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Surface Water proposals

Client
Dallol.

Our Ref J2184

Date 9-Apr-18
By Engineer MSH

Surface Water Proposals

J2184 - Chelveston.

Client: Dallol.

The Site

The total site area, calculated from the proposal drawings is 2.1Ha.

The plan area of the proposed buildings is 4166m^2, if we include roof area, the area is 5000m^2 due to roof pitch.

Including the additional roof area taking into regard roof pitc, the total effective area of the site is considered to be 2.18Ha.

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Existing Drainage.

The existing site is situated over two levels with a fall of 1.4m between the southern boundary which sits at 90.4m AOD and the northern boundary at 89.0m AOD. It is made up of 95% concrete hard standing upon which a derelict and defunct agricultural type building now stands along with two similar units used to store tyres. The structure has no effective rainwater collection system. The whole site drains to a point at the north east point of the hard stand. Water then flows through an existing pipe to a brick transfer chamber before being allowed to discharge into a small pond which then drains via the field into a channel which becomes a brook to the north west end of the entire site.

The site was previously part of Chelveston Air base and the drainage system built for that purpose still exists, has full integrity and is in use. The existing drainage system was built to accommodate rain water runoff from a far larger area of concrete, (being the runways that were broken up and removed to be used as hard core during the construction of Milton Keynes in the 1970s.) Approximately 1/3 of the old airfield drains to the culvert and stream that then runs past Chelveston village and eventually into the River Nene. Our enquiries reveal that there is no history of any flooding in Chelveston in living memory. The area is categorised as having the lowest level of flood risk according to Environment Agency data.

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Proposed Drainage

The proposals intend to create a comprehensive drainage system for the site. The system intends to maintain the disposal of the surface water via the existing method, albeit with a more comprehensive on site catchment system, and with run-off attenuation.

The rate of discharge into the existing drainage system is not known and there is currently no evidence of any existing attenuation system.

The development proposals increase the effective impermeable area on site by 834m^2, that being mainly due to the roof pitch to the proposed buildings. However, it is considered necessary to design a drainage system with underground storage capacity for a 1 in 30 year return rainfall event, and for additional surface water from a 1 in 100 year return event to be retained on site avoiding flooding to third party land.

A discharge rate of 5ltrs/sec has been used to calculate required attenuation storage. The is, in our opinion, regarded as an appropriate discharge rate considering the site already has evidence of positive draining via the existing system.

Attenuation storage calculations have added an additional 30% to account for climate change and have yielded a total attenuation requirement for 4746m^3 for storm water from a 1 in 100 year return rainfall event. Calculations also show the need to store 2606m^3 below ground for a 1 in 30 year return event.

The 1 in 30 year attenuation requirement can be accommodated for within storage cells 35m x 28m x 2.8m deep.

Surface water from the attenuation storage system can then discharge at 5ltrs/sec into the existing system.

The location of the below ground attenuation is to be located with the adjacent field to the east. The developer should be advised to have written confirmation of an agreement with the adjacent land owner to carry out these works.

Additional surface water generated from a 1 in 100 year return rainfall event would be accommodated for above land but kept within the confines of the development site.

Available hard standing space on site is approximately 3445m^2, while the calculated additional surface water generated from a 1 in 100 year event is 16,800m^3.

This surface water across the site results in a total flood depth of 127.3mm. This can be adequately contained within the site using 150mm raised kurb edging to border the edge of the site. A raised “speed bump” on the vehicular access to the site would prevent surface water discharging into the highway.

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This drainage scheme is considered to be the most appropriate plan for the development proposals considering the existing site currently positively drains, albeit via an inadequate (to current standards) on-site drainage system.

The proposed design significantly reduces run-off compared to the existing system and ultimately the brook to the north of the site and also helps reduce overland run-off across the site and reduces flooding affects to third party land. Therefore, the implementation of the managed drainage system is not only beneficial to the site, but is also beneficial in terms of reducing flows into Chelveston Brook, which in turn will help alleviate flood risk to Water Lane.

J2184 - Chelveston

Copas Formula 1 in 30yr Return

1

09 April 2018

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1. Copas Formula 1 in 30yr

1.1 Calculate the Required Storage Capacity

Return Rainfall Event (I)	=	30	years		
Restricted Discharge Rate (Q)	=	5	litres/ sec		
	=	**0.005**	m^3/ sec		
Impermeable Area (A_p)	=	21800	m^2		
	=	**2.180**	ha		
Storage Capacity Required (C_{req})	=	**1999.56**	m^3	plus30%	**2599.4** m^3

1.2 Calculate the Provided Storage Capacity - Option 1: Pipe Network

From storage capacity within SW drainage system = m^2

1.2 Calculate the Provided Storage Capacity - Crate storage (95% void ratio)

Pond Depth (d)	=	2800	mm	
Pond Length (L)	=	35	m	
Pond Length (W)	=	28	m	
Pipe Capacity (C_{prov})	=	**2606.80**	m^3	(Approx. Pond)

