City of Wolverhampton Council Level 2 Strategic Flood Risk Assessment Detailed Site Summary Tables

Site details	
Site Code	**E23**
Address	Bilston Urban Village, Bath Street
Area	6.02ha
Current land use	Brownfield with greenery
Proposed land use	Employment
Flood Risk Vulnerability	Less Vulnerable
Sources of flood risk	
Location of the site within the catchment	The site is located in the urban extent of Bilston with an education facility at the western boundary, rail tracks bordering the eastern boundary, employment facilities along the north-west boundary. At the curved south-western boundary, the site is bordered by greenery, with the southern boundary bordered by employment facilities. The site is in the heavily urbanised downstream reach of the culverted Bilston Brook that flows eastwards along the north-western boundary. The Bilston Brook rises approximately 2.8km west and from the site it then enters the Darlaston Brook approximately 1.1km east of the site, where it then joins the River Tame. The site is located within the Tame (Wolverhampton arm) source to confluence Oldbury Water Body.
Topography	Environment Agency 1m resolution LiDAR across the site shows that the site is on a north-western slope. The maximum elevation is 144.9m AOD in the north-western of the site, and the minimum elevation is 133.87m AOD at the south-western boundary of the site. The site is situated within a densely populated, developed urban area and LiDAR data is unlikely to be representative of the actual site topography, this may have an impact on some of the flood risk datasets used in this assessment.
Existing drainage features	There are no drainage features within the site. The site is likely to drain into the surface water sewer network where there are urban extents, which is in turn likely to then drain into the River Tame. While there is a water body directly west of the site, and the Wednesbury Oak Loop Canal to the south, the topography of the area suggests it is unlikely the site will be able to drain into them.
Critical Drainage Area	The site is not located within a Critical Drainage Area (CDA).
Fluvial and tidal	**The proportion of site at risk FMFP:** **FZ3 – 4.4%** **FZ2 – 5.64%** **FZ1 – 94.36%** *The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at*

	flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%). **Available data:** Flood Zones are determined from the Environment Agency's Flood Map for Planning (FMfP). **Flood characteristics:** Flood Zones 2 and 3 at the site are of similar extent, and at the site both Flood Zones encroach along the north-western boundary and the upper area of the western boundary, following the culverted Bilston Brook.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 1.09% Max depth – 0.3 - 0.6m Max velocity – <0.25m/s **1% AEP** – 1.85% Max depth – 0.3 – 0.6m Max velocity – <0.25m/s **0.1% AEP** – 5.56% Max depth – 0.6 – 0.9m Max velocity – 0.25 – 0.5m/s *The % SW extents quoted show the % of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. the 1% AEP event includes the 3.3% AEP event %).* **Available data:** The Environment Agency's Risk of Flooding from Surface Water mapping was used in this assessment. **Description of surface water flow paths:** The 3.3% AEP and 1% AEP events surface water flood extents are similar, with small instances of ponding at the north-western boundary, the central area of the site and at the southern boundary. In both AEP events maximum depths are between 0.3 to 0.6m with velocities that do not exceed 0.25m/s. Both AEP events have a maximum hazard rating of 'Danger to Some' within the ponding. In the 0.1% AEP event, there are three instances of ponding in the southern area and a further three in the central area. Two flow paths lead to the northern boundary, one from the north-western area and the other from the central area of the site. Withing the ponding at the southern boundary, maximum depths are between 0.6 to 0.9m, and a maximum velocity between 0.25 to 0.5m/s is with in the central flow path. The maximum hazard rating within the site is 'Danger to Most' within the larger instances of ponding.
Reservoir	The site is shown to not be at risk of Dry Day and Wet Day reservoir flooding according to the Environment Agency's reservoir flood mapping.
Groundwater	The JBA Groundwater Flood Emergence Mapping (5m resolution) shows the site is at predominantly at no risk. However, along the northern boundary and upper north-western boundary, groundwater levels are less than 0.025m from the grounds surface. For the majority of the site, there is likely negligible risk from groundwater flooding due to the nature of the geological deposits. However, at the northern boundary, there is risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and have the capacity to flow overland and/or pond within topographic low points within and near the site.

