	Borough Council of King's Lynn and West Norfolk Level 2 Strategic Flood Risk Assessment **Detailed Site Summary Tables**
Site details	
Site Code	**GT11**
Address	Homefields, (Western Side, Goose Lane) Marshland St James
Area	0.2ha
Current land use	Authorised Gypsy & Traveller Site
Proposed land use	Gypsy & Traveller Site
Flood Risk Vulnerability	Highly Vulnerable
Sources of flood risk	
Location of the site within the catchment	The site is located within the King's Lynn IDB area, and is drained by a complex network of drainage channels, which discharge into the River Nene to the East and River Great Ouse, via the Middle Level Drain, to the West. These two rivers are tidal through the IDB area and flow into the sea at the Wash, approximately 17km north of the site. The site is located within a rural area of the IDB, on the outskirts of Marshland St James.
Topography	The site and most of the surrounding area is very flat and low lying, with elevation of approximately 2m AOD. To the west of the site, Smeeth Road runs along a raised ridge with an elevation of approximately 2.7m AOD.
Existing drainage features	There are several small drainage channels within the vicinity of the site which form part of the IDB drainage network, the closest of which flows along the western boundary of the site. Smeeth Lode, a larger drainage channel, runs north-south 300m west of the site.
Fluvial and tidal	**The proportion of site at risk FMFP:** FZ3 – 49% FZ2 – 51% FZ1 – 0% **Fluvial model outputs:** 3.3% AEP fluvial event – 0% 1% AEP fluvial event – 0% 0.1% AEP fluvial event – 0% **Breach Fluvial model outputs:** 1% AEP fluvial event – 0% **Defended Tidal Model Outputs** 3.3% AEP tidal event – 0% 1% AEP tidal event – 0% 0.5% AEP tidal event – 0% 0.1% AEP tidal event – 0%

	Undefended Tidal Model Outputs 3.3% AEP tidal event – 0% 1% AEP tidal event- 0% 0.5% AEP tidal event – 46% 0.1% AEP tidal event – 49% **Available data:** Fluvial outputs are taken from the Environment Agency's Fenlands Flood Risk Mapping Model (2015). Undefended runs have not been undertaken since the Fenlands in its current form exists only due to the long history of land drainage and continuous management by the IDB. Rather, there is composite breach mapping available which represents the risk due to failure of embankments and key management assets during the 1% AEP scenario. Tidal outputs are taken from the Environment Agency's The Wash Model (2018). **Flood characteristics:** The site is at low risk in all fluvial modelled events, including in the modelled breach events. The site is protected by tidal defences to a standard greater than the 0.1% AEP event, including an allowance for climate change. In undefended scenarios, however, the site is at risk. In the 0.5% AEP tidal undefended event, half of the site is flooded to depths of up to 0.5m and hazard on site reaches 'Danger for most'. Depth and hazard are similar in the 0.1% AEP event with extents being slightly wider on site. The unaffected part of the site to the west is on a dry island and much of the surrounding area is flooded. This means that in the event that tidal defences were to fail during an extreme event, occupants of the site would be at significant risk to life, and the nature of defence failure means that the speed of onset of flooding could be rapid. It is noted that there are currently questions as to the funding of defences around the King's Lynn area for the long term, and maintenance of these defences could affect the risk to the site throughout its lifetime. Given this, and the widespread nature of flooding in the area, a flood warning and evacuation plan which considers the 'Highly Vulnerable' nature of the site will be essential if the site is to be bought forward. This plan should consider the speed of onset of flooding, and it may not be appropriate for residents to occupy the site during events where the defences are operational as a precaution in case of breach.
Surface Water	**Proportion of site at risk (RoFfSW):** **3.3% AEP** – 0% Max depth – N/A Max velocity – N/A **1% AEP** – 0% Max depth – N/A Max velocity – N/A **0.1% AEP** – 0% Max depth – N/A Max velocity – N/A **Description of surface water flow paths:** The site is in a rural area which is well drained by the network of IDB drainage channels, and there is very little risk of surface water flooding to the site identified even in the most extreme/ high risk rainfall events.

