The Sizewell C Project

5.2 Main Development Site Flood Risk Assessment Addendum Appendices A-F Part 1 of 10

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MAIN DEVELOPMENT SITE FLOOD RISK ASSESSMENT ADDENDUM APPENDICES

Documents included within this issue are as follows:

APPENDIX A: EXTRACT OF THE ENVIRONMENT AGENCY RELEVANT REPRESENTATION RELATED TO FLOOD RISK

APPENDIX A: EXTRACT OF THE ENVIRONMENT AGENCY RELEVANT REPRESENTATION RELATED TO FLOOD RISK

A.1. Introduction

A.1.1. This appendix provides an extract from the Environment Agency's Relevant Representation on Sizewell C Development Consent Order (Ref. 1.1) relevant to the Main Development Site and its associated flood risk.

A.2. Relevant Responses

A.2.1. The following responses have been provided by the Environment Agency within the main body of the Relevant Representation document:

> *"Much of the Sizewell C Main Development Site and Associated Development Sites are in Flood Zone 3 (high probability of flooding), and there are also numerous proposed watercourse crossings. It is therefore essential for the DCO application to be supported by an adequate Flood Risk Assessment (FRA), based on information from appropriate flood risk modelling that demonstrates that there will be no increased risk of flooding on-site or elsewhere."*

> *"During the Pre-Application stage of the DCO, the Environment Agency repeatedly gave NNBGenCo (SzC) Ltd comprehensive specialist guidance to help them ensure that an adequate FRA would be submitted so that the Examining Authority would have a sound evidence base upon which to make their decisions. It is therefore a great disappointment to the Environment Agency that NNBGenCo (SzC) Ltd has knowingly chosen to submit an FRA which is neither supported by adequate modelling, nor demonstrates that the site, its users, and neighbouring areas will be safe in the event of a flood."*

> *"The main area of concern is over the main development site fluvial hydrology. Some aspects of the analysis are rigorous but others are not. There are a number of shortcomings, particularly in the choice of an outdated method for flow estimation and limited use of available local data. Whilst it is possible that the overall conclusion of the FRA is unaffected by these shortcomings, it seems reasonable to expect to see a hydrological assessment that is above reproach in the case of a new nuclear development. Where shortcomings have been identified*

these need to be properly checked and tested using more recent hydrological methods and datasets to ensure that the conclusions of the FRA are not affected.”

“The Main Development Site Flood Risk Assessment demonstrates that 4 residential and 6 non-residential properties will be put at an increased risk of flooding as a result of the development, with no compensatory storage or property-level mitigation provided. This increase in flood risk off-site is contrary to paragraph 5.7.16 of National Policy Statement EN-1. This is an unacceptable conclusion to draw, without at least providing assurances that these increases in flood risk can be managed / or mitigated to an appropriate level. “

“During the early construction phase, the existing defences will need to be removed prior to the construction of a new haul road / site flood and coastal defence structure. Coastal inundation during this phase has not been adequately assessed. The overtopping assessment, for the period when the existing defences are removed, has indicated a flood flow rate of 140.36l/s, which dangerously exceeds the recommended safety limits for people. The FRA does not address how the safety of the site, and its users, will be ensured during this period of the construction phase.”

“The FRA states that a Flood Risk Emergency Plan (FREP) will be in place, although no FREP has been submitted. It is therefore unknown whether the Environment Agency’s Flood Warning Service will be used, or how site users will know what to do in the event of a flood, or whether safe dry access, egress and refuge is even available to help people escape from the effects of flooding. This information is required to demonstrate that site users will be safe, during both the construction and operational phases, and throughout the lifetime of the development.”

A.2.2. In addition to comments within the main body of text, further responses have been provided in a table to the rear of the Relevant Representation document. Responses relevant to the Main Development Site Flood Risk Assessment are reproduced as follows:

Document Title	Paragraph number	Issue	Comment	Suggested solution
Sizewell C Main Development Site FRA	General comment	The FRA must show that site users will have safe dry access to and from the site in fluvial & tidal flood events, but access/egress, refuge and flood warning and evacuation are not discussed in detail. This is contrary to paragraph 5.7.5 of National Policy Statement EN-1. Appendix D of the EA & ONR Joint Advice Note (July 2017) states that Safe assess /egress must be provided in the 0.5% tidal flood and 1% fluvial flood with an allowance for climate change. A safe means of escape (or sufficient time available) must be provided up to the 0.1% fluvial and tidal event.	NNBGenCo (SzC) Ltd has stated an intention is to develop a Flood Risk Emergency Plan (FREP) post-DCO stage, which will be informed by emerging information regarding construction phasing and operations. However, this information is required in order to demonstrate that workers and users of the site will be safe during the construction and operation phases. It is unknown whether the site will use the Environment Agency's Flood Warning Service, how site users will know what to do in the event of a flood, when evacuation should occur, whether there is safe dry access, egress and refuge available, or what the flood hazard presented to site users would be.	Provide further information on the flood warning and evacuation procedures to demonstrate that the proposed development can be made safe for people both during construction and operation. This Flood Response Plan should be informed by the hazards posed to people using the site and the phasing of construction activities, as well as ongoing operational activities throughout the lifetime of development. Please refer to guidance on Flood Risk Emergency Plans for New Development Also refer to the standards set out in Appendix D of the EA & ONR Joint Advice Note (July 2017) to ensure people on site are safe in the event of a flood. We will object where these are not met.
Sizewell C Main Development Site Fluvial Model Update Report & Appendix C, D & E	MDS FRA 11.3.8, 12.7.1912.7.22 and Fluvial Model Update Report 8.1.9	The Fluvial Flood Risk Assessment has established that the hazard rating category for 4 residential properties will be increased as a result of the proposed development. Modelling shows the development will increase flood risk elsewhere which is contrary to paragraph 5.7.16 of National Policy Statement EN-1	The fluvial modelling results confirm that the change in the maximum water levels within the Minsmere catchment area is less than 15mm for all the considered scenarios, including 100-year and 1,000-year events with 65% and 80% climate change allowances. the number of residential properties at risk of fluvial flooding does not increase as a result of the scheme, the hazard rating which 4 of these residential properties could experience will be increased (in 1% with 35%climate change event). There is inconsistency within the FRA as to	Investigate whether the provision of compensatory flood storage could mitigate this increased fluvial flood risk. Threshold survey data could inform of specific nature of anticipated flood risk (e.g. internal flooding). Adequate mitigation and compensation should be provided to ensure the development does not increase flood risk to property.

