

Lowestoft FRA requirements

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1. Introduction

The Lowestoft Flood Risk Management Project (LFRMP) aims to provide a sustainable flood risk management scheme for the town of Lowestoft. The scheme is envisaged to include provision of a tidal barrier and associated flood walls to provide a standard of protection of 1 in 200 years (including climate change). The approval and consenting of tidal barrier will follow the Transport and Works Act Order (TWAO) route while the tidal flood walls will be subject of local planning permission from the Waveney District Council.

A site-specific Flood Risk Assessment (FRA) will be prepared as part of the planning application for the tidal flood walls element of the Lowestoft FRMP.

The project delivery plan includes construction of the flood walls ahead of the proposed tidal barrier. The wall alignment is shown in Figure 1. The FRA will consider both the temporary and permanent works. It is currently understood that the temporary works will involve limited amount of ground excavation and no material will be left on the floodplain, therefore permanent works will be the focus of the document.

The proposed permanent development is classified as a 'water compatible structure' and is located in Flood Zone 3 (Figure 2). Tidal flooding is considered the primary source of flood risk in the area. Tidal flooding could materialize either from direct ingress of water from the North Sea to Lake Lothing or from Great Yarmouth through the Broadlands system.

The site could also be subject to fluvial flooding from Kirkley Stream or the River Waveney (part of the Broadlands system), and to surface water flooding from the local Anglian Water sewage network. Groundwater flooding is assumed a secondary risk in the catchment (Broadlands Rivers Catchment Flood Management Plan, 2009).

MEMORANDUM

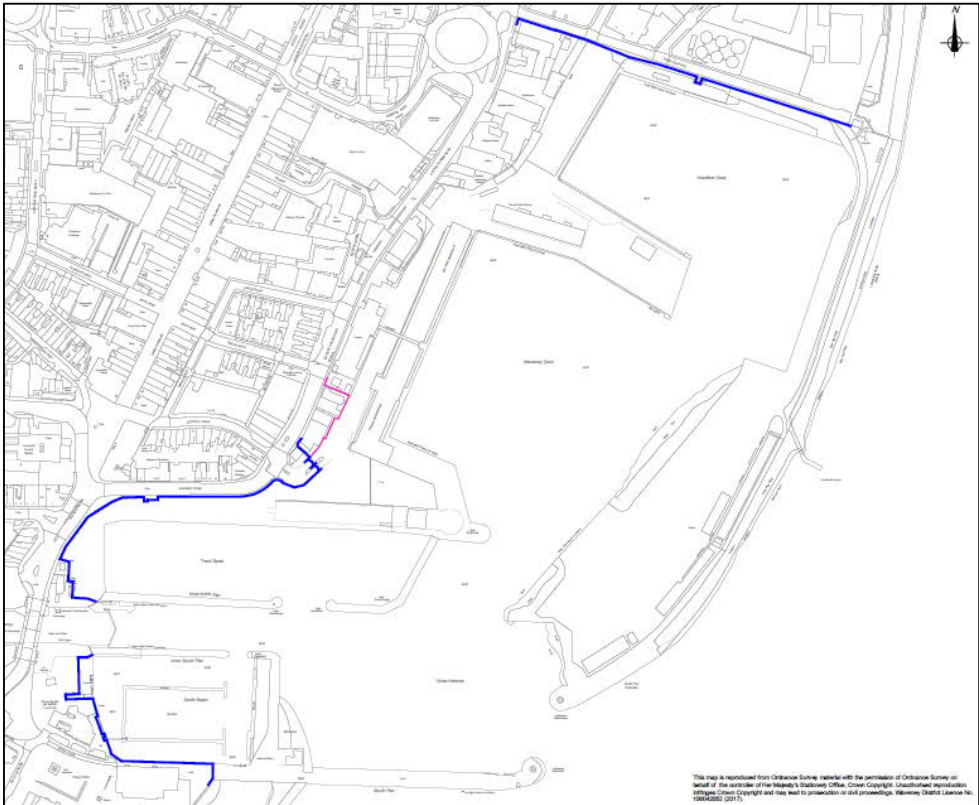


Figure 1: Location of the proposed flood walls and structures of options 3, 4, 5 and 6. Lengths are the approximate total lengths of the defence line taking into account lengths of walls, flood gates and demountable barriers.

