

Ladycross Plantation Holiday Park, Egton

Whitby, North Yorkshire

Flood Risk Assessment & Drainage Strategy

February 2023

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Document History		
Revision	Date	Comment
01	10/03/2022	First issue
02	23/11/2022	Second issue – Updated following LLFA and Yorkshire Water comments
03	03/02/2023	Third issue – Updated following Client review and completion of drainage design

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This report will remain valid for a period of twelve months (from the date of last issue) after which the source data should be reviewed in order to reassess the findings and conclusions on the basis of latest available information.

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Introduction

Waterco has been commissioned to undertake a Flood Risk Assessment and Drainage Strategy in relation to a proposed extension and restructuring at Ladycross Plantation Holiday Park, Egton, Whitby, YO21 1UA.

The purpose of this report is to outline the potential flood risk to the site, the impact of the proposed development on flood risk elsewhere, and the proposed measures which could be incorporated to mitigate the identified risk. This report has been prepared in accordance with the guidance contained in the National Planning Policy Framework (NPPF) and the National Planning Practice Guidance (NPPG): Flood Risk and Coastal Change.

From April 2015, North Yorkshire County Council as Lead Local Flood Authority (LLFA) is a statutory consultee for major planning applications in relation to surface water drainage, requiring that all planning applications are accompanied by a Sustainable Drainage Strategy. The aim of the Sustainable Drainage Strategy is to identify water management measures, including Sustainable Drainage Systems (SuDS), to provide surface water runoff reduction and treatment.

Existing Conditions

The site covers an area of approximately 3.686ha and is located at National Grid Reference (NGR): 481872, 508138. A location plan and an aerial image are included in Appendix A.

Online mapping (including Google Maps / Google Streetview imagery, accessed February 2023) shows that the site comprises of woodland, an existing touring caravan park and an access road. The site is bordered by woodland to the north and east, the existing holiday park to the south and agricultural land to the west.

The existing holiday park is accessed off an unnamed road to the east.

Local Topography

Topographic levels to metres Above Ordnance Datum (m AOD) have been derived from a 1m resolution Environment Agency (EA) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM). The LiDAR data shows that the site generally slopes from 221m AOD in the east to approximately 217m AOD in the west. A LiDAR extract is provided as Appendix B.

Ground Conditions

The British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the site is underlain by superficial Devensian Glaciofluvial deposits generally comprising sand and gravel. The superficial deposits are identified as being underlain by the Long Nab Member consisting of sandstone, siltstone, and mudstone.

The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a site-specific basis.

According to the EA's Aquifer Designation data, obtained from MAGIC's online mapping [accessed February 2023] the Devensian Glaciofluvial deposits are classified as a Secondary A Aquifer. The underlying Long Nab

Member is also classified as a Secondary A Aquifer.

Secondary A Aquifers are 'permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers'.

The EA's 'Source Protection Zones' data, obtained from MAGIC's online mapping [accessed February 2023], indicates that the site is not located within a Groundwater Source Protection Zone.

Site Investigations

In order to establish infiltration capacity, infiltration testing was undertaken (by others) in October 2022 in general accordance with the BRE Digest 365 Specification. Infiltration test results and a photographic record of the testing are included in Appendix C.

6No. trial pits were excavated to a maximum depth of 2m. No groundwater was encountered in any of the trial pits.

Trial Pit 1

The water level fell by 1.61m (from 0m.bgl to 1.61m.bgl) over a period 72 hours and 58 minutes.

Trial Pit 2

The water level fell by 1.58m (from 0m.bgl to 1.58m.bgl) over a period of 71 hours and 13 minutes.

Trial Pit 3

The water level fell by 1.72 metres (from 0m.bgl to 1.72m.bgl) over a period of 69 hours and 31 minutes

Trial Pit 4

The water level fell by 1.67 metres (from 0m.bgl to 1.67m.bgl) over a period of 67 hours and 50 minutes

Trial Pit 5

The water level fell by 1.69 metres (from 0m.bgl to 1.69m.bgl) over a period of 64 hours and 40 minutes.

