

Flood Risk Assessment

Port of Tyne

Client:
RES Ltd

Prepared by:
McCloy Consulting Ltd

August 2016


REVISION HISTORY


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CONTRACT

This report describes work commissioned by RES Ltd, following written instruction dated 03/05/2016. The RES Ltd representative for the contract was Chris Banks.

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Date: 22 August 2016

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EXECUTIVE SUMMARY

This Flood Risk Assessment (FRA) report was commissioned by RES Ltd to support a planning application as part of an Energy Storage Project, at Port of Tyne, South Shields.

Proposals comprise a battery storage system containing battery storage units, transformers and substations to replace the existing coal storage yard occupying the site.

This FRA considers potential flooding of the site from a number of sources including tidal flooding from nearby watercourses and reservoir flooding. Reference has been made to Environment Agency (EA) Flood Maps. Flooding from other sources has also been considered.

An analysis of the potential flood mechanisms affecting the site has been undertaken as part of this assessment. The primary flood risk at the site is posed by tidal flooding from nearby tidally affected watercourses. Based on the best available EA data, the application site has been determined to be located in the coastal Flood Zone 1.

The applicant has indicated that given the nature of the proposal is classified as "Less Vulnerable" in line with the descriptive guidance stated in National Planning Policy Framework (NPPF) guidelines therefore is deemed as appropriate development for Flood Zone 1.

Measures are proposed to ensure that the proposal is designed to be resilient to a 0.5% AEP + Climate Change flood appropriate to the design horizon of the proposal; the proposed finished levels of all electrical infrastructure units and any other aspects vulnerable to floodwater damage are to be sited at an absolute minimum level of 4.15m above OD.

Further measures are detailed in relation to management of flood risk to users in the event that the site access was affected by flooding, causing restricted access and egress.

The proposal, when developed in accordance with the mitigation described, is considered acceptable in relation to flood risk and in accordance with the relevant planning policies stated in the NPPF.

1 INTRODUCTION

1.1 Terms of Reference

This Flood Risk Assessment report was commissioned by Renewable Energy Systems (RES) Ltd to support a planning application, for a development at Port of Tyne, South Shields.

The assessment will determine potential sources of flooding at the site and their associated risk to life and property. The assessment will determine the suitability of the site for development in relation to flood risk, and propose appropriate design and mitigation measures where appropriate.

1.2 Statement of Authority

This report and assessment has been prepared and reviewed by qualified professionals with appropriate experience in the fields of flood risk, drainage, wastewater, and hydraulic modelling studies. The key staff members involved in this project are as follows:

- Victoria Ramsey BSc (Hons) MSc is an Environmental Consultant with experience in the fields of flood risk assessment, flood modelling, drainage and surface water management design.
- Kyle Somerville BEng (Hons) CEng MIEI is a Senior Engineer within the company, and is a chartered engineer specialising in engineering hydrology, flood modelling and flood risk investigation and assessment. Responsible for technical review, reporting, and technical project management.

1.3 Approach to the Assessment

Consideration has been given to the sources and extent of flooding of the site from pluvial sources, infrastructure failure, overland flow and ponding of localised rainfall within the site.

Stakeholders who hold data relating to flooding events in the area were contacted, and information gathered from responses received is incorporated in the following assessment.

The detail and complexity of the study required should be appropriate to the scale and potential impact of the development. For the purposes of this study, the following have been considered:

- Available information on historical surface water flooding in the area;
- Site level information based on 1m LiDAR from OS Open Data;
- Site observations based on an inspection undertaken on 10th June 2016;
- Available data provided by the EA.
- Local Flood Risk and Management Strategy.
- Allowances for increased flows resulting from the effects of climate change.
- Assessment of the existing runoff characteristics and the potential impact the proposed development will have on the runoff.

The approach is informed by the practice guidance published in relation to Flood Risk and Coastal Change to supplement the National Planning Policy Framework (NPPF).

Further guidance is also provided in the CIRIA Research Project 624 "Development and Flood Risk: Guidance for the Construction Industry", PPS 25 – Development and Flood Risk Technical Guide and 'Flood Risks to People Methodology' (FD2321/TR11).

1.4 Application Site

The site (centroid BNG 434928 564876) is located on Jarrow Road approximately 2.4km west of Jarrow and 2.7km south-west of South Shields and lays within South Tyneside Council (Planning Authority and lead Local Flood Authority). The planning application boundary has an area of 0.6 Ha and is formerly comprised of a vacant industrial site.

The site context and location is shown on drawings submitted in support of the application (see Appendix A).

1.4.1 Existing Site

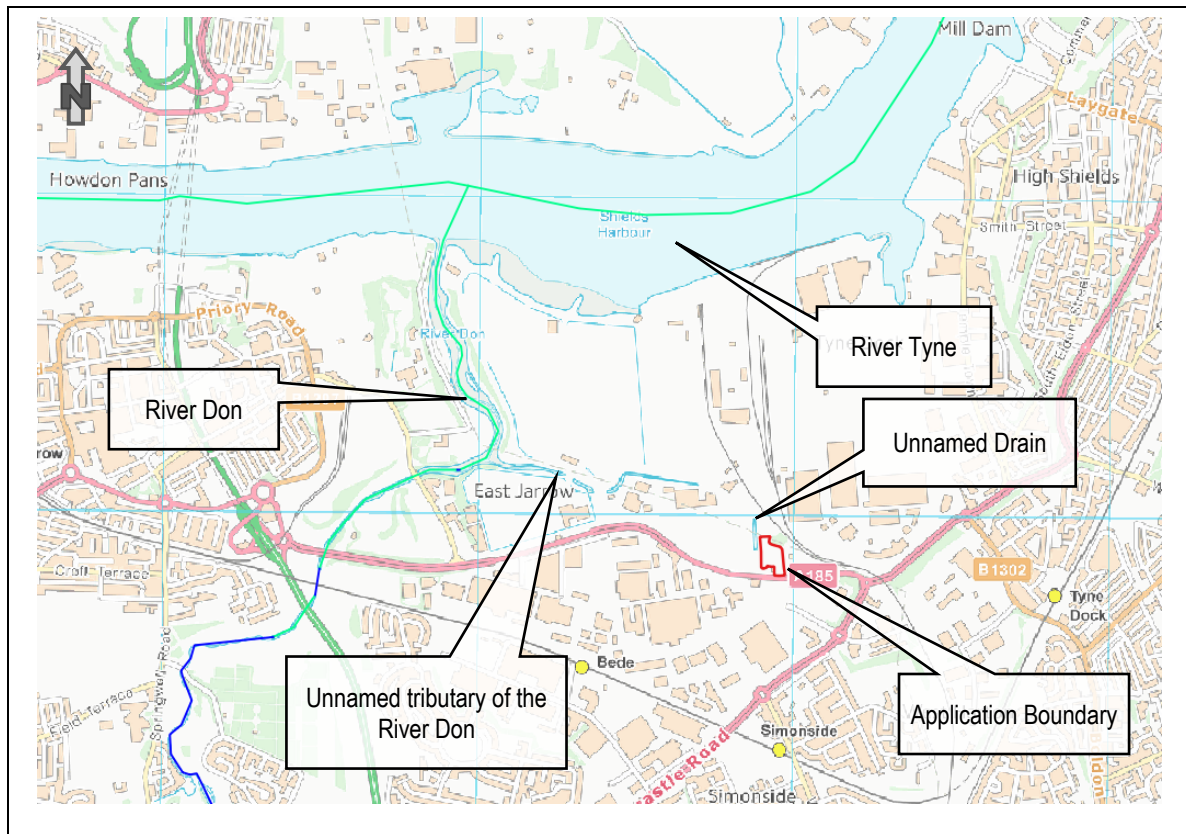
Land within the application boundary was previously occupied by Premier Waste Management and comprises a vacant concrete yard currently used for coal storage, with access from internal Port of Tyne service roads. A raised vegetated area is located within the site boundary to the south-east. Land within the application boundary typically falls from south-east to north-west with ground levels ranging between 3.86 and 7.8m OD.

