Cooper, Kerri

From:	James Calvert
Sent:	19 October 2010 15:50
To:	planningliaison@anglianwater.co.uk
Cc:	Neil Waterson; Hopkinson, Rona
Subject:	612263 NW Haverhill - Surface Water Discharge
Follow Up Flag:	Follow up
Flag Status:	Blue
Attachments:	612263_L_AW_191010.pdf

FAO Carly Summers,

ref 1405/HAV2(006)

Please see the attached letter in response to your letter dated 7 October setting out the discharge rates that AW are prepared to accept, unfortuantly we do not agree with these rates. I have spoken with Jason Swatman regarding the discharge rates and he indicated that he would be able to reply within 5 days of our response. There is a meeting with the landowners on the 28th and so we would much appreciate it if this timescale could be met.

I look forward to hearing from you.

Regards,

James Calvert
Chartered Engineer
E:

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Our ref: JJH/612263/JRC

Your ref: 1405/HAV2(006)

19 October 2010

Carly Summers
Planning & Equivalence
Anglian Water Services Ltd
PO Box 1067
Peterborough
PE1 9JG

Dear Carly,

North West Haverhill, Suffolk - Planning ref: SE/09/1283

Further to our previous correspondence dated 15th September 2010 and your response of 7th October 2010 we are writing to request that you reconsider the maximum discharge rates that you would be prepared to accept.

In our letter of 15th September 2010 we set out the existing green-field run-off rates from the development which drain via the on site ditch network to the Anglian Water (AW) sewers, these rates are:

Return Period (years)	Green-field Run-off Rate (l/s/ha)	Watercourse A (19.1ha) (l/s)	Watercourse B (14.3ha) (l/s)
1	1.99	38.0	28.5
30	5.41	103.3	77.4
100	7.43	141.9	106.2

The AW letter stated that the maximum discharge that would be permitted to the AW sewers would be the equivalent of the 1 in 1 year green-field run-off rate. This is not acceptable to our client as it is overly onerous and contrary to best practice. There are a number of current design guide references to support our view, including:

Drainage of development sites – a guide (x108) (CIRIA/HR Wallingford)

Section 8.2.2 states that the requirement to limit discharge to the 1 in 1 year green-field run-off rate does not reflect the natural catchment run-off characteristic and can be an onerous criterion to meet.

8.2.2 Regime in the receiving watercourse

A major principle behind most of the SUDS techniques is the reduction and attenuation of flows. Current practice often involves the provision of balancing storage to reduce runoff rates from impervious surfaces for the 100-year event to that equivalent to a 1 in 1-year greenfield runoff rate for the undeveloped site. Such a philosophy does not reflect the natural catchment runoff characteristics and can be an onerous criterion for a developer to meet. However, uncontrolled runoff from pipe systems is highly undesirable as it causes rapid runoff, with spate river flows potentially creating downstream flooding, erosion and stressful environments for flora and fauna in receiving waters.

The SUDS Manual (C697) (CIRIA)

The extract below (Table 3.1 of CIRIA 697) states that Drainage systems should aim to replicate the natural rainfall run-off processes occurring on the site, pre-development.

Table 3.1 *Principles driving drainage design criteria selection*

Principles	Objectives
Level of service	1. Flood protection should be provided to a minimum level of service. 2. Risks to people and amenity benefits should be addressed (including safety).
Sustainability	1. Drainage systems should aim to replicate the natural rainfall-runoff processes occurring on the site, pre-development. 2. Water quality treatment should minimise environmental impact. 3. Ecological benefits should be maximised. 4. Drainage systems should aim to utilise natural resources that can be reused and are energy efficient in terms of constituent products, construction processes and operation and maintenance activities.
Cost	1. A Whole Life Cost analysis of the system should demonstrate cost-effectiveness (through option appraisal) and financial viability (through security of long-term funding).

The extract below (see section 3.2.3 of CIRIA 697) clearly states that the rate of discharge should be limited to the equivalent **Greenfield Runoff Rate** for the site. This infers a like for like discharge for any given storm return period.

Runoff rate

Development runoff, if allowed to discharge unchecked, will flow into receiving waters at orders of magnitude faster than from the undeveloped site. This can cause flash flows in the river and increased frequencies of bankfull flows.

3 – 4 CIRIA C697

Such an impact is likely to cause scour and erosion that could seriously affect the morphology and ecology of the stream.

