Digital Communications Academy
Flood Risk Assessment

EXTRACT



- Flood Risk Assessment
- Revision 4
- 13 October 2008
- A-Site Ref: NMH_SKM_RP_002

3. Flood Risk Assessment

This section outlines the results of the flood risk assessment, which has been carried out to satisfy the requirements of PPS25.

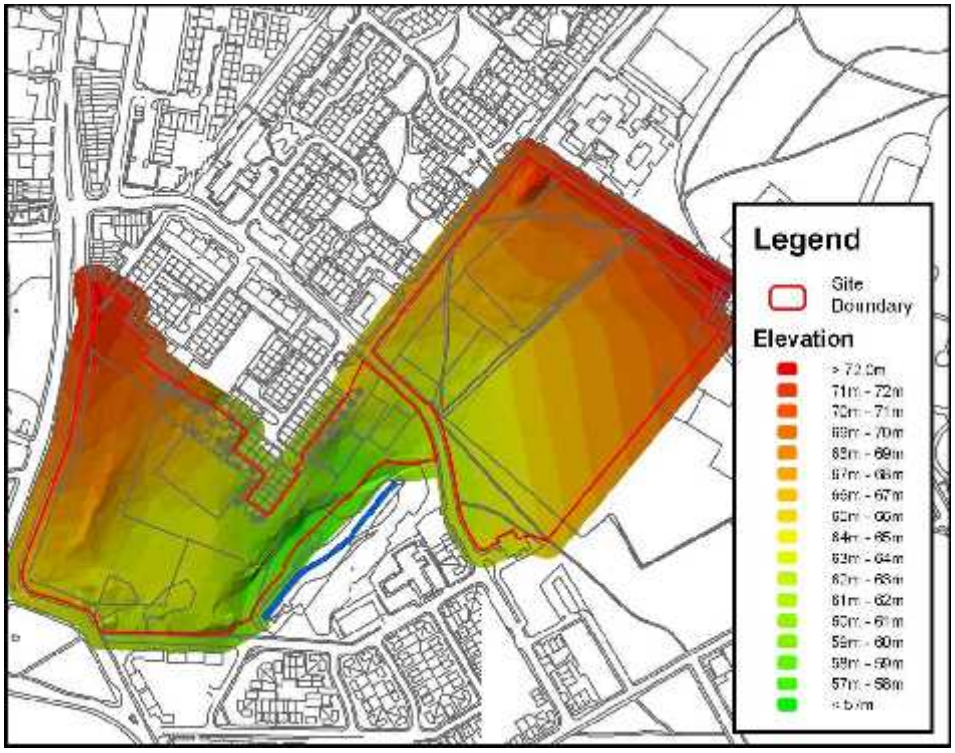
3.1 Location Plan

Please refer to Figure 1 and Figure 2.

3.2 Site Topography

Site topography generally slopes down in a south or southeast direction. The northern area of the site, above Lathbury Road slopes from 71.5m above ordnance datum (AOD) on Monsall Road to a level of 63.0m AOD on Lathbury Road. Gradients across this area of the site are generally consistent apart from a relatively steep embankment down to the site from Monsall Road and the presence of an earth mound, approximately 3.0m in height, in the northern corner of this area of the site.

Figure 4 - Site Topography



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The southern area of the site falls from a level of 63.0m AOD on Lathbury Road and 71.5m AOD on Rochdale Road, down to 62.0m AOD along Queens Road and 60.0m AOD on Silchester Drive. This fall in boundary level is reflected on the site as an irregular series of gently sloping and flatter areas. The site is bounded to the southwest by dense trees and shrubs which occupy the top and

side of a steep bank down to Moston Brook. Levels along this section of the site boundary fall to a minimum of approximately 55.0m AOD, with levels at the bottom of the bank outside the site boundary and adjacent to Moston Brook, at a level of approximately 51.0m AOD.

Figure 4 above illustrates the site topography at the proposed Academy site. Site inspections confirmed the site to be all open space with no current development and confirmed that levels across the site were consistent with surrounding highways and residential areas. Photographs of the site are contained in Appendix A at the end of this report.

3.3 Existing Flood Alleviation Measures

The site is currently not served by any reticulated drainage infrastructure and no other flood alleviation measures were noted at the site.

3.4 Potential Sources of Flooding

The main risk to the proposed development is considered to be from extreme rainfall events resulting in surcharge of proposed drainage systems. The possibility of flooding from other sources such as overland flow or groundwater is assessed below but considered less likely. Tidal flooding has not been considered due to the geographic location of the site.