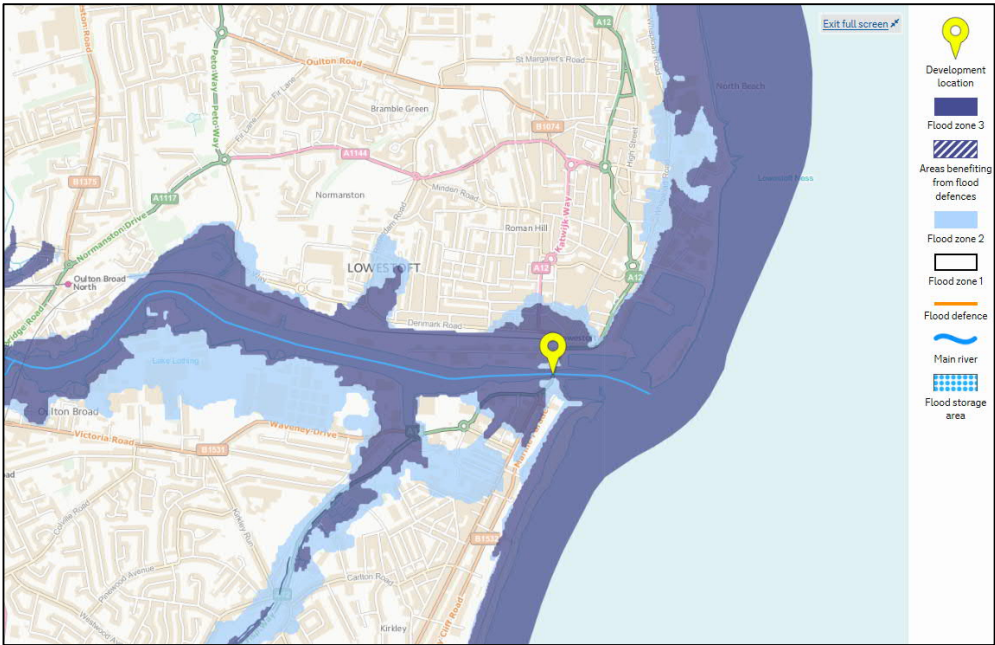


Figure 2: Flood zones in the study area (from <https://flood-map-for-planning.service.gov.uk/>, accessed 2nd of March 2018)

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2. Objectives

This FRA considers the development proposal with regard to National Planning Policy Framework (NPPF) and addresses any flood risk concerns raised by the project team. The objectives of this FRA are to:

1. Assess existing flood risk in Lowestoft (i.e. baseline), from all sources, including: tidal flood risk, surface water flood risk, groundwater flood risk and fluvial flood risk.
2. Assess the risk of flooding in Lowestoft after the construction of the flood walls while the barrier will not be in place.

3. Available Data

To date (01/02/2018), the following data is available to support the development of this FRA:

- 2017 CH2M Lowestoft Flood and Coastal Erosion Risk Management Outline Business Case hydraulic model and outline design.
- 2017 AECOM Lowestoft Strategic Flood Risk Assessment (DRAFT)
- 2017 JBA Lowestoft Flood Risk Management Strategy (including surface water hydraulic model results)
- 2017 CH2M Lowestoft Flood Risk Management Strategic Outline Case
- 2014 Broadlands Environmental System Ltd (BESL) model (including hydraulic model, related results and report)

4. Methodology

The proposed methodology to meet the FRA objectives (as listed in the previous section) is as follows:

1. The proposed approach to assess the 'baseline' flood risk in Lowestoft is outlined in Table 1. Flood risk will be analysed both for present day conditions and in a future epoch (i.e. including an allowance for climate change). The proposed approach will make use of best available data for each source of flooding. The approach for each source of flooding will be proportional to the existing flood risk as described in Section 1.

