Power Park Exeter
Drainage Strategy

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Revision 02

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Contents

01 - PROJECT BACKGROUND

01

01 Drainage Strategy

Introduction

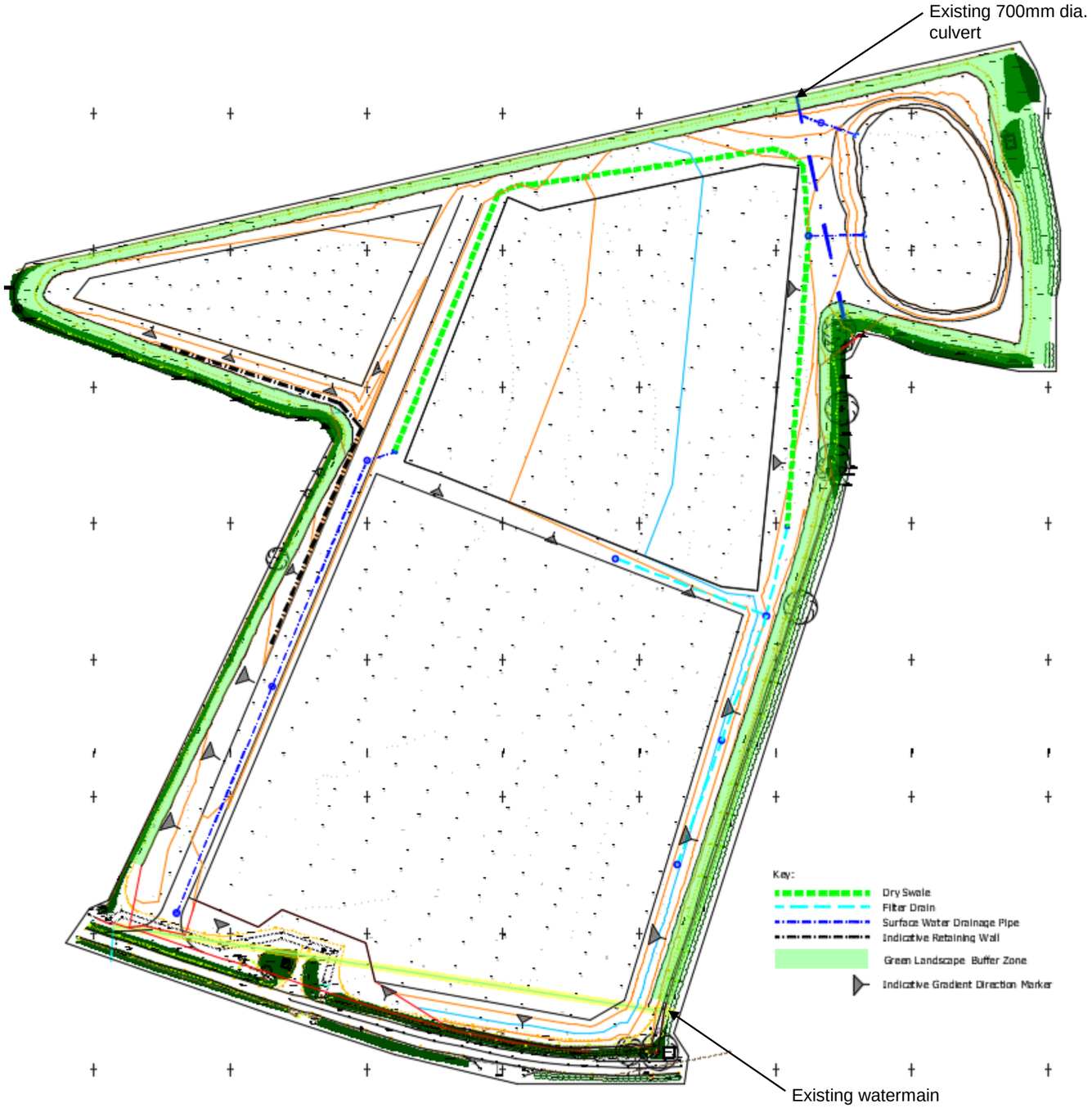

Figure 1 – Outline Surface Water Drainage Plan (Not to Scale)

Introduction

This document sets out the drainage strategy for the long term management and maintenance of both the surface water and foul water drainage systems proposed for the Exeter Power Park Development. The proposed development is located to the south of Exeter International Airport, a site plan is shown in Figure 1 and the site location is outlined in red in Figure 2.