Trial Pit 6

The water level fell by 1.65 metres (from 0m.bgl to 1.65m.bgl) over a period of 65 hours and 23 minutes.

The fastest infiltration rate recorded is 1.592×10^{-6} m/s within Trial Pit 5. Due to slow infiltration within the trial pits, infiltration techniques are not considered suitable for the site.

Local Drainage

Public sewer records have been obtained from Yorkshire Water in February 2022 and are included in Appendix D. The Yorkshire Water sewer records show that there are no public sewers within immediate vicinity of the site. The nearest public sewer is a 150mm public foul sewer located approximately 1.68km south-west of the site in Egton.

Anecdotal information from the Client indicates that foul flows from the site are pumped to the public sewer

in Egton. Surface water from the site discharges to a series of ditches within the site. Existing drainage plans showing the indicative location of the ditches and foul sewers within the site are included in Appendix D.

Development Proposals

The proposed development is for an extension and restructure of Ladycross Plantation Holiday Park.

Proposals include 7 woodland lodges (in addition to 41 lodges that have already been consented). Proposed development plans are included in Appendix E.

The Drainage Strategy element of this report will consider the proposed additional units and the consented units.

The proposed development (including the previously consented lodges) will include approximately 5390m² of new hardstanding in the form of holiday lodges and associated access roads.

Flood Zone Classification and Policy Context

The Environment Agency (EA) 'Flood Map for Planning', included in Appendix F, shows that the site is located within an area outside of the extreme flood extent (Flood Zone 1), meaning it has a less than 0.1% annual probability of flooding.

In accordance with Annex 3 of the NPPF, sites used for holiday or short-let caravans and camping are considered to be 'more vulnerable'. Table 2 of the NPPG: Flood Risk and Coastal Change, states that 'more vulnerable' development is considered appropriate within Flood Zone 1. Therefore, the NPPF Exception Test does not need to be applied and the Sequential Test is passed.

Local Policy

The Scarborough Borough Local Plan 2011-2032 (adopted July 2017) contains the following policy relating to flood risk and drainage:

'Flood Risk

8.25 - The Local Planning Authority will adopt the sequential approach in accommodating development (as detailed in the NPPF and NPPG) and any proposals that will involve an exception to this approach will need to demonstrate appropriate measures have been taken in order to ensure any adverse impacts are mitigated.

8.26 - The Local Plan aims to ensure development is avoided in areas at the highest risk of flooding and manage the risk of flooding to ensure there are no adverse impacts elsewhere. The North-East Yorkshire Strategic Flood Risk Assessment (SFRA) (February 2010) and Environment Agency data are used to identify areas at being of high, medium or low-risk to flooding.

8.27 - The NPPF and NPPG seek to ensure the impacts from flood risk are avoided or limited wherever possible and in doing so seek the utilisation of both the Sequential and Exception Tests.

8.28 - The Sequential Test states development should not be permitted on land when there are reasonably available sites in areas with a lower probability of flooding as defined by the SFRA. Where this may not be possible, the Exception Test must be used in order to demonstrate wider sustainability benefits to the community are accrued that outweigh flood risk and demonstrate that the development can be achieved without increasing flood risk elsewhere through a site-specific flood risk assessment. In this instance, proposals should be supported by a demonstration that they are in accordance with relevant policy and guidance such as the Flood and Water Management Act 2010, the SFRA, the NPPF and NPPG and any future updates.

Drainage Sensitive Areas and Sustainable Drainage Systems

8.30 - The SFRA also identifies Drainage Sensitive Areas, and proposals on such locations will be expected to provide a detailed assessment of this and implement Sustainable Drainage Systems as mitigation. The use of Sustainable Drainage Systems will also be encouraged as a way of achieving wider benefits such as sustainable development, water quality, biodiversity and local amenity.

