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Drainage Strategy & SUDS Assessment for Lindisfarne

Prepared for
Natural England

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Rev. 03

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1. INTRODUCTION

1.1. General

1.1.1. This report has been prepared on instruction received from Natural England and relates to the proposed development at Lindisfarne.

1.1.2. The report outlines the initial drainage design philosophy in relation to the proposed development.

1.1.3. This report is prepared solely for the benefit of the Client. This report may not be assigned without prior written permission from Clancy Consulting.

1.1.4. This report is for Planning Application purposes only and does not constitute a construction-ready design.

1.2. Report Structure

1.2.1. The drainage strategy will provide justification of the discharge method in accordance with the National Planning Practical Guidance, considering the following (in order of preference), with evidence provided where possible;

1. Discharge by Infiltration
2. Discharge to Watercourse
3. Discharge to Surface Water Sewer
4. Discharge to Combined Sewer

1.2.2. The drainage strategy will discuss proposed SUDs techniques and comply with the 'Non-Statutory Technical Standards for Sustainable Drainage Systems'

1.2.3. Sources of information:

- Lead Local Flood Authority Surface Water Management Guidance.
- Non-statutory technical standards for sustainable drainage systems.
- Topographical Survey by Formby Surveys.
- Utilities Survey by Formby Surveys.
- Google
- Architectural Drawings by Firth Associates.
- Phase 2 Geo-Environmental Ground Investigation by IGE Consulting (September 2022).

2. LOCAL POLICY

Full details are found in the LLFA's surface water management guidance report and supporting information. In summary this indicates:

- Consideration of the site area should be made together with EA flood maps to determine the flood zone and whether a Flood Risk Assessment is required.

- Drainage Strategy should follow SUDS hierarchy – i.e. in preferential order – Use on Site*, Infiltration, Watercourse, Surface Water Sewer, Combined Sewer. Infiltration tests are required to demonstrate whether a soakaway is feasible. It should be noted that Utilities companies also apply this strictly and detailed consideration of the hierarchy will need to be demonstrated in supporting documentation.

- Appropriate discharge rates should be calculated for the 30 and 100 year flood events for use in drainage design. In line with NPPF this should be attenuated to greenfield rates for greenfield sites/ site area and as close as possible to greenfield rates for brownfield areas (30% betterment on existing). Climate change should be considered appropriately.

3. SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS)

Any new drainage for the development should be designed in accordance with the non-statutory technical guidance for the design of sustainable drainage systems.

3.1. Surface Water Disposal Hierarchy

3.1.1. The disposal of surface water should be considered in the following order of priority;

1.Discharge to be used on site.
2.Infiltration into the subsoil via soakaways or permeable paving.
3.Discharge to a water course or the sea.
4.Discharge to a surface water sewer.
5.Discharge to a combined sewer.

3.1.2. If it is not possible to use discharge on site or discharge to a soakaway, then surface water should be controlled with the use of Sustainable Drainage Systems (SuDS) and considered using the SuDS Hierarchy.

	SUDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
Most Sustainable	Living roofs	✔	✔	✔
	Basins and ponds - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	✔	✔	✔
	Filter strips and swales	✔	✔	✔
	Infiltration devices - soakaways - infiltration trenches and basins	✔	✔	✔
	Permeable surfaces and filter drains - gravelled areas - solid paving blocks - porous paviors	✔	✔	
Least Sustainable	Tanked systems - over-sized pipes/tanks - storms cells	✔		

Table 1 - SuDS Hierarchy (Environment Agency)

3.2. Disposal Strategy

3.2.1. Use on Site

Under the Design and Construction Guidance document (2020), use of surface water generated on site is now the preferred first option in the SUDS hierarchy.

There is a potential for any surplus runoff from the green roof to be stored and used for irrigation purposes.

3.2.2. Infiltration

The ground investigation report appears to indicate the site is underlain by silty, sandy clays which will by their nature have minimal filtration properties.

In addition, the ground investigation has identified potential contaminants in the ground – likely to be from the past history of the site as a railway sidings. Filtration has the potential to carry contaminants into the groundwater.

These two characteristics make infiltration difficult to use.

Furthermore, Network Rail will restrict the positioning of any soakaway to be 20m away from their boundary. This leaves no suitable place to locate any form of soakaway on the development.