The site is surrounded by industrial land uses. A concrete factory lies to the east of the site and a commercial car park area to the west. Immediately north of the redline boundary is a yard currently used for car parking beyond which is an embankment forming one of the Port of Tyne access roads. A railway line and coal terminal is located north of the road. Jarow Road runs along the southern site boundary, across which further commercial/industrial activities dominate the land use. Land on site generally falls from east to west.

1.4.1.1 Existing Drainage

The River Tyne flows approximately 900m north of the site in a westerly direction to its discharge point in the North Sea 4km north-east of site. A tributary of the River Don (a tidal river) flows approximately 280m north-west of site in a westerly direction where it meets the River Don 950m from site. The River Don discharges to the River Tyne. A coastal overflow ditch containing water is located adjacent to the western site boundary.

Figure 1.1: Proposed Site Location




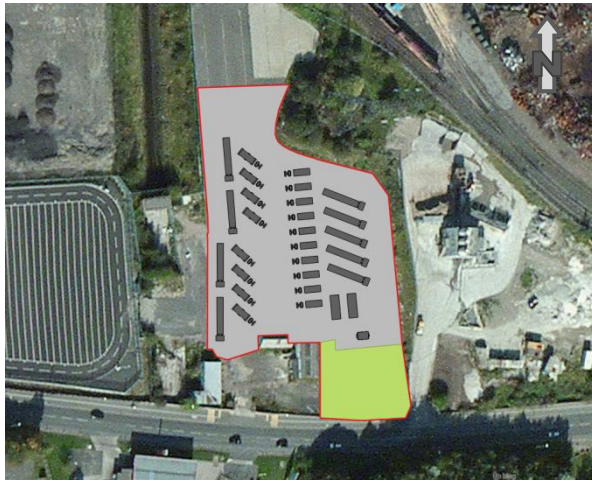
1.4.2 Proposals for the Site

Site proposals include a number of battery units stored in containers across the site along with Power Conversion System units with transformers. The site will also include a harmonic filter, substation, control rooms, hardstanding areas and access roads.

A schematic showing change of land use is included on the following figure. Key proposal drawings on which this assessment is based are included in Appendix A for ease of reference.

1.4.3 Summary of Permeable / Impermeable Areas

Figure 1.2: Summary of Land Use Change / Site Properties

Current Site Layout		Proposed Site Layout
Land Use:	Industrial / Vacant	Industrial
Total Site Area:	0.6 Ha	0.6 Ha
Built Area	0 m ² (0 %)	803 m ² (12 %)
Hard Surfaced Area	5505 m ² (86 %)	4702 m ² (74%)
Permeable Area	870 m ² (14 %)	870 m ² (14 %)
Site Layout		
		

2 BACKGROUND INFORMATION REVIEW

As part of the study data collection phase, a number of available sources of information were investigated in order to build an understanding of the potential risk of flooding to the site. The following review highlights the key findings of the anecdotal evidence collection exercise.

2.1 Internet / Media / Background Search

No evidence of flooding at the site could be established from an internet research.

2.2 Environment Agency

In correspondence, the EA has determined the tidal aspects of the River Jarrow to be the main flood risk to the Port of Tyne area and advises the use of 1 in 200 year (0.5% AEP) tidal flood levels. The location of the site was reviewed with reference to the Environment Agency Flood Maps Data. Extracts from the data provided are shown in Appendix B and are summarised as follows:

- The EA Flood Map for Planning (Rivers and Sea) indicates western areas of the site lie within Flood Zone 2 (between 0.5% and 0.1% AEP coastal flooding events) and 3 (>0.5% coastal flooding events) (Figure B.1).
- The EA has provided Product 4 data for the study area and includes 0.5% and 0.1% AEP modelled tidal flood levels for the River Tyne at the site from the Jarrow Model. **In correspondence¹, the EA has confirmed that these modelled levels supersede the Flood Map for Planning (Rivers and Sea).** Modelled flood levels have been plotted on 1m LiDAR and indicate that the site lies within Flood Zone 1 (detailed flood mapping can be found in Appendix C).
- The EA Modelled Extents Map (Figure B.2) indicates that the site is within an area affected by the modelled fluvial 0.5% and 0.1% +Climate Change AEP flood events.
- The EA Risk of Flooding from Surface Water map (Figure B.3) indicates the site is affected by surface water flood extents.
- The EA Risk of Flooding from Reservoirs map indicates that the site and surrounding areas are at risk of flooding from the Kielder Reservoir (Figure B.4).

2.3 Local Flood Risk Management Strategy

South Tyneside Council (STC) as Lead Local Flood Authority produced a Preliminary Flood Risk Assessment (June 2011) as required by the Flood Risk Regulations (2009). The PFRA is not intended to be used to identify individual properties that may be at risk of flooding, however the PFRA² states that four historic flood events have been recorded at the roundabout of Newcastle Road / Jarrow Road.

The STC Strategic Flood Risk Assessment (SFRA) was issued in February 2011³. The SFRA indicates the following:

- The water levels along the River Tyne are tidally influenced throughout the South Tyneside area.
- Areas of land along the Don River and its tributaries have been known to flood and are at a significant risk of flooding and land use changes within these areas may alter conveyance and storage characteristics.
- The tidally influenced areas of the River Tyne and River Don are located with Flood Zone 3a.
- The site lies within the vicinity of a Flood Warning Area.
- Historical surface water flooding has been recorded at the roundabout of Jarrow Road and Newcastle Road.

In direct correspondence, STC have confirmed no recorded flooding within the site boundary, however Jarrow Road has previously experienced flooding where the railway crosses the A185 and at the Tyne Dock roundabout.

¹ See correspondence dated 04/08/2016 Appendix B

² South Tyneside Council (2011) Preliminary Flood Risk Assessment. Available at: <http://www.southtyneside.gov.uk/CHttpHandler.ashx?id=14241&p=0> Accessed 03/06/2016

³ South Tyneside Council (2011) Strategic Flood Risk Assessment. Available at: <http://www.southtyneside.gov.uk/CHttpHandler.ashx?id=14240&p=0> Accessed on: 03/06/2016

3 INITIAL FLOOD RISK ASSESSMENT

3.1 NPPF Vulnerability Classification & Exception Test

The National Planning Policy Framework states that ‘determining planning applications for development at any particular location should take into account the flood risk vulnerability of land uses’.

The applicant has indicated that as the development comprises of a battery energy storage system consistent with the description the stated in NPPF Flood Zone and Flood Risk Tables (Table 2: Flood Risk Vulnerability Classification), i.e. *Buildings used for..general industry*, the development is deemed “Less Vulnerable”.

NPPF policy (Table 3) indicates that essential infrastructure developments are appropriate in Flood Zone 1, 2, and 3a with an exception test required for any proposal in Zone 3b.