Policy ENV 3: Environmental Risk

Proposals will be expected to mitigate against the implications of environmental risk and the effects of climate change. This will be achieved by:

... ensuring water supply and water resources are managed and water efficiency measures are incorporated to reduce resource need, in line with the Environment Agency's licensing strategies;

d. using mitigation measures such as Sustainable Drainage Systems where possible in order to facilitate development in areas of sensitive drainage and to meet the requirements of the Water Framework Directive;

e. ensuring development has adequate provision for foul and surface water disposal in advance of occupation;

f. ensuring development does not lead to pollution of controlled waters in line with the requirements of the Water Framework Directive;

g. requiring development to manage waste from the site (both during construction and operation) in a sustainable way consistent with the waste hierarchy;

h. requiring the remediation or mitigation of contaminated or unstable land to reduce unacceptable risks to the environment through development;'

Local guidance documents including the North East Yorkshire Strategic Flood Risk Assessment (SFRA) (updated February 2010) and the North Yorkshire County Council Preliminary Flood Risk Assessment (PFRA) (August 2011) have been reviewed and inform this report.

Consultation

A consultation request was submitted to the LLFA in February 2022. A response is included in Appendix G. The LLFA have stated that:

'Should site investigation and testing deem that infiltration is not viable, discharging at greenfield rate is acceptable, however land drainage consent may be required to discharge to the drain, this is a separate matter outside of the planning process.'

'If the site is in a critical drainage area or source control zone, further restrictions may be required.' An LLFA response to the submitted planning application was provided by the Client in September 2022. The LLFA response is included in Appendix G and details that additional information is required to support the planning application.

A pre-development enquiry request was submitted to Yorkshire Water in February 2022. In their response (Appendix D) Yorkshire Water have stated that:

'Foul Water

Development of the site should take place with separate systems for foul and surface water drainage. The separate systems should extend to the points of discharge to be agreed.

The site is remote from the public sewer network. Foul water domestic waste can discharge to the 150 mm diameter public foul sewer recorded in Egton High Street, at a point approximately 1.5 kilometres to the south of the site.

Surface Water

The developer's attention is drawn to Requirement H3 of the Building Regulations 2010. This establishes a preferred hierarchy for surface water disposal. Consideration should firstly be given to discharge to soakaway, infiltration system and watercourse in that priority order.

Sustainable Drainage Systems (SuDS), for example the use of soakaways and/or permeable hardstanding etc, may be a suitable solution for surface water disposal appropriate in this situation. You are advised to seek comments on the suitability of SuDS in this instance from the appropriate authorities.

As the proposed site is currently undeveloped no surface water is known to have previously discharged to the public sewer network.

As such, the local public sewer network does not have capacity to accept any surface water from the proposed site. If SuDS are not viable, the developer is advised to contact the Environment Agency/local Land Drainage Authority/Internal Drainage Board with a view to establishing a suitable watercourse for discharge.

It is understood that a watercourse is located adjacent to the site. This appears to be the obvious place for surface water disposal (if SuDS are not viable).

Please note further restrictions on surface water disposal from the site may be imposed by other parties. You are strongly advised to seek advice/comments from the Environment Agency/Land Drainage Authority/Internal Drainage Board, with regard to surface water disposal from the site.'

The Yorkshire Water response to the submitted planning application has been provided by the Client in August 2022 and is included in Appendix D. Yorkshire Water have stated that:

'Waste Water

1) The submitted Flood Risk Assessment prepared by Waterco, dated March 2022 is generally acceptable. In summary, the report states that:

a) foul water will discharge via the existing private pumping station within the site, to the public foul sewer network in Egton

b) sub-soil conditions may support the use of soakaways (infiltration testing to be undertaken); and

c) failing infiltration, the entire site will discharge to watercourse (the drainage ditch network which discharges to the River Esk)

As surface water from the site is not proposed to discharge to the public sewer network, no assessment of the capacity of the public sewers to receive surface water has been undertaken. Should the surface water disposal proposals change, further consultation with Yorkshire Water will be required.

2) Additional details are required regarding the disposal of foul water from the developed site. Although the existing pumping station and points of connection are to be utilised, the report mentions that the existing pump rate may need to be altered to accommodate the extra flows.