Figure 2 - Exeter Power Park Site Location

Development details are summarized in Table 1:

Site Name	Power Park Development
Location	Exeter
Grid Reference	SY 00851 93414
Development Area	7.67 Ha
Development Type	Commercial
Flood Zone	1
Surface Water Flood Risk	Rivers/Sea – Low Rainfall – Low to High
Local Water and Sewage Undertaker	South West Water
Planning Authority	East Devon District Council
Lead Local Flood Authority	Devon County Council

Table 1 – Development Details

02 – Foul Drainage Strategy

02 Drainage Strategy

Foul Water

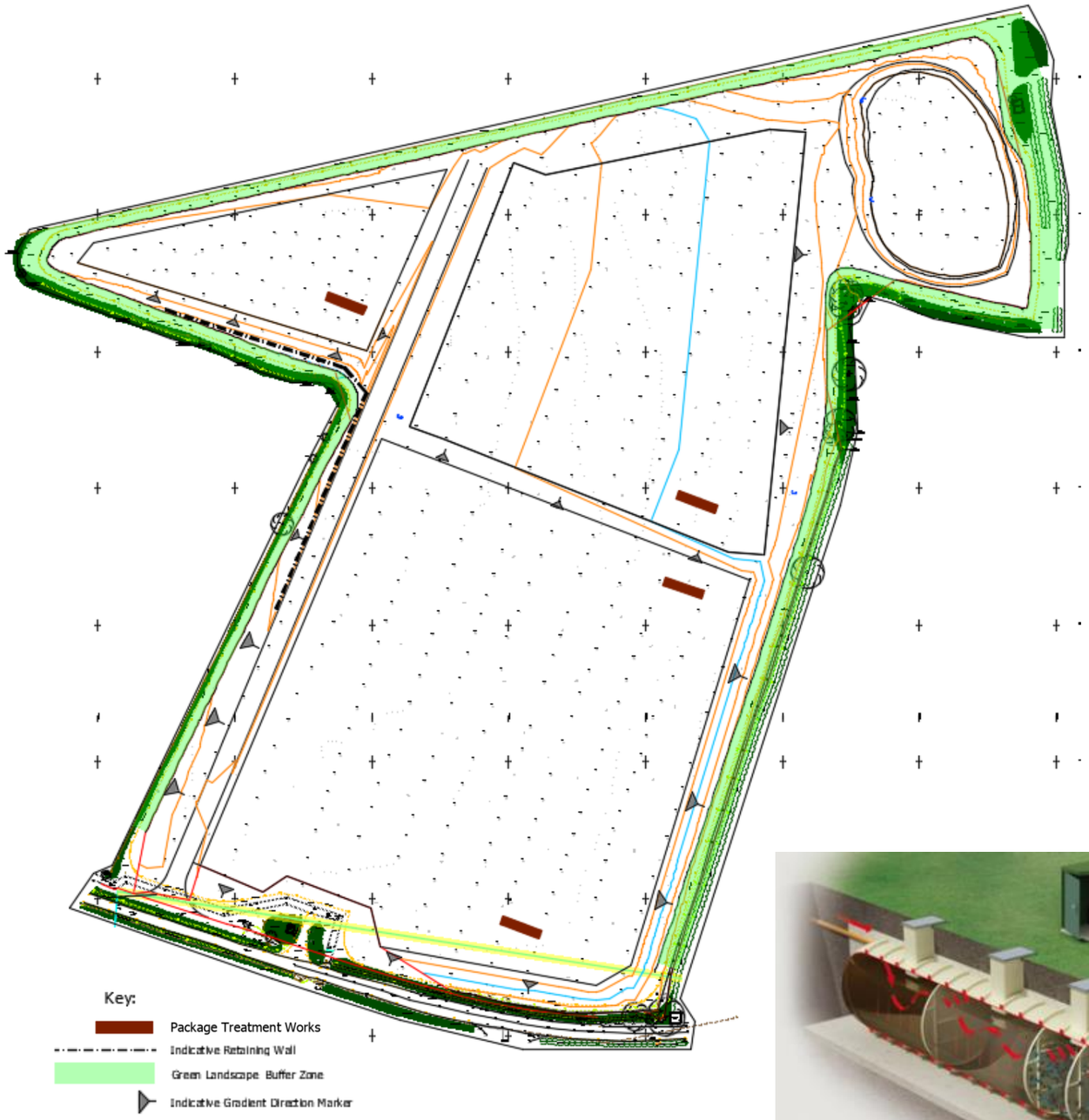

Figure 3 - Outline Foul Water Package Treatment Plants Plan (Not to scale)

Foul Water Drainage Strategy

Pre-development enquiries with South West Water revealed no public foul water connection within the vicinity of the proposed development, nor are there any plans to install foul water drainage as part of the road improvements adjacent to the development.

On South West Water's recommendation, contact was made with Exeter Airport to investigate the option of connecting into their private foul water system but Exeter Airport have advised that they do not have any capacity to accept additional foul water flows. However, it is acknowledged that there are ongoing discussions to progress a pumping station requisition with South West Water and construct a new sewer running north east of the airfield towards Cranbrook. This is not yet a feasible strategy for the development, predominantly due to timescales.

It is therefore proposed to utilise package treatment works to capture and treat foul water drainage on site, treated effluent will then be discharged to the watercourse in the north east corner of the site. Provisional locations of package treatment works are presented in Figure 3. Examples of package treatment works are presented in Figure 4.

Based on Design and Construction (DCG) guidance by Water UK, a foul water discharge of 0.5 l/s/ha has been proposed, based on an impermeable area of 4.54 ha a contribution of 2.27l/s of treated foul water flows from the development site into the watercourse.

Foul Water Maintenance Requirements

Maintenance requirements of package treatment plants will vary dependent on the type of package treatment plant and size; typical maintenance will include:

- Cleaning of pipework, air diffusers (for aerated treatment systems), air blower inlet (for aerated systems) on a 6 to 12 monthly basis (dependent on use and flows received).
- Regular emptying as required by certified waste carriers.
- Serviced annually as a minimum.