3.2 Requirements under PPS25 – Planning and Flood Risk

Table 3.1: Possible Flooding Mechanisms

Source/Pathway	Significant / Assess Further?	Comment/Reason
Fluvial (Rivers)	No	EA product 4 data for fluvial-only events confirms that fluvial flooding in isolation would not affect the site. Flooding from the Tyne adjacent to the site is tidally influenced and is considered further under Coastal Flooding.
<i>Flood Defence Failure</i>	No	The site is undefended.
<i>Blockage / Failure of Culverts</i>	No	There are no culverts within the vicinity of the site.
Coastal	Yes	EA Flood Maps indicate the site lies within Flood Zone 1 with parts of the access road to the site located within Flood Zones 2 and 3a. The site situated within the flood extents of 0.5% and 0.1% AEP +Climate Change tidal flood events of the River Tyne.
Surface water	No	Review of EA Surface Water Flood Maps indicates that the site is not significantly affected by surface water flooding.
<i>Drainage Impact</i>	Yes	Development has the potential to modify surface water runoff characteristics on site/off site.
<i>Urban Drainage / Sewer Incapacity</i>	No	No particular information was made available that would indicate any additional particular flood risk caused by urban drainage networks. The STC SFRA indicates no record of out of sewer flooding at the site.
Groundwater	No	The PFRA indicates that the area is underlain with slowly permeable clay soils that tend to impede natural drainage and there is no evidence of historic groundwater flooding in South Tyneside. Given the topography of the site and the surrounding area the site is not considered to be at risk from ground water flooding.
Reservoirs	Yes	EA Risk of Flooding from Reservoirs maps indicate that the site and the surrounding area are at risk from reservoir flooding.

Based on information provided by the EA, the greatest risk of flooding at the site is considered to be that of tidal flooding from the River Don and River Tyne.

4 DETAILED FLOOD RISK ASSESSMENT

4.1 Fluvial/Coastal Floodplain

4.1.1 River Tyne / Don River

The River Tyne is located approximately 900m north of the site and a tributary of the River Don flows approximately 280m north-west of site. Water levels in both rivers are dominated by the tidal influence of the North Sea. Modelled flood levels in the River Tyne adjacent to the site have been provided by the EA and supersede the EA Flood Map for Planning (Rivers and Sea) as detailed in Section 2.2.

Modelled tidal levels were provided at a number of locations along the River Tyne. Levels considered applicable to the site are taken from upstream of the site and adjacent to Tyne Car Terminal (Node Point TY1058 of the River Tyne model at Jarrow) and are as follows:

- 0.5% AEP (Q₂₀₀) tidal flood level - 3.94 m OD.
- 0.1% AEP (Q₁₀₀₀) flood level - 4.21 m OD.

Modelled flood levels of the River Tyne were plotted on 1m LiDAR and indicate that the application site is unaffected and lies within Flood Zone 1.

In relation to access to the developed site (outside the application boundary), the road leading to the site is affected by the 0.5% and 0.1% AEP flood extents resulting in flood depths ranging between 0.1 – 1.0m.

Mitigation of flood risk to proposed development on the application site, and management of access / egress during a flood, is discussed further in Section 5.3.

Flood extents mapping is included in Appendix C.

4.1.1.1 Effect of Climate Change

Modelled flood levels at the site which include allowances for climate change to 2115 have been provided by the EA. The anticipated useful design life of the proposal is 25 years and therefore the projected increase in sea level rise until 2041 has been calculated using EA's sea level rise allowances as per the 2016 guidance⁴. A conservative estimate of projected climate change flood levels has been calculated using the cumulative rise in sea level for the "North west, north east" region for the 2050s time epoch (210mm). Tidal flood levels at the site including climate change are indicated below:

- 0.5% AEP tidal flood level + climate change – 4.15 m OD
- 0.1% AEP tidal flood level + climate change – 4.42 m OD

Flood levels with climate change were plotted on 1m LiDAR for the site and indicate that the area where development is proposed is not affected by either the 0.5% and 0.1% AEP + climate change (CC) flood events. Areas within the northern and south-eastern site boundaries are affected as follows:

Table 4.1: Effect of Climate Change

Flood Magnitude	Site Area Affected (m ²)	%-age Application Site Area	Max. Depth (m)
0.5% AEP + CC	6.2	0.1%	0.29
0.1% AEP + CC	135.6	2%	0.56

Access to the site via lands outside the application boundary are predicted to be affected by maximum flood depths of approximately 1.25m and 1.52m for 0.5% and 0.1% AEP + climate change flood events respectively.

Mitigation of the effect of climate change to the proposed development on the application site, and management of access / egress during a flood, is discussed further in Section 5.3.

⁴ Environment Agency (2016) Flood Risk Assessments: climate change allowances. Available at: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances> Accessed on 19/8/2016.

4.2 Surface Water Flooding

4.2.1 Runoff from site / Drainage Impact

The site is currently developed comprising a hard bound surfaced yard used for the storage of coal with a raised area of vegetated ground to the south east. Development is proposed on areas of the site that are currently impermeable; therefore, there is no anticipated increase in surface water runoff from the proposed re-development when compared to the existing scenario. The nature of the proposal would cause no significant earthworks that would cause any new or amend existing overland flow routes that could increase flood risk on adjacent downgradient lands.

The proposal intends to make no change to local drainage networks and would re-utilise existing site drainage for discharge of runoff from the site. The proposal would cause a slight beneficial effect to downstream flood risk in receiving drainage networks, anticipated due to the increased proportion of unbound / semi impermeable surfacing proposed.

4.2.2 Runoff Onto the Site

The EA Flooding from Surface Water map indicates that land within the south-east boundary is affected by flood extents from the 0.1% AEP flood event. No development is proposed for this area of site and therefore poses no risk to the development.

4.3 Reservoirs

The EA reservoir flood map indicates that the site and surrounding areas are at risk of flooding from the Kielder Reservoir located approximately 70km upstream of the site, in the event of a reservoir flood incident. In the event of such an incident a flood level at the site has been interpolated by overlaying the EA Risk of Flooding from Reservoirs map on 1m LiDAR. A flood level at the site has been estimated at 8m OD creating flood depths on site up to 3.6m.

The reservoir is owned by Northumbrian Water Ltd. The Northumberland County Council SFRA⁵ indicates that as the Kielder Water is >25,000m³ the reservoir falls under, and is maintained in line with the Flood and Water Management Act (2010) which supersedes the Reservoirs Act (1975).

A reservoir breach event is highly unlikely and therefore the risk of flooding to the site is low.

⁵ Northumberland County Council (2015) Northumberland Level 2 Strategic Flood Risk Assessment. Available at:
<http://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Planning-and-Building/planning%20policy/Core%20strategy/Evidence%20based/EB16-Northumberland-Strategic-Flood-Risk-Assessment-Level-2-October-2015.pdf>
Accessed on 15/09/2016.

5 DESIGN CONSIDERATIONS AND RECOMMENDATIONS

5.1 Summary of Findings

- For purposes of spatial planning, the application site lies in Flood Zone 1.
- The effect of climate change causes an increase in flood risk at the site with 60% and 92% of the site affected by the 0.5% and 0.1% AEP + climate change events and flood depths of up to 0.46m and 0.75m, respectively.
- The site is not at significant risk of flooding from any other source.

5.2 NPPF Sequential Test

The proposed site is considered to be appropriate for 'less vulnerable' as detailed in Section 3.1 under the guidance within the NPPF. Modelled tidal flood levels at the site show the proposed development site lays within Flood Zone 1 and therefore no exception test is required.

5.3 Design Considerations and Mitigation

The design flood level for purposes of establishing flood resilience is that of the adjacent 0.5% (including climate change) coastal flood, i.e. 4.15 m OD.

5.3.1 Land Use

This assessment indicates that lands within the application boundary do not lie within the modelled tidal flood extents of the River Tyne provided by EA. When allowances for climate change are applied, the northern area of the site and south-east corner lies within the 0.5% and 0.1% AEP + climate change flood extents.

5.3.2 Finished Levels

Care should be taken to ensure that infrastructure is sited in such a way as to ensure flood resilience and minimise or avoid flood damage. It is noted that the site is intended to be unmanned and as such protection of life by providing safe refuge is a lesser consideration.