In addition to the above, we also require details of how septicity will be managed, especially as the existing wetwell is to increase in size and given the fact that the public foul sewer is c. 1.5 km from the site. Increased hydraulic retention of foul effluent is more likely to occur which increases the likelihood of odours emitting from the pumping station. We strongly recommend that countermeasures are used to reduce the impact/loss of amenity to nearby residents/workers.'

Sources of Flooding and Probability

Fluvial

As shown on the existing surface water plan (Appendix D), the site is intersected by a number of ditches. The ditches originate on or immediately adjacent to the site and accommodate surface water drainage from the site and adjacent land in Client ownership. The ditches merge south of the site and flow south eventually draining into the River Esk approximately 2.45km south-east of the site. There are no other watercourses within the immediate vicinity of the site.

The EA 'Historic Flood Risk' map (Appendix F) shows that there are no historical records of fluvial flooding at or in the immediate vicinity of the site.

The EA 'Flood Map for Planning' (Appendix F) shows that the site is located within Flood Zone 1 – an area outside of the extreme flood extent, considered to have less than 0.1% annual probability of flooding from rivers or the sea.

The ditches on site serve a limited catchment area (originating within the wider holiday park) and were originally constructed as drainage features to serve the existing holiday park. As such, flows within the ditches will be minimal and the associated flood risk is very low.

The SFRA and PFRA contain no records of fluvial flooding at or near to the site. It can therefore be concluded that the risk of fluvial flooding is very low.

Tidal

The site is situated at a minimum of approximately 217m AOD and is significantly above sea level. Therefore, there is no risk from tidal flooding.

Surface Water

Surface water flooding occurs when rainwater does not drain away through the normal drainage system or soak into the ground. It is usually associated with high intensity rainfall events but can also occur with lower intensity rainfall or melting snow where the ground is saturated, frozen or developed, resulting in overland flow and ponding in depressions in topography. Surface water flooding can occur anywhere without warning. However, flow paths can be determined by consideration of contours and relative levels.

The EA 'Flood Risk from Surface Water' map (Appendix F) indicates that the site is at very low risk of surface water flooding, meaning there is less than 0.1% annual probability of flooding.

The SFRA and PFRA contain no records of surface water flooding affecting the site. The North Yorkshire SFRA 'Areas susceptible to surface water flooding' map (Appendix H), shows that the site is not situated within an area vulnerable to surface water flooding.

Any potential surface water flooding arising at or near to the site would be directed south-west, away from the site, following the local topography. There are no distinct flow routes in the area which would direct any potential surface water flooding towards the site.

It can therefore be concluded that the risk of surface water flooding is very low.

Sewer

Flooding from sewers can occur when a sewer is overwhelmed by heavy rainfall, becomes blocked, is damaged, or is of inadequate capacity. Flooding is mostly applicable to combined and surface water sewers.

The Yorkshire Water sewer plan (Appendix D) indicates that there are no public sewers within the immediate vicinity of the site. It can therefore be concluded that the risk of sewer flooding is very low.

Groundwater

Groundwater flooding occurs when water levels underneath the ground rise above normal levels. Prolonged heavy rainfall soaks into the ground and can cause the ground to become saturated. This results in rising groundwater levels which leads to flooding above ground.

The SFRA and PFRA contain no records of groundwater flooding at or near the site. The site will entail holiday lodges/caravans raised above surrounding ground levels. As such, the risk of groundwater flooding is considered to be low.

Artificial Sources

There are no canals within the vicinity of the site. The EA 'Flood Risk from Reservoirs' map (Appendix F) shows that the site is not at risk of flooding from reservoirs.

It can therefore be concluded that the risk of flooding from artificial sources is very low.

Summary of Potential Flooding

It can be concluded that the risk of flooding from all sources is very low. Therefore, no site-specific mitigation measures are considered necessary.

Surface Water Management

Surface water from the existing holiday park drains to a ditch network within the park which has connectivity to the River Esk.

The proposed development will introduce 5390m² of hardstanding in the form of holiday lodges (new and consented), parking and the access road.