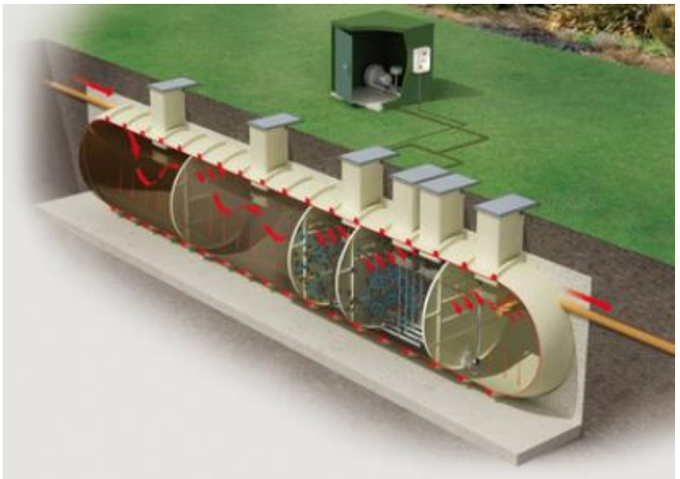

Figure 4 – Package Treatment Plants

03 – Surface Water Drainage Strategy

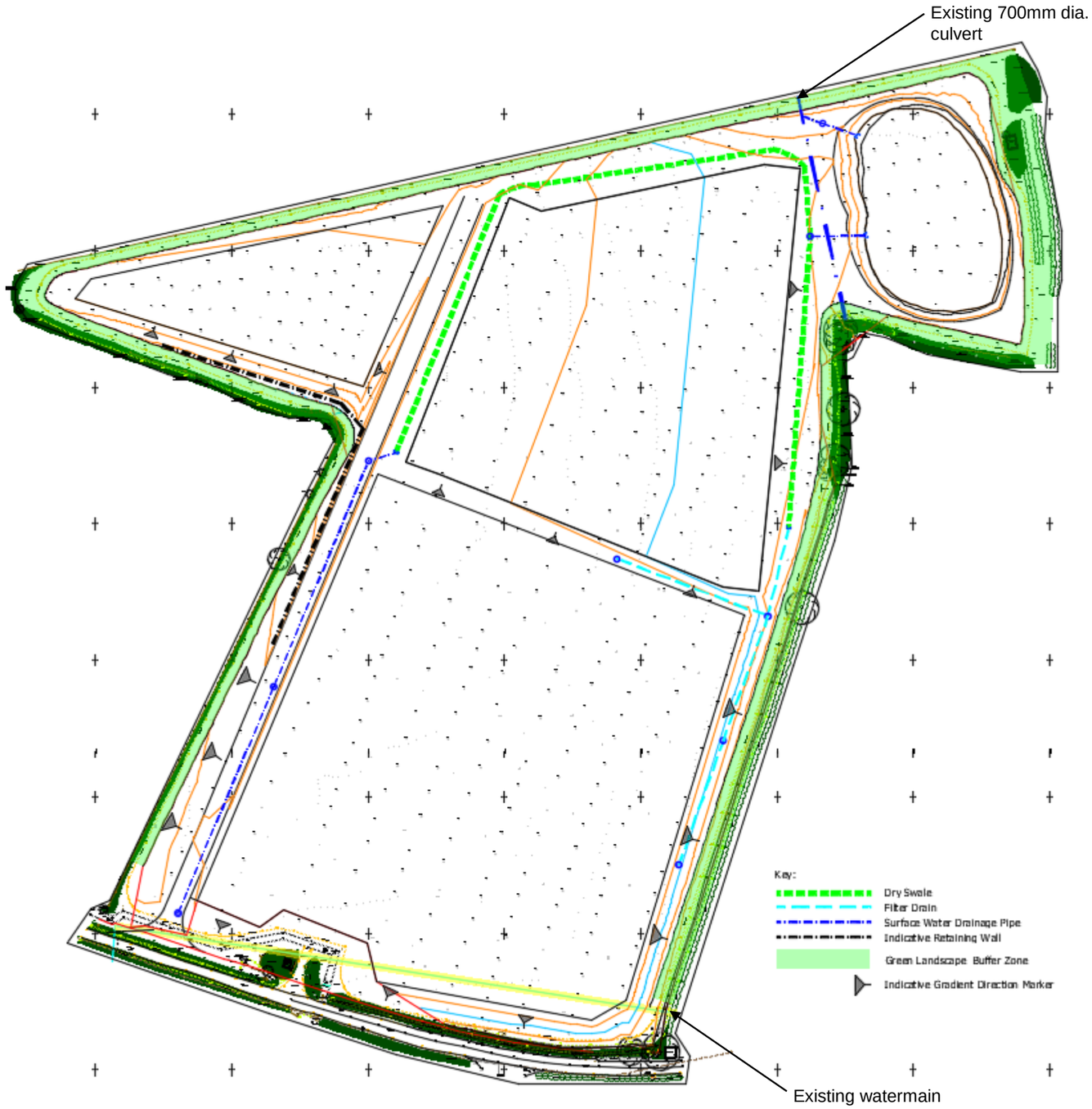

Figure 5 – Outline Surface Water Drainage Plan (Not to Scale)

Surface Water Drainage Strategy

The surface water drainage proposals for the Power Park development comply with the Surface Water Drainage Hierarchy where surface water must be managed in the following preferential order:

1. Infiltration to ground
2. Discharge to watercourse (ditch, river etc)
3. Connection to surface water sewer
4. Connection to a combined sewer

Groundwater was encountered close to the surface during the ground investigation. As per the Phase 2 Ground Investigation (Appendix B of Design Code), groundwater was measured at 0.68 to 1.12m below ground level in the north east corner, thus it Is not feasible to infiltrate surface water run off to the ground; discharge to watercourse is the next preferred option.