3.2.3. Discharge to a Water Course

There is a small open water course along the West boundary which appears to be where surface water currently discharges to.

It would be the intention to take the discharge from the new building and the car park into this watercourse.

Further investigations would be required to assess the feasibility of discharging into this. At this stage, due to the size and limited information this would have to be used in conjunction with a primary source of draining the site.

3.2.4. Discharge to a Surface Water Sewer

There are no surface water sewers within the vicinity of the development that would not entail crossing third party land.

There are likely to be highway drains in the adopted highway but local authorities do not usually accept discharge from private developments and often they do not have adequate capacity to take the additional discharge of the increased risk of liability from flooding.

3.2.5. Combined/ Foul Sewer

It is not proposed to combine the surface water with the foul and collect this into any existing or upgraded foul sewer system.

3.3. SuDS Strategy

3.3.1. Living Roof

A significant area of the site receiving surface water is roof area. A sustainable solution to control run-off at its source is to provide green, blue or brown roof areas. These roof areas retain part of the rainwater, slow down the speed of run-off and also help to reduce water pollution whilst providing a habitat for nature.

Any roof system would impose additional weight onto the roof structure which would need to be designed accordingly to accommodate the additional weight.

The roof is currently proposed to be a living roof with the design to be developed during detailed design. This will slow down the volume of water at the source with any excess entering the watercourse.

3.3.2. Ponds/Basins and Swales

No ponds or swales are proposed as there is insufficient space to locate them.

3.3.3. Infiltration/ Permeable Surfaces

The ground investigation report appears to indicate the site is underlain by silty, sandy clays which will by their nature have minimal filtration properties.

In addition, the ground investigation has identified potential contaminants in the ground – likely to be from the past history of the site as a railway sidings. Filtration has the potential to carry contaminants into the groundwater.

These two characteristics mean infiltration is not viable.

Permeable surfaces are proposed on the car park to maintain the current passage as best as possible.

Tree pits and other soft borders can be accommodated and have been proposed to offer some removal of rainwater via vegetation extraction.

3.3.4. Landscaped Areas

Areas of landscaping will offer a reduction on the total area taking rainfall.

3.3.5. Tanked System

No artificial tanked system is proposed. The car park will be used as a subbase reservoir to hold waters in before forward passage into the watercourse.

3.3.6. Pollution

The development does not contain 50 spaces or an area for parking greater than 800m^2 therefore a petrol interceptor is not required.

4. DRAINAGE STRATEGY

4.1. Surface Water Drainage

4.1.1. The rainwater will fall onto a green roof (approximate area of 110 square metres) with water held within the buildup and absorbed by the vegetation with excess allowed to drain freely.

4.1.2. This can either be collected for irrigation or allowed to drain into the existing open water course/ brook as the surface water off the adjacent building does currently.

4.1.3. Surface water on the car park will pass through the permeable surface into a lined subbase reservoir where it will be held before forward passage to the watercourse via a network of perforated pipes hidden with the subbase.

4.2. Development Foul Water Drainage

4.2.1. Foul water will be collected in a separate system to surface water. This will be collected via pipes & inspection chambers.

4.2.2. Foul water will be collected and pass through either a septic tank or sewage treatment plant (also known as Package Treatment Plant (PTP)) before dispersing – via an inspection chamber (for water testing collection) – into the brook at the rear of the development.

4.2.3. As per 3.2.2, there is limited scope to use infiltration given the ground conditions and the proximity to the railway line.

4.2.4. The treated discharge will pass into the watercourse at the rear of the development.

4.2.5. The system will be designed in accordance to the criteria set out in Annex F of Natural England's letters to LPAs regarding Nutrient Neutrality.

4.2.6. Further guidance regarding set out and preliminary design of a drainage field or mound is provided with Part H of the Building Regulations.

4.2.7. The binding rules set out by The Environment Agency will also be followed as part of detailed design.

4.2.8. A suitable PTP system is the Klargester BioDisc® by Kingspan, this is proposed by the client and can support between 6 to 18 people. This allows aerobic micro-organisms, naturally found in sewage, to establish on a biologically active film or biomass. Natural breakdown of sewage can then occur

4.2.9. Wastewater and sewage flows into the primary settlement zone where solids are settled out and retained. This accumulated sludge is drawn out (by pump) periodically.

