD		

NORTH (INDICATIVE)



M.J. ZARA ASSOCIATES
 LAND & MEASURED BUILDING SURVEYORS
 139 HIGH STREET - LEWES
 EAST SUSSEX - BN7 1XS
 TEL 01323 472492
 E-MAIL: mzarassociates@gmail.com

SITE
 LAND AT THISTLEWORTH FARM, DIAL POST
 WEST SUSSEX
CLIENT
 MR A. HYATT
X-REF: DOUGLAS J.P. EDWARDS
NOTES
 LEVELS AND GRID BASED ON ORDNANCE
 SURVEY DATUM VIA GPS.
 CONTOURS ARE COMPUTER GENERATED.
JOB REF. 9022 **PREVIOUS JOB REF.** 8814
SCALE
 1:1000 **SHEET SIZE**
 A1 LANDSCAPE
DATE
 MAY 2020 **SURVEYED BY**
 EH/CS

Appendix C Infiltration Test Results

SOAKAWAY TEST RESULTS & SOILS INFILTRATION RATE
Site: Thistleworth Farm
Job No: D1867 **Trial Hole: Hole A Test 2 of 2**

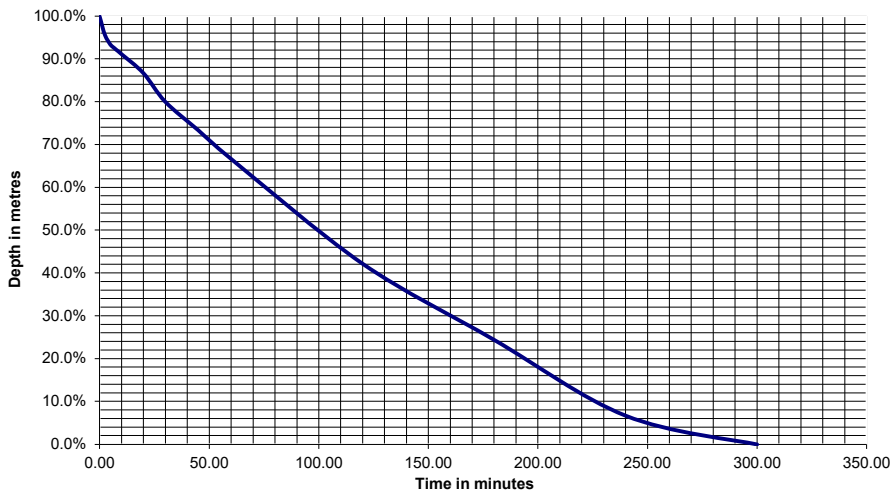
Time in minutes	Depth in meters to water surface	Depth in metres of water	Percentage of water depth at start
0.00	0.000	0.45	100.0%
2.50	0.020	0.43	95.6%
5.00	0.030	0.42	93.3%
7.50	0.035	0.42	92.2%
10.00	0.040	0.41	91.1%
20.00	0.060	0.39	86.7%
30.00	0.090	0.36	80.0%
45.00	0.120	0.33	73.3%
60.00	0.150	0.30	66.7%
120.00	0.260	0.19	42.2%
180.00	0.340	0.11	24.4%
240.00	0.420	0.03	6.7%
300.00	0.450	0.00	0.0%
300.00	0.450	0.00	0.0%

INFILTRATION CALCULATED FROM 75%-25% WATER DEPTH RANGE

Pit Size	Time in mins
Length 2.10	42 75%
Width 0.40	175 25%
Depth 0.45	

Infiltration Rate from 75%-25% **1.2053E-05**

Permeability Graph TH02








Appendix D BGS Records

GROUND LEVEL.....A.O.D.
 DATE STARTED.....27/2/1967
 DATE COMPLETED.....27/2/1967

TYPE OF BORING...HAND AUGER...
 DIA. OF BORING.....8 ins.
 BOREHOLE LINED TO.....ft.....ins.