			whether the flood hazard rating increases from 'Danger to Some' to 'Danger to Most' or from 'Danger to Most' to 'Danger to All'	
Sizewell C Main Development Site Fluvial Model Update Report & Appendix C, D & E.	Tables 6.2 and 6.3, Plates 6.146.20, Table 6.5	The FRA has identified that, as a result of the proposals, an additional 5/6 non-residential properties will be at risk of fluvial flooding, which currently are not. Modelling shows the development will increase flood risk elsewhere which is contrary to paragraph 5.7.16 of National Policy Statement EN-1.	Reference to Tables 6.2 and 6.3 clearly show that the scheme could result in an additional 5 non-residential properties at risk in all return period events, from the 5year to the 1000 year event, with 6 additional non-residential properties at risk in the 1000year with the higher 65% and 80% climate change allowances. The location of the properties at risk is not made clear. The FRA appears to excuse this increased flood risk to non-residential property as being within the Very Low hazard category (as the increase in peak flood level is less than 0.1m). However, the inclusion of these properties within the flood outlines constitutes an increased flood risk to people and property.	Investigate whether the provision of mitigation measures, including compensatory flood storage could mitigate this increased fluvial flood risk. Threshold survey data could inform of specific nature of anticipated flood risk (e.g. internal flooding). Adequate mitigation should be provided to ensure the development does not increase flood risk to property.
Sizewell C Main Development Site FRA	11.3.13, 11.3.6, 11.3.8 & 11.3.9	FRA has demonstrated an increased change in off-site fluvial flood risk to both residential and non-residential properties as a result of the development. Yet, compensatory flood storage has not been provided. There is no clear and justified explanation for this. FRA states that EA confirmed that compensatory storage is not usually required where change in flood depth is less than 30mm, which is inaccurate.	Generally 30mm is a small change but the consequence of this change must still be assessed in the FRA to confirm this. The FRA has identified that the change in fluvial flood risk as a result of the scheme will result in the flood hazard rating increasing for 4 residential properties for the 1% with 35% climate change. This therefore confirms that the scheme is anticipated to increase the fluvial flood risk to 4 residential properties, with at least one of these becoming considered dangerous for most users. It is not acceptable to increase flood risk to people or properties. Paragraph 11.3.9 also	The evidence submitted demonstrates that the off-site fluvial flood risk will be increased as a result of the scheme. Compensatory flood storage or other means of mitigation should be investigated to determine whether this would mitigate against this increased risk.

			states that the scheme will result in an increase in flood risk to 5/6 non-residential properties. Flood depths are assessed to be between 5 and 8mm with low velocities. However, this is still a greater number of properties at risk as a direct result of the scheme.	
Sizewell C Main Development Site FRA	General and 7.1.12 & 7.2.9, Table 7.4 & 7.1.29 7.1.20	There is a lack of clarity over the proposed sequencing of the early construction phases, which has implications for assessing the flood risks posed from overtopping of the defences during the construction phases.	The existing defences will be removed prior to construction of a new haul road/defence. It is not made clear how long this phase will take, or the time of year etc. No detail regarding the proposed design or construction of the temporary haul road has been provided. Throughout this phase, the crest level is anticipated to be as low as 4.36mAOD. The overtopping assessment has indicated rate of 140.36l/s during this stage. This is not within safe threshold limits. The FRA has not fully assessed what this means for the safety of the site and its users during this early construction phase (depth, extent, duration, velocity, and hazard). NNBGENCO (SZC) Ltd have commented that they will address this post DCO, as a better understanding of sequencing and inundation modelling for construction phase is developed, alongside the FREP. Works to remove existing defences are also likely to require an environmental permit. On the basis of the FRA at the current time, it is therefore not clear how, or whether, this level of risk from overtopping can be managed.	Clarify the following issues within the FRA: What are the implications of this rate of overtopping. How might the temporary lowering of the defences impact on flood extents and receptors? What are the risks to the site itself and to the ongoing construction works across the site area? How could these risks be managed?

Sizewell C Main Development Site FRA	8.1.11, Table 8.2 & 8.2.7, 8.3.10	The temporary SSSI crossing during construction will be at risk of fluvial flooding and also coastal flooding in the 0.1% event as the existing defences are inundated, and also during a breach flood event.	The risk of fluvial flooding for the area of the temporary SSSI crossing is unclear. 8.3.10 indicates that the levels of the proposed temporary crossing are unknown, but that these should be set above 2.0mAOD in order that the road would remain dry from fluvial flooding (1 in 100yr +25% level 1.86mAOD). However, there is no assessment of the potential implications of fluvial flood risk on the construction site itself, nor for the safety of the construction workers. Para 8.1.13 states a 0.1% still water level of 4.35mAOD, which is above the shingle crest. This is below the level of the proposed haul road (7.3mAOD). However, there will be a period of risk during the early construction phase BEFORE completion of the haul road. For a period of time where this risk will be real and there will be no defences in place. What impacts would this event have at this time and how will this risk be managed?	Explain the fluvial and coastal flood risk posed to the temporary crossing and people using it, for both the risk of fluvial flooding or coastal inundation during the early construction phase, and also in the event of a breach occurring. Ensure there is a safe access/egress or a safe means of escape. Detail how this would be implemented and how people on site will know when to evacuate or stop work. A breach flood can occur without warning.
Sizewell C Main Development Site FRA	11.2.6	FRA identifies a change in flood risk associated with a breach at Tank Traps, and attempts a description of the impacts of this change, however references a Table (8.2), the data in which does not appear to be consistent with the description.	Any change in flood risk (either increased or reduction) must be clearly identified in the FRA with maps, plates or figures so it is clear to the reader what the impact of the development is. This must then be assessed in detail (depth, hazard, velocity) and the results interpreted for the receptors affected. What is the consequence of this change in flood risk? For example if an area is already at risk of flooding in a breach to significant depths additional flooding which does not increase the hazard to people could be	Provide full assessment of change in off-site flood risk in a breach. Clearly show change in depth, hazard and velocity and identify key areas where the impact is felt. Assess the consequence of this change to the receptors present. This also applies to offsite flood risk as result of the development for tidal overtopping and fluvial flood risk.

			acceptable. If there are new areas flooded that were not flooded before this would be a more significant consequence. The receptors in this area would then need to be identified to determine if this change is significant.	
Sizewell C Main Development Site FRA	7.2.16, Tables 7.5, 7.6 and 7.7	There is detailed assessment of the depth, hazard, velocity and time until inundation on the platform in the event of a breach at: 1).Tank Traps (Table 7.5; during the construction phase, prior to raising of the platform area and construction of the new defences), 2). the main defence (Table 7.6 and 7.7 during the operational epoch and beyond).	7.2.7 and Table 7.5 show the depth, velocity and hazard of a breach at tank traps in 2030 and 2190. There is no information on how this risk (which at some points/locations indicates Danger for Most/All) shall be managed (including main platform 2030 in 0.5%/0.1% events, which would present a risk during the early construction phase, prior to raising of the platform area). Breach in main HCFD in 2140 (worst case credible maximum) results in flooding to MPlatform, 7.2.27 indicates 70mm170mm of internal flooding for up to 3hours. The FRA (7.2.25-7.2.26) mentions forecasting, warning, suspension of operations and a flood emergency plan, although there is no detail to indicate that this could act as a means of keeping people safe.	The FRA must be updated to show how the risk to people will be managed.
Sizewell C Main Development Site FRA	Fig 33, 9.2.13 and Fig 56 and 9.3.3	Water Management Zone 1 basin is shown to be at fluvial risk in the 1000yr (and to a lesser extent the 200yr) extent in the baseline scenario, however, in the with scheme mapping, the proposed basin acts as the boundary for the flood extent.	The proposals should be made clear. Will proposed raised embankments create the boundaries of the flood extents? If so, the updated flood extents must be demonstrated. Figure 56 indicates that this location would be inundated in the future 100year flood events, based upon upper end and credible maximum scenarios.	Provide plates and figures showing flood risk and the construction site location. Illustrate the flood risk for the areas of the construction site that are at risk (depth, hazard & velocity). Confirm mitigation measures if required.