4.2.10. Partially clarified liquor containing fine suspended solids flows upwards into the first stage Biozone for breaking down by micro-organisms. Suspended solids return to the primary settlement zone and the liquor is transferred to the second stage Biozone for further treatment.

4.2.11. Any solids remaining are settled out in the final settlement tank. The very high effluent quality is discharged to either the public sewer or a drainage field (network of perforated pipes buried below ground to allow natural infiltration into the ground).

4.2.12. The system uses slowly rotating mechanism to agitate the treatment process and so there is a low energy consumption electric motor within the system.

4.2.13. The discharge will then enter into the watercourse.

4.2.14. All proposed below ground foul water drainage will comply with Building Regulations Part H:2010, BS EN 12056-2:2000 and BS EN 752:2008.

4.2.15. The proposed foul sewer system will be designed to handle this flow rate.

4.3. Flood Risk within the Development

4.3.1. As per Environment Agency Flood Maps, the development is predominantly in Flood Zone One with a low probability of flooding. Very low risk of Surface Water Flooding and from Rivers and Seas.

4.3.2. A small area (circa 50 square metres of the total 640 square metres) is within Flood Zone Two. As the area in Flood Zone Two represents less than 10% of the total site area, it is assumed Flood Zone One regulations govern.

4.3.3. Flood Zone Two is present due to the vast flood plains of the Lindisfarne/ Holy Island coast.

4.3.4. The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event.

4.3.5. The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.

4.3.6. The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100-year rainfall event are managed in exceedance routes that minimise the risks to people and property.

4.3.7. Initial levels have been designed to be sympathetic to the existing levels with no vast areas of landscaping resulting in significant or abrupt level changes.

4.3.8. Levels will be designed such that in the event of a more extreme rainfall event water will discharge away from buildings but be held on the development.

5. MAINTENANCE & CONSTRUCTION

5.1. Maintenance Considerations

5.1.1 This section is intended to give an overview of the operation and maintenance for the drainage features included with the drainage strategy and in relation to typical details.

5.1.2 Where proprietary products are specified, the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise due to project constraints.

5.1.3 The surface water network has been designed to accommodate the 1 in 100-year storm rainfall event plus an allowance for climate change particular to the requirements of the development.

5.1.4 As the flows are generally being attenuated on site, there will be a period after storm events where the network is still partially or fully surcharged and is draining down.

5.1.5 Where this surcharging is still present after 48hrs appropriate action should be taken.

5.1.6 A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

5.1.7 No large shrubs should be planted over any geocellular tanks within 3m in all directions and 6m from small/ medium specimen tree planting. Larger trees should not be planted within 20m of the tanks.

5.1.8 It is advisable that above ground signage is installed detailing size and depth of any below ground structures to make any future works manageable.

5.1.9 An outline regular and remedial maintenance strategy table is shown below;

Regular Maintenance Schedule	
Weekly	Visual inspection to check gullies are free flowing and not blocked. Removal of litter and other materials left on development that could find a pathway into the drainage network. Silt removed as necessary and branches of drainage flushed.
Monthly	As Weekly plus landscaped areas to be cut and maintained with clippings collected and removed. Lifting of manhole covers to check they are free flowing and not blocked. Silt removed as necessary and system flushed as necessary.
Annually	Full inspection of systems to identify and remove silt and debris including inlet and outlet pipes. Remove

	sediment/ flush as necessary. Issue report to file for record keeping.
Other	If surcharge remains after 48 hours of a storm event, undertake inspection of components to ensure water can drain freely and make good if required. CCTV and high pressure flushing to remove sediment build up – every 5 years or as required.
Remedial Maintenance Schedule	
Tasks in advance of a significant storm	Inspections may be required to ensure the system is clear of blockages and continues to operate effectively. Sandbags at door thresholds.
Inspection following a significant storm	Inspect system in full, remove/ repair blockages, sediment etc. Flush system
Likely tasks following a significant storm	Removal of debris/ sediment.

5.1.10 It is assumed that the maintenance of the drainage network will be the responsibility of an on-site facilities management team.

5.1.11 A copy of the final construction drainage layout should be provided in the final Operations and Maintenance Manual.

5.1.12 It is recommended that the drainage system is inspected as a minimum twice a year, with the system also being inspected after any major storm event.

5.1.13 Significant sediment deposition is likely in areas used for storage, so a post clean-up operation may be required including the removal of litter, vegetation, sewerage debris and larger objects.

