

South Tyneside Level 2 Strategic Flood Risk Assessment

Scoping Report

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South Tyneside Council

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This report describes work commissioned by South Tyneside Council by an instruction dated 18 October 2023. The Client's representative for the contract was Matthew Clifford of South Tyneside Council. Laura Thompson and Mike Williamson of JBA Consulting carried out this work.

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Contents

1	Introduction	1
2	Level 2 SFRA requirements	2
	2.1 Level 2 SFRA sites	2
	2.2 Objectives	3
3	Available data and information	5
	3.1 EA models	5
	3.2 EA Open Data	5
	3.3 Other datasets	6
4	Proposed methodology	7
	4.1 Tidal modelling	7
	4.2 Residual risk modelling	9
	4.3 Assessing flood risk from reservoirs	9
	4.4 Assessing flood risk from groundwater	9
	4.5 Assessing flood risk from sewers	10
	4.6 Assessing access, escape routes, and emergency planning	10
	4.7 Cumulative impacts	10

List of Tables

Table 2-1: main barriers to development at each site	3
Table 3-1: EA river model	5
Table 4-1: Sea level rise allowances for Northumbria RBD	7

Abbreviations

AEP	Annual Exceedance Probability
BGS	British Geological Survey
EA	Environment Agency
FRA	Flood Risk Assessment
FRCC-PPG	Flood Risk and Coastal Change Planning Practice Guidance
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
NW	Northumbrian Water
SFRA	Strategic Flood Risk Assessment
STC	South Tyneside Council
WwNP	Working with Natural Processes

1 Introduction

A Level 2 Strategic Flood Risk Assessment (SFRA) is required by South Tyneside Council (STC) for nine potential development sites located at the Port of Tyne. As identified through the South Tyneside Level 1 SFRA addendum prepared in September 2023, these sites cannot be allocated outside of areas of flood risk. A Level 2 SFRA is therefore required to help determine whether these sites can be safe for their lifetime and subsequently be allocated in STC's local plan.

Consequently, this report entails a Level 2 scoping study to identify the requirements of the Level 2 SFRA. This report defines the methodology required to prepare the Level 2 SFRA, with consideration of the latest government guidance on flood risk and policy, namely:

- National Planning Policy Framework¹ (NPPF) 2023,
- Flood Risk and Coastal Change Planning Practice Guidance² (FRCC-PPG) 2022,
- How to Prepare a Strategic Flood Risk Assessment³ guidance 2022,
- Strategic Flood Risk Assessment Good Practice Guide⁴ 2021,
- Flood Risk Assessments: Climate Change Allowances⁵ 2022.

It is recommended that this scoping report is shared with the Environment Agency (EA) prior to commencing the Level 2 assessment. Full agreement on the scope and methodology should be gained from the EA to avoid any issues or objections on flood risk grounds at examination.

1 [National Planning Policy Framework | UK Government | 2021](#)

2 [Flood Risk and Coastal Change Planning Practice Guidance | UK Government | 2022](#)

3 [How to Prepare a Strategic Flood Risk Assessment | Environment Agency | 2022](#)

4 [Strategic Flood Risk Assessment Good Practice Guide | Association of Directors of Environment, Economy, Planning & Transport | 2021](#)

5 [Flood Risk Assessments: Climate Change Allowances | Environment Agency | 2022](#)

2 Level 2 SFRA requirements

The aim of a Level 2 assessment is to build on the findings of the Level 1 SFRA, focussing on identified high-risk sites or communities that are considered important to local plan development. This allows the SFRA process to be time efficient using detailed modelling techniques only where they are required in the Level 2 assessment i.e. the Port of Tyne. These locations usually include significant development and / or regeneration areas that are at higher risk of flooding from main rivers, ordinary watercourses, or surface water whilst also accounting for the impacts of climate change. Flood risk data such as modelled flood extents, depths, velocities, and hazards are used to assess the sustainability of these areas, appropriate mitigation techniques and achievable site layouts.

This detailed information should support further application of the Sequential Test, the sequential approach to development management, inform on whether sites can pass the Exception Test, where applicable, and allow for flood risk indicators to be produced for use in the Sustainability Appraisal of the Local Plan.

