WAPUG Autumn 1988 Meeting

The Albany Tank Sewer

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In 1985 Trevor Crocker & Partners were commissioned by an Ipswich based house builder to design drainage works that would enable planning permission to be granted for a site that they had owned since 1965.

The centre of Ipswich suffers from extensive flooding from storms of less than 1 in 2 year frequency and the problem is largely due to the surrounding steep topography plus the fact that most of Ipswich is served by a combined sewerage sytem.

Preliminary investigations of the Tuddenham Valley Sewer, situated adjacent to the site, revealed that the average gradient was 1 in 30 and that the flooding from it is due to the short duration and high levels of surcharge resulting from the high velocities and short times of concentration. A flow detention system would therefore be particularly effective and a wassp model of the sewer's catchment was created and simulations demonstrated the considerable benefits of a modestly sized detention tank associated with the proposed development.

A design was prepared to comply with criteria for elimination of flooding from 1 in 20 year events as specified by the Adopting Authority. The existing sewer would be diverted into the greenfield development site where a tank sewer (2.4 m diameter) was to be constructed in open cut. The flow returned to the existing sewer via a Hydrobrake. The tank was designed to store only the peak flows and the Hydrobrake allowed the early flows from the tank to be maximised.

The use of the Wassp SIM program throughout the design process allowed the design to be progressively refined and allowed the maximum discharge without flooding to be determined which resulted in the minimum storage volume necessary.

Some months after completion of the design and receipt of planning permission but before construction commenced a site further upstream was then released for development with the result that a larger tank was now required. Furthermore the Borough Council had now completed their drainage area plan and a different set of design criteria were set including protection against flooding for 1 in 25 year events. These revised criteria required major changes to the previous design, the most fundamental being that the downstream system was no longer capable of receiving unattenuated 1 in 25 year flows for the period up to maximum rainfall intensity. The very short time of concentration along other contributing branches downstream of the site caused high peak flows to occur which took up most of the available capacity.

A Hydrobrake type control device was therefore inappropriate because the early flows now also needed to be attenuated. A single orifice small enough for the early flows was found to be too small for the later flows when downstream capacity was available. The use of multiple outlets at various levels was investigated. The best arrangement comprised a two stage storage system with the upstream tank discharging via an orifice to the downstream tank which was also controlled by a single orifice.

The cost of the tank sewer construction is being met by the developers as are all design and supervision fees. The construction cost of the original tank was approximately £350,000 and this has risen to approximately £500,000.

DISCUSSION NOTES

Technical Session 3
Paper 3.1 Discussion

P.Ambrose ; Bournemouth B.C.

You said that a 60 minute storm was the critical duration, did it alter after you had included your attenuation option in the model ?

R.Allitt ; Trevor Crocker & Ptnrs

This didn't prove to be the case.

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D.Beale : Howard Humphries

Did you base your design just on summer storms ?

R.Allitt

Yes, the real problems occurred during the summer.

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D.Wright ; Applied Research

Level prediction in WASSP is generally unreliable. Did you regard the "225mm below GL" surcharge requirement as reasonable ?

R.Allitt

Our client wanted the planning permission and therefore agreed to whatever the local authority said.

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D.Prebble ; Shipwey D.C.

Why did you include a dummy pipe d/s of orifice no. 1 ?

R.Allitt

The model was unstable without this dummy pipe, for reasons we were not entirely sure of.

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C.Jefferies : Dundee College of Technology

How did you justify such precise sizing of orifice diameters ?

R.Allitt

They were refined to meet the stringent requirements of the local authority.

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D.Balmforth : Sheffield City Polytechnic

I would like to take up the point about using different duration storms to get the maximum storage volume. Graphs showing storage against duration are usually flat, although this does depend to some extent on the inflow/outflow ratio. I am not convinced that in longer events the return period of rain correlates with the return period of flooding and full storage-tanks.

J.Packman ; IH

By using a range of durations you are in some way moving outside the WASSP calibration data - however I accept that R.Long's method is probably the only practical way-forward.

D.Wright ; Applied Research

Is it the case that the return period of surcharging is generally greater than the return period of rain, and that design is therefore conservative ?

D.Balmforth

Generally, yes.

J.Packman

Internationally, synthetic design storms are being recognised as inappropriate when applied to storage, and that Time-Series Rainfall is the way-forward.

R.Henderson ; WRc

We are looking at synthetic storms vs. TSR in one catchment where there is a 12 year record of observed data. The design storms would appear to be underestimating storage volume requirements by about 10%, but much more work is needed before any conclusive evidence can be published.