The introduction of hardstanding area will result in an increase in surface water runoff rates and volumes. In order to ensure the proposed development will not increase flood risk elsewhere, surface water discharge from the site will be controlled.

Runoff Rates

In order to establish the proposed limited discharge rate, greenfield runoff rates have been estimated using the Revitalised Flood Hydrograph Model (ReFH2) method. Rainfall data used within the ReFH2 runoff estimation has been derived from the FEH web service. A summary of the greenfield runoff rates for a range of events, including ReFH2 input data, is provided as Appendix I.

The existing 1 in 1 year greenfield runoff rate for the 3.686ha site is 10.5 l/s. A discharge rate of 10.5 l/s will therefore be applied.

The proposed discharge rate of 10.5 l/s will be split pro-rata with 8.5 l/s applied for the area north of the ditch which intersects the site (0.414ha) and the remaining 2 l/s applied to the area south of the ditch

(0.125ha).

Discharge Method

Paragraph 056 of the NPPG: Flood Risk and Coastal Change sets out the following hierarchy of drainage options: into the ground (infiltration); to a surface water body; to a surface water sewer, highway drain or another drainage system; to a combined sewer.

Infiltration

The first consideration for the disposal of surface water is infiltration (soakaways and permeable surfaces). BRE 365 infiltration testing has been undertaken (by others) in October 2022 and concluded that infiltration drainage techniques are not feasible at the site due to the impermeable nature of the underlying strata.

Watercourse

A connection to watercourse is the next consideration. The site is served by a network of ditches which merge south of the site and have wider connectivity to the river network. Discharge by gravity to the drainage ditches within the site, or beyond the site and within Client ownership appears feasible. A plan showing the route of the ditch to the nearest watercourse as identified on Ordnance Survey mapping is provided in Appendix J.

Discharge to watercourse will be made at the limited 1 in 1 year greenfield runoff rate of 10.5 l/s.

Attenuation Storage & Sustainable Drainage Systems

In order to achieve a limited discharge rate, attenuation storage will be required. A network simulation has been undertaken using Causeway Flow drainage design software and is included in Appendix K.

Attenuation storage will be provided in the form of the sub-grade material of porous surfaced access roads. The Causeway Flow network simulations detail the required subgrade depths.

The required sub-grade depth varies across the site from 375mm to 1.4m during the 1 in 100 plus 30% CC storm event.

A Proposed Drainage Layout is included in Appendix L. The proposed surface water drainage system will ensure no increase in runoff over the lifetime of the development.

Exceedance Event

Storage will be provided for the 1 in 100 year plus 30% CC event. Storm events in excess of the 1 in 100 year plus 30% CC event should be permitted to produce temporary shallow depth flooding within the access roads and landscaped areas. Finished floor levels will be set above surrounding ground levels ensuring exceedance flooding will not affect the buildings.

Surface Water Treatment

In accordance with the CIRIA C753 publication 'The SuDS Manual' (2015), residential roofs (applicable to holiday lodges) have a 'very low' pollution hazard level with low traffic roads classified as having a 'low'

pollution hazard level. Table 1 shows the pollution hazard indices for each land use.

Table 1 – Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Low Traffic Roads	Low	0.5	0.4	0.4

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.2

* Indices values range from 0-1.

Runoff from roofs and roads will be directed to the sub-grade of permeable surfaced access roads. Table 2 demonstrates that permeable surfaces will provide sufficient treatment.

Table 2 – SuDS Mitigation Indices

Type of SuDS	Mitigation Indices		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable Surfacing	0.7	0.6	0.7

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.3

Maintenance

Maintenance of the drainage system including permeable surfacing will be the responsibility of the site owner. A maintenance schedules for permeable surfacing is included in Appendix M.

Foul Drainage

Correspondence from Yorkshire Water (Appendix C) states:

'The site is remote from the public sewer network. Foul water domestic waste can discharge to the 150 mm diameter public foul sewer recorded in Egton High Street, at a point approximately 1.5 kilometres to the south of the site.'