The rate of discharge of the urban runoff to the receiving water should be limited to the equivalent **Greenfield Runoff Rate** for the site via the provision of storage (**Attenuation Storage**) and flow constraints (**Downstream Flow Controls**). The flow control will constrain the rate of discharge, and the attenuation storage will fill when the rate of inflow from the upstream drainage system is greater than the allowable rate of discharge to the receiving watercourse. The attenuation storage will empty once the event has passed.

The extract below (Table 3.5 of CIRIA 697) states that the rate of discharge from the 100 year event should be less than **OR** equal to the existing 100 year greenfield run-off rate; our proposal will meet this criterion.

Table 3.5 *Summary of SUDS design criteria*

Criteria	Design event	Design objective
Hydraulic		
Protection against flooding:		
Protection against flooding from watercourse.	Catchment, 100/200 year event.	Control risks to people and property. Floor levels = Max river level + appropriate freeboard
Protection against flooding from drainage system.	Site, 10/30 year event.	No flooding on site, except where planned and approved.
	Site, 100/200 year event.	Control risks to people and property. Floor levels = Max flood storage levels + freeboard.
Protection against flooding from overland flows.	Site, 100/200 year event, short duration events.	Planned flood routing and temporary storage accommodated on site.
Protection against flooding from adjacent land.	Adjacent catchment, 100/200 year event.	Planned flood routing.
Protection of watercourse:		
Rate of discharge.	Catchment, 1 year event.	*Attenuation storage* to control 1 year site discharge rate to ≤ 1 in 1 year greenfield peak rate (or 2 l/s/ha).
	Catchment, 100/200 year event.	100/200 year site discharge rate to ≤ 1 in 100/200 year greenfield peak rate.
	All events.	Where possible, *interception storage* to prevent runoff from first 5 mm of rainfall.
Volume of discharge.	Catchment, 100 year event.	Where possible, *long-term storage*/ infiltration to control 1 in 100 year discharge volume to ≤ 1 in 100 year greenfield volume. Usually applied to 6 hr event.

Reducing flood risk

One of the Key Planning Objectives of Planning Policy Statement 25 (PPS25) is 'reduce flood risk to and from development...'.

With this in mind we set the surface water discharge rates from the site at existing equivalent greenfield run-off rates and this has been agreed with the EA. This includes for the 100 year rainfall event, inclusive of 30% allowance for climate change, to discharge at a rate not exceeding the existing 100 year greenfield run-off rate. This reduces the future flood risk downstream of the development by attenuating flows which could otherwise have caused flooding.

In addition we have not applied any increase to the greenfield run-off rate to take allowance for climate change for any of the rainfall events. The extract below (see section 3.2.4 of CIRIA 697) discusses that fixing greenfield discharge rates to existing values may be considered as too conservative an approach and that a 10% uplift could be applied.

Hydraulic performance accounting for climate change

It is recommended that the factors given in Table 3.2 are applied when accounting for climate change in the design of drainage systems. As a precaution it is advised that the same uplift is not applied to the calculated flow rates for greenfield runoff. This provides an additional safety factor on the uncertainty related to climate change. However the uncertainty associated with change in rainfall characteristics is much greater than sea level rise. The use of 20 per cent or 30 per cent increase in rainfall intensity for design horizons after 2055 will result in storage volumes that are 50 per cent greater than present day rainfall. Fixing greenfield runoff criteria to present day conditions may therefore be considered as being rather too conservative an assumption in this situation. It is therefore suggested that as predictions for greenfield runoff have not been related to climate change that rainfall intensity increases are kept to 10% (for normal development design horizons) to allow the continued use of current greenfield runoff equations for assessment of storage, and that all aspects of conveyance and flood routing should use the factors given in Table 3.2.

Capacity of Discharge Pipes

During discussion with your Jason Swatman, concern was raised over the capacity of the existing pipes forming the connection into your system which the watercourses discharge into. The particular concern expressed was that those pipes would throttle discharge rates causing backing up and flooding either on site or flowing off site overland.

We have undertaken calculations to demonstrate that the pipes can accommodate the full greenfield flows including the 100 year condition and a copy of these is attached. These calculations demonstrate that with just a small amount of head (1.0m available in each watercourse without flooding as conservatively estimated following a site visit), there would be more than adequate capacity within the pipes to accept the flow from the 100 year greenfield run-off.