3.4.1 Fluvial

OS mapping shows the only significant watercourse to the site is the Moston Brook which passes alongside a section of the site, within 10m of the southern boundary. The Brook is fully culverted upstream of Lathbury Road to a point approximately 2km upstream of the site and is also culverted downstream of Silchester Drive to the confluence with the River Irk, approximately 475m downstream of the site. The open section of the Brook adjacent to the site is down a steep embankment, approximately 5m lower than elevations surveyed along the site boundary.

The EA report that the indicated fluvial floodplain for Flood Zone 2, detailed in Figure 5, has been based on a coarse form of hydraulic modelling which would be unsuitable for a specific site assessment within this report. Although out of bank flow may be experienced within the open channel section of the Moston Brook during extreme events, all flow will be contained within the steep sided valley section leading down to the Brook and no inundation of the site is predicted from this source.

A site walkover inspection revealed no further watercourses or open drainage channels in the vicinity of the site.

3.4.2 Groundwater

There is no recorded incidence of flooding from groundwater sources at the site. A review of groundwater levels encountered during ground investigations shows groundwater to be present at

depth, generally below made ground that covers much of the site. Groundwater closest to the surface was noted at a borehole on the southern boundary of the site, adjacent to Silchester Drive. The depth of groundwater was recorded as 5m below ground level.

Evidence from these ground investigations and knowledge of the general topography of the area indicates that groundwater will not present a flood risk to any development of the site.

3.4.3 Surface Water

No formal drainage infrastructure serves the current site, with all rainfall passing direct to ground infiltration or passing overland to adjacent street drainage or Moston Brook. Site investigations identified that the northern site boundary at the junction with Monsall Road and Carisbrook Street and the north western boundary along Lathbury Road and Rochdale Road were all at, or close to the top of respective runoff catchments. As such it is considered unlikely that any excess overland flow from outside the site boundary would cause flood issues on the proposed development. Any excess flow from the limited areas at a higher elevation than the site will be confined to existing street drainage channels and will not pass to site areas.

The proposed development of the site will seek to manage stormwater runoff in two distinct areas. The sports areas in the northern sector of the site will drain to existing stormwater sewerage that passes through the site, while the main academy site will drain directly to Moston Brook via a new outfall. The new drainage systems will be designed to contain on site the runoff from a 1% probability (1 in 100 year) rainfall event, including an allowance for climate change. Hydraulic modelling of the system using Win*Des* software will be undertaken during the design phase which will demonstrate the development to be free from risk of flooding from surface water runoff. For the purpose of this FRA, Appendix B outlines volume calculations for stormwater storage assuming discharge from the site at greenfield runoff rates during a 1% probability event with an allowance for climate change. These calculations are designed to demonstrate the peak attenuation requirements for development of the site.

3.5 Site Visit

An SKM hydrologist undertook a site walkover inspection on 18th January 2008 to identify the following:

- evidence of recent flooding (silt or deposition);
- areas of poor drainage (potential for surface water ponding);
- routing of overland flow paths; and
- extent and condition of any existing drainage channels and catchpits.

Weather during the site walkover was wet with moderate to heavy rainfall throughout the previous 7 days.

The site walkover inspection did not identify any evidence of recent or historical flooding within the development site. Assessment of the site topography suggests that rainfall runoff discharges directly to ground or during extreme conditions would pass overland to adjacent street drainage or to Moston Brook. Ground conditions across the site varied between well drained and slightly waterlogged in areas with moderate vegetation. No significant pooling or standing water was observed across the site.