Foul flows from the site currently discharge to the public foul sewer in Egton. As such, it is proposed to retain the connection to the public foul sewer in Egton utilising the existing connection (rising main) from the site. However, upgrades to the existing foul drainage system (pumps and emergency storage capacity) may be required.

Foul Flow Review

Existing

The total daily foul flows for the existing units are estimated at 35,900 litres. This is based on 150 litres per person/ day, derived from British Water Flows and Loads-4. Estimated occupancies have been provided by the Client.

- 69no. fully serviced touring pitches: 150 litres per person per day. Estimated occupancy of 2 per pitch (population of 138). Foul flow = $138 \times 150 = 20,700$ litres per day.
- 70no. grass / hardstanding pitches (not serviced): 100 litres per person per day (this accounts for water use in amenity blocks). Estimated occupancy of 2 per pitch (population of 140). Foul flow = $140 \times 100 = 14,000$ litres per day.
- 1no. 4-bed house: 150 litres per person per day with max occupancy of 6. Foul flow = $6 \times 150 = 900$ litres per day.
- 1no 2-bed warden static: 150 litres per person per day with occupancy of 2. Foul flow = $2 \times 150 = 300$ litres per day.

The total estimated daily flow of 35,900 litres equates to an average flow of 0.4155 litres per second and a peak flow (multiplier of 6 + 10% applied) of 2.742 l/s.

Proposed

The proposed daily foul flows for 48 number lodges are estimated at 31,650 litres. This is based on 150 litres per person/ day, derived from British Water Flows and Loads-4. Estimated occupancies have been provided by the Client.

- 29no. 2-bed lodges: 150 litres per person per day with occupancy of 4 people per lodge (population of 116). Foul flow = $116 \times 150 = 17,400$ litres per day
- 19no. 3-bed lodges: 150 litres per person per day with occupancy of 5 people per lodge (population of 95). Foul flow = $95 \times 150 = 14,250$ litres per day

The total estimated daily flow of 31,650 litres equates to an average flow of 0.3663 litres per second and a peak flow (multiplier of 6 + 10% applied) of 2.417 l/s.

The total peak flow from the existing and proposed units is 5.159 l/s.

A review of the performance and capacity of the existing foul pump arrangements confirm there is insufficient capacity to cope with the entirety of the proposed development. As such, the existing pumps would likely have to be replaced to accommodate the additional inflows. Additional wet well storage (to prevent flooding in times of pump or power failure) will also be necessary, to provide a storage volume of approximately 31.65m^3 . This volume is based on 24-hours of peak design flow, in accordance with Sewer Sector Guidance.

It is recommended that a full survey of the existing pump and drainage network is undertaken to fully understand the existing performance.

As per Sewer Sector Guidance, the lodges will be located a minimum of 15m away from the wet well / foul storage facility.

The potential risk of septicity can be combated through considered design of the wet well/pumped system and use of chemical dosing.

Conclusions

The proposed development is for the extension and restructure of Ladycross Plantation Holiday Park.

The site is located within Flood Zone 1 on the Environment Agency (EA) 'Flood Map for Planning' – an area considered to have the lowest probability of fluvial and tidal flooding. The site is shown to be located outside the extreme 0.1% annual probability extent.

The risk of flooding from all sources has been assessed and the flood risk to the site is considered to be very low. Therefore, no flood risk mitigation measures are considered necessary.

The proposed development will include impermeable drainage area in the form of holiday lodges, parking and access roads. The increase in impermeable area will result in an increase in surface water runoff. In order to ensure the increase in surface water runoff will not increase flood risk elsewhere, sustainable drainage systems will be used to accommodate storm events up to and including the 1 in 100 year plus 30% climate change event.

Surface water runoff will discharge to a ditch which crosses the site at the 1 in 1 year greenfield runoff rate of 10.5 l/s, which will be split pro-rata with 8.5 l/s applied for the area north of the ditch and the remaining 2 l/s applied to the area south of the ditch. A gravity connection can be achieved. Attenuation will be provided within the sub-grade of a permeable surfaced access road.