EA guidance³ states a Level 2 SFRA should:

- *Be detailed enough for the LPA to identify which potential development allocation sites have the least risk of flooding,*
- *Contain the information needed to apply the exception test, if relevant,*
- *Enable the LPA to decide if development can be made safe without increasing flood risk elsewhere.*

It should enable the LPA to:

- *Apply the sequential approach by identifying the severity and variation in risk within medium and high flood risk areas,*
- *Establish whether proposed allocations or windfall sites, on which your local plan will rely, are capable of being made safe throughout their lifetime without increasing flood risk elsewhere,*
- *Apply the exception test, where relevant.*

2.1 Level 2 SFRA sites

Table 2-1 lists the Port of Tyne sites and provides a brief statement on the barriers to development of each site and therefore the subsequent requirement for a Level 2 SFRA. Each site is proposed for employment uses and therefore classified as less vulnerable meaning the Exception Test is not required at these sites. However, the Level 2 SFRA must still show each development site can be made safe throughout its lifetime, without increasing flood risk elsewhere.

Table 2-1: main barriers to development at each site

Site ID	Site name	Main barriers to development
E16	Tyne Dock Enterprise Park South (Dock infill)	80% of site located in tidal Flood Zone 3b
E17	Hill 60	None based on the Level 1 screening assessment. However, site to be reviewed using latest allowances change
E19	Tyne Dock Enterprise Park (former McNulty Offshore), Commercial Road	Site partially within tidal Flood Zone 3b, Flood Zone 3a, and Flood Zone 2. Significant additional risk from sea level rise due to climate change
E30	Compound beside Jarrow Road	Significant additional risk from sea level rise due to climate change
E31	Tyne Dock Enterprise Park (SE), Commercial Road	Site partially within Flood Zone 3b, Flood Zone 3a, and Flood Zone 2. Significant additional risk from sea level rise due to climate change
E32	East of wood pellet silos	98% of site located in tidal Flood Zone 3a
E33	Tyne Renewables Quay	Site partially within tidal Flood Zone 3a and at additional risk from sea level rise due to climate change
E34	North of Warehouse 21	Significant additional risk from sea level rise due to climate change
E35	Former M H Southern	Site partially within tidal Flood Zone 3b, Flood Zone 3a, and Flood Zone 2. Significant additional risk from sea level rise due to climate change

2.2 Objectives

In accordance with the latest national policy and guidance, and the individual requirements of STC, the key objectives of this Level 2 SFRA are to:

- Update the EA's 2015 Tidal Tyne model with the latest climate change allowances,
- Update the functional floodplain (Flood Zone 3b) utilising the EA's 2015 Tidal Tyne model Assess detailed modelled outputs including flood depths, velocities, and hazards,
- Assess existing flood warning, emergency planning procedures and safety of site access and escape routes in times of flood,
- Assess potential cumulative impacts of development,
- Provide site-specific surface water flood risk screening / drainage calculations including recommendations on the requirements for drainage control; surface water runoff rates and impact mitigation, including Sustainable Drainage Systems (SuDS); and design solutions that could reduce flood risk,

- Provide site-specific advice on mitigation options i.e. developable / nondevelopable areas; blue / green infrastructure and open spaces; maintenance of surface water flow routes; land raising and compensatory storage; and advice on likely minimum finished floor levels,
- Assess any catchment-wide or strategic solutions, e.g. upstream opportunity areas for flood management (storage solutions) to mitigate against the risk of flooding downstream and elsewhere,
- Assess the potential effects from Natural Flood Management (NFM) and Working with Natural Processes (WwNP) schemes on mitigating flood risk
- Demonstrate whether each site can be made safe throughout its lifetime, without increasing flood risk elsewhere,
- Provide recommendations for additional and future works required following on from or to supplement the Level 2 SFRA i.e. further tidal or surface water modelling, modelling of site layout / design options including provisions for safe access and egress routes, development optioneering (land raising, compensatory storage, flow routes / rates), drainage strategies, site-specific Flood Risk Assessment requirements,
- Consult with all relevant risk management authorities, including:
 - The Environment Agency
 - The Lead Local Flood Authority
 - Northumbria Regional Flood and Coastal Committee
 - Highways authorities (National Highways and local council)
 - Northumbrian Water

The following should also be consulted:

- Emergency planners
- Local resilience forum
- Emergency services

Consultation should begin at the start of the SFRA process, and each consultee should be invited to review and comment on the draft version of the Level 2 SFRA.

3 Available data and information

The data and information described in this chapter will be used in the Level 2 SFRA to assess the risk to each site as required, as described in Chapter 4. We will provide a data request spreadsheet to be forwarded to the required data holders.

3.1 EA models

Table 3-1 states the EA hydraulic river model that will need to be updated to provide an up to date assessment of risk at the Port of Tyne sites.