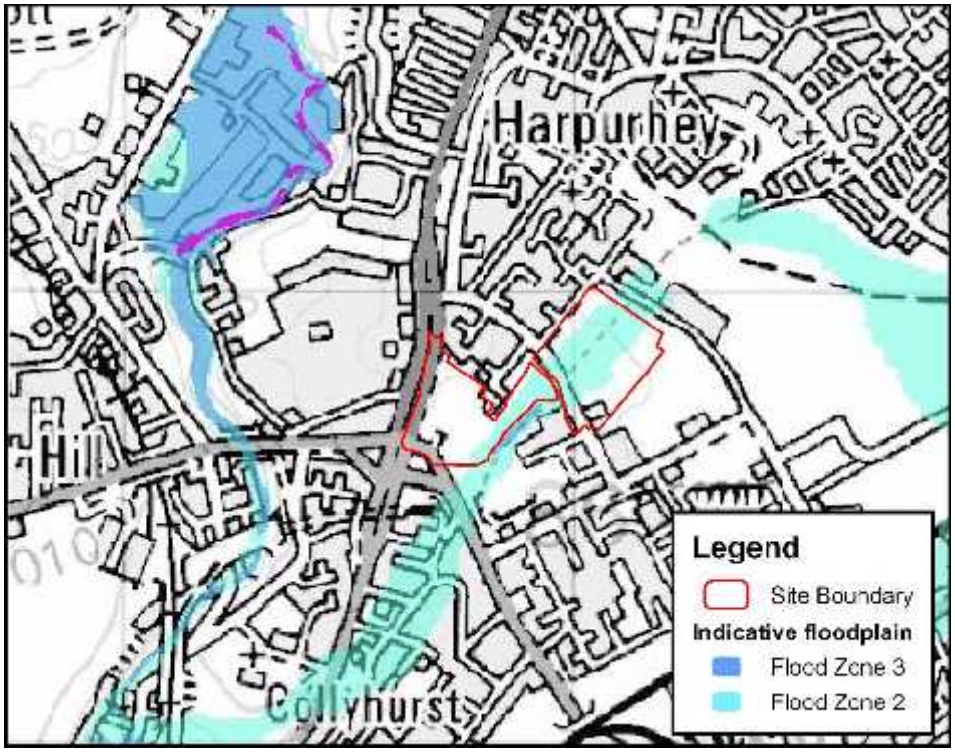
Drainage channels, catchpits and kerb gullies in surrounding roads were observed to be in good condition with drainage of hardstanding areas well maintained. Moston Brook was observed to be conveying moderate flows, consistent with the rainfall over previous days. All flow was well contained within the banks of the Brook and both the upstream and downstream culverts were noted to have a significant amount of additional capacity for flow.

Photographs from the site walkover are contained in Appendix A.

3.6 Plan Indicating Flood Risk

Figure 5 below details the indicative flood mapping provided by the EA.

Figure 5 - Indicative Environment Agency Floodplain Mapping



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This figure shows the proposed development to be predominantly within Flood Zone 1. The south eastern fringes of the site adjacent to the line of Moston Brook are shown to be within the Flood

Zone 2 fluvial floodplain which indicates a 0.1% probability (1 in 1000 year) event. Sandrine Thomas, Development Control Officer at the Environment Agency, stated that the Flood Zone 2 floodplain had been defined using Jflow hydraulic modelling, using coarse terrain data and as such it is not considered to be suitable for site specific assessments.

As the proposed site boundary is situated approximately 5m above the mean water level in Moston Brook, it is considered highly unlikely that the 0.1% probability floodplain would extend as far into the site as the indicative mapping shows. As would be anticipated considering the topography of the site, no areas are shown to be at risk from Flood Zone 3 inundation.

3.7 Hydraulic Structures

The Moston Brook is culverted both upstream and downstream of the site. Observations made during a site walkover, undertaken following wet antecedent conditions, indicated that both culvert structures had considerable spare capacity for additional flows. It is assumed that floodplain information sourced from the EA website will have incorporated the culvert structures into the hydraulic modelling exercise. No other hydraulic structures were noted within the vicinity of the site.

3.8 Flood Probability

No flooding is predicted over any area of the site during a 1% probability rainfall event.

3.9 Assessment of Rate at Which Flooding Might Occur

No flooding of the proposed development buildings is predicted at this site for scenarios up to the 1% probability rainfall event.