Finished levels of any buildings and electrical or other infrastructure susceptible to damage by floodwater should be sited at a level 0.6m greater than the design flood level, i.e. 4.75 m OD, in line with typical EA recommendations.

5.3.3 Emergency Access / Egress

Access to the site would flood to a depth of c. 1.0 m and 1.25 m for 0.5% AEP (present day) and 0.5% AEP (climate change) magnitude floods respectively. Such a scenario would prevent access to the energy storage site via the designed site access, and would similarly prevent egress from the area for any site personnel present.

The developer (applicant) has confirmed that there would be no essential requirement to access the site during a flood event. The site is unmanned. Periodic maintenance would be undertaken including access to the permanent substation / control building, all of which will be sited above the flood level.

Access to the site would be precluded during a flood event and the site can be remotely shut down during such an event. Persons undertaking maintenance on site are unlikely to become trapped due to the predictable nature of coastal flooding and appropriate measures have been outlined below.

The Health and Safety file and the Emergency Procedures document developed for the site, which would form part of a compulsory induction to site staff prior to commencing work on the site, would detail flood risk management and evacuation procedures, and would nominally include:

- Registration of the site with EA Flood Warnings Direct, with access to the site restricted in the event flooding was anticipated.
- Mapping of areas where flooding should be anticipated by site staff.
- Emergency access routes and emergency contact details for site staff.

5.3.4 Drainage Design

It has previously been demonstrated that the development will cause a decrease in impermeable surfacing (and as such rate and volume of runoff), and intends to re-use existing site drainage networks.

Site drainage would comply with DEFRA's Sustainable Drainage Systems 'Non-statutory technical standards for Sustainable drainage systems' March 2015, read in conjunction with the National Planning Policy Framework and Planning Practice Guidance.

Given discharge is to a tidally influenced waterbody, peak flow and volume requirements stated in DEFRA's Sustainable Drainage Systems 'Non-statutory technical standards for Sustainable drainage systems' would not apply. As such it is not anticipated that there would be any rationale for the local planning authority to impose any further restriction in relation to site drainage.

5.3.4.1 SuDS Opportunities

SuDS principles would tend to direct the drainage design to intercept and manage runoff "at source" and maximise disposal to ground by infiltration prior to discharging to existing drainage systems. Suitability of disposal by infiltration may be limited by the presence of contaminated land.

Nonetheless, particular opportunities exist in relation to:

- Maximising the area of broken / unbound surfacing to provide a permeable surface, to increase interception losses; and/or provide permeable surfacing through porous bitmac or permeable paving.
- Encourage interception and disposal of surface water to gravel-filled infiltration trenches to buildings, plinths and other structures.

5.4 Summary of Flood Risk and Mitigation

The following table summarises the mechanisms of flooding identified as requiring further assessment in the initial assessment, their associated hazards, and proposed measures to mitigate the predicted risk.

Table 5.1: Summary of Risks and Mitigation

Flood Hazard	Mitigation Measures
Tidal Flooding	The proposal is sited in an appropriate Flood Zone. All proposed development susceptible to flood damage shall be situated min. 0.6m above the adjacent maximum 0.5% AEP flood level including climate change. Access to the site to be managed by means of a Flood Management Plan.
Surface Water Flooding (Drainage Impact)	The development would have no significant effect on site drainage characteristics causing an increased flood risk elsewhere and can satisfactorily be developed without being at risk of surface water flooding.
Reservoir Flooding	Affecting reservoir is maintained under the Flood and Water Management Act (2010) and a breach is highly unlikely.

5.5 Residual Risk - Events Greater than Design Standard

Consideration has been given to flooding caused by events greater than the design standard with residual impacts listed in Table 5.2.

Table 5.2: Residual Impacts

Description of Risk	Hazard	Comment / Residual Impact
Extreme tidal events well in excess of design 0.1% AEP (Q ₁₀₀₀) event	Inundation of the site	Freeboard provided exceeds the 0.1% AEP + Climate Change flood; likelihood of exhausting all additional freeboard is remote.
Reservoir failure	Inundation of the site	In the highly unlikely event of local reservoir failure, the site would be subject to significant and extensive flooding that would similarly affect significant areas of East Jarrow and the Port of Tyne.

5.6 Summary

The proposals for the site outlined in this report, when developed in line with the design recommendations contained within this assessment, show that the site is not at risk of tidal flooding.

The vulnerability of classification of the development is such that development is considered acceptable in relation to flood risk and in accordance with the relevant planning policies including the NPPF.

APPENDIX A

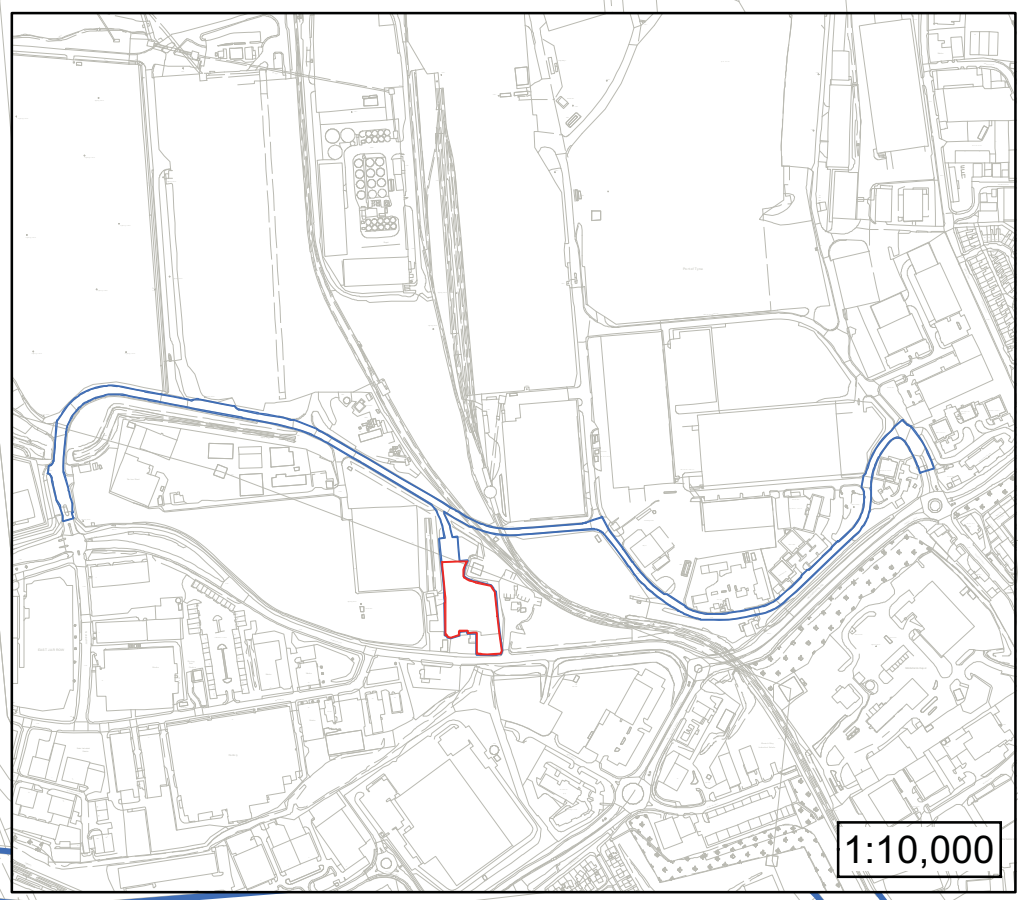
Site Drawings

DRAWING NUMBER 03629D2202-01

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KEY:

- APPLICATION SITE
(LINE OFFSET INWARDS)
- WORKING BOUNDARY
(LINE OFFSET OUTWARDS)