1.3 Design Check

Total Capacity = Option 1 + Option 2

2606.80	>	2599.43	Design OK

∴ Pipe and/or Pond has Sufficient Capacity

2. Copas Formula 1 in 100yr

2.1 Calculate the Required Storage Capacity

Return Rainfall Event (I)	=	100	years	
Restricted Discharge Rate (Q)	=	5	litres/ sec	
	=	**0.005**	m^3/ sec	
Impermeable Area (A_p)	=	21800	m^2	
	=	**2.180**	ha	
Storage Capacity Required (C_{req})	=	**3650.68**	m^3	plus30% **4745.9** m^3

2.2 Capacity already within attenuation storage from 1 in 30yr event

= **2606.80** m^3

2.3 Remaining surface water run-of to be stored above ground.

= **2139.09** **m^3**

2.4 Total flood depth on site

available site area = 16800 **m^2**

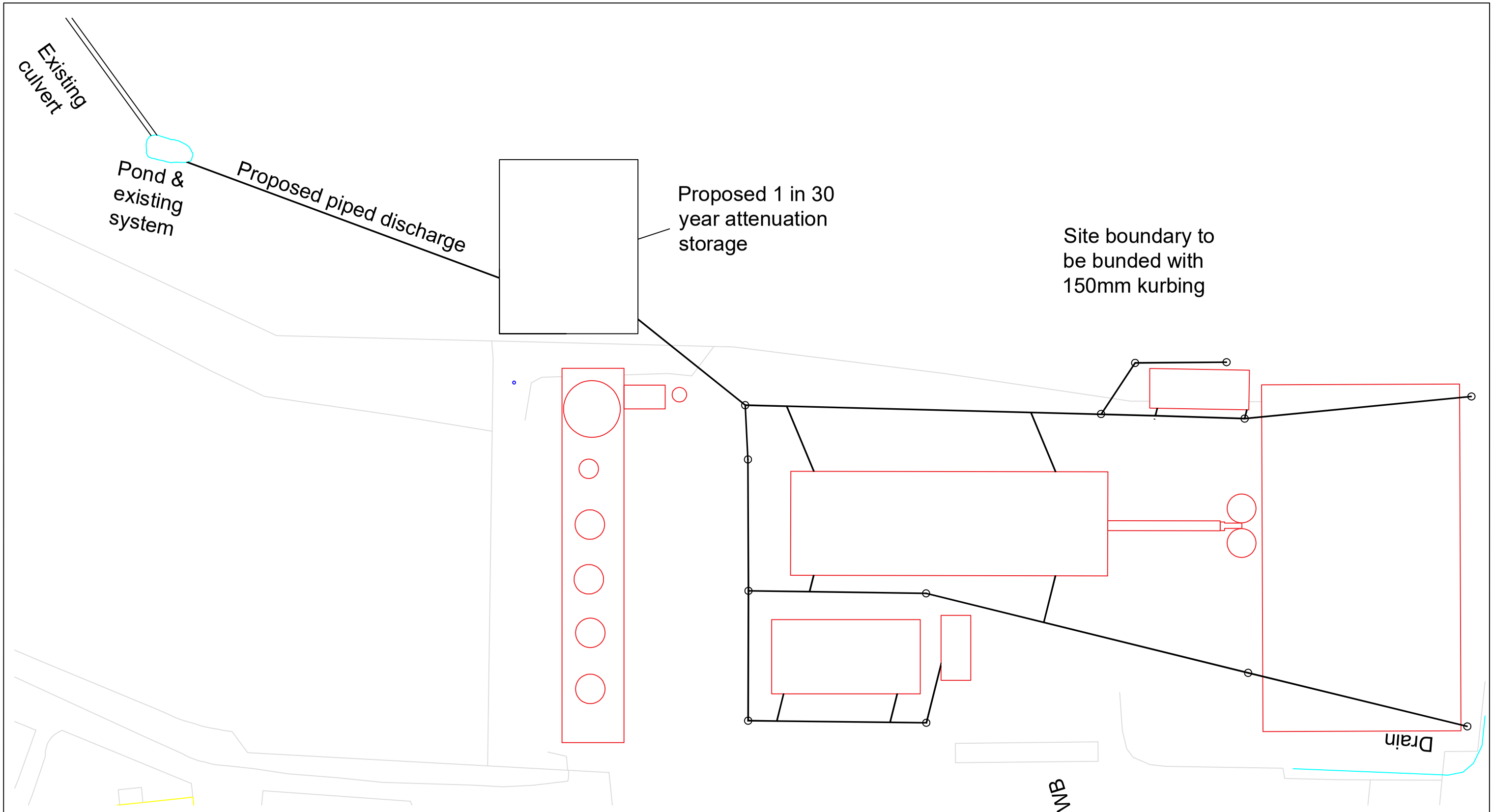
1 in 100 year flood depth = **127.32665** **mm**

Run-off from 1 in 100 year event can adequately be stored within curtilage of site.

2.6 Copas Formula Definition

$C = 8.02 \times A_p^{1.5} \times I^{0.5} \div Q^{0.5}$

Where:
- C is the Storage Capacity required in m3
- A_p is the impermeable area in hectares
- I is the return rainfall event in years
- Q is the (restricted) rate of outflow from the storage area in cumecs (m^3/s



PLAN VIEW

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