Sizewell C Main Development Site FRA	General comment	The FRA must show that site users will have safe dry access to and from the site in fluvial & tidal flood events, but access/egress, refuge and flood warning and evacuation are not discussed in detail. This is contrary to paragraph 5.7.5 of National Policy Statement EN-1. Appendix D of the EA & ONR Joint Advice Note (July 2017) states that Safe assess /egress must be provided in the 0.5% tidal flood and 1% fluvial flood with an allowance for climate change. A safe means of escape (or sufficient time available) must be provided up to the 0.1% fluvial and tidal event.	NNBGenCo (SzC) Ltd has stated an intention is to develop a Flood Risk Emergency Plan (FREP) following the examination stage of the DCO, which will be informed by emerging information regarding construction phasing and operations. However, this information is required in order to demonstrate that workers and users of the site will be safe during the construction and operation phases. It is unknown whether the site will use the Environment Agency's Flood Warning Service, how site users will know what to do in the event of a flood, when evacuation should occur, whether there is safe dry access, egress and refuge available, or what the flood hazard presented to site users would be.	Provide further information on the flood warning and evacuation procedures to demonstrate that the proposed development can be made safe for people both during construction and operation. This Flood Response Plan should be informed by the hazards posed to people using the site and the phasing of construction activities, as well as ongoing operational activities throughout the lifetime of development. Please refer to guidance on Flood Risk Emergency Plans for New Development Also refer to the standards set out in Appendix D of the EA & ONR Joint Advice Note (July 2017) to ensure people on site are safe in the event of a flood. We will object where these are not met.

APPENDIX B: COLLATED COMMENTS FROM THE ENVIRONMENT AGENCY RECEIVED ON 5TH FEBRUARY 2020 AND 4TH AUGUST 2020

No.	Document Title	Paragraph number	Issue	Comment	Suggested solution	Priority	Raised By	Date Raised	SZC Co. Response
Flood Risk Assessment									
1.4	Sizewell C Main Development Site FRA	General comment	Access/egress, refuge and flood warning and evacuation are not discussed in detail. FRA should show that site users will have safe dry access to and from the site in fluvial & tidal flood events. This is contrary to paragraph 5.7.5 of National Policy Statement EN-1	Appendix D of the EA & ONR Joint Advice Note (July 2017) states that Safe assess /egress must be provided in the 0.5% tidal flood and 1% fluvial flood with an allowance for climate change. A safe means of escape (or sufficient time available) must be provided up to the 0.1% fluvial and tidal event. The FRA states a FREP will be in place although details have not been provided. Will the site use the Environment Agency's Flood Warning Service? Should a flood event occur how will people on site know what to do? When should they evacuate? Is there safe dry access, egress and refuge available? Identify the flood hazard presented to site users. EDF have commented in their response to our previous comments that the intention is to develop a Flood Risk Emergency Plan (FREP) post-DCO stage, which will be informed by emerging information regarding construction phasing and operations. However, this information is required in order to demonstrate that workers and users of the site will be safe during the construction and operation phases.	In order to demonstrate that the proposed development can be made safe for people both during constructions, and operation, please provide further information on the flood warning and evacuation procedures. This Flood Response Plan should be informed by the hazards posed to people using the site and the phasing of construction activities, as well as ongoing operational activities throughout the lifetime of development. Please refer to guidance on Flood Risk Emergency Plans for New Development available here: https://www.adeptnet.org.uk/floodriskemergencyplan. Also refer to the standards set out in Appendix D of the EA & ONR Joint Advice Note (July 2017) to ensure people on site are safe in the event of a flood. We will object where these are not met.	1	GD	03/07/2020	Construction phase assessed in the FRA Addendum (section 4 and Appendix F). Further details included (i.e. temporary coastal defence with minimum crest at 7.3m AOD and temporary bailey bridge at SSSI crossing with level above 2m AOD.
4.3	Sizewell C Main Development Site FRA	7.1.12 & 7.2.9	The haul road will also be a temporary reinforced coastal defence at 7mAODN. Very little detail is provided on this element of the scheme.	EDF have commented that they have a POST DCO action to develop a Better understanding of sequencing and inundation modelling for construction phase. Develop alongside the FREP. As this indicates, further detail is required on the construction phasing in this area as this is when the site and site users/ workers will be most exposed to tidal flooding. 7.1.12 states that current sea defence will be removed, leaving shingle beach and dune (cross sec 4.36@lowest). Once this is done, a temporary reinforced coastal defence/ haul rd will be constructed @7m until main platform is completed. Main HCDF will be constructed in front of haul road, initially narrow until widened to final design @ end construction period. Risk of overtopping/ flooding during this early construction phase where the existing defence is removed, and before the haul road has been constructed is presented in Table 7.4. The overtopping rate is estimated to be 140l/s/m, but there is no assessment of what the implication of this rate would be on the site/ users. What is the risk to the site and its users?	Provide detailed construction phasing of the defence removal and haul road temporary defence construction and illustrate the flood risk posed to the site and its users in detail throughout this process. Detail the extent, depth, hazard and velocity that could impact the site in a range of return periods. Explain what people on site will do in the event of a flood and identify safe access, egress and refuge.	1	GD	03/07/2020	Construction phase assessed in the FRA Addendum (section 4 and Appendix F). Further details included (i.e. temporary coastal defence with minimum crest at 7.3m AOD and temporary bailey bridge at SSSI crossing with level above 2m AOD.
4.4	Sizewell C Main Development Site FRA	7.1.20 & Table 7.4	Overtopping rates of 140 l/s/m are expected when the mound is removed and the haul road defence is not yet in place. The FRA does explain what this rate of overtopping means for flood risk on the site.	The FRA should fully illustrate the flood risk posed to the site. Para 7.1.20 7.1.20 states that an overtopping rate of 140l/s/m would be anticipated in 1 in 200yr event in 2030, although there is no explanation as to what this would mean, other than the statement that Such overtopping rate would pose risk to safety to people at the construction site of the coastal defences. This section does not discuss the consequences of the overtopping rates modelled. There is no discussion of consequences of overtopping, depth , velocity, extent etc? It is over threshold for vehicle safety as per 7.1.34.	Discuss and assess overtopping rates in more detail so it is clear to the reader what the rate of overtopping will look like and what the consequences are. 7.2.15 discusses managing this via monitoring and ceasing construction if necessary. The impacts of this overtopping risk may not be known…. Can they therefore be managed this way?	1	GD	03/07/2020	Construction phase assessed in the FRA Addendum (section 4 and Appendix F). Further details included (i.e. temporary coastal defence with minimum crest at 7.3m AOD and temporary bailey bridge at SSSI crossing with level above 2m AOD.

