6. FLUVIAL FLOOD RISK – DETAILED ASSESSMENT

6.1 Estimating Peak Flood Flows

The catchment area for the stream, shown outlined blue on Figure 6-1, measures 1.0 km^2.

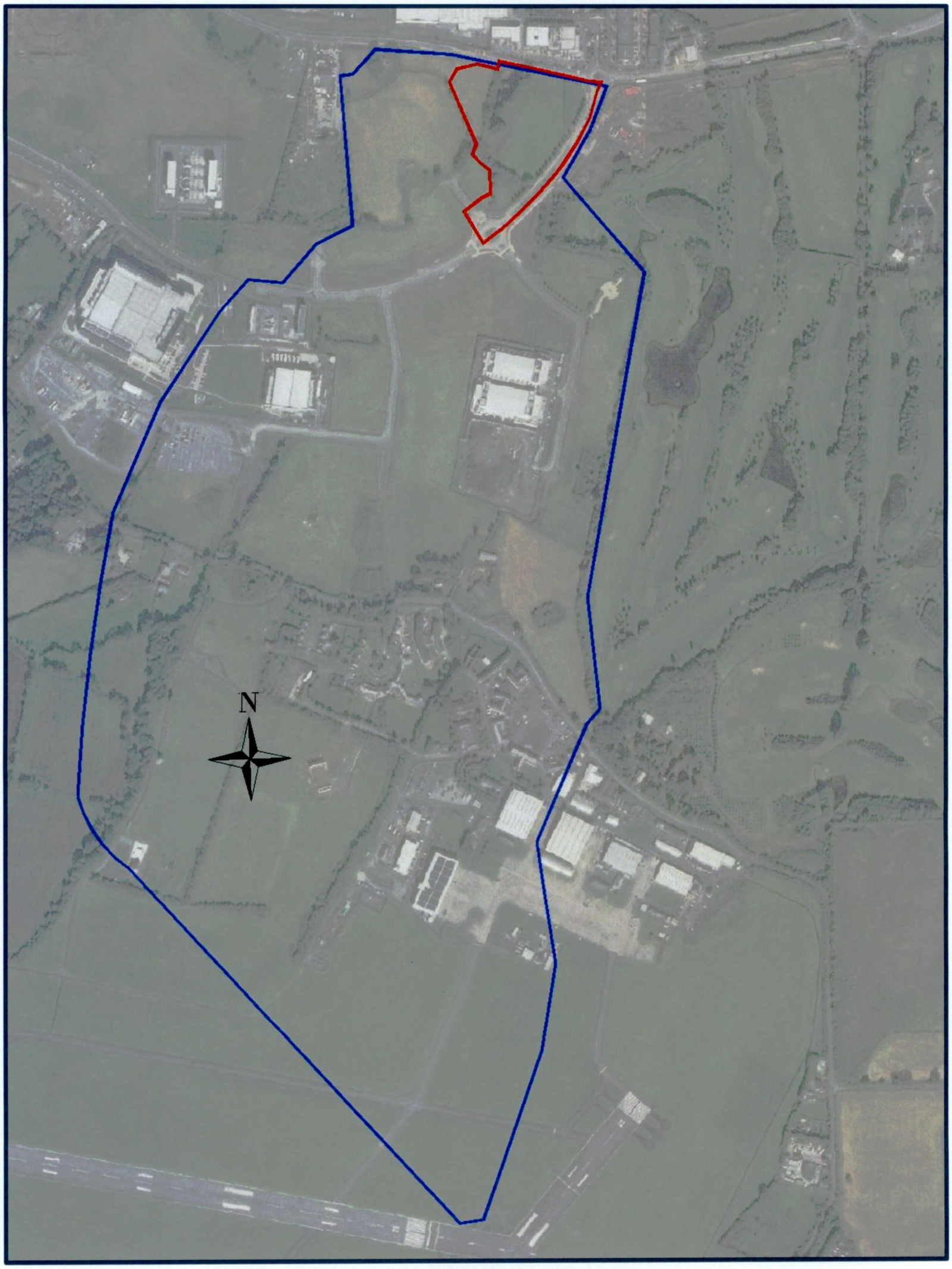

Figure 6-1 Catchment Area for Stream

The OPW provides a Web Portal for estimating peak flood flows in natural catchments (Flood Studies Update (FSU) Web Portal). While the use of this portal is generally considered best practice for the estimation of flood flows, the portal advises particular caution where peak flows are being estimated for catchments of less than 25km^2. Accordingly, peak flood flows were estimated using statistical methods for ungauged small catchments.