Geological Formation	Legend	Description of Strata	Depth	Samples	Water Levels
WEALD CLAY		TOP SOIL	6"		
		FIRM BROWN - GREY SILTY CLAY	1' 6"		
		FIRM GREY VERY SILTY CLAY	2' 6"		
		FIRM ORANGE-GREY SILTY CLAY	3' 6"		
		STIFF MOTTLED ORANGE AND GREY SILTY CLAY	8' 0"		

REMARKS:
 NO GROUNDWATER ENCOUNTERED

KEY:
 WATER STRUCK
 STANDING WATER LEVEL
 UNDISTURBED SAMPLE
 STANDARD PENETRATION TEST
 (25) N° OF BLOWS FOR 12" PENETRATION
 SLIPPED CORE
 SCALE: 1" = 5 ft.

ORDER N° 6112 LABORATORY N° 2803

SITE INVESTIGATION
 BY
 LE GRAND ADSCO

A24. DIAL POST DIVERSION
 FOR
 WEST SUSSEX COUNTY COUNCIL

GROUND LEVEL.....A.O.D.
 DATE STARTED.....28/2/1987
 DATE COMPLETED.....1/3/1987

TYPE OF BORING.....HAND AUGER
 DIA. OF BORING.....8 ins.
 BOREHOLE LINED TO.....ft.....ins.

Geological Formation	Legend	Description of Strata	Depth	Samples	Water Levels
WEALD CLAY		TOP SOIL			
		FIRM MOTTLED ORANGE - GREY SANDY SILTY CLAY			
		—DITTO—	5' 0"		
		FIRM TO STIFF MOTTLED GREY SILTY CLAY	6' 0"		
			8' 0"		

REMARKS:
 NO GROUNDWATER ENCOUNTERED

KEY:
 WATER STRUCK
 STANDING WATER LEVEL
 UNDISTURBED SAMPLE
 STANDARD PENETRATION TEST
 (25) N° OF BLOWS FOR 12" PENETRATION
 SLIPPED CORE
 SCALE: 1 in. = 5 ft.