3.10 Assessment of Hydraulics of Sewers and Drains

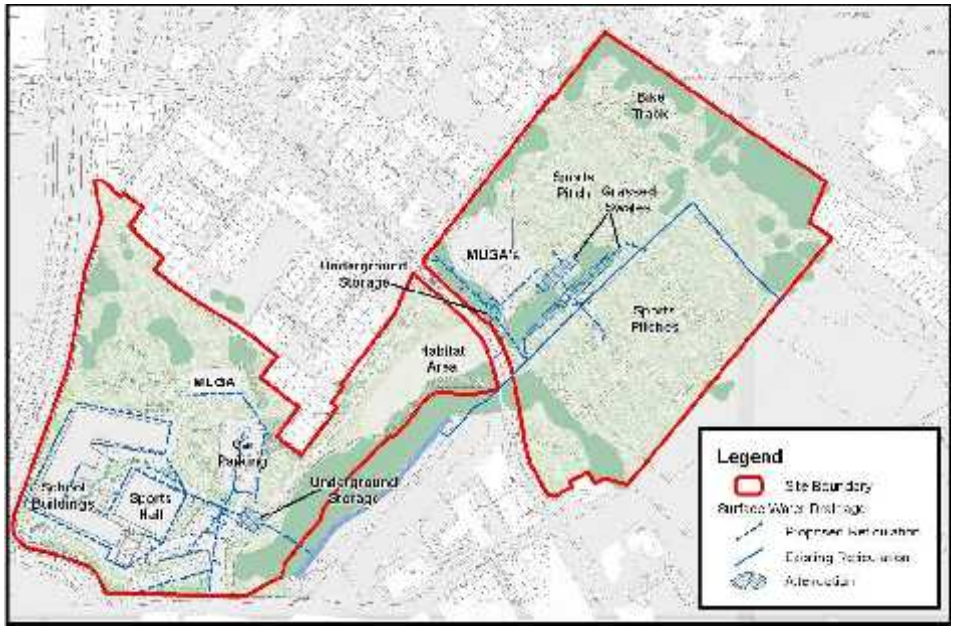
The proposed development is split by Lathbury Road into two distinct areas, with the main academy campus to the south and sports facilities to the north. Stormwater management systems will be developed for each area of the site, with final discharge from each system to Moston Brook and existing stormwater sewerage respectively. The systems will be designed with reticulation to accommodate runoff from a 3.3% probability (1 in 30 year) rainfall event without surcharge, with the overall system design being capable of managing flows from a 1% probability rainfall event within the development boundary. All calculations will include an allowance on peak rainfall intensity for future climate change in accordance with PPS25.

Discharge from the new drainage systems to either sewerage or directly to the Brook will be restricted to greenfield runoff rates. Utilising the calculated greenfield runoff rate of 3.626 l/s/ha, the 1% probability critical duration rainfall event for the site was determined to be 26 hours. All calculations for greenfield runoff rates and attenuation storage requirements are contained within Appendix B.

Attenuation calculations will be refined during the detail design phase which will model the proposed system using Win*Des* drainage software. Catchpit chambers upstream of sewer reticulation or soakaways will capture larger debris, while oil interceptors will be provided on reticulation serving any access roads or car parking areas.

An Operations and Maintenance manual will be produced for the academy which will detail the inspection of the catchpits, attenuation systems and general drainage infrastructure. Inspections and maintenance will be made at regular intervals throughout the life of the development.

- **Figure 6 - Indicative Drainage Layout**



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Southern Campus

Based on an estimated impermeable area of 1.26ha from new build elements of the educational area of the development, south of Lathbury Road, the attenuation requirement for the 1% probability event was calculated to be 210m^3. This volume provides an indication of maximum attenuation requirements for the new build elements of the site if runoff is to be restricted to greenfield rates.

Options for the provision of this attenuation will be decided at the detail design stage, in agreement with the EA and United Utilities. The current scheme proposes the use of underground attenuation storage adjacent to the car parking area, with a hydrobrake control restricting the peak discharge into Moston Brook.

The option to incorporate other Sustainable Drainage System (SUDS) techniques within the final academy layout will be determined at the detail design stage. This could include but is not limited to, the use of a green roof, rainwater harvesting or inclusion of semi-permeable paving.

Northern Campus

The sports area of the development to the north of Lathbury Road will include MUGA pitches, grassed sports pitches and some car parking area. Including the formal drainage of all sports pitch areas, a new drainage system will serve this area of the site with runoff during a 1% probability event requiring the inclusion of approximately 990m^{3}of attenuation storage within the drainage system. This volume provides an indication of maximum attenuation requirements for the drained elements of the site if runoff is to be restricted to greenfield rates. It should also be noted that drainage of sports pitches will be through a permeable surface cover to a sub-surface reticulated drainage network. This system will serve to attenuate the runoff from the pitch areas and will also provide an element of storage within the sub-surface layer.

Options for the provision of attenuation will be finalised at the detail design stage, in agreement with the EA and United Utilities. The current scheme proposes the use of grassed swale areas for the majority of the attenuation requirement, with a small provision in the form of an underground storage tank. Flows from the swales and storage tank will be regulated by hydrobrake controls, restricting the peak discharge to greenfield runoff rates.

3.11 Flood Displacement

No change to floodplain storage is predicted at this site for scenarios up to a 1% probability rainfall event.

3.12 Impact on Fluvial and Coastal Morphology

The development is situated at the top of a bank of Moston Brook but will not alter any physical attributes of the embankment. It is not considered that the development will result in any impact on fluvial morphology.

3.13 Adjustments for Climate Change

When assessing the flood risk to any potential development site, consideration must be made of any potential for change to that risk throughout the life of the development. The life of the proposed Digital Communications Academy development has been assessed as 60 years due to the non-residential nature of the facility.