1:10,000



1	LT	170816	CB	180816	FIRST ISSUE
ISSUE	DRAWN	DATE	APPD	DATE	REVISION NOTES
LAYOUT DWG	N/A			LAYOUT NO.	N/A

DRAWING NUMBER 03629D2202-01

COORDS British National Grid

PURPOSE PLANNING

SCALE 1:1,250 ORIGINAL PLOT SIZE A3

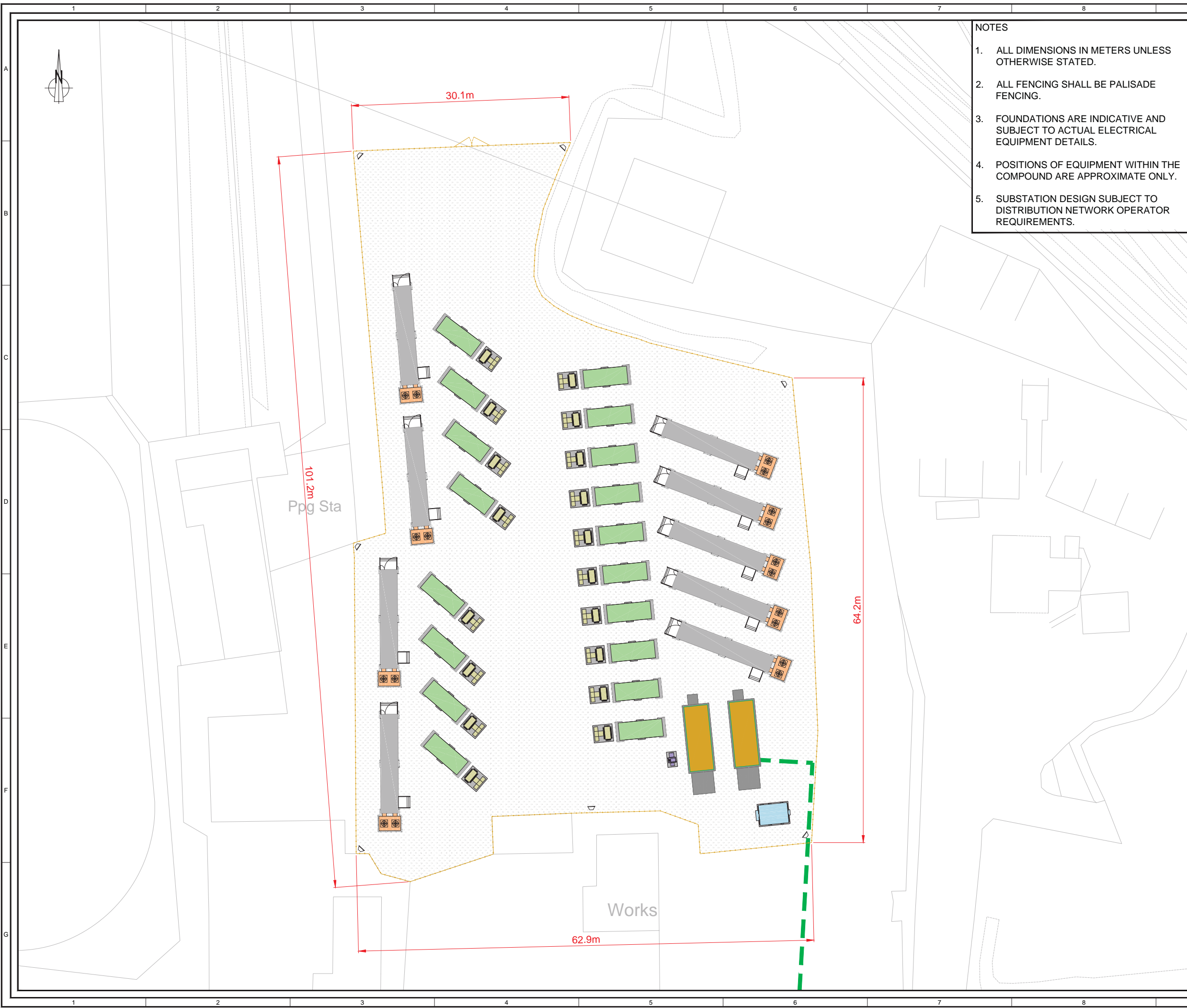
PROJECT TITLE PORT OF TYNE ENERGY STORAGE

DRAWING TITLE LOCATION PLAN

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- NOTES**
1. ALL DIMENSIONS IN METERS UNLESS OTHERWISE STATED.
 2. ALL FENCING SHALL BE PALISADE FENCING.
 3. FOUNDATIONS ARE INDICATIVE AND SUBJECT TO ACTUAL ELECTRICAL EQUIPMENT DETAILS.
 4. POSITIONS OF EQUIPMENT WITHIN THE COMPOUND ARE APPROXIMATE ONLY.
 5. SUBSTATION DESIGN SUBJECT TO DISTRIBUTION NETWORK OPERATOR REQUIREMENTS.

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- KEY:**
- ENERGY STORAGE CONTAINER
 - POWER CONVERSION SYSTEM
 - TRANSFORMER
 - SUBSTATION
 - AUXILIARY TRANSFORMER
 - HARMONIC FILTER
 - FENCE
 - CCTV
 - SURFACE COVERING TO COMPROMISE A MIX OF EXISTING HARDSTANDING OR CLEAN CRUSHED ROCK AS NECESSARY
 - INDICATIVE CABLE ROUTE

01	SDN	GE	PF	18-08-2016	NEW LAYOUT WITH CORRECT NO. CONTAINERS, MOVED FROM DWG 03629D1002-01
ISSUE	DRAWN	CHKD	APPD	DATE	REVISION NOTES
LAYOUT DWG	N/A			T-LAYOUT NO.	N/A