No.	Document Title	Paragraph number	Issue	Comment	Suggested solution	Priority	Raised By	Date Raised	SZC Co. Response
4.5	Sizewell C Main Development Site FRA	7.1.22 (incorrectly under the heading 'Residual Risk Management')	The FRA states that an appropriate risk management plan should be in place for the initial stages of construction to manage the actual risk of flooding posed to the site when the haul road temporary defence is being constructed. Very little detail is provided. This is contrary to paragraph 5.7.5 on National Policy Statement EN-1.	7.1.22 states An appropriate Flood risk emergency plan would be in place for the initial stages of construction while the temporary coastal defence is being constructed as this is when the construction-site is most exposed. The flood emergency plan in accordance with the standards set out in Appendix D of the Environment Agency and ONR Joint Advice Note (Ref 1.3) would include procedures to ensure people on site are safe in the event of a flood. The FRA suggests that the weather and tidal conditions will be monitored. Will the site be signed up to the Environment Agency's Flood Warning Service? Should a flood event occur how will people on site know what to do. Should they evacuate or stay on site and take refuge? Is safe dry access, egress and refuge possible given the site will be so exposed? When should people evacuate? All sources of flooding should be assessed.	Remove word 'residual' from subheading (risk of overtopping is an actual risk). Provide further information on the flood warning and evacuation procedures and assess the hazards posed to people using the site. Please confirm when the risk management plan will be produced for the site during construction and operation up to its full lifetime. Please refer to guidance on Flood Risk Emergency Plans for New Development available here: https://www.adeptnet.org.uk/floodriskemergencyplan. Also refer to the standards set out in Appendix D of the EA & ONR Joint Advice Note (July 2017) to ensure people on site are safe in the event of a flood. We will object where these are not met.	1	CS	15/01/2020	Construction phase assessed in the FRA Addendum (section 4 and Appendix F). Further details included (i.e. temporary coastal defence with minimum crest at 7.3m AOD and temporary bailey bridge at SSSI crossing with level above 2m AOD.
4.8	Sizewell C Main Development Site FRA	Table 7.4 & 7.1.27	A credible maximum scenario for the 0.5% (200 year) & 0.1% (1000 year) overtopping event at 2190 has not been modelled.	Table 7.4 indicates that overtopping can be managed in the design 0.5% (1 in 200 year) flood using the planned defences up to 2190 using a reasonably foreseeable climate change allowance. However the likely rate of overtopping in the credible maximum scenario is unknown. Wave overtopping occurs in the 0.1% BECC Upper at 2140 with the highest defence crest in place. The credible maximum scenario was not modelled for 0.5% and 0.1% events in 2190, as explained in 7.1.36 as the extreme water level used for Overtopping assessment would have been 8.0mAOD in 0.5% and 8.84mAOD in 0.1%, and 10,000yr event was modelled with peak of 8.85mAOD. However, EDF have provided comments that they intend a POST DCO Action to Run additional scenarios for the credible max.	EDF have provided comments that they intend a POST DCO Action to Run additional scenarios for the credible max. Run 0.5% & 0.1% credible maximum scenario and provide wave overtopping rates and inundation modelling & mapping so we can establish the possible impacts of climate change into the future. It must be evidenced that the defences proposed can be adapted in future should the credible maximum climate change scenario be realised in the 0.5% (1 in 200 year) event. This is in line with Paragraph 4.8.8 of National Policy Statement EN-1 & Appendix C & D of the EA & ONR Joint Advice Note (July 2017).	1	CS	15/01/2020	Further assessment of overtopping at credible maximum scenarios undertaken and discussed in FRA Addendum (section 3.4) and Coastal Wave Overtopping Modelling Report Addendum (section 5.2).
5.1	Sizewell C Main Development Site FRA	Table 7.4 & 7.1.29	The FRA has determined the anticipated coastal overtopping rates, but has not interpreted what this may mean for the safety of people. Table 7.4 of the FRA presents the overtopping rates that may be experienced at the crest of the new Hard Coastal Defence. However, there is limited interpretation of what these rates will mean for the safety of the site or how this will be managed on site.	It is important that the FRA interprets the overtopping rates and explains what they mean on the ground. Some overtopping may not result in flooding on the site but based on the information provided it is not possible to conclude this. 7.1.34 incorrectly states that, considering the proposed managed adaptive approach, the results presented in Table 7.4 show the risk of overtopping up to 2140 are below the safe for vehicles threshold of 5 l/m/s stated in the EurOtop Manual (Appendix 4). However, during the early construction phase, the overtopping rate in a 1 in 200yr event (2030 epoch) could be 140l/s/m. How does this translate into flood extent, depth, velocity and hazard? If wave overtopping occurs how will this risk be managed? The FRA identifies site management protocols and a warning system will be used but does not explain how this will work. Does this potential rate of overtopping during the early construction phase pose an increased flood risk to off-site/nearby receptors, for example by increasing the extent or depth of flooding during this tidal event?	• Elaborate on the overtopping rates shown in the tables of the FRA so it is clear to the reader what the consequences of this overtopping is for flood risk on site in the 0.5% and 0.1 % events over the lifetime of the development. • State if the overtopping will impact the site (platform and SSSI crossing) and if it does provide inundation mapping and illustrate the depth, hazard and velocity expected and how the overtopping water will be managed. • State if the overtopping will impact any off-site receptors, and if it does provide inundation mapping and illustrate the depth, hazard and velocity expected and how the overtopping water will be managed • Explain the management protocols and warning system. Please refer to guidance on Flood Risk Emergency Plans for New Development available here: https://www.adeptnet.org.uk/floodriskemergencyplan. Also refer to the standards set out in Appendix D of the EA & ONR Joint Advice Note (July 2017) to ensure people on site have safe access and egress in the event of a flood. We will object where these are not met.	1	GD	01/07/2020	Further assessment undertaken provided in the FRA Addendum (section 4).