Sewers	The site is located within a postcode area (WV14 0) with one incidence of sewer flooding in 1997, according to the Severn Trent Water Hydraulic Sewer Flood Risk Register.
Flood history	The site is not located in or near historic flood outlines in accordance with flood records provided by City of Wolverhampton Council and the Environment Agency's Historic Flood Map and Recorded Flood Outline Map datasets.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset that there no flood defence within or near the site.
Residual risk	The site encounters residual risk from the culverted Bilston Brook that is at the northern boundary of the site. The culvert could pose a residual risk to the site in the event of a blockage or breach, which could cause water to back up and encroach on the site. Developers should seek modelling of blockage scenarios for the culverts at the site.
Emergency planning	
Flood warning	The south-western area of the site is within the Upper Tame (033WAF303) Flood Alert Area, but the site is not within a Flood Warning Area.
Access and egress	At present, the site is accessible through pathways that are part of the Bilston Urban Nature Reserve (with access points to the path north-west and south of the site), and a path that runs parallel to the northern boundary with an access point to Brook Street/Bath Street. Access from east of the site is impeded due to the presence of railway tracks. Development at the site should consider additional access points to the site. For fluvial events, Flood Zones 2 and 3 are similar in events where access and egress from the north of the site has the capacity to be impeded. However, access from the lower western boundary is maintained from the south with a pathway leading to Himley Close. Access and egress within the site are also maintained. In the 3.3% AEP and 1% AEP surface water events, extents are similar with access and egress maintained within the site. Access from the north-west area is impeded, where depths are between 0.3 to 0.6m, velocities between 0.25 to 0.5m/s and encounter a maximum hazard rating of 'Danger to Most'. However, access from the western boundary to the south and from the north/north-eastern areas to Bath Street are maintained. For the 0.1% AEP surface water event access and egress within in the site are maintained, as is access from the lower western boundary to the south. Access to the site from Bath Street is also maintained with shallow, slow flowing extents across the path. However, access from the north-west is impeded due to extents with depths between 0.9 to 1.2m and velocities of 0.6 to 0.9m/s along the pathway. Extents in the northwestern area along the pathway north have a predominant hazard rating of 'Danger to Most'. For the surface water design event (1% AEP plus 40% climate change allowance), the extents are similar, and access and egress within and to the site are expected to be similar. Within the north-western extents, the maximum depth is 1.1m and a maximum velocity of 1.5m/s with a maximum hazard rating of 'Danger to Most'. Arrangements for safe access and egress will need to be demonstrated for the 1% AEP plus an allowance for climate change rainfall events, using the depth, velocity, and hazard outputs. Any raising of access routes should not impede surface water flows or contribute to increasing flood risk off-site. If detailed modelling (including consideration of breach scenarios) suggests that the site is at significant risk of flooding which affects access routes, a Flood Warning and Evacuation Plan will be required.

Dry Islands	The site is not located on or contain a dry island.
Climate change	
Implications for the site	**Management Catchment: Tame, Anker and Mease** Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding **Surface Water:** The design event for rainfall intensities is the upper climate allowance for the 2070s epoch. As such the design event is the 1% AEP + 40% CC. The extent of the design event is similar to that of the present day 0.1% AEP event, with maximum depths of 0.75m in the area of ponding along the southern boundary. With an increase in extent, the site is shown to be slightly sensitive to increased surface water flood risk due to climate change. Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and egress must also address the potential increase in severity and frequency of flooding.
Requirements for drainage control and impact mitigation	

Broad-scale assessment of possible SuDS	**Geology & Soils**
	• The geology consists of:
	  ○ Bedrock formed of mudstone, siltstone, sandstone, coal, ironstone and ferricrete, which forms the Pennine Middle Coal and the South Wales Middle Coal Measures Formations.
	  ○ There are no superficial deposits at the site
	• The soil is comprised of slowly permeable, seasonally wet, acidic loamy and clayey soils
	
	SuDS
	• The majority of the site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. While at the northern boundary the site is at risk of groundwater emergence. As such, there is risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and have the capacity to flow overland and/or pond within topographic low points within and near the site. This should be confirmed with site investigations.
	• BGS data suggests that the underlying geology is likely to have variable permeability and should be confirmed through infiltration testing. Off-site discharge in accordance with the SuDS hierarchy may be required to discharge surface water runoff.
	• The site is not in a Groundwater Source Protection Zone.
	• The site has areas within its boundary designated by the Environment Agency as being a historic landfill site. A thorough ground investigation will be required as part of a detailed site-specific FRA, to determine potential mitigation for contamination and the impact this may have on SuDS. As such, proposed SuDS should be discussed with the relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.
	• The site is within the River Trent (source to confluence with Derwent) Nitrate Vulnerability Zone (NVZ), and partially in a Secondary A Superficial Aquifer Designation Zone. As such, infiltration techniques may not be appropriate at the site in order to preserve water quality.
	• Surface water discharge rates should not exceed pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation with the

	LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques. • In accordance with information provided by Severn Trent Water, surface water should be managed through SuDS and any excess flow discharged to the adjacent watercourse. Although there are constraints on SuDS at the site (due to the presence of historic landfill, the NVZ, and the Secondary Superficial Aquifer Designation Zone), any designs from developers should be investigated and tested to ensure they are appropriate to the site.
Opportunities for wider sustainability benefits and integrated flood risk management	• Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. • Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development • Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered. Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will clean and improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies. • Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
NPPF and planning implications	
Exception Test requirements	The Local Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. As the site is within Flood Zone 3 and Flood Zone 2, classified as 'Less Vulnerable' and has some surface water flood risk, the Exception Test is not required for this site.
Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:** Section 2 of the Level 2 SFRA and Sections 2 and 3 of the Level 1 SFRA have more guidance on this section and any relevant policies and information applicable to development within Wolverhampton. • Consultation with City of Wolverhampton Council, Severn Trent Water, and the Environment Agency should be undertaken at an early stage. • Developers should consult with Severn Trent Water to ensure that the development aims to help achieve the targets of the Drainage and Wastewater Management Plan. • Development plans should use their Level 1 and 2 SFRA for Wolverhampton, as well as the Local Flood Risk Management Strategies to identify cumulative flood risk issues. It should also promote an integrated approach to water management. Drainage should be designed and implemented in ways that promote multiple benefits. • Any FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance; Birmingham City Council's Local Plan Policies and Sustainable Drainage Design and Evaluation Guide for developers. • Development within the site should be designed in line with requirements set out in the Bilston Corridor Area Action Plan, with policy BC8 requiring that "all development proposals and public realm improvements should

consider the use of Urban Wetlands and Street Rain Gardens as part of Sustainable Urban Drainage Schemes (SuDS) and the incorporation of street trees and areas of woodland in new development, particularly where there are known surface water flooding issues or where wildlife habitat connectivity could be enhanced." Additionally, as the site is within the Loxdale Industrial area and Bilston Urban Village, development at the site will need to incorporate sustainable drainage features to minimis flood risk.

- **From the Black Country Core Strategy – Policy ENV5 (2011)**

  The Wolverhampton Local Plan succeeds the Black Country Core Strategy building upon policies from the Strategy. Until the Local Plan is adopted the Strategy still applies. Developers should ensure the correct policy is applied. The following development principles will apply to assist in both reducing the extent and impact of flooding:
  - incorporate Sustainable Drainage Systems (SuDS), unless it would be impractical to do so, in order to significantly reduce surface water run-off and improve water quality. The type of SuDS used will be dependent on ground conditions;
  - on sites requiring a Flood Risk Assessment, reduce surface water flows back to equivalent greenfield rates;
  - create new green space, increase tree cover and/or provide green roofs.

Guidance for site design and making development safe:

- The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG).
- Should built development be proposed within the 1% AEP surface water flood extent, careful consideration will need to be given to flood resistance and resilience measures.
- The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to greenfield rates.
- Developers should seek new topographic survey to confirm topography at the site in addition to detailed ICM modelling at and close to the site to confirm actual flood risk to the site.
- Developers should wherever possible open up underground culverts, and in a manner which improved biodiversity, amenity and natural drainage in accordance with the current River Basin Management Plans for the area
- Development must not take place over culverted watercourses and a suitable easement must be provided from the outside edge of the culvert.
- Where there is known or suspected culverted watercourse(s) either on or immediately downstream of a site, and where the Level 1 SFRA highlights that there may be a risk of flooding, developers should:
  - Confirm the location and presence of the watercourse (or otherwise) through ground-truthing strategic datasets and undertaking an assessment of the culvert extent and location
  - Confirm by survey, modelling and mapping the flood extents of the watercourse(s), as many of the flood outlines associated with such watercourses have been carried out at a broad scale and may not account specific local features, such as culverts, bridges and detailed topographical survey.
  - Design the development to accommodate the floodplain of the watercourse and mitigate against flooding to properties to the

site. This should include a consideration of residual flood risk e.g. if a culvert were to block downstream.