5.1.14 Long-term management practices include monthly sweeping of external paved areas. The sweeping program will remove sand and contaminants directly from paved surfaces before they become mobilised during storm events and transported to the drainage system.

5.1.15 During the winter months, drainage features such as gullies and channels should be cleared of ice, snow, debris or litter.

5.1.16 Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as the filter drains and the upstream/downstream chambers.

5.1.17 Pumping should only be used to facilitate drainage for those parts of the site where it is not reasonably practicable to drain water by gravity.

5.1.18 The foul treatment system will need to follow the maintenance recommendations of the manufacturer to ensure its consistent running but also to ensure warranties and guarantees remain valid.

5.2. Construction

5.2.1 Components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirement for reasonable levels of maintenance.

5.2.2 Damage to the drainage system resulting from associated construction activities must be minimised and must be rectified before the drainage system is considered to be completed.

5.2.3 The materials, including products, components, fittings or naturally occurring materials, which are specified by the designer, must be of a suitable nature and quality for their intended use.

5.2.4 The detailed design of the system and product selection for the storage and pipe solution will be made at the detailed design stage when all the site constraints can be considered. There are numerous products available for storage of water below ground and care will be needed to ensure that the right product is chosen for the final loading conditions.

6. CONCLUSIONS AND RECOMMENDATIONS

1.1. This report gives outline details of the Drainage Strategy which has been undertaken in relation to the proposed development of a parcel of land at Lindisfarne, Berwick on Tweed.

1.2. The existing site is predominantly a permeable developed surface with a variety of storage buildings on the site. No existing connections off the development have been currently confirmed with surface water appearing to enter the open watercourse along the West boundary and foul water collected in a septic tank.

1.3. The proposed development provides an opportunity to reduce local area flood risk by controlling surface water on site. Following the SuDS and water disposal hierarchy it has been determined the most viable solution will be to utilise green roofs to control water at the source with the surplus entering the existing watercourse.

1.4. The car park area will be permeable with the subbase designed to hold rainwater in with discharge directed towards the existing watercourse.

1.5. Infiltration is not considered viable given the ground conditions.

1.6. A foul water system will pass via a self contained sewage treatment system and then into the watercourse. Discharging via a drainage mound is not currently considered feasible due to the ground conditions and the proximity to the rail line which will impose restrictions on the proximity of any form of soakaway.

1.7. The detailed design of this system will be in accordance with Annex F of Natural England's letter to LPAs and Part H of The Building Regulations.