No.	Document Title	Paragraph number	Issue	Comment	Suggested solution	Priority	Raised By	Date Raised	SZC Co. Response
5.3	Sizewell C Main Development Site FRA	7.2.16	FRA report provides flood depths expected in a breach of the Tank Traps and the main defence and assesses the hazard, velocity and time until inundation. However, it is not clear how this potential risk to people will be managed.	The FRA provides an assessment of the flood risk in the event of a breach of the main defence. Flooding is expected on the platform which will need to be managed. . 7.2.3 states HCDF breach in 2030 0.1% would not pose flood risk to the Main Platform, which is raised. However, Figs 25 and 26 clearly show the breach flood extent on the Main platform area in the baseline scenario, and therefore during the early construction phase, before the platform is raised. With water level of 3.2mAOD, the platform is raised above this once constructed. In 2190, breach water levels are higher (5.7mAOD n 0.5% and 5.9mAOD in 0.1%), but still below the level of the platform, which will be constructed by this point (7.3mAOD). 7.2.7 and Table 7.5 show the depth, velocity and hazard of a breach at tank traps in 2030 and 2190. There is no information on how this risk (which at some points/locations indicates Danger for Most/All) shall be managed (including main platform 2030 in 0.5%/0.1% events, which would present a risk during the early construction phase, prior to raising of the platform area). Breach in main HCFD in 2140 (worst case cred max) results in flooding to Platform, 7.2.27 indicates 70mm-170mm of internal flooding for up to 3hours. The FRA (7.2.25-7.2.26) mentions forecasting, warning, suspension of operations and a flood emergency plan, although there is no detail to indicate that this could act as a means of keeping people safe.	There is detailed assessment of the depth, hazard, velocity and time until inundation on the platform in the event of a breach at 1).Tank Traps (Table 7.5; during the construction phase, prior to raising of the platform area and construction of the new defences), and 2). the main defence (Table 7.6 and 7.7 during the operational epoch and beyond). Based on this information the FRA should present how this risk will be managed.	1	GD	01/07/2020	Further assessment undertaken provided in the FRA Addendum (section 4).
6.8	Sizewell C Main Development Site FRA	11.1.5 Fig 60-61	The FRA and figures show an increase in flood depth (coastal inundation) as a result of the development for the Minsmere Levels, with a decrease in flood depths for the Sizewell Belts area.	11.1.5 indicates the difference between baseline and with scheme as 0.07m-0.1m (0.5% and 0.1% 2030 events). 2030 was selected as indicative of the greatest difference. Figure 61 illustrates how the nature of coastal inundation could change as a result of the proposals, with an increased depth of flooding on the Minsmere Levels, and a decreased depth on the Sizewell Belts area. This is attributed to the throttling effect of the SSSI Crossing (11.1.14-11.1.16) Table 11.1 and 11.1.7 state no additional properties at risk in 2030 or 2190 event (both 0.5% and 0.1%). BUT it has not been made clear whether any of these properties could experience greater depth of flooding, or increased hazard category (assuming it is the same properties affected).There is an increase in velocity at locations, but no assessment has been made as to what the impacts of this, (if any) could be on hazard rating to workers/site users. Figs 61 and 62 indicate increased depth and velocity in 2030 0.5% event at the area to the immediate south of the existing power station. The change in flood risk/ hazard should be assessed/discussed in detail within the FRA owing to the proximity to properties (some residential). This is particularly important here, as Figure 61 indicates several 'wet' residential properties to the south of the existing power station.	The FRA must clearly address where there is a change in flood risk as a result of the development. Relevant experts such as Natural England should be consulted regarding the throttling effect of the SSSI crossing, and the potential impacts on flood depths experienced within the Minsmere Levels and the Sizewell Belts. The potential impacts should be made clear on all receptors. This is particularly important where there is an increase in flood risk as this is against the National Policy Statements. Please provide a full assessment of the potential impacts on receptors, particularly on those 'wet' residential properties, as per Figure 61. Where there is a change the implications of this must be assessed in detail in order to determine if this is acceptable. What do increases in water level of 0.07-0.1m mean for people? Are properties at risk of greater depths of flooding? What do the increases in velocity mean for hazard to users? What of the increased velocity and water level to the south of SZA/B site?	1	GD	01/07/2020	Further assessment undertaken following design changes, results discussed in FRA Addendum (section 3.4).
7.2	Sizewell C Main Development Site FRA	11.2	Breach mapping for the tank traps is only provided for 0.5% and 0.1% return periods at 2030 and 2190. No breach or coastal inundation runs were undertaken between 2030 and 2190.	Figures do show impacts of breach at Tank Traps on velocity, hazard, depth, but limited to outputs for 2030 and 2190 epochs. The FRA identifies that the greatest impact to off site flood risk in a breach flood event is in the 0.5% and 0.1% events at 2030, when compared with the 2190 scenario. The impact off site is not as noticeable at 2190 due to significant inundation. The FRA should provide evidence that the impact in the intermediate years between 2030 and 2190 do not create a greater impact on off site flood risk.	Provide evidence & explanation to show there is not a greater impact on off site flood risk in years between 2030 and 2190. Further breach & inundation modelling may be required to evidence this.	1	GD	01/07/2020	Additional runs for intermediate epochs in between 2030 and 2190 have been carried out and are presented in the FRA Addendum (section 2.3) and Tidal Breach & Coastal Inundation Modelling Report Addendum (section 2.4).

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7.5	Sizewell C Main Development Site FRA	11.3.13, 11.3.6, 11.3.8 & 11.3.9	Generalisation of EA advice regarding compensatory storage requirements. FRA has demonstrated an increased change in off site fluvial flood risk to both residential and non-residential properties as a result of the development. Yet, compensatory flood storage has not been provided. There is no clear and justified explanation for this.	FRA states that EA confirmed that compensatory storage is not usually required where change in flood depth is less than 30mm. FRA does not include full advice provided. Generally 30mm is a small change but the consequence of this change must still be assessed in the FRA to confirm this. The FRA has identified that the change in fluvial flood risk as a result of the scheme will result in the flood hazard rating increasing for 4 residential properties for the 1% with 35% climate change. This therefore confirms that the scheme is anticipated to increase the fluvial flood risk to 4 residential properties, with at least one of these becoming considered dangerous for most users. It is not acceptable to increase flood risk to people or properties. 11.3.9 also states that the scheme will result in an increase in flood risk to 5/6 non-residential properties. Flood depths are assessed to be between 5 and 8mm with low velocities. However, this is still a greater number of properties at risk as a direct result of the scheme.	The evidence submitted demonstrates that the off-site fluvial flood risk will be increased as a result of the scheme, and compensatory flood storage should be investigated to determine whether this would mitigate against this increased risk.	1	GD	03/07/2020	Mitigation has been embedded into the updated design. Further assessment undertaken and discussed in the FRA Addendum (section 3).
8	Sizewell C Main Development Site Fluvial Model Update Report & Appendix C,D & E.	Tables 6.2 and 6.3, Plates 6.14-6.20, Table 6.5	The FRA has identified that, as a result of the proposals, an additional 5/6 non-residential properties will be at risk of fluvial flooding, which currently are not. The FRA appears to excuse this increased flood risk to non-residential property as being within the Very Low hazard category (as the increase in peak flood level is less than 0.1m). However, the inclusion of these properties within the flood outlines constitutes an increased flood risk to people and property. Modelling shows the development will increase flood risk elsewhere which is contrary to paragraph 5.7.16 of National Policy Statement EN-1.	Reference to Tables 6.2 and 6.3 clearly show that the scheme could result in an additional 5 non-residential properties at risk in all return period events, from the 5year to the 1000 year event, with 6 additional non-resi properties at risk in the 1000year with the higher 65% and 80% climate change allowances. The location of the properties at risk is not made clear. • No maps of property locations have been provided. Although maps showing the differences in depth, velocity and hazard (between baseline and with scheme scenarios) are provided in Appendix E, with summary maps within the Update Report (plates 6.14- 6.20). The locations of the properties are not on these maps. •A summary is provided in Table 6.5 of the Fluvial Model Update Report, which illustrates the difference in flood risk (baseline vs with scheme) to all properties, and details the difference in depth, velocity and hazard for the 100year with both 35% and 65% climate change. A list of properties is provided in Appendix C (baseline) and Appendix D (with scheme). The mapped locations of these properties (residential and commercial) that are at risk in the baseline and with scheme scenarios have not been provided. • The NRD data (object ID and partial address) has been provided and could be cross-referenced. The excel spreadsheet has not been provided, but an adobe version (less useable) can be viewed, although this is not user friendly enough to be reviewed in detail, compared or interrogated. At the beginning of Appendices C and D and E, the spreadsheet data outputs focus on residential and commercial NRD points only. Again, the format does not lend itself to accurate interpretation, although a comparison of baseline and with scheme has been provided in Appendix E. It is this which is summarised in Table 6.5.	Investigate whether the provision of compensatory flood storage could mitigate this increased fluvial flood risk. Threshold survey data could inform of specific nature of anticipated flood risk (e.g. integral flooding). Adequate mitigation should be provided to ensure the development does not increase flood risk to property.	1	GD	03/07/2020	Mitigation has been embedded into the updated design. Further assessment undertaken and discussed in the FRA Addendum (section 3).