- Arrangements for safe access and egress will need to be demonstrated for the 1% AEP pluvial events with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs.
- Consultation with RMAs early on should be implemented to ensure an appropriate flood evacuation plan is put in place for the site.
- In accordance with information supplied by Severn Trent Water, the site is likely to be served by the Minworth Works wastewater treatment works, which has been assed to have 'marginal concern… (to estimated spare capacity) subject to development size" and "limited scope to provide additional capacity" for surface water discharge into watercourses. As such surface water disposal measures (detailed in the broad-scale assessments of SuDS section) should be undertaken by the developer.
- Developers should adhere to CWC's guidance on SuDS as laid out in Policy ENV 13 – Sustainable Drainage Systems (SuDS) and Surface Water Management:
    - All developments must incorporate Sustainable Drainage Systems (SuDS) and provide for their adequate adoption, ongoing maintenance, and management over the lifetime of the development, in accordance with any surface water drainage strategy required for the development under Policy ENV12.
    - SuDS must be designed in accordance with Local Lead Flood Authority standards, as follows:
        - demonstrate application of the surface water discharge hierarchy: Re-Use (Water Harvesting); Infiltration; Discharge to a watercourse; Discharge to a surface water sewer; Discharge to a combined sewer;
        - manage surface run-off as close to the source as possible to reduce flood risk and improve water quality;
        - include mitigation within storage calculations for future climate change, designed to 100yr + Climate Change (currently 40%);
        - designed to accord with the Environment Agency's Guidance on Flood Risk and Coastal Change, Construction Industry Research and Information Association (CIRIA) guidance, and Department for Environment Food & Rural Affairs (DEFRA) non-statutory technical standards;
        - designed to be daylight (open), natural and contribute to the conservation and enhancement of biodiversity and green infrastructure in the wider area, as far as is practical and viable.
    - For all major developments, surface water flows must be reduced back to equivalent greenfield rates. If greenfield runoff rates are not considered to be feasible for viability or other reasons, then the developer must submit evidence demonstrating what the constraints to achieving this are and how their development will accommodate runoff rates that are as close as reasonably possible to greenfield rates.
    - For all minor developments, a minimum reduction of 30% over pre-development run-off rates will be required. Under no circumstances will post-development runoff rates that are greater than pre-development run-off rates be permitted.
    - A hydrogeological risk assessment must be provided where infiltration SuDS is proposed for anything other than clean roof drainage in a Source Protection Zone 1.
- Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels. These measures should be assessed to make sure that flooding is not increased elsewhere. If the floor levels cannot be raised to meet the minimum requirements, developers will need to:
    - raise them as much as possible.

	○ consider moving vulnerable uses to upper floors. ○ include extra flood resistance and resilience measures. • Other examples of flood resistance and resilience measures include: ○ using flood resistant materials that have low permeability to at least 600mm above the estimated flood level. ○ making sure any doors, windows or other openings are flood resistant to at least 600mm above the estimated flood level. ○ by raising all sensitive electrical equipment, wiring and sockets to at least 600mm above the estimated flood level.

Key messages

The site is affected by Flood Zones 2 and 3 in the northern area, with access and egress issues from the north-western area in the fluvial and surface water events. There is residual risk from the culverted Bilston Brook. Development is likely to proceed if:

- To locate new development in areas of lowest risk, in line with the Sequential Test, by steering sites to river Flood Zone 1 and avoiding where possible areas with a high risk of surface water flooding. If a Sequential Test is undertaken and a site at flood risk is identified as the only appropriate site for the development, the Exception Test shall be undertaken. If development can't be avoided in a high-risk surface water Zone, then part "b" of the Exception Test should be satisfied.
- A site-specific Flood Risk Assessment demonstrates that site users will be safe in the 1% AEP fluvial and surface water events, including an allowance for climate change. This will need to use detailed fluvial/surface water modelling to show that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk off site. Additionally, it is recommended that developers seek a detailed integrated ICM model of the culverted Bilston Brook, with a new topographic survey of the site and its vicinity. Developers should consult the Environment Agency to ensure latest model are used. Depending on the age of the model, additional updates including consideration of breach scenarios may be required.
- Safe access and egress can be demonstrated in the 1% AEP plus upper climate change fluvial and surface water events. If this is not possible, an appropriate Flood Warning and Evacuation Plan is needed.
- Surface water should be managed through SuDS and excess flow should be discharged into the adjacent watercourse in accordance with information provided by Severn Trent Water.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed modelling (as above), with development to be steered away from the areas identified to be at highest risk of surface water flooding within the site. This is in line with the sequential approach to site layout.
- Raise commercial finished floor levels 600mm above the 1 in 100-year plus climate change flood level. Protect and promote areas for future flood alleviation schemes.
- If flood mitigation measures are implemented then they are tested to ensure that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another).

Mapping Information

The key datasets used to make planning recommendations for this site were the Environment Agency's Flood Map for Planning and the Environment Agency's Risk of Flooding from Surface Water map. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 2 and 3 have been taken from the Environment Agency's Flood Map for Planning mapping.
Climate change	The latest climate change allowances (updated May 2022) have been applied to the EA's RoFSW dataset.
Surface Water	The Environment Agency's Risk of Flooding from Surface Water (RoFSW) map has been used to define areas at risk from surface water flooding.

Surface water depth, velocity and hazard mapping	The Environment Agency's Risk of Flooding from Surface Water (RoFSW) has been used to define areas at risk from surface water flooding.