Table 1: Proposed methodology to analyse baseline flood risk at Lowestoft

Source of flooding	Proposed Methodology
Tidal flood risk	<p>Analysis of present day and climate change results from Lowestoft appraisal modelling.</p> <p>Four return periods will be considered (proposed return periods include 1 in 20 year, 1 in 30 year, 1 in 100 year and 1 in 200 year). Events to be considered will be confirmed with the relevant planning authority. The required climate change epoch will be established at a scoping meeting with the Environment Agency.</p> <p>Sea level rise allowances to be used will follow latest climate change guidance for planning by the Environment Agency (i.e. Upper End estimate, Table 5, "Adapting to Climate Change: Advice for Flood and Coastal Erosion Management Authorities", Environment Agency, August 2016).</p>

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Source of flooding	Proposed Methodology
Surface water flood risk	Analysis of available 2017 JBA modelling outputs. Section 106 reports will be consulted if available.
Fluvial flood risk	Analysis of available 2017 JBA modelling outputs for Kirkley Stream. Analysis of available BESL modelling outputs for the Broadlands system.
Groundwater flood risk	Analysis of readily available information from Local Authorities and internet sources.

2. We will evaluate the potential impact on tidal flood risk of the walls only scenario by building and running a hydraulic model representing the 'leading option'. Wall heights will include any freeboard allowance included in the engineering calculations. The model will be run for both overtopping and breach scenarios. Two breach locations will be selected following consultation with Waveney County Council. It is currently understood that the tidal barrier will be built shortly after the walls (12 months). We therefore propose to include a set of climate change runs for this scenario as well. The climate change epoch will be established following the EA scoping meeting.

The impact on fluvial/ surface water flood risk of the walls only scenario will be qualitatively inferred by existing modelling results.

Impact of temporary enabling works will be qualitatively assessed using available model results and information.

5. Assumptions

1. The scenarios tested will not include the proposed tidal barrier. The effect of tidal barrier will be evaluated during the TWAO application.
2. We propose the FRA to consider one climate change epoch in addition to the present day runs.
3. Kirkley Stream modelling and surface water modelling readily available and suitable for flood risk assessment.
4. BESL model outputs are suitable to evaluate fluvial flood risk from the Broadlands system.
5. Risk of combined tidal/ fluvial events is considered negligible along the East Coast.
6. Risk of wave overtopping of the walls considered negligible. Further consideration to this element will be given at detailed design stage.
7. Sensitivity runs for the tidal model will include sensitivity to Manning's n roughness and downstream water levels.
8. Model runs to analyse flood risk from tidal sources are summarized in Table 2. Currently, we assume only one climate change epoch will be sufficient for the purpose of this FRA. The required climate change horizon will be established during the initial scope meeting with the Environment Agency. Similarly, return periods to be used and required sensitivity tests will be agreed at the project start-up meeting.

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Table 2: Proposed runs to evaluate tidal flood risk

Scenario	Return period (RP)/ Climate change epoch	Source/ Model file used	Total number of runs
Baseline (i.e. existing conditions)	4 RPs- Present day 4 RPs- Climate change epoch (TBC)	Lowestoft tidal model used for appraisal	8
Walls only	4 RPs- Present day 4 RPs- Climate change epoch (TBC)	Lowestoft tidal model used for appraisal modified to include wall structures	8
Walls only-sensitivity	1 RPs	Lowestoft tidal model used for appraisal modified to include wall structures	2
Walls only, breach	2RPs, 2 breach locations-present day	Lowestoft tidal model used for appraisal modified to include wall structures and breach location/ dimensions	4