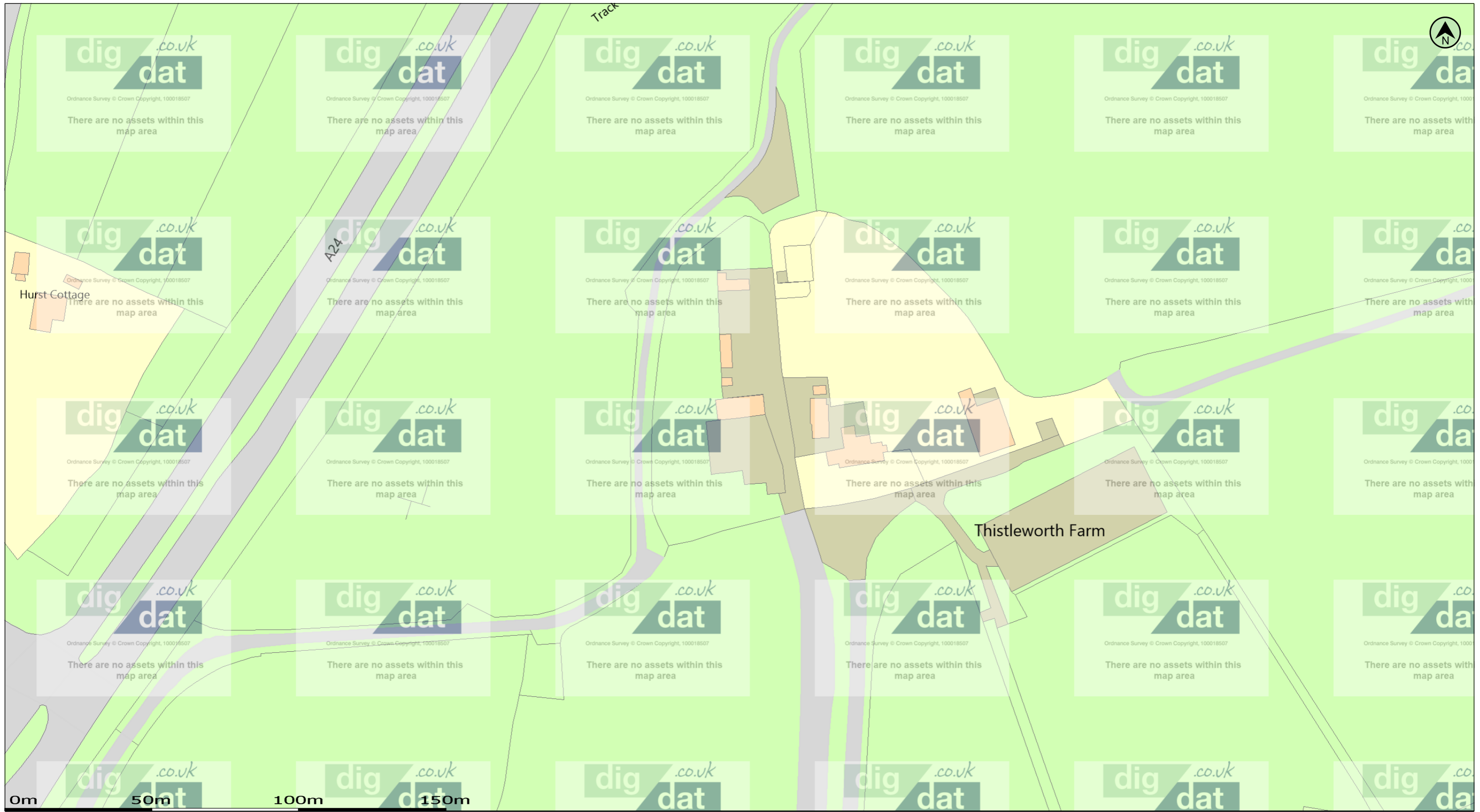
ORDER N° 6112

LABORATORY N° 2803

SITE INVESTIGATION
 BY
 LE GRAND ADSCO

A 24 DIAL POST DIVERSION
 FOR
 WEST SUSSEX COUNTY COUNCIL

Appendix E Southern Water Sewer Records



(c) Crown copyright and database rights 2020 Ordnance Survey 100031673

Date: 18/05/20

Scale: 1:1250

Map Centre: 515549,118953

Data updated: 01/04/20

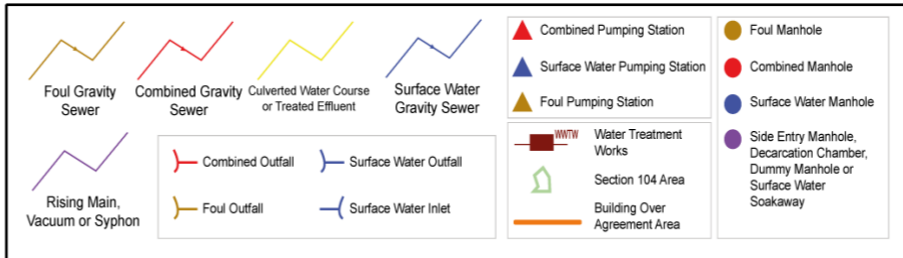
Our Ref: 389053 - 1

Wastewater Plan A3

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2020 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.



m.akmenkalns@bpcivils.co.uk

Thistleworth Farm



Appendix F Drainage Calculations

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	810	810
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes
(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	10.88	10.88
1 in 1 year (l/s):	9.25	9.25
1 in 30 years (l/s):	25.03	25.03
1 in 100 year (l/s):	34.71	34.71
1 in 200 years (l/s):	40.7	40.7

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	250.0
Additional Flow (%)	10	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	0.600
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
1	0.349	5.00	29.000	1200	1.200
2		5.00	29.000	1200	1.000
3			28.500	1200	1.200
4			28.500	1200	1.300

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.01	1	3	15.000	0.600	27.800	27.500	0.300	50.0	225	5.13	60.0
2.01	2	3	10.000	0.600	28.000	27.625	0.375	26.7	100	5.11	60.1
3.01	3	4	6.500	0.600	27.300	27.200	0.100	65.0	225	5.20	59.7

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.01	1.854	73.7	83.2	0.975	0.775	0.349	0.0
2.01	1.500	11.8	0.0	0.900	0.775	0.000	0.0
3.01	1.624	64.6	82.8	0.975	1.075	0.349	0.0

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m ³ /ha)	20.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.300	1 year (l/s)	9.3
Summer CV	1.000	30 year (l/s)	26.1
Winter CV	1.000	100 year (l/s)	34.7
Analysis Speed	Normal	Check Discharge Volume	✓
Skip Steady State	x	100 year +40% 360 minute (m ³)	1001