A 700mm diameter culvert is located to the north east of the development and current information indicates that this culvert discharges to watercourses to the north of Exeter Airport runway. It is assumed riparian rights to discharge exist through this culvert for the development; flows from the development are currently assumed to be restricted to greenfield run off rate which will need to be agreed with the Lead Local Flood Authority (LLFA) and Environment Agency (EA). This means that surface water run off from the proposed development will be no greater than existing and therefore there is no increase in risk of downstream flooding.

Surface water is conveyed from development plateaus to a detention basin via a combination of filter drains and/or swales; surface water discharges are restricted via Hydrobrake from the detention basin to the surface water culvert. A provisional outline of the surface water drainage plan is shown in Figure 5.

Preliminary Surface Water Modelling

Preliminary results from surface water drainage modelling detailing discharge rate, detention basin size and maximum resulting water level from the 1 in 100 Year plus 40% Climate Change event are shown in Table 2. Design and Construction Guidance (Water UK) gives a number of estimates for foul water flows dependent on type of industry with 0.5 litres per second per hectare given for normal industry. The discharge rates below have been agreed with the LLFA, on the basis that existing greenfield run off rate is 8.9l/s.

Surface Water Management	Parameter
Existing Greenfield Run-off Rate (2l/s/ha x 4.45ha)	8.9l/s
Proposed Surface Water Discharge Rate	5.0 l/s
Pond Size	Base Level – 26.000m AoD Top of Embankment Level – 27.400m AoD Freeboard – 300mm Total Storage Volume – 3881.1m^3
Maximum Water Level (1 in 100 + 40% Climate Change)	27.083m AoD
Estimated Additional (Treated) Foul Water Flows Discharging to Watercourse	2.27l/s

Table 2 – Preliminary Surface Water Modelling Results

Detailed modelling of the drainage system should highlight areas of efficiency, for example swales and filter drains will provide minor additional surface water attenuation and slow the time of entry compared to traditional surface water sewer systems.

The existing watercourse shall be surveyed prior to construction to assess the condition of the existing culvert.

Surface Water Flood Risk

The proposed development is predominantly at very low risk of flooding from surface water run off however; a small area of low to medium risk areas are present in the central southern area and an area of medium to high risk exist in the north eastern corner of the development. This information is presented in Figure 6 and Figure 7.

The discharge rates above offer a betterment to the existing arrangement and therefore reduces the risk to flooding downstream of the development.