The required sub-grade depth varies across the site from 375mm to 1.4m during the 1 in 100 plus 30% CC storm event

Yorkshire Water have confirmed that foul flows can discharge to the 150mm public foul sewer in Egton High Street. It is proposed to discharge foul flows to the public foul sewer in Egton as per the existing situation, utilising the existing rising main. The existing pump is considered to be insufficient to cope with the entirety of foul flows from the proposed development. As such, the existing pumps would likely have to be replaced to accommodate the additional inflows and additional emergency storage provided.

A Designer's Risk Assessment (DRA) has been prepared to inform future designers of any identified hazards associated with the scheme. The DRA has been included in Appendix N.

Recommendations

1. Submit this Flood Risk Assessment and Drainage Strategy to the Planning Authority in support of the Planning Application.
2. Verify the attenuation volumes included in this report when undertaking detailed drainage design.

Appendix A Location and Aerial Plan



Notes:
 1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

- LEGEND**
- Site Boundary
 - Watercourses
 - Waterbodies

NYMNP

02/02/2023



CLIENT:
 Ladycross Plantation Holiday Park



SCHEME:
 Ladycross Plantation Holiday Park, Egton

PLOT TITLE:
 Location Plan

PLOT STATUS: FINAL	DATE: 23-11-2022
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DRAWN: MW	CHECKED: AW	APPROVED: NJ	PLOT SCALE AT A3: 1:2500
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PLOT NAME: 14491_Location_Plan	REVISION: -
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Notes:
 1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