The calculations show that watercourse A can discharge 496.1 l/s to the sewerage system and that watercourse B can discharge 350.6 l/s to the system. The proposed run-off rates from the development are substantially less than these capacities.

Summary

The existing site discharges at greenfield run off rates into watercourses which are currently connected to and which discharge into the Anglian Water sewerage system. Anglian Water currently accept these flows for all storm intensities.

The proposed discharge arrangements remain unchanged. The developed site will still discharge into the same existing watercourses and ultimately via the existing connections into the Anglian Water system.

Proposed discharges will be attenuated to rates no greater than the existing run-off into the watercourses and it is further proposed to limit the 100 year climate change run-off to the existing 100 year run-off rate in accordance with good practice and as agreed with the EA.

The surface water drainage proposals will reduce the volume of water discharging to the Anglian Water surface water sewerage network with respect to increased run-off caused by climate change and will therefore reduce flood risk downstream from the site.

The drainage solution meets the requirements of current design guidance, notably PPS25, CIRIA 697 'The SUDS Manual' and "Drainage of Development Sites – A Guide (X108) in reducing flood risk.

In addition to these measures the development will incorporate rainwater harvesting techniques to reduce the volume of surface water run-off from the site, this includes a novel approach to harvesting rainwater for reuse on the proposed allotments and elsewhere.

On this basis we trust that you will now revise your position and agree to the proposed discharges which maintain the existing run-off regime and reduce flood risk. In addition we would appreciate your confirmation that you will not object to the planning application once these discharge rates are agreed.

As discussed, we would appreciate an early response to avoid any delays to the planning process.

Yours sincerely

James Calvert
Chartered Engineer

Enc: Calculations

Copied to: Neil Waterson – Bidwells
Jason Swatman – Anglian Water
Rona Hopkinson – SEBC

PROJECT			MADE	REF	
North West Haverhill			JRC	612263	MLM
SECTION			CHECKED	SHEET NUMBER	
ESTIMATION OF PIPE CAPACITY				1	
REV	DATE	DESCRIPTION	DATE	COMPANY	
			19.10.10	MLMCE	www.mlm.uk.com

This spreadsheet is used to esitmate the capacity of the pipe under discharging to the rear of Forest Glade (Watercourse A), and is based on the formula below which gives the velocity of the flow.

V = -2 √ 2g D Sf   log (Ks / 3.7D + 2.51v / D√2g D Sf)

is taken from Chadwick and Morfett 'Hydraulics in Civil and Environmental Engineering' 2nd Ed, page 102, equation 4.16.

Where:

V =	velocity	
g =	gravity	(9.810)
D =	diameter of the pipe	(0.400)
Sf=	difference between inlet and outlet of pipe / length	(0.056)
Ks =	surface roughness (m)	(0.0015)
v =	$1.13 \times 10^{-6}\ m^2 / s$	

This gives a velocity of the flow of **3.948 m/s**

To calculate the flow through the pipe

Q = V A

where

Q = flow
V = velocity
A = cross sectional area of pipe

V = 3.948
A = 0.126

Q = 0.496 m^3/s^{-1}
496.1 l/s

PROJECT			MADE	REF	
North West Haverhill			JRC	612263	MLM
SECTION			CHECKED	SHEET NUMBER	
ESTIMATION OF PIPE CAPACITY				2	
REV	DATE	DESCRIPTION	DATE 19.10.10	COMPANY MLMCE	www.mlm.uk.com

This spreadsheet is used to esitmate the capacity of the pipe under discharging adjacent to Gurlings Close (Watercourse B), and is based on the formula below which gives the velocity of the flow.

V = -2 √ 2g D Sf   log (Ks / 3.7D + 2.51v / D√2g D Sf)

is taken from Chadwick and Morfett 'Hydraulics in Civil and Environmental Engineering' 2nd Ed, page 102, equation 4.16.

Where:

V =	velocity	
g =	gravity	(9.810)
D =	diameter of the pipe	(0.400)
Sf=	difference between inlet and outlet of pipe / length	(0.028)
Ks =	surface roughness (m)	(0.0015)
v =	1.13 X 10¯ 6 m² / s	

This gives a velocity of the flow of **2.790 m/s**

To calculate the flow through the pipe

Q = V A

where

Q = flow
V = velocity
A = cross sectional area of pipe

V = 2.790
A = 0.126

Q = 0.351 m^3/s^{-1}
350.6 l/s