Reservoir	There are no reservoirs which could pose a risk to the site in event of an uncontrolled release.
Groundwater	The site is within an area where there is considered to be a low risk of groundwater emergence.
Sewers	Anglian Water's Sewer Flooding register was not available for this assessment.
Flood history	The site is not within the Environment Agency's recorded flood outlines dataset. Historic Flood Records from the LLFA were not available to support this assessment.
Flood risk management infrastructure	
Defences	The site is protected by embankments and engineered high ground along the coastline to the north and River Great Ouse to the east. The embankments are owned and operated by the Environment Agency and are recorded to give protection up to the 1% AEP event, although modelling suggests they will protect the site up to the 0.1% AEP event including climate change.
Residual risk	The site is shown to be at significant risk (hazard rating: danger to most) in the 0.5% and 0.1% AEP undefended tidal events. Therefore, the site would be at considerable risk in the event of a breach or failure of defences.
Emergency planning	
Flood warning	The site lies within the Environment Agency's 'Tidal Great Ouse from Denver to south of King's Lynn in Norfolk' Flood Alert area. The site lies within the Environment Agency's 'Tidal Breach east of Wisbech along the A47 at West Walton, Emneth Hungate and Terrington St John' Flood Warning Area.
Access and egress	Access and egress to the site is from Goose Lane. Access and egress to the site is unlikely to be affected in any fluvial or surface water event. During undefended tidal events, flooding is widespread on and around the site with significant depths (exceeding 0.9 m on the road near the site) and velocities posing a risk to life in the 0.5% and 0.1% AEP events, with a hazard rating of "Danger to Most" to "Danger to All". Access/egress will not be possible, and a Flood Warning and Evacuation Plan will be essential to bringing forward the site. This should consider the 'Highly Vulnerable' nature of the site and the potential for the rapid onset of flooding if defences were to breach.
Dry Islands	The site is located within a dry island during the 0.1% AEP modelled flood event.
Climate change	
Implications for the site	**Management Catchment: North West Norfolk** **Fluvial Flooding (Fenlands Flood Risk Mapping):**

	The site is not shown to be at risk in either the 1% AEP baseline or breach fluvial event including climate change from the Environment Agency's Fenland Flood Risk Mapping model. **Tidal Defended:** The site is not shown to be at risk in the 0.1% AEP +CC (2115 epoch) tidal defended event. **Tidal Undefended/Breaches:** In the undefended/breach scenarios, the site is shown to be highly sensitive to climate change, with depths on site during the 0.5% AEP Tidal event increasing from 0.5m in the baseline to 1.2m with climate change. Flood extents in the surrounding area are much wider and Smeeth Road is no longer on a dry island, and it is likely that the site will be at risk in smaller magnitude events that in the present day it is unaffected by. Flood warning and evacuation plans should consider the projected wider extents of flooding and potential increased depths, velocity and hazard due to climate change. **Surface Water:** Climate change allowances have not been applied to the Environment Agency's Risk of Flooding from Surface Water Dataset for this assessment. However, a comparison of the extent of the 1% AEP surface water event to the 0.1% AEP surface water event suggests that the site is not sensitive to increases in surface water risk as a result of climate change and is likely to remain low risk in future.
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. The NPPF classifies Gypsy and Traveller Sites as "Highly Vulnerable". Normally, Highly Vulnerable uses would not be permitted within Flood Zone 3. However, given the widespread extent of Flood Zone 3 within the Borough area, a pragmatic approach is required. The Borough Council of King's Lynn and West Norfolk has engaged with the Environment Agency in their approach and demonstrated through a documented sequential screening process (see Main Report) that there are not sufficient sites outside Flood Zones to meet the required need. Therefore, this site has been taken forward for consultation. As the site is within Flood Zone 3 and Flood Zone 2, and classified as 'Highly Vulnerable', the Exception Test is required for this site.
Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:** Appendix C of the Level 2 SFRA and Sections 8 and 9 of the Level 1 SFRA have more guidance on this section and any relevant policies and information applicable to development within King's Lynn and West Norfolk borough. The Level 2 SFRA Addendum contains a summary of changes in legislation since the Level 1 and Level 2 SFRAs were completed. • Consultation with the Borough Council of King's Lynn and West Norfolk, Anglian Water, King's Lynn IDB, and the Environment Agency should be undertaken at an early stage.