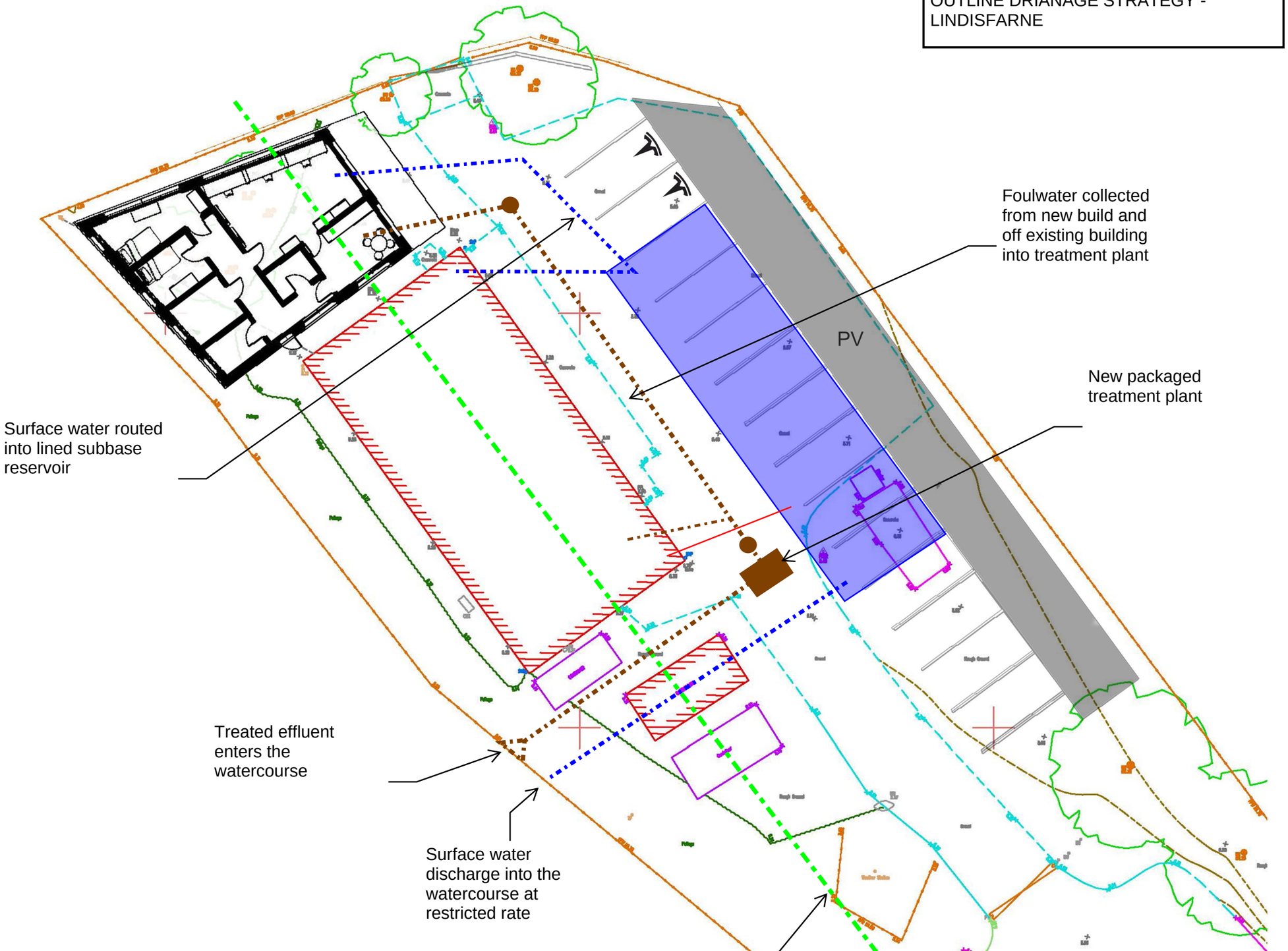
1.8. Under current proposals, no connection to the public sewer is proposed.

1.9. A Wastewater Pre-Development Enquiry has been submitted to the Local Water Authority for comment on the proposed drainage strategy presented within this report. They have confirmed a gravity connection to the sewer is acceptable.

1.10. The proposed system will be designed to meet the Sustainable Drainage Systems Non-statutory technical standards for sustainable drainage systems, March 2015.

APPENDIX A: OUTLINE DRAINAGE STRATEGY

OUTLINE DRIANAGE STRATEGY - LINDISFARNE



m 0 2 4 6 8 10 12 14 16 18 20
SCALE
1:200

Drawn By: CFC	Project start date: 07/22
Checked By: JF	Date: 13.07.22
Drawing Scale: 1:200 @ A3	
Drawing Status: CONCEPT	

This drawing is to be read in conjunction with all engineers and specialists drawings along with all relevant specifications.

All permissions & approvals are to be obtained prior to commencement of any works on site.

All gridlines, dimensions, building lines, etc. are to be checked carefully on site prior to the commencement of any works.

All workmanship and materials shall comply with current Building Regulations, British Standards, Codes of Practice and N.H.B.C. requirements.

All materials shall be fixed, applied or mixed in accordance with manufacturer's instructions or specifications and all materials shall be suitable for their purpose.

Dimensions are not to be scaled from this drawing.

Any discrepancies between the information given by engineers and other specialists must be brought to the attention of the designer prior to the commencement of any works.

Where it is required that inspection be made by the local authority this shall be arranged by the contractor to suit their programme.

The contractor shall comply with the health and safety requirements as set out by the CDM Regulations, The Health and Safety Executive.

Prior to commencing work the contractor shall carry out an internal and external condition survey of the existing building and shall take into account everything necessary for the proper execution of the works, to the satisfaction of the 'Inspector' whether indicated on the drawing or not.

Rev.	Date	Description

Project Description:
NEW FACILITY AT LINDISFARNE
NATIONAL NATURE RESERVE

Project Address:
LINDISFARNE NATIONAL
NATURE RESERVE
BERWICK-UPON-TWEED

Client:
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Drawing Title:
PROPOSED SITE PLAN

Drawing Number: NNR-LDF / 010

Revision