Table 6-1 shows a number of Physical Catchment Descriptors taken from the FSU portal that were used to estimate peak flood flows.

PCD	Value	
BFISOIL	0.5199	
SAAR	714.82	mm
FARL	1	
DRAIND	0.721	km/km^2
S1085	0.1	m/km
ARTDRAIN2	0	
ARTDRAIN2	0	
URBEXT	0.3589	

Table 6-1 Physical Catchment Descriptors from FSU Web Portal

Initially, various alternative statistical methods were used and the results of these are reproduced in Table 6-2 (details of these calculations are included in Appendix B). All flow estimates include a climate change factor of 20%.

Typically, peak flow estimates for the 1% AEP flood event are below 1.0m^3/s. The only exception is the flow estimate given by IH124 which is over three times the next greatest estimate and not consistent with the size of the catchment and the drainage infrastructure in the area. IH124 it generally considered to over-estimate peak flood flows *{WP4.2 Flood Estimation in Small and Urbanised Catchments – OPW 2012}*. Therefore, the IH124 flow estimate will not be used and instead the flow estimates used will be the next greatest; i.e. those given by the FEH-Statistical method.

Method	1% AEP	0.1% AEP
	m^3/s	m^3/s
IH124	2.79	3.69
FSU Update	0.47	0.64
FSU-3V	0.14	0.18
FSU_7V	0.37	0.51
FEH-Statistical	0.89	1.20

Table 6-2 Estimates for Peak Flood Flows

6.2 Pre-development Hydrological Model

A hydrological model was prepared to simulate flow patterns during the 1% and 0.1% AEP rainfall events. This model was developed using the River and Flood Analysis module of the industry standard package Infrastructure Ultimate Design Suite produced by Autodesk. The hydrological modelling within this module is itself based on the HEC-RAS modelling software produced by the US Army Corps of Engineers.

The module calculates flood risk zones for the catchment based on the peak flood flows and the following:

- a terrain model created using topographical survey data;
- dimensions of culverts and other drainage structures;
- appropriate values for the roughness coefficient 'Manning's n' as determined from visual inspection of the Site.

Culvert downstream of Site

As described above, the stream is culverted downstream of the Site. This culvert comprises two 600mm diameter pipes at its inlet. A CCTV survey of the culvert revealed that one of the pipes changes to 450mm diameter approximately 20m from the inlet. Furthermore, both pipes show significant blockages that greatly reduce the capacity of the culvert; the extent of these blockages was such that the survey could not be completed for the full length of the culvert.

In regard to this culvert, the hydraulic models assumes:

- the culvert comprises a 600mm dia. pipe and 450mm dia. pipe for its entire length;
- the culvert will be cleared of all obstructions and maintained free of debris / deposition throughout the operational life of the proposed development;
- the maximum depth of deposition in the culvert will be 100mm.

Pre-Development Fluvial Flood Risk Zones at the Development Site

The map in Figure 6-2 shows the existing fluvial flood risk zones determined using the hydrological model described above. Peak water levels are as follows:

- 1.0% AEP Flood Event 72.15 m;
- 0.1% AEP Flood Event 72.53 m.

The Site was found to be not affected by either 1% or 0.1% AEP flood risk zones.