 Site Boundary

NYMNP
 02/02/2023



CLIENT:
 Ladycross Plantation Holiday Park



SCHEME:
 Ladycross Plantation Holiday Park, Egton

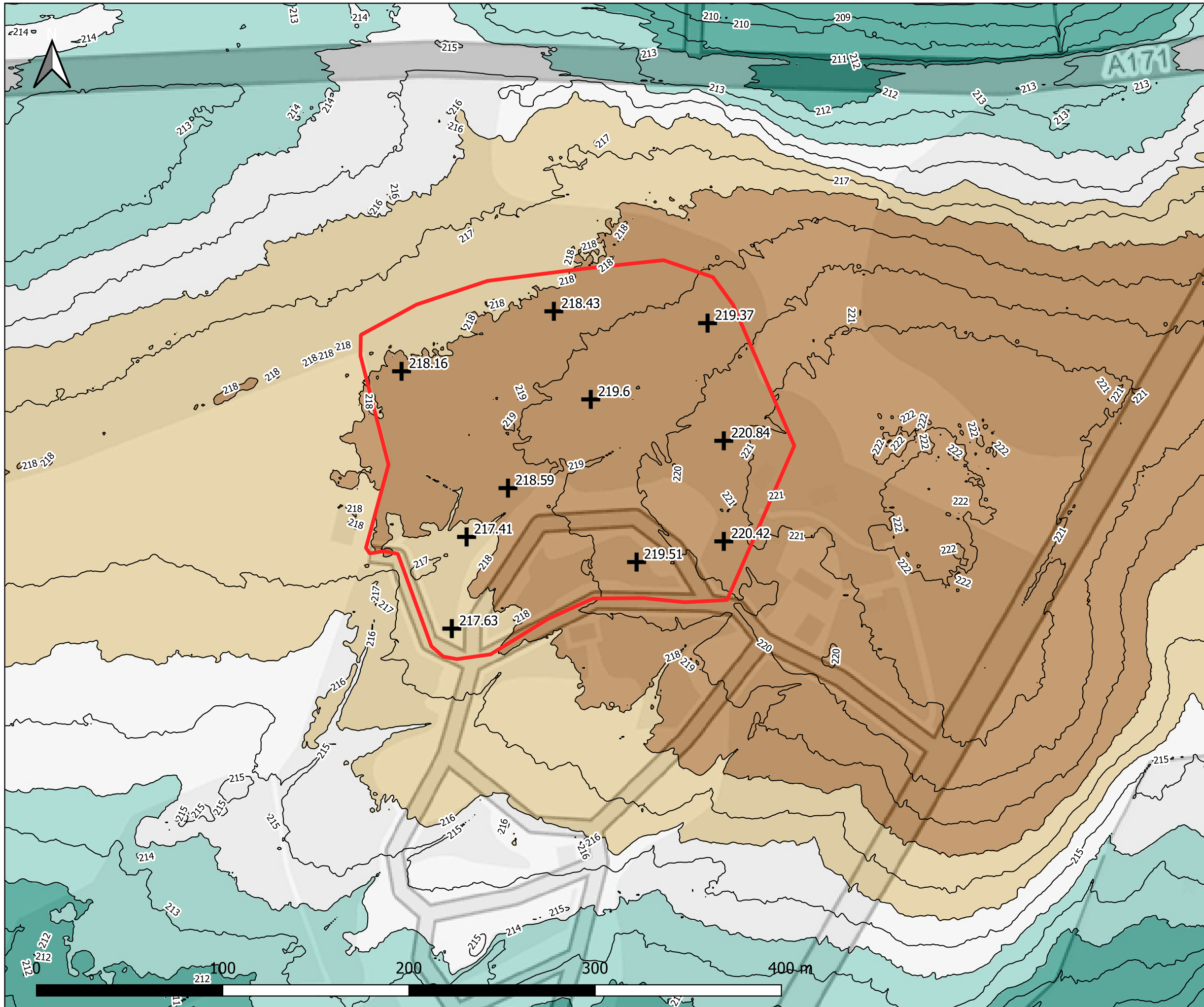
PLOT TITLE:
 Aerial Plan

PLOT STATUS:	FINAL	DATE:	23-11-2022
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DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
MW	AW	NJ	1:2500

PLOT NAME:	REVISION:
14491_Aerial_Plan	-

Appendix B LiDAR Plan



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless

LEGEND

- Site Boundary
- Site Levels (m AOD)
- Ground Elevations (m AOD)
 - <= 212.0
 - 212.0 - 214.0
 - 214.0 - 216.0
 - 216.0 - 218.0
 - > 218.0

NYMNP

02/02/2023

CLIENT:			
Ladycross Plantation Holiday Park			
 www.waterco.co.uk			
SCHEME:			
Ladycross Plantation Holiday Park, Egton			
PLOT TITLE:			
LiDAR Plan			
PLOT STATUS:	DATE:		
FINAL	19-10-2022		
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
IH	AW	NJ	1:2000
PLOT NAME:			REVISION:
14491_LiDAR_Plan			-

Appendix C Infiltration Test Results



- 1) The location of the trial pits are subject to ground conditions, root protection areas, and other on site restrictions. Trial pits should only be excavated once the ground has been surveyed by a suitably appointed surveyor / contractor.
- 2) Client / Contractor is responsible for service clearance and ensuring trial pit locations are appropriate.
- 3) Trial pits should be 1.5m – 2.5m long x 0.3m – 0.6m wide and a minimum of 2m deep
- 4) All dimensions in millimetres and all levels in metres above ordnance datum unless shown otherwise.
- 5) This drawing is an amendment of the 'Plan' by 'Consultant'. This drawing provides a concept only and is not intended for detailed design.

LEGEND

● Trial Pit Location

Notes

6 test pits 1 to 6
2m x 0.5m x 2m (l x w x d)
Rain on Thursday (13th)
evening

CLIENT:		Ladycross Plantation Holiday Park	
SCHEME:		Ladycross Plantation Holiday Park, Egton	
PLOT TITLE:		Trial Pit Location Plan	
PLOT STATUS:	SKETCH	DATE:	30-09-2022
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
MW	AW	NJ	1:800
PLOT NAME:			REVISION:
14491_Trial_Pit_Location_Plan			-

Test Pit 1



Test Pit 1



Test pit 1

TIME	Hrs:Mins	DEPTH (2000 mm) approx
11 oct 22		
09:13	0	0
12:09	02:56	410
17:21	08:08	680
19:36	10:23	770
12 oct		
08:55	23:42	1190
13 oct 22		
09:25	48:12	1480
14 oct		
10:11	72:58	1610

Test Pit 2