Provision for future climate change is given in tables of recommended contingency allowances for increased rainfall runoff and increased river flow, in Appendix B of PPS25. These climate change allowances represent the current view of Defra following extensive national and international research, based on the best information and predictive modelling techniques currently available.

Recommendations state that a consideration of up to 20% increase in peak rainfall intensity and 20% increase in peak river flows is made when assessing proposed drainage requirements for a new development with a lifespan of 60 years. This increase in surface water runoff or peak river flow will mean increased water levels within proposed and existing drainage infrastructure and a

potential requirement for increased attenuation on site during more extreme events. All calculations detailed in Appendix B have taken account of climate change allowances.

3.14 Assessment of Residual Flood Risk

No flooding of any proposed infrastructure is predicted at this site for scenarios up to a 1% probability rainfall event. Fluvial flooding of land in the bottom of Moston Brook valley, to the south east of the southern campus area, will be contained within the valley area for all events up to the 1% probability fluvial event and it is considered highly unlikely that more extreme event within the Brook will result in flooding of the Academy site due to the topographic nature of surrounding land.

Provided the proposed drainage plans take account of future climate change impacts and reticulation is designed to cope with the increased runoff, residual risk to the development of the Academy is considered to be negligible.

3.15 Mitigation Measures

This section outlines recommended flood protection measures to be incorporated into the development of the Academy site. The mitigation measures are based on the following guidance:

- PPS25: Development and Flood Risk documentation;
- Consultation with the Environment Agency;
- Interim Code of Practice for Sustainable Drainage Systems, (National SUDS Working Group, 2004);
- Environment Agency website (www.environment-agency.gov.uk); and
- Preparing for Floods documentation (Department for Transport and Local Government Regions).

3.15.1 Drainage Infrastructure Mitigation

Infrastructure within the development will be designed and constructed with due consideration given to the risk of flooding from rainfall runoff. Taking into consideration the existing site conditions, mitigation measures will include but not be limited to:

- discharge rate from site no greater than greenfield runoff rates to existing drainage infrastructure or directly to Moston Brook, in agreement with United Utilities and the EA;
- stormwater drainage network capable of containing with no surcharge, runoff from a 3.3% probability rainfall event, including an additional allowance for climate change; and
- attenuation capable of containing on-site the runoff from a 1% probability rainfall event, including an additional allowance for climate change.

Detail design of the new stormwater drainage networks will also give due consideration to options incorporating SUDS.

4. Summary

This report outlines the results of a flood risk assessment (FRA) for the development of land at Harpurhey in Greater Manchester. The site is proposed to be developed as a new North Manchester High School for Girls, incorporating a main educational building, sports hall and energy centre with provision for car parking, landscape habitat zones and several sports areas. An additional area to the north of Lathbury Road will incorporate multi-use games areas, grassed sports pitches, a bike track and a car parking area. The report has been prepared for outline planning submission to meet the requirements set out in PPS25: *Development and Flood Risk*.

The development defined by the site boundary is slightly greater than 9.8 hectares in size and is irregular in shape. The site is currently open space split into two areas by Lathbury Road, located within a residential area in the suburb of Harpurhey to the north of Manchester city centre. A recent site topographical survey shows current elevations across the site to be between 71.5m and 60.0m AOD. Site inspections confirmed that levels across the site were consistent with the adjacent roads and surrounding features. Floodplain details provided by the Environment Agency show the majority of the site to be located within low risk areas, with no areas of the site within high risk zones.

For development of the site it is proposed to manage surface water runoff through two new drainage systems, with the northern sports areas discharging to existing United Utilities stormwater sewerage, and the main educational campus draining directly to Moston Brook via a new outfall. Design of these systems will incorporate attenuation, as required, to facilitate the storage on site of runoff from all events up to a 1% probability event. All calculations during the design phase will make allowance for an additional 20% on peak rainfall intensity to simulate the effect of climate change in accordance with Appendix B of PPS25.

The main risk to the site is considered to be from extreme rainfall events resulting in surcharge of proposed drainage systems. The site facilities are not considered to be at risk from fluvial, tidal or groundwater sources. Residual risk on the site relates to the potential for flooding during a surcharge of the proposed drainage system. Mitigation recommendations for the site include:

- discharge rates to be limited to greenfield runoff rates, in agreement with United Utilities and the EA;
- stormwater drainage networks capable of containing with no surcharge, runoff from a 3.3% probability rainfall event, including an additional allowance for climate change; and
- on-site storage attenuation capable of containing runoff from a 1% probability rainfall event, including an additional allowance for climate change.

Design of the new stormwater drainage network will aim to provide due consideration to options incorporating Sustainable Drainage Systems (SUDS).