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8.1	Sizewell C Main Development Site Fluvial Model Update Report & Appendix C,D & E.	MDS FRA 11.3.8 and Fluvial Model Update Report 8.1.9	The Fluvial Flood Risk Assessment has established that the hazard rating category to which 4 residential properties could experience will be increased as a result of the proposed development. Modelling shows the development will increase flood risk elsewhere which is contrary to paragraph 5.7.16 of National Policy Statement EN-1.	The fluvial modelling results confirm that the change in the maximum water levels within the Minsmere catchment area is less than 15mm for all the considered scenarios, including 100-year and 1,000-year events with 65% and 80% climate change allowances. 8.1.9. states that "The total number of residential properties at risk of flooding has not changed as a result of the Sizewell C development". However, while the number of residential properties at risk of fluvial flooding does not appear to increase as a result of the scheme, it appears that the hazard rating which 4 of these residential properties could experience will be increased (in 1% with 35%climate change event). 8.1.9 states that the " Flood hazard rating changed from class 'Danger for some' to 'Danger for most' for four properties located within Leiston area." Conversely, Section 11.3.8 of the FRA states that for the 100year with 35% climate change, the hazard rating to 4 residential properties has increased, with one from Danger to most to Danger for All (It is not made clear how the hazard rating of the other residential properties is affected by the scheme). Thus, while the number of residential properties does not appear to increase as a result of the scheme, it appears that the hazard rating which 4 of these residential properties could experience is increased.	Investigate whether the provision of compensatory flood storage could mitigate this increased fluvial flood risk. Threshold survey data could inform of specific nature of anticipated flood risk (e.g. integral flooding). Adequate mitigation should be provided to ensure the development does not increase flood risk to property.	1	GD	03/07/2020	Mitigation has been embedded into the updated design. Further assessment undertaken and discussed in the FRA Addendum (section 3).
9	Sizewell C Tidal Breach and Coastal Inundation Modelling Update Report	6.3-6.4	Comparison of the characteristics (depth, velocity, hazard, speed of onset) of a breach event for three different breach locations between baseline and 'with scheme' have been presented. However, little information of the implication of this assessment of flood risk for people and property has been made, and the intended means of mitigation to provide safety has not been made clear.	6.3.8 shows HCFD breach would result in flooding of main platform to depth of 0.3-0.7m in 0.5% 2140 'with scheme' scenario. 6.3.10 mentions potential mitigation measures, but no specific detail is provided to demonstrate safety (e.g. mAOD level for FFL or water resistant design). Section 6.4 presents the changes between baseline and with scheme. A breach at tank Traps changes flood depth 2030 0.5% and 0.1%, increasing depths by approx 0.1-0.3m north of the breach, and reducing depths by a similar amount to the south and west. This change is less significant for the 2190 epoch scenario. 6.4.2 explains the increased depth in the context of the general depths of 3.0-3.5m for the 2030 epoch and 5.5-6.0m for the 2190 epoch. Table 6.9 illustrates time to inundation as a result of tank traps breach: fastest onset is 7 hours.	Sufficient detail should be provided to demonstrate how the proposed mitigation measures should keep people and property safe and resilient to flooding in a breach scenario. Where mitigation is proposed on the main platform area, detail regarding the mAOD to which finished floor levels or water resistant building design (as per 6.3.10) should be made clear in the FRA.	1	GD	01/07/2020	Mitigation has been embedded into the updated design. Further assessment undertaken and discussed in the FRA Addendum (section 3).
	Sizewell C Main Development Site FRA	12.7.19-12.7.22	The off-site fluvial flood risk identified within the FRA has not been adequately mitigated. It has been demonstrated that the development will result in off site impacts which pose a risk to people and property. This is contrary to paragraph 5.7.16 of National Policy Statement EN-1.	12.7.19-12.7.22 does not adequately address the off-site increase in fluvial flood risk that has been identified within the FRA. There are residential properties which will be at increased risk of greater flood depths and the flood hazard will increase (to one property, the hazard rating will be elevated to danger for all). There are also a greater number of non-residential properties which will be exposed to flood risk. This has not been adequately addressed.	Could the provision of compensatory flood storage overcome this increased risk which is posed as a result of the development? Alternatively, would a redesign prevent any increased flood risk from occurring? Or can this increased fluvial flood risk be reduced/ mitigated in any other way?	1	GD	03/07/2020	Mitigation has been embedded into the updated design. Further assessment undertaken and discussed in the FRA Addendum (section 3).
	Sizewell C Main Development Site FRA	General	There is a lack of clarity over the proposed sequencing of the early construction phases, which has implications for assessing the flood risks posed from overtopping of the defences during the construction phases.	There is a lack of clarity over sequencing of early construction phase, although at one point, the existing defences will be removed, prior to construction of a new haul road/defence. It is not made clear how long this phase will take, or the time of year etc. Throughout this phase, the crest level is anticipated to be as low as 4.36mAOD. The overtopping assessment has indicated rate of 140.36l/s during this stage. This is not within safe threshold limits. The FRA has not fully assessed what this means for the safety of the site and its users during this early construction phase (depth, extent, duration, velocity, hazard?). EDF have commented that they will address this POST DCO, as a better understanding of sequencing and inundation modelling for construction phase is developed, alongside the FREP. Works to remove existing defences are also likely to require a FRAP. On the basis of the FRA at the current time, it is therefore not clear how, or whether, this level of risk from overtopping can be managed.	What are the implications of this rate of overtopping. How might the temporary lowering of the defences impact on flood extents and receptors? What are the risks to the site itself and to the ongoing construction works across the site area? How could these risks be managed?	1	GD	03/07/2020	Construction phase assessed in the FRA Addendum (section 4 and Appendix F). Further details included (i.e. temporary coastal defence with minimum crest at 7.3m AOD and temporary bailey bridge at SSSI crossing with level above 2m AOD.