DRAWING NUMBER
03629D1002-01

COORDS UK OS

PURPOSE PLANNING

SCALE 1:500 ORIGINAL PLOT SIZE A3

PROJECT TITLE
PORT OF TYNE

DRAWING TITLE
INFRASTRUCTURE LAYOUT

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APPENDIX B

Environment Agency Product 4 Data & Correspondence

Figure B.1: Flood Map for Planning (Rivers and Sea) – Flood Zones

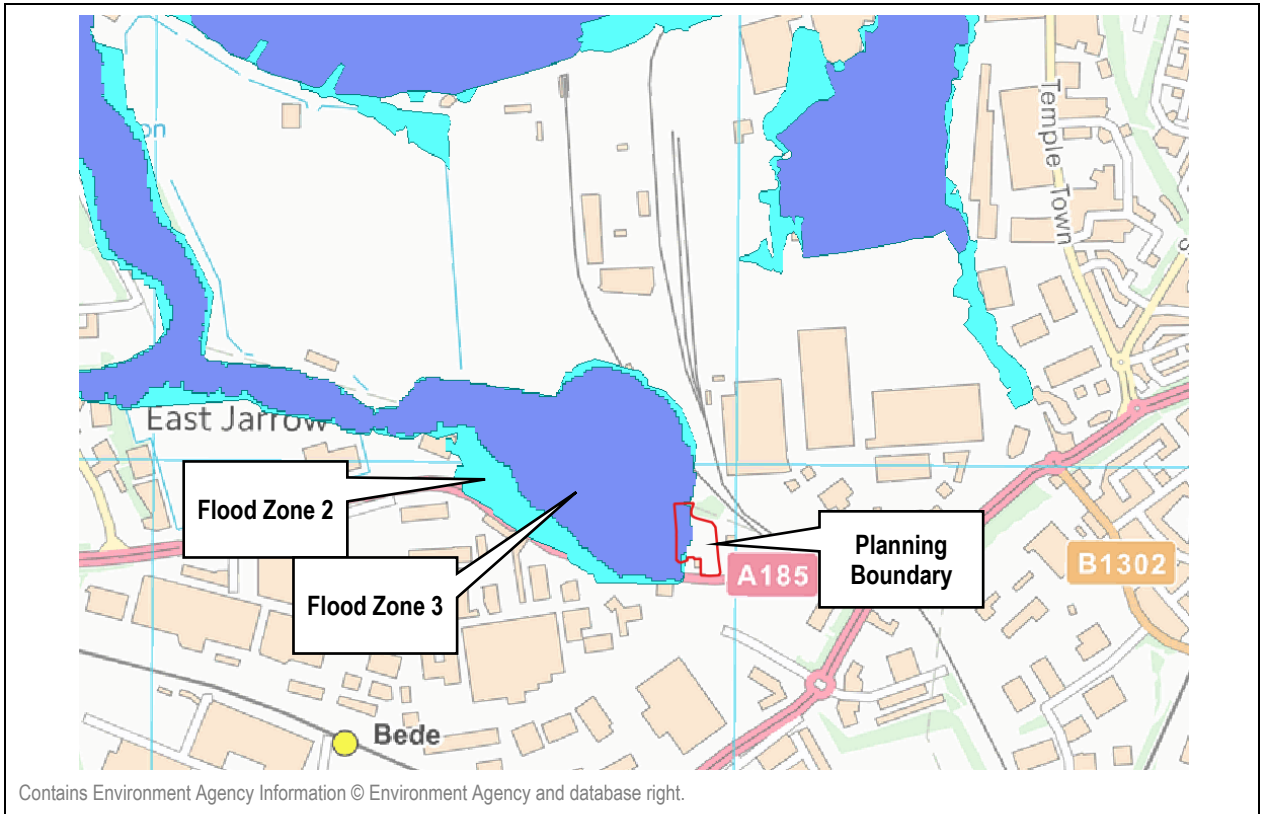


Figure B.2: Modelled Extents Map

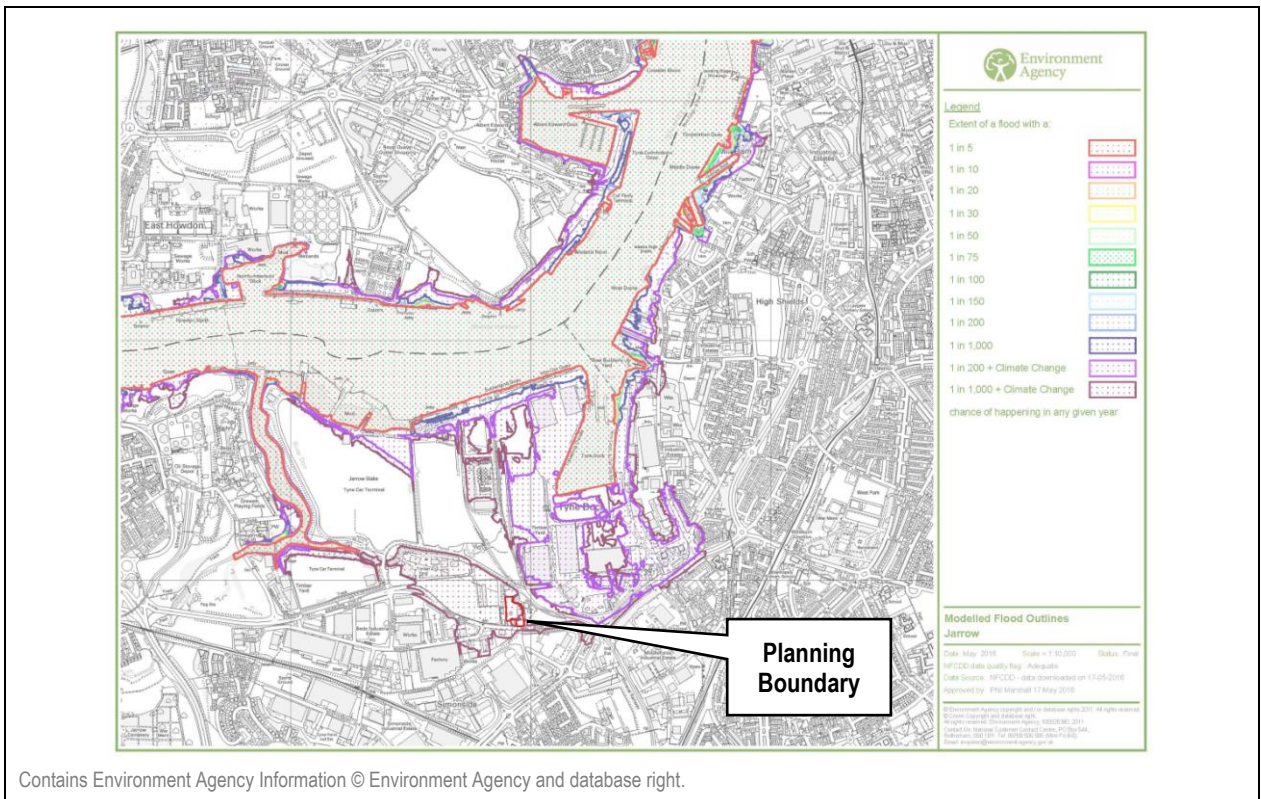


Figure B.3: Risk of Flooding from Surface Water

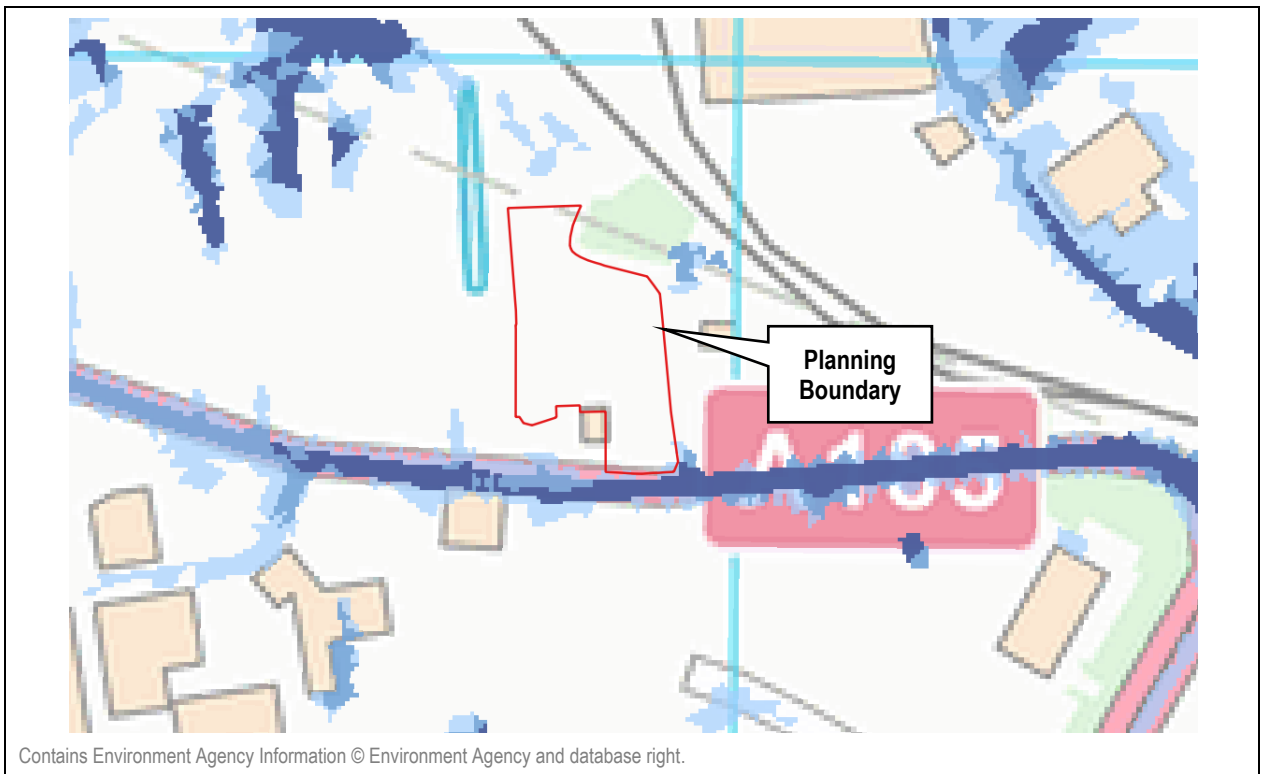
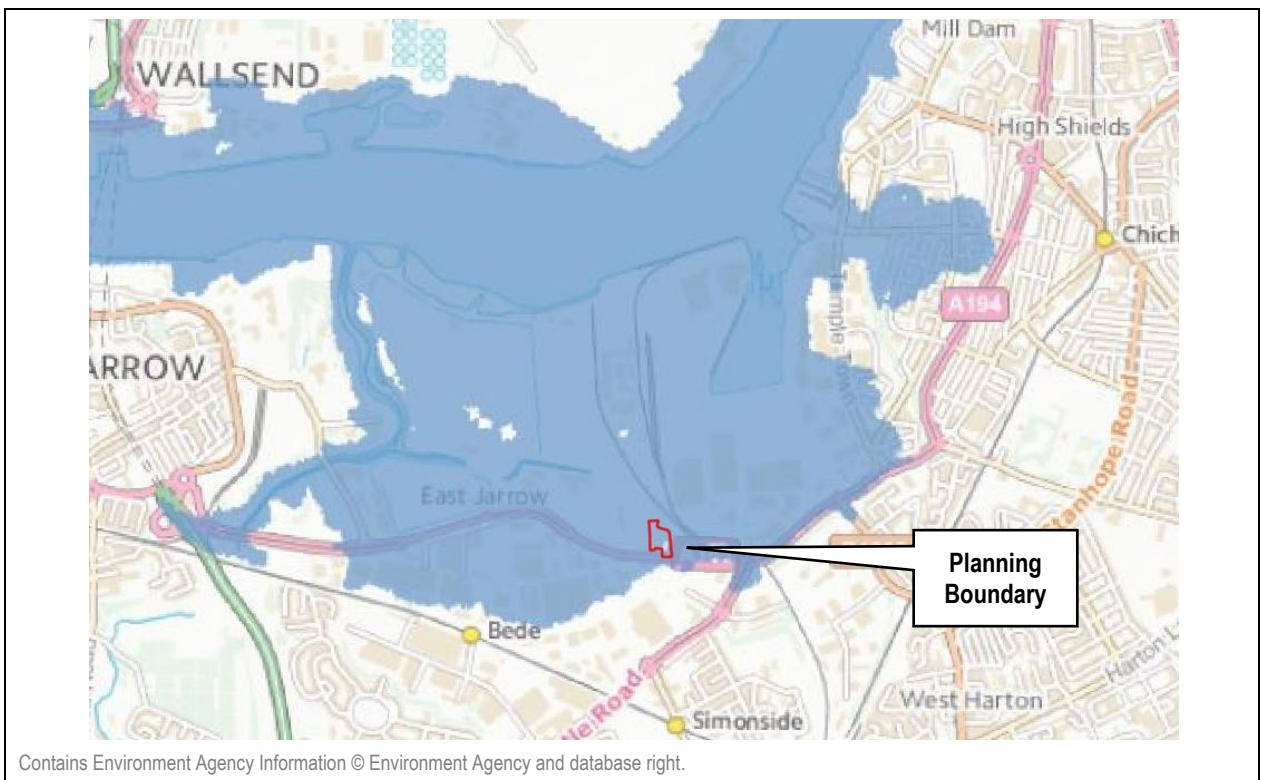


Figure B.4: Risk of Flooding from Reservoirs



Victoria Ramsey

From: Northeast Newcastle, Customer Contact [northeast-newcastle@environment-agency.gov.uk]
Sent: 04 August 2016 11:12
To: Victoria Ramsey
Subject: RE: Our ref 12278 Port of Tyne - Flood Data Request

Hello Victoria,