- Developers should consult with Anglian Water to ensure that the development aims to help achieve the targets of the Drainage and Wastewater Management Plan.
- Any FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance; Borough Council of King's Lynn and West Norfolk's Local Plan Policies and Sustainable Drainage Design and Evaluation Guide for developers.
- Flood Risk Assessments should be informed by detailed modelling including depth velocity and hazard outputs, including an allowance for climate change.

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).
- This development is proposed within the 0.5% AEP tidal breach extent; careful consideration will need to be given to flood resistance and resilience measure and an appropriate Flood Warning and Evacuation Plan will be essential.
- 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.
- Planning permission is required to surface more than 5 square metres of unpaved ground using a material that cannot absorb water.
- Arrangements for safe access and egress will need to be demonstrated for the 0.5% AEP tidal event and surface water events with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs. As access and egress may not be possible during tidal breach events, a Flood Warning and evacuation Plan will be required.
- Consultation with RMAs early on should be implemented to ensure an appropriate flood evacuation plan is put in place for the site. This should consider the Highly Vulnerable nature of residents, widespread extents of flooding, and potential for rapid inundation of the site in event of breach.
- 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 floor levels cannot be raised to meet the minimum requirements, developers will need to:
    - raise them as much as possible
    - 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

In the defended scenario, the site is generally at low risk from all sources. However, the site is Highly Vulnerable, within Flood Zone 3, and shown to be at significant risk of tidal flooding in extreme events in the event of a breach or failure. Normally, Highly Vulnerable uses are not permitted within Flood Zone 3. However, considering the wide extent of Flood Zone 3 within the Borough, and the Borough's evidence demonstrating a clear need and lack of lower risk suitable sites, it may be appropriate to develop the site provided:

- A site-specific Flood Risk Assessment, supported by detailed modelling demonstrates users of the site are not at risk of flooding from fluvial and surface water sources during the 0.1% AEP event including an allowance for Climate Change.
- An appropriate Flood Warning and Evacuation Plan is prepared for the site, which considers the Highly Vulnerable nature of the site and its users, the potential for rapid onset of flooding, and the potential widespread nature of flooding affecting access routes. The plan will need to demonstrate that users of the site can be warned and evacuated safely during the 0.1% AEP tidal breach event, including an allowance for climate change. Given the risk of rapid inundation during a breach, it may be determined that the site be evacuated as a precaution whenever the defences are considered actively holding back flooding.

Mapping Information

Flood Zones	Flood Zones 2 and 3 have been taken from the Environment Agency's Flood Map for Planning mapping.
Climate change	Climate change runs from the Environment Agency's Fenlands Flood Risk Mapping and The Wash Models have been used in this assessment.
Fluvial and tidal extents, depth, velocity and hazard mapping	Fluvial outputs are taken from the Environment Agency's Fenlands Flood Risk Mapping Model (2015). Undefended runs have not been undertaken since the Fenlands in its current form exists only due to the long history of land drainage and continuous management by the IDB. Rather, there is composite breach mapping available which represents the risk due to failure of embankments and key management assets during the 1% AEP scenario. Tidal outputs are taken from the Environment Agency's The Wash Model (2018).
Surface Water	The Environment Agency's Risk of Flooding from Surface Water dataset has been used for this assessment.
Surface water depth, velocity and hazard mapping	The Environment Agency's Risk of Flooding from Surface Water dataset has been used for this assessment.