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	0	0



Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 years	2.40
Greenfield Method	IH124	Growth Factor 100 years	3.19
Positively Drained Area (ha)	1.900	Betterment (%)	0
SAAR (mm)	810	QBar	10.9
Soil Index	4	Q 1 year (l/s)	9.3
SPR	0.47	Q 30 year (l/s)	26.1
Region	7	Q 100 year (l/s)	34.7
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	40
Positively Drained Area (ha)	1.900	Storm Duration (mins)	360
Soil Index	4	Betterment (%)	0
SPR	0.47	PR	0.538
CWI	121.482	Runoff Volume (m ³)	1001

Node 2 Time-Area Diagram

Overrides Design Area	x	Depression Storage Depth (mm)	10
Overrides Design Additional Inflow	x	Evapo-transpiration (mm/day)	10
Depression Storage Area (m ²)	10000		

Applies to All storms

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-60	0.060	60-120	0.060	120-180	0.060	180-240	0.060	240-300	0.060

Node 3 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	27.300	Product Number	CTL-SHE-0132-8000-1000-8000
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.0	Min Node Diameter (mm)	1200

Node 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	27.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.32	Time to half empty (mins)	10

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	104.0	0.0	1.200	104.0	0.0

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	27.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	120.0	0.0	1.200	385.0	0.0



Approval Settings

Node Size	✓	Maximum Full Bore Velocity (m/s)	3.000
Node Losses	✓	Proportional Velocity	✓
Link Size	✓	Return Period (years)	
Minimum Diameter (mm)	150	Minimum Proportional Velocity (m/s)	0.750
Link Length	✓	Maximum Proportional Velocity (m/s)	3.000
Maximum Length (m)	100.000	Surcharged Depth	✓
Coordinates	✓	Return Period (years)	
Accuracy (m)	1.000	Maximum Surcharged Depth (m)	0.100
Crossings	✓	Flooding	✓
Cover Depth	✓	Return Period (years)	30
Minimum Cover Depth (m)		Time to Half Empty	x
Maximum Cover Depth (m)	3.000	Discharge Rates	✓
Backdrops	✓	1 year (l/s)	
Minimum Backdrop Height (m)		30 year (l/s)	
Maximum Backdrop Height (m)	1.500	100 year (l/s)	
Full Bore Velocity	✓	Discharge Volume	✓
Minimum Full Bore Velocity (m/s)		100 year 360 minute (m³)	

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 15 minute summer	441.486	124.925	100 year +40% CC 360 minute summer	63.377	16.309
100 year +40% CC 15 minute winter	309.815	124.925	100 year +40% CC 360 minute winter	41.197	16.309
100 year +40% CC 30 minute summer	304.460	86.152	100 year +40% CC 480 minute summer	50.006	13.215
100 year +40% CC 30 minute winter	213.656	86.152	100 year +40% CC 480 minute winter	33.223	13.215
100 year +40% CC 60 minute summer	214.603	56.713	100 year +40% CC 600 minute summer	40.997	11.214
100 year +40% CC 60 minute winter	142.577	56.713	100 year +40% CC 600 minute winter	28.011	11.214
100 year +40% CC 120 minute summer	135.791	35.885	100 year +40% CC 720 minute summer	36.560	9.799
100 year +40% CC 120 minute winter	90.216	35.885	100 year +40% CC 720 minute winter	24.571	9.799
100 year +40% CC 180 minute summer	104.615	26.921	100 year +40% CC 960 minute summer	30.041	7.911
100 year +40% CC 180 minute winter	68.003	26.921	100 year +40% CC 960 minute winter	19.900	7.911
100 year +40% CC 240 minute summer	82.776	21.875	100 year +40% CC 1440 minute summer	21.775	5.836
100 year +40% CC 240 minute winter	54.994	21.875	100 year +40% CC 1440 minute winter	14.634	5.836



Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
30 minute summer	1	21	28.993	1.192	237.6	47.9718	0.0000	FLOOD RISK
480 minute summer	2	464	28.982	0.982	14.0	7.0009	0.0000	FLOOD RISK
720 minute summer	3	705	28.458	1.158	34.5	288.2105	0.0000	FLOOD RISK
15 minute summer	4	1	27.200	0.000	8.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
30 minute summer	1	1.01	3	133.1	3.347	1.806	0.5966	
480 minute summer	2	2.01	3	13.8	1.761	1.169	0.0782	
720 minute summer	3	Hydro-Brake®	4	8.6				382.7