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	Sizewell C Main Development Site FRA	11.2.6	FRA identifies a change in flood risk associated with a breach at Tank Traps, and attempts a description of the impacts of this change, however references a Table (8.2), the data in which does not appear to be consistent with the description.	Any change in flood risk (either increased or reduction) must be clearly identified in the FRA with maps, plates or figures so it is clear to the reader what the impact of the development is. This must then be assessed in detail (depth, hazard, velocity) and the results interpreted for the receptors affected. What is the consequence of this change in flood risk? For example if an area is already at risk of flooding in a breach to significant depths additional flooding which does not increase the hazard to people could be acceptable. If there are new areas flooded that were not flooded before this would be a more significant consequence. The receptors in this area would then need to be identified to determine if this change is significant.	Provide full assessment of change in off site flood risk in a breach. Clearly show change in depth, hazard and velocity and identify key areas where the impact is felt. Assess the consequence of this change to the receptors present. This also applies to off site flood risk as result of the development for tidal overtopping and fluvial flood risk. We will object if this is not undertaken.	1	GD	01/07/2020	Mitigation has been embedded into the updated design. Further assessment undertaken and discussed in the FRA Addendum (section 3).
	MDS Fluvial Modelling Update report	6.4.19, 6.4.20, 6.4.21, 6.4.22	Although the modelling report has identified and increased off-site fluvial flood risk as a result of the proposed development, adequate mitigation has not been proposed.	The maximum change in flood depth for all affected residential properties is 15mm. Although there is no increase in the total number of residential properties at risk, the proposed development could increased the flood hazard rating for four residential properties (6.4.20). In the 1 in 100 yr with 35% climate change, one of these residential properties moves from the Danger to some to Danger to most category. There are also an additional 5 non residential properties which will experience increased flood risk as a result of the proposed development in the design fluvial flood event. 6.4.4-6.4.8 discuss the changes in water levels. As per our comments relating to impacts of increased flood risk on receptors, the anticipated increased flood risk to residential (increased hazard rating) and commercial (greater number at risk) properties as a result of this proposed development have not been adequately addressed. These off-site flood risk impacts have not been mitigated. The information submitted demonstrates that the proposed development will result in an increased off-site fluvial flood risk to both residential and non-residential properties.	Property level threshold survey will provide a means of more accurate interpretation of the potential increases in flood risk to these properties. Mitigation should be proposed to ensure that the proposed development does not result in an increased flood risk.	1	GD	Jul-20	100mm threshold applied to residential properties only. Details and justification provided in the FRA Addendum (section 3).
1.7	Sizewell C Main Development Site FRA	General comment	Full details of the surface water drainage strategy are not available.	Infiltration is proposed to manage surface water. This is dependant upon infiltration testing which has not been undertaken in all circumstances.	SCC will be responsible to establishing whether the surface water management proposals are acceptable e.g. 7.4.9 states A 20% allowance for climate change is to be incorporated into the construction drainage system.	2	CS	06/12/2019	Clarifications on surface water drainage provided in the FRA Addendum (section 5).
2.3	Sizewell C Main Development Site FRA	4.3	Breach approach is not fully justified. Why were 2030, 2090, 2140 and 2190 scenarios run with UKCP18 climate change allowances only?	It is important that the approach to assessing breach flood risk over the lifetime of the development has been fully justified and explained in the reporting. A current day and credible maximum scenario not been run. The FRA must ensure a breach event in the credible maximum scenario does not impact the platform or SSSI crossing. The approach to assessing the flood risk in a breach scenario has not been fully justified and explained in the FRA report. However, reference in section 4.5.4 of the MDS Breach Modelling Update report indicates that the more conservative BECC upper climate scenario was worked to, although this appears to be only for the breach in the main sea defence. It appears that the Tank Traps, Sizewell Gaps and coastal inundation modelling for 2030 and 2190 breach scenarios were carried out using UKCP18 climate change allowances only. Current day breach doesn't appear to have been modelled.	Please add explanation to the report. Provide additional evidence and modelling if required. EDF have commented that they intend a POST DCO Action to: Further runs (for epoch in between 2030 and 2190) to confirm that the worst case has been assessed. It appears that the intention is to address this later on. Does this enable an assessment of the potential impacts of a breach scenario? It should be considered that the worst case could demonstrate a considerable level of risk. Without understanding this, is it possible to plan in order to manage that risk and ensure safety?	2	CS	06/12/2019	Current coastal flood risk discussed in the FRA (submitted with the Application) in section 5.3 and 5.4. Earliest epoch considered 2030 for construction phase of the development. Intermediate epochs between 2030 and 2190 have been assessed and results are discussed in the FRA Addendum (section 2.3).