Table 3-1: EA river model

Model	Return periods currently available	Climate change availability
2015 Tyne Tidal ISIS-TUFLOW (Due to be updated by the EA)	2, 5, 10, 20, 30, 50, 75, 100, 150, 200, 1000 years	200+CC, 1000+CC (not based on most up to date allowances)

The 2015 Tyne Tidal model is currently not up to date with the latest climate change allowances, nor does it account for the risk from the River Don tributary. We have direct access to the 2015 Tyne Tidal model as this is a JBA built model. We therefore only require a licence from the EA to use and update this model. Section 4 advises on the modelling methodology, presenting two options. Note, the methodology for both options should be reviewed and either option agreed with the EA ahead of commencing any work.

We are aware that the 2015 Tyne Tidal model is due to be updated by the EA as part of the Flood Map updates. However, timescales are unknown at this stage. The EA must advise on any forthcoming updates ahead of commencing the Level 2 SFRA to avoid any possible abortive work.

3.2 EA Open Data

Additional to the 2015 Tidal Tyne flood model, the following datasets will be downloaded from the EA's Open Data website and considered in the Level 2 SFRA:

- Flood Map for Planning - Flood Zones 2 and 3
- Flood Storage Areas
- Risk of Flooding from Surface Water extents, depths, and hazards for 3.3%, 1% and 0.1% Annual Exceedance Probability (AEP) events
- Reduction in Risk of Flooding from Rivers and Sea due to Defences
- Spatial Flood Defences
- Historic Flood Map
- Recorded Flood Outlines
- Flood Warning Areas
- Flood Alert Areas

- Reservoir Flood Map

3.3 Other datasets

Other datasets and information we propose to assess in the Level 2 SFRA include:

- Climate change data. To be produced for tidal risk from the Tyne using the updated Tidal Tyne model and for surface water risk using the national Risk of Flooding from Surface Water flood map models. Section 4 details the proposed methodology.
- JBA 5m Groundwater Flood Map (available under licence from JBA Risk Management).
- LLFA historic flood incident register.
- Sewer flooding - Northumbrian Water flood incident register.
- Functional floodplain dataset - existing functional floodplain delineated through the Level 1 SFRA. This dataset will require updating for the Port of Tyne area.
- OS Open Data base mapping.

4 Proposed methodology

It is recommended that the content of this methodology is consulted upon with the EA and the LLFA to ensure a sufficiently robust approach is being proposed.

4.1 Tidal modelling

As discussed, JBA can access the EA's current 2015 Tidal Tyne flood model. A licence to use and update this model will be required from the EA before any modelling can begin. As this is a detailed Level 2 SFRA and the current model is approximately 7-8 years old, the EA may suggest an update to the current model hydrology and the digital terrain model (DTM) are required. **STC must confirm this with the EA before any modelling can commence.**

4.1.1 Functional floodplain update

It is recommended that the functional floodplain is updated with the latest 1 in 30 year flood extent (3.3% AEP), in line with the latest FRCC-PPG² requirements. In summary, this will entail:

- Updating the existing 2021 flood extent for the Tyne estuary only (which is currently based on the 1 in 20 year flood extent (5% AEP) as delineated through the 2021 Level 1 SFRA update for South Tyneside) with the 1 in 30 year (3.3% AEP) defended modelled flood event from the Tidal Tyne model. Note, if the model hydrology is to be updated then the 3.3% AEP event will require remodelling.

4.1.2 Climate change allowance modelling

The EA's SFRA guidance³ states that the SFRA should assess the effects of climate change on all sources of flooding. Based on the EA's climate change guidance⁵, the higher central and upper end allowances for sea level rise should be modelled for SFRAs.

The River Tyne is tidally influenced up to Wylam, which is the westernmost boundary of Gateshead local authority to the west of South Tyneside authority area. Climate change modelling for the Tyne must therefore be based on the allowances for sea level rise for the Northumbria river basin district, as listed in Table 4-1.

Table 4-1: Sea level rise allowances for Northumbria RBD

Allowance	Cumulative rise 2000 to 2125 (metres)
Higher Central	1.03
Upper End	1.43

Based on EA guidance we recommend modelling the following climate change scenarios for sea level rise to inform the Level 2 SFRA:

- Defended 1 in 30 year + 1.43m sea level rise (future functional floodplain)
- 1 in 200 year + 1.03m sea level rise
- 1 in 200 year + 1.43m sea level rise
- 1 in 1000 year + 1.03m sea level rise
- 1 in 1000 year + 1.43m sea level rise

The 2015 Tyne Tidal model should be updated with the above sea level rise allowances.

4.1.3 Model geometry

The study area is entirely within the domain of the River Tyne Reach 1 & 2 1D HEC RAS model. In this area, the existing flood extents of the EA's Flood Map for Planning, derived by the 2015 study, used this model.

The existing model represents the River Tyne channel only and the River Don channel is not included. However, the Don is potentially significant as it runs to the west of Tyne Dock, close to Port of Tyne's proposed development sites.