In response to your earlier phone call and email below, the Flood Zones at NZ 34933 64868 are part of the original Flood Zone mapping undertaken for all rivers nationally. Unfortunately we have not been able to undertake any detailed modelling on this reach and therefore this remains the best information available to us.

The modelled levels from the 2015 Tyne model supersede the Flood Map mentioned above.

I hope that helps,

Kind Regards,

Sarah Anderson
Flood Recovery Engagement Officer
North East Area

Tel: 020 847 46591
Email: sarah.anderson@environment-agency.gov.uk

Environment Agency
Tyneside House
Skinnerburn Road
Newcastle Business Park
Newcastle upon Tyne
NE4 7AR

Part of the Environment Agency's North East Area

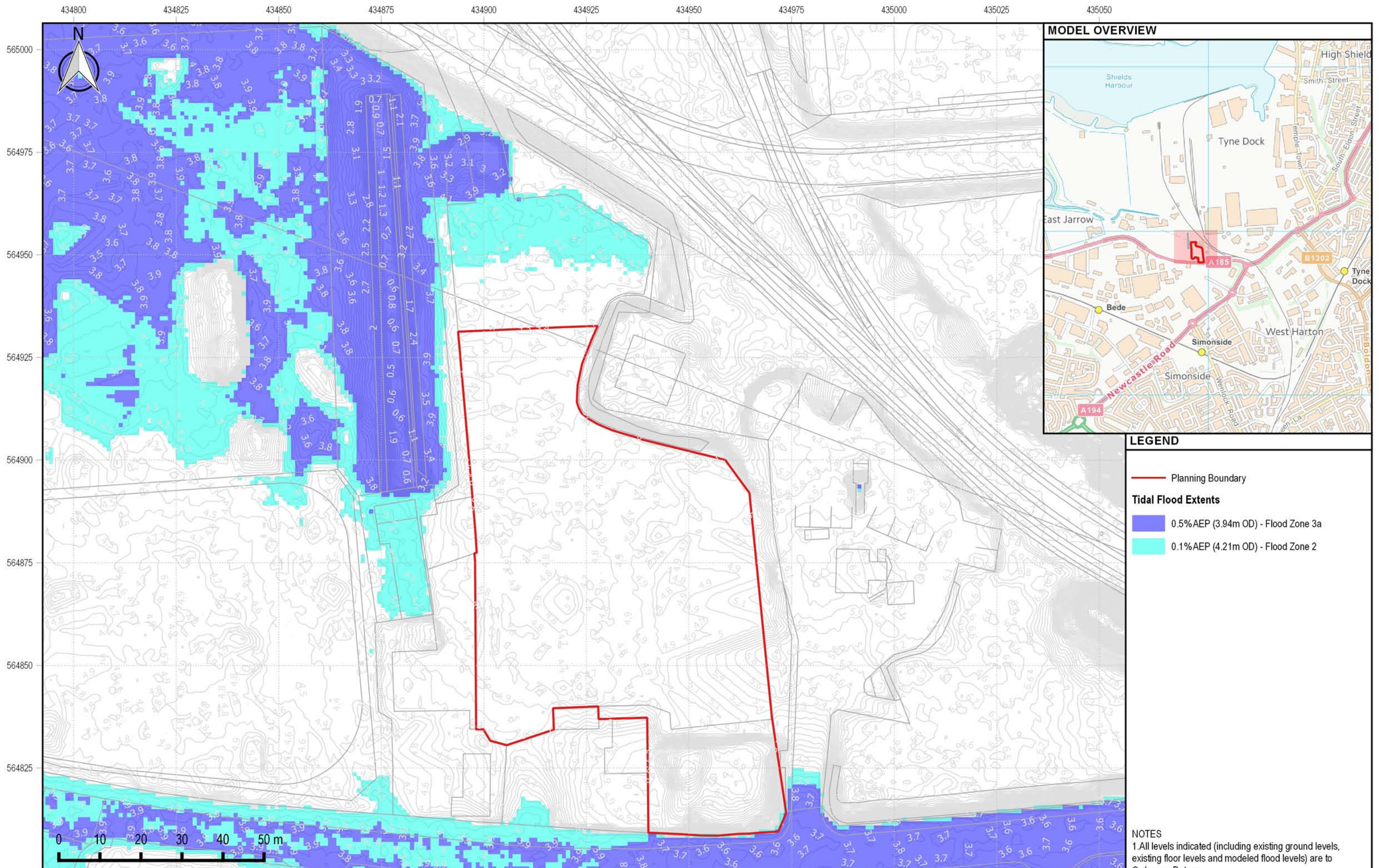
From: Victoria Ramsey [mailto: victoria.ramsey@mccloyconsulting.com]
Sent: 01 August 2016 15:11
To: Northeast Newcastle, Customer Contact <northeast-newcastle@environment-agency.gov.uk>
Subject: RE: Our ref 12278 Port of Tyne - Flood Data Request