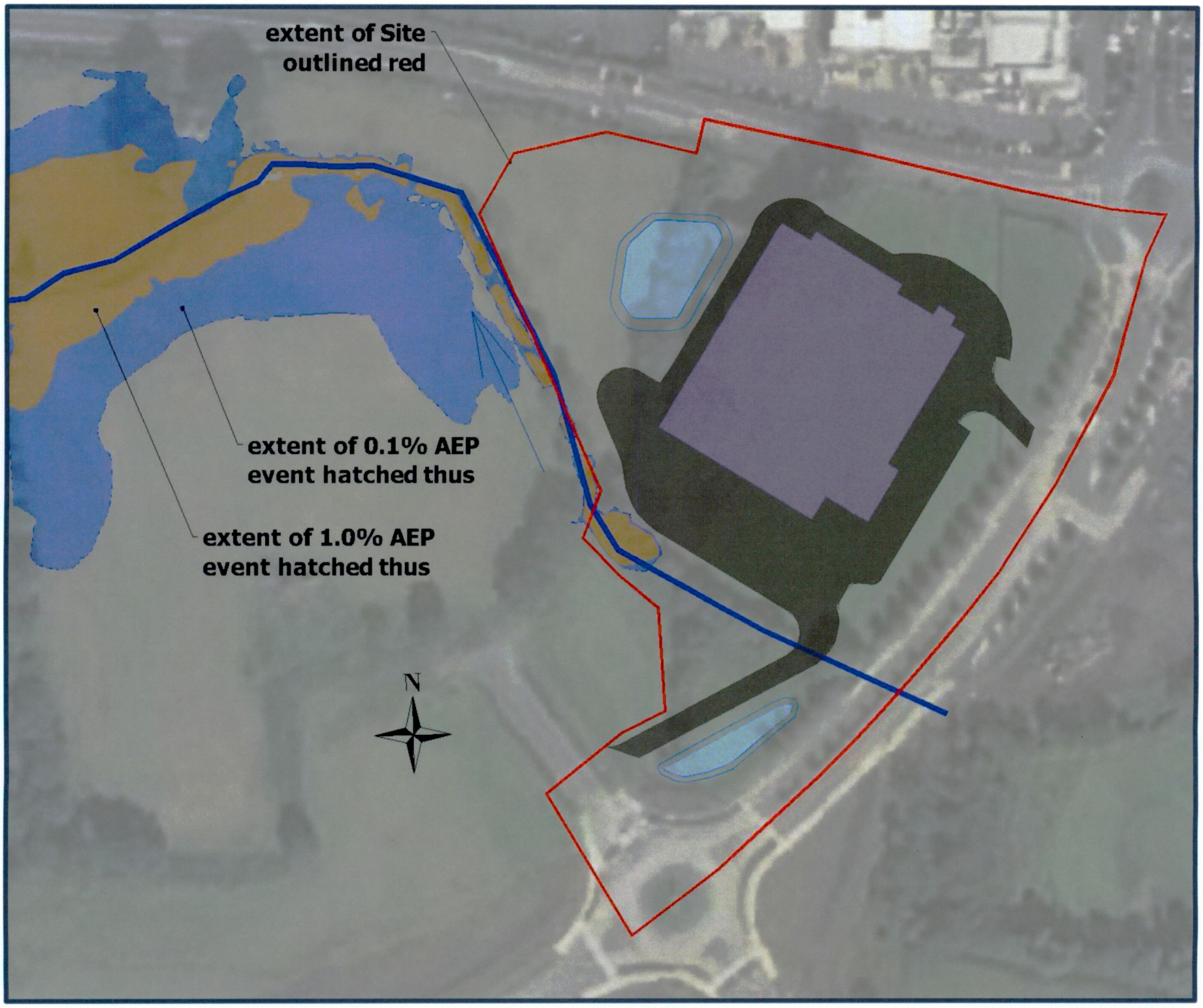

Figure 6-2 Fluvial flood risk zones - Pre-Development

6.3 Development Proposals - Surface Water Drainage

The surface water drainage system for the proposed development has been designed by Pinnacle Consulting Engineers who have provided design calculations demonstrating compliance with the Greater Dublin Strategic Drainage Study in the schedule of documents listed in Appendix A.

Full compliance with GDSDS ensures the drainage system ensures the flood regime in the receiving stream will not be affected, thus not giving rise to flood risk elsewhere.

6.4 Development Proposals - Road crossing of Baldonnell Stream

As described in Section 5.2, the Stream crosses under the Park Road through a twin-pipe culvert, each pipe 1400mm diameter. The proposed road crossing is 20m downstream from the Park Road culvert.

Figure 6-3 shows a box culvert to convey the Stream under the proposed crossing.

The internal dimensions of the box culvert are 1.4m in height and 3.5m in width and it thus has a significantly greater hydraulic capacity than that of the Park Road culvert.