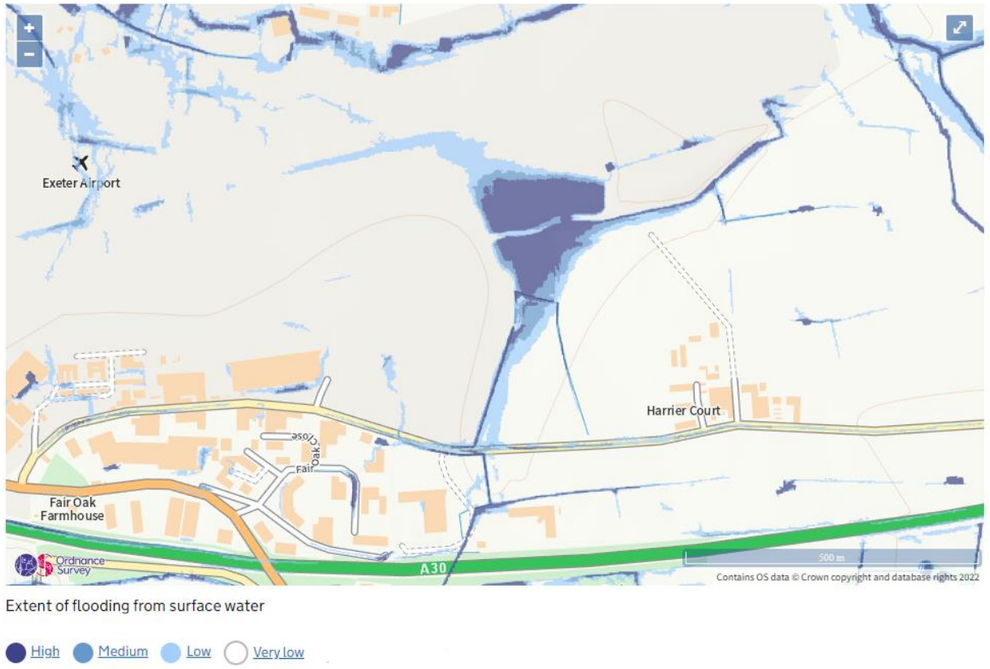

Figure 6 – Surface Water Flooding Risk

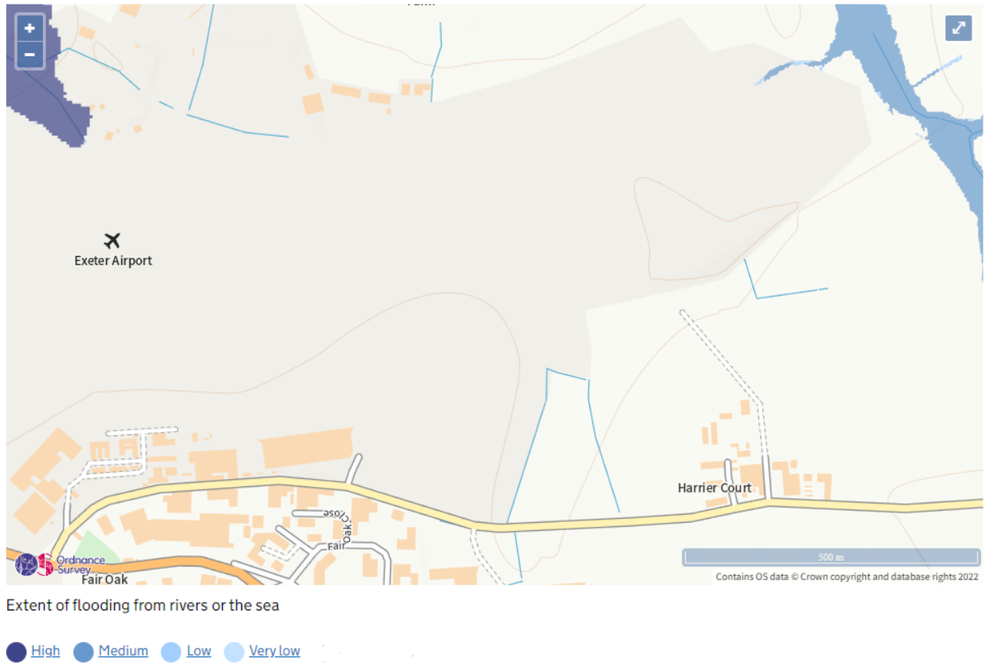

Figure 7 – Rivers and Sea Flooding Risk

Airport Safeguarding

Exeter Airport is subject to "Safeguarding of Aerodromes" and any proposed development located within the vicinity of Exeter Airport will have a number of factors and restrictions to account for in the development.

SuDS features can provide habitats for wildlife and birds, this is of particular concern to Exeter Airport. Advice Note 3 for "Safeguarding of Aerodromes" covers Wildlife Hazards around Aerodromes and has the below table noting the specific bird species concerns dependent on development type which is presented in Table 3.

Development Type	Specific	Species concerns
Waste Management	Landfill Composting Recycling Treatment	Feeding opportunities for potentially large numbers of scavenging birds e.g. Gulls, Corvids, Starlings, Pigeons, Raptors.
Water	Nature Reserves Reservoirs Ponds River diversions Sewage/Water Treatment	Diversity of feeding, loafing, breeding and roosting opportunities for Waterfowl, waders and Gulls e.g. Swans, Geese, Gulls, Ducks, Herons and Egrets, Wading birds such as Lapwing, Oystercatcher etc.
Wetland	Nature Reserves Marshland Reedbeds Swales SUDS Schemes Drainage schemes Flood Alleviation Works Managed retreat	Feeding, roosting, breeding and loafing for Waterfowl, passerines, *hirundines* e.g. Swans, Geese, Ducks, Herons and Egrets, Gulls, Wading birds etc and potential for large Starling or Swallow roosts to form (e.g. Reedbeds).
Sports Facilities	e.g. Golf course open grassland, watercourses, fishing lakes, sailing clubs	Landscape developments risking feeding, loafing and breeding opportunities for different species such as Canada Geese, Gulls, Pigeons, Corvids, Starlings, Herons and Egrets etc.
Developments	Housing, Factories Industrial Estates / Units Mineral extraction Green roofs	Diverse human factors and built environment providing food and shelter for urban species such as Pigeons, Gulls, Corvids, Starlings etc.
Rural	Woodland plantations Pig rearing facilities Poultry facilities	Potential feeding, nesting and cover for species such as Pigeons, Gulls, Corvids, Starlings, Game birds etc.
Energy	Solar farms Tidal barrage Energy plantations	Potential perching opportunities and feeding for raptors. Changes to waterfowl and passerines distribution