Our proposal provides two options. Option 1 would provide a quicker and cheaper solution but without the detail in modelling included in Option 2. **STC should agree the appropriate approach with the EA, considering local plan programme and budget.**

Option 1 – re-run existing model only

This option repeats the approach used for the 2015 modelling, but with updated climate change allowances. The approach assumed flood levels in the study area were controlled by water levels in the River Tyne. Flood mapping was derived by interpolating water levels from one river cross section to the next, then projecting these water levels across the floodplain. It makes no allowance for the River Don as a flow pathway.

Option 2 – incorporate new modelling of the River Don

This option would incorporate new modelling of the River Don into the existing model. A new cross section survey of the Don would be carried out to represent the channel, which would be added to the existing 1D model domain.

A new 2D model domain of the Tyne Dock area would be developed in HEC-RAS, based on EA LIDAR, and dynamically linked to the 1D river channels. This is because the previous approach to mapping would no longer be appropriate at the confluence of the Tyne and Don (water levels projected from 1D cross sections would overlap).

A modelling technical note would be produced detailing the modelling process carried out.

4.1.4 Surface water

EA climate change guidance⁵ states that, for SFRAs, the upper end allowance on peak rainfall for the 2070s should be modelled.

For the Tyne Management Catchment this would include:

- 1 in 30 year rainfall event +40%
- 1 in 100 year rainfall event +45%

As with peak river flows, there is currently no nationally consistent mapping that shows the impact of climate change on surface water flooding. This creates a challenge for understanding the areas that are going to be the most sensitive to this increase in risk at both a national and a local level. However, JBA has developed a methodology, consistent with the present day national mapping, for modelling the effects of climate change on surface water flood risk which can be used to assess future risk from surface water in the Level 2 SFRA.

4.2 Residual risk modelling

FRCC-PPG para 004 states the requirement in plan making to account for residual flood risks from flood risk management infrastructure. For a Level 2 SFRA this involves modelling potential defence breach scenarios and blockages of drainage assets (culverts) using available EA models for any sites located in defended areas or with culverts on or near to the site.

The EA's SFRA guidance³ states that if specific breach models are not available from the EA, then the EA should be consulted on how to assess the potential effect and reach of floodwater if a defence is breached.

It is our understanding from the 2015 Tidal Tyne model and from EA datasets that there are not any formal defences, structures or culverts that could present a residual risk to the Port of Tyne sites.

4.3 Assessing flood risk from reservoirs

The EA's SFRA guidance³ requests for the assessment of the risk from reservoir dam failure using the EA's Reservoir Flood Map (RFM) which shows the credible worst-case scenarios from dam failure. If a site is shown to be at risk, the SFRA should assess if the design or maintenance of the reservoir would need improving. This will require contacting the reservoir owner(s) to ascertain the flood risk in more detail and whether the proposed development could affect the reservoir's risk designation, its design category or how it is operated. Consider seeking expert advice from an all reservoirs panel engineer. Local authorities, as category 1 responders, can access more detailed information about reservoir risk and reservoir owners using the [Resilience Direct](#) system.

All 9 sites are shown to be at risk from reservoir flooding, namely from Kielder reservoir in Northumberland. Kielder reservoir is categorised as a high risk reservoir. Northumberland County Council is named as the responsible local authority to contact.

4.4 Assessing flood risk from groundwater

Susceptibility of areas to groundwater flooding will be appraised using JBA's national 5m resolution Groundwater Flood Map which is much more refined than the British Geological

Survey (BGS) datasets and is recommended for us in the SFRA Good Practice Guide⁴. In creating this map, JBA's team of hydrogeologists and flood risk specialists modelled how and where groundwater levels would rise following prolonged periods of rainfall, considering factors such as topography, groundwater recharge volumes and spatial variations in aquifer storage and transmission properties. The model outputs were validated against recorded groundwater levels for past flood events and checked against areas historically affected by groundwater flooding. The high resolution maps make it easier for users to pinpoint and report risks from groundwater flooding.

4.5 Assessing flood risk from sewers

Northumbrian Water should be approached for a copy of its historic flood incident register. This will be referenced against the Port of Tyne sites.

4.6 Assessing access, escape routes, and emergency planning

EA Flood Warning Areas and Flood Alert Areas will be reviewed against the sites. JBA will also assess access and escape routes for each site and identify on maps any evacuation routes which are modelled to stay dry or experience non-hazardous to life flooding. Liaison with emergency planners and the local resilience forum may be required.

4.7 Cumulative impacts

An assessment will be carried out as to whether the development of any of the Port of Tyne sites may impact on sites elsewhere. This will be an iterative process may entail additional modelling work.

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