Gemma,

Apologies, but I have another query with the modelled levels provided. When I plot the Q200 and Q1000 modelled tidal flood levels provided from the Jarrow model (without climate change) on 1m resolution LiDAR, the flood outlines of Flood Zone 2 and 3a differ from that of the EA's flood maps for planning (rivers and sea). See below images for comparison. Can you confirm that the modelled levels from the Jarrow model supersede that of the Flood Map for Planning (Rivers and Sea)?

APPENDIX C

Flood Extent Mapping



LEGEND

- Planning Boundary
- Tidal Flood Extents**
- 0.5% AEP (3.94m OD) - Flood Zone 3a
- 0.1% AEP (4.21m OD) - Flood Zone 2

NOTES

1. All levels indicated (including existing ground levels, existing floor levels and modeled flood levels) are to Ordnance Datum
2. Flood extents within the planning application boundary are plotted on OS OpenData 1m LiDar

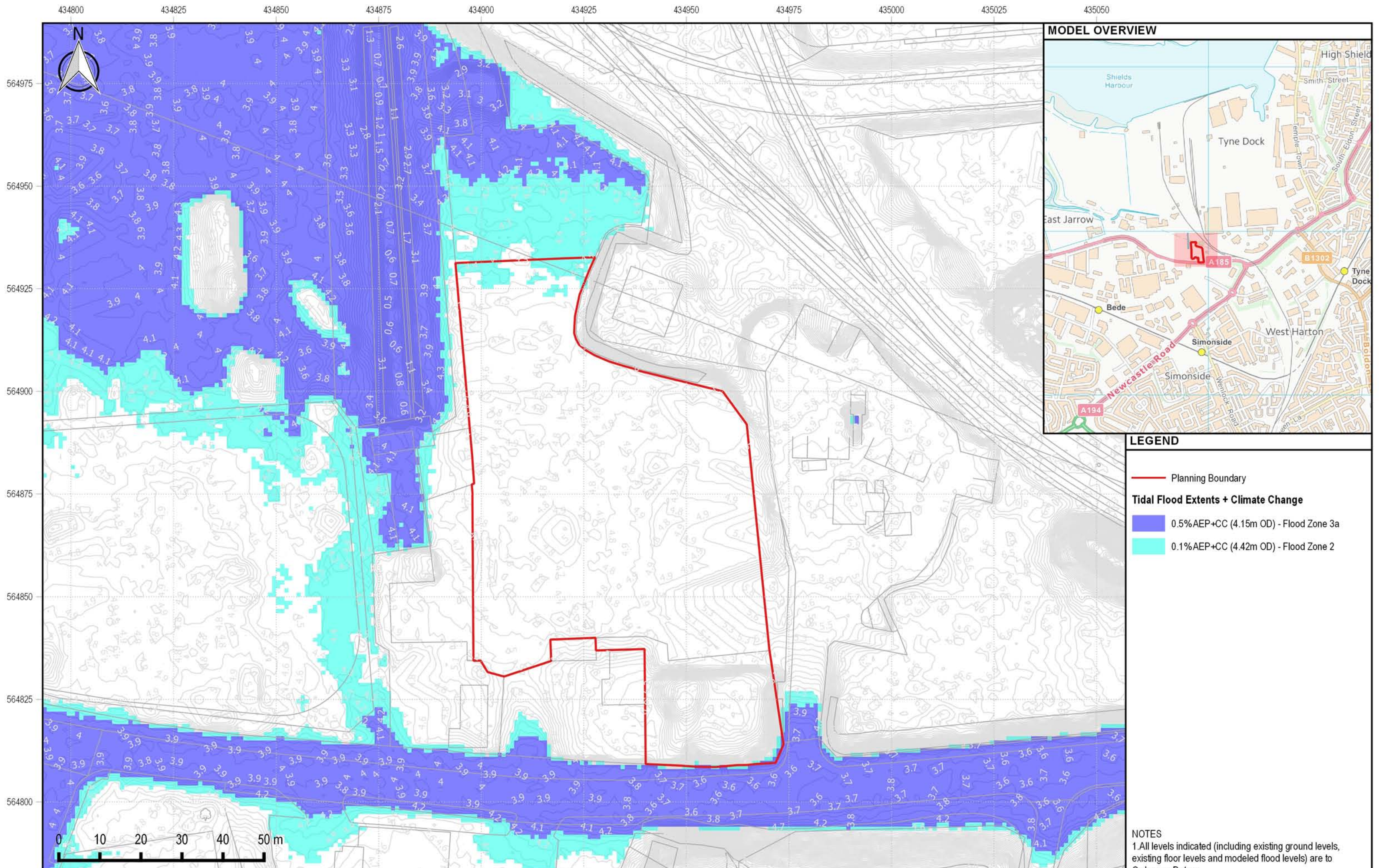
McCloy Consulting
 Water Engineering Solutions

52 Mallusk Enterprise Park
 Newtownabbey BT36 4GN
 T: 028 9084 8694
 E: info@mccloyconsulting.com
 W: www.mccloyconsulting.com

DESCRIPTION		Port of Tyne 0.5% & 0.1% Tidal Flood Extents		
PROJECT / FIGURE NO.		MCL115-80 FLO1		
DRAWN BY	SCALE	REVISION	DATE	
VR	AS SHOWN	2	22/08/2016	

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LEGEND

- Planning Boundary
- Tidal Flood Extents + Climate Change**
- 0.5% AEP+CC (4.15m OD) - Flood Zone 3a
- 0.1% AEP+CC (4.42m OD) - Flood Zone 2

NOTES

1. All levels indicated (including existing ground levels, existing floor levels and modeled flood levels) are to Ordnance Datum
2. Flood extents within the planning application boundary are plotted on OS OpenData 1m LiDar



52 Mallusk Enterprise Park
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DESCRIPTION			
Port of Tyne 0.5% & 0.1% Tidal Flood Extents + Climate Change			
PROJECT / FIGURE NO.		MCL115-80 FLO2	
DRAWN BY	SCALE	REVISION	DATE
VR	AS SHOWN	2	22/08/2016

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