Table 3 – Safeguarding of Aerodromes – Advice Note 3 Development Type Table

Airport Safeguarding is not just concerned with the finished construction project, it needs to be considered throughout the lifespan of the project; Advice Note 3 offers and example of concerns typically associated with Industrial Estate Developments as per Table 4.

Development	Type	Attraction
e.g. Industrial Estate Development	Development site - ground works	Corvids, Gulls & Scavenging birds feeding on soil invertebrates
	Development site - standing water	Loafing or bathing Gulls and dabbling ducks (Mallard). Potential for fish eating birds (e.g. Grey Heron)
	Development site - human factors	Workers cafeteria or mobile food outlet; waste food attracting Feral Pigeons, Starlings, Corvids or Gulls.
	Construction works	As above
	Construction works - buildings	Unfinished buildings providing nesting grounds for Feral Pigeons
	Completed works - rooftops	Open flat roofs – breeding grounds for roof nesting Gulls
	Completed works - landscaping	Tree planting or hedgerows presenting nesting opportunities for Woodpigeon / Rook and berry, fruit or nut provision providing food for Thrushes, Starlings, Pigeons etc.
	Completed works - SUDS	Drainage swales resulting in streams, ponding / open grassland etc. suitable for waterfowl.

Table 4 – Safeguarding of Aerodromes – Advice Note 3 Industrial Estate Development Risks

As part of the Wildlife Management required for "Safeguarding of Aerodromes", Sustainable Drainage Systems (SuDS) need to have no permanent water level present and the following storm events must drain within specified timeframes to avoid the need for bird exclusion measures:

- 1 in 100 year storm event to drain within 14 days
- 1 in 1 year storm event to drain within 1 to 4 days

SUDS will require continual monitoring to ensure water does not persist beyond these requirements. Further engineered bird mitigation measures will be needed if the above is not achieved; it is our current intention for SuDS features on the development to be dry and comply with the required drain down times stated above.

03 Drainage Strategy

Water Quality and SuDS Maintenance

Water Quality

Surface water drainage proposals need to ensure suitable water quality is achieved prior to the development discharging to a watercourse. CIRIA 753 - The SuDS Manual details the “Simple Index Approach” to managing water quality on developments, this approach assigns an index value to risk factors dependent on land use classifications.

Further mitigation index values are assigned to sustainable drainage features such as detention basins and swales; provided the total mitigation indices exceed the risk factor indices then suitable water quality is achieved.

The proposed surface water drainage strategy incorporates filter drains, swales and a detention basin which should provide adequate mitigation indices for the proposed development.

Drainage System Maintenance

The drainage system including the detention basin, filter strips/drains, pipework, manhole chambers/catch pits, Hydrobrake and associated inlet/outlet headwalls will be subject to a routine monitoring and maintenance schedule as part of the general site management.

Surface water drainage systems will be maintained in accordance with guidance and recommendations from CIRIA 753 – The SuDS Manual and where applicable any relevant manufacturer information (e.g. Hydrobrake).

Foul water treatment systems are to be maintained in accordance with manufacturer instructions and recommendations.

Conclusion

This document illustrates that it is feasible to provide both foul water and surface water drainage to the proposed Power Park Development located south of Exeter International Airport.

Preliminary modelling shows suitable storage capacity for surface water flows with treated foul water flows from development treatment plants discharging directly to the watercourse. Sustainable drainage features ensure water quality for surface water flows from the development, package treatment works will treat effluent to agreed Environment Agency standards prior to discharge to the watercourse.

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