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

Site details	
Site Code	**E17**
Address	Former MEB Site, Major Street/Dixon Street
Area	2.54ha
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 bounded by Dixon Street along the south-eastern boundary, and Major Street along the lower western boundary. The eastern boundary is upon the banks of the Birmingham Canal, and there are industrial buildings along the north/north-western boundary. The site falls within the urbanised upstream reach of the Tame (Wolverhampton arm) source to confluence Oldbury Water Body, with the culverted River Tame approximately 380m east of the site. The River Tame flows eastwards where it flows towards Birmingham.
Topography	Environment Agency 1m resolution LiDAR across the site shows that the site is located on a north-eastern slope. The site is relatively flat with an elevation around 146m AOD but has an area of high ground with the maximum elevation within the site is 149.0m AOD in the lower central area of the site, with the minimum elevation of 145.4m AOD close to the lower western boundary. 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, however it is likely the site is able to drain into the Birmingham Canal. Additionally, 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.
Critical Drainage Area	The site is not located within a Critical Drainage Area (CDA).
Fluvial	**The proportion of site at risk FMFP:** **FZ3 – 0%** **FZ2 – 0%** **FZ1 – 100%** *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:** The site is situated entirely within Flood Zone 1 and is highly unlikely to encounter fluvial flood at the site.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 0.92% Max depth – 0.3 – 0.6m Max velocity – <0.25m/s **1% AEP** – 5.09% Max depth – 0.3 – 0.6m Max velocity – 0.25 – 0.5m/s **0.1% AEP** – 32.23% Max depth – 0.6 – 0.9m Max velocity – 0.5 – 1.0m/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. 100-year includes the 30-year %).* **Available data:** The Environment Agency's Risk of Flooding from Surface Water mapping was used in this assessment. **Description of surface water flow paths:** In the 3.3% AEP event, there is one instance of ponding close to the lower western boundary in the topographic low point. The depth of the ponding is between 0.3 to 0.6m, with a velocity less than 0.25m/s, with a resultant hazard rating of 'Danger to Some'. In the 1% AEP event, a flow path forms along the lower western boundary and from the topographic low point flowing onto Major Street, there are then two instances of ponding in the south-western area of the site. Maximum depths between 0.3 to 0.6m are found in the path from the topographic low point with maximum velocities between 0.25 to 0.5m/s within the same flow path. The maximum hazard rating is 'Danger to Most' within the topographic low point. In the 0.1% AEP event, there are two main flow paths through the site, the first, smaller flow path flows into a larger flow path at the lower western boundary. The larger flow path flows across and through the southern area of the site from the west to east boundaries where it enters the Birmingham Canal. There is an instance of ponding in the north-western area. Maximum depths of 0.6 to 0.9m are found within the topographic low point, with maximum velocities between 0.5 to 1.0m/s in the flow paths in the western area of the site. Throughout the flow paths there is a maximum hazard rating of 'Danger to Most'.
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 no risk, as such there is likely negligible risk from groundwater flooding due to the nature of the geological deposits.

Sewers	The site is located within a postcode area with one incidence of sewer flooding from 2001, 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	There is no residual risk from culverts or reservoir flood extents at the site.
Emergency planning	
Flood warning	The site is not within an Environment Agency Flood Alert or Flood Warning Area.
Access and egress	At present, access and egress to the site is through an access point along Dixon Street at the south-western boundary, with access to the south-west and north-east. There is potential for an access point along Major Street at the lower western boundary, where access from the north can be provided. In the 3.3% AEP and 1% AEP surface water event, access within the site is maintained, as is access to the site through the use of Dixon Street. Access from Major Street is impeded due to ponding across the road which a maximum depth between 0.36 to 0.9m and a maximum velocity between 0.25 to 0.5m/s, with a hazard rating of 'Danger to Most'. In the 0.1% AEP surface water event the flow path that bisects the site, with the northern area only accessible from the east side where there are shallower (less than 0.3m) and slower flowing velocities. The northern area remains inaccessible from the northern and eastern boundaries. Access to the site is maintained from Dixon Street, however access from Major Street is impeded with maximum depths between 0.9 to 1.2m, maximum velocities that exceed 2.0m/s and have a resultant hazard rating of 'Danger to Most'. The design surface water event (1% AEP plus 40% climate change allowance) extents are similar to the 0.1% AEP event and is expected to have similar access and egress. As such maximum depths are 1.2m, maximum velocities are 3.0m/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 on a dry island but does contain dry islands within the 0.1% AEP surface water and design surface water events where there are topographic high points.
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 0.81m at the topographic low point at the lower western 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 Lower Coal and the South Wales Lower Coal Measures Formations.
	  ○ Bedrock formed of mudstone, siltstone, sandstone, coal, ironstone and ferricrete, which forms the Pennine Middle Coal and the South Wales Middle Coal Measures Formations.
	  ○ Superficial deposits consisting of diamiction till
	• The soil is comprised of:
	  ○ Slowly permeable, seasonally wet, slightly acidic but base-rich loamy and clayey soils.
	  ○ Slowly permeable, seasonally wet, acidic loamy and clayey soils.
	
	SuDS
	• The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. 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, nor does it contain historical landfill.
	• The site is within the River Trent (source to confluence with Derwent) Nitrate Vulnerability Zone (NVZ), and in an undifferentiated Secondary 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 600mm diameter storm system within the development site, eventually discharging into the adjacent watercourse. Although there are constraints on SuDS at the site (due to the presence of 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 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. • All Major development and any new development falling within a Critical Drainage Area must reduce surface water run-off to greenfield run-off rates through the application of Sustainable Urban Drainage Systems and other design considerations. • **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.
- 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.
- 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 assessed 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.

- Consultation with RMAs early on should be implemented to ensure an appropriate flood evacuation plan is put in place for the site.
- 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.

Key messages

The site is predominantly affected by the 0.1% AEP surface water event and the surface water design event (1% AEP event plus 40% climate change allowance), dry islands within the site during these two events.

- 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 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 topographic survey of the site and its vicinity. Developers should consult the Environment Agency to ensure latest models 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 with excess flow discharged into a 600mm diameter storm system, discharging 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.
- 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 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.