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4.6	Sizewell C Main Development Site FRA	Table 7.3	This table shows overtopping rates at the northern mound at 2110 for a range of return periods.	The FRA does not explain why the lifetime of 2110 was used. We agree with 7.1.29, which determines that it is not necessary to rerun the scenario with the UKCP18 figures, as the difference between the UKCP09 and UKCP18 levels is less than 0.2m, and given there is no anticipated overtopping in the 1 in 200 and 1 in 1000 yr events, this would not change conclusions of flood risk as water levels with wave height are well below defence crest heights, thus the assessment was not revised. However the relevance of a lifetime to 2110 should be explained.	EDF have commented in their response to our previous comments that they have proposed POST DCO action to '"carry out assessment at 2190". The justification for a lifetime of 2110 should be made clear, as should it be made clear why the intention is to run scenarios to 2190 AFTER the DCO process. This information is necessary in order to demonstrate the flood risk from overtopping of the northern mound over the operational lifetime of development to 2190.	2	GD	01/07/2020	Additional runs for the northern mound have been carried out and are presented in the FRA Addendum (section 2.4).
5.8	Sizewell C Main Development Site FRA	Tables 4.3 and 7.9	It is not appropriate to use the 35% allowance for the year 2090 as it falls within the 2090's epoch. The appropriate allowance is 65%.	As the lifetime of the development extends beyond the projection of the fluvial allowances (2115) it was agreed that the flood risk implications of the higher central and upper end fluvial allowances at 2115 were assessed i.e. 35% and 65% but it would not be appropriate to use the 35% allowance alone to assess flood risk at 2090.Table 7.9: the 65% is used for 2140, but 25% and 35% are still applied for 2090. This does not appear to have been updated. EDF have commented as follows: Agreed, 2090 falls within the 2080s' epoch with would require 65% cc allowance based on the upper end estimates, however for the higher central allowance category it is 35%. Both allowances were assessed as part of the Sizewell C study in accordance to Table 4.3 in the FRA. To limit number of modelled scenarios the 35% cc allowance was considered with 2090 sea level rise allowance, whereas more conservative 65% allowance was considered with SLR up to 2140.	The appropriate climate change allowance is the upper end allowance of 65% for the 2090s (2070-2115) epoch, in accordance with .gov.uk guidance regarding climate change allowances to be considered for this proposed development.	2	CS	15/01/2020	According to the guidance (https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances), 35% allowance is applicable for the 2090 epoch under the Higher Central scenario. Assessment also carried out with 65% allowance with sea level rise at 2140 i.e. slightly more conservative scenario. No impact on overall conclusions.
6	Sizewell C Main Development Site FRA	8.1.8, 8.1.11, 8.3.6, 8.3.5, 8.3.4, 8.3.10	A short-term bridge will be required over the Leiston Drain to provide access between the temporary construction area and the main platform. Information regarding the design and levels of the temporary crossing have not been provided.	The design of the temporary bridge could impact on flood risk and the main river and may not be acceptable to the EA. 8.1.11 states the short term bridge will be bank top to bank top and the level is unknown, although it is assumed to be at coastal risk in 0.1%. 8.3.6 states span will be c.15m. 8.3.4 states FRAP likely to be required. 8.3.10 indicates that the levels of the proposed temporary crossing are unknown.	Provide details of the temporary bridge crossing in the context of flood risk and explain how the FRA and modelling assesses its impact in the FRA. A Flood Risk Activity Permit will be required. EDF comment: Impact of temporary bridge to be assessed. FRAP to be developed at a later stage	2	CS	15/01/2020	Construction phase assessed in the FRA Addendum (section 4 and Appendix F). Further details included (i.e. temporary coastal defence with minimum crest at 7.3m AOD and temporary bailey bridge at SSSI crossing with level above 2m AOD.
6.1	Sizewell C Main Development Site FRA	8.1.11, Table 8.2 & 8.2.7, 8.3.10	The temporary SSSI crossing during construction will be at risk of fluvial flooding and also coastal flooding in the 0.1% event as the existing defences are inundated, and also during a breach flood event.	The risk of fluvial flooding for the area of the temporary SSSI crossing is unclear. 8.3.10 indicates that the levels of the proposed temporary crossing are unknown, but that these should be set above 2.0mAOD in order that the road would remain dry from fluvial flooding (1 in 100yr +25% level 1.86mAOD). However, there is no assessment of the potential implications of fluvial flood risk on the construction site itself, nor for the safety of the construction workers. Overtopping risk: Para 8.1.13 states a 0.1% still water level of 4.35mAOD, which is above the shingle crest. This is below the level of the proposed haul road (7.3mAOD). However, there will be a period of risk during the early construction phase BEFORE completion of the haul road. For a period of time where this risk will be real and there will be no defences in place. What impacts would this event have at this time and how will this risk be managed? Breach risk from main defence:8.2.2 and 8.2.3 state no on site risk to SSSI crossing resulting from breach in 'with scheme' breach outputs in 2030 as height of dev above max water levels. Tank traps breach: 8.2.3 discusses max water levels of 5.7 and 6mAOD (0.5% and 0.1% 2190), but Table 8.2 has water depths and states Danger to All in 2030 and 2190. What are the implications of this for the safety of the site, and how will this risk be managed? Appendix D of the EA & ONR Joint Advice Note (July 2017) states that Safe assess /egress must be provided in the 0.5% tidal flood and 1% fluvial flood with an allowance for climate change. A safe means of escape (or sufficient time available) must be provided up to the 0.1% fluvial and tidal event.	Explain the fluvial and coastal flood risk posed to the temporary crossing and people using it, for both the risk of fluvial flooding or coastal inundation during the early construction phase, and also in the event of a breach occurring. Ensure there is a safe access/egress or a safe means of escape. Detail how this would be implemented and how people on site will know when to evacuate or stop work. A breach flood can occur without warning.	2	GD	01/07/2020	Construction phase assessed in the FRA Addendum (section 4 and Appendix F). Further details included (i.e. temporary coastal defence with minimum crest at 7.3m AOD and temporary bailey bridge at SSSI crossing with level above 2m AOD.

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6.2	Sizewell C Main Development Site FRA	Table 8.1 Para 8.1.16	FRA states there is no risk to the SSSI crossing from overtopping at 2090 in the 0.5% (200 year) event when this scenario has not been run with UKCP18 RCP 8.5 95th percentile climate change.	No justification is provided within the fRA to explain why the 2110 95% medium emissions scenario from UKCP09 is appropriate to illustrate the flood risk from overtopping to the SSSI crossing in 2090 using the current climate change allowances from UKCP18. However, EDF have commented "The UKCP09 scenarios were run prior to UKCP18 being published. These were included in the FRA to provide further information on potential risk and avoid repeating very similar scenarios. Text has been amended to aid interpretation of the results. Based on the results for the 0.1% AEP scenario at 2090 (with higher water level) suggest that overtopping rate would be well below 2.95l/s/m and therefore below the acceptable threshold. Therefore it was assumed not necessary to simulate this particular scenario."	UPDATE text in 8.1.16 to explain that the 1 in 200 year UKCP18 2090 scenario has not been run, and in its place the intention is to assume that the rate of overtopping would be below that of the 1000yr event and JUSTIFY this approach. Remove the statement that "there is no risk of overtopping from the 1 in 200 year event at 2090" as this is simply not evidenced.	2	GD	01/07/2020	Additional scenarios have been run and are presented in the FRA Addendum (section 2.4).
6.4	Sizewell C Main Development Site FRA	8.4.6	The surface water from the SSSI crossing may drain into a swale (location not clear). FRA states that sediment may reduce the capacity of the swale and result in minor increased flood risk.	Surface water drainage features should not be located in areas that are already at risk of flooding from other sources as it will compromise the ability of the swale to function in a flood. The assessment of 'minor increase in associated flood risk' does not appear to be based upon evidence.	Surface water scheme must be agreed in consultation with Suffolk County Council.	2	CS	15/01/2020	Clarifications on surface water drainage provided in the FRA Addendum (section 5).
6.7	Sizewell C Main Development Site FRA	Fig 33, 9.2.13 and Fig 56 and 9.3.3	Water Management zone 1 basin is shown to be at fluvial risk in the 1000yr (and to a lesser extent the 200yr) extent in the baseline scenario, however, in the with scheme mapping, the proposed basin acts as the boundary for the flood extent.	The proposals should be made clear. Will proposed raised embankments create the boundaries of the flood extents? Figure 56 indicates that this location would be inundated in the future 100year flood events, based upon upper end and credible maximum scenarios.	Provide plates and figures showing flood risk and the construction site location. Illustrate the flood risk for the areas of the construction site that are at risk (depth, hazard & velocity). Confirm mitigation measures if required.	2	GD	01/07/2020	The water management zone is only temporary during construction phase. There will be a bund around the WMZ1 creating a boundary for flood extent. Further clarification provided in the FRA Addendum (section 5).
7.1	Sizewell C Main Development Site FRA section and Breach modelling Update Report	MDS FRA section 11.2 and Breach modelling Update Report Table 5.1	FRA does not justify why a credible maximum breach event was not run for the Tank Traps or Sizewell Gap breach locations.	Tank traps and Sizewell Gap breaches were only run to reasonable foreseeable, rather than for H++ max credible (as per main SZC defence breach modelling).The impact of a credible maximum breach event at the Sizewell Gap and Tank Traps upon on site flood risk (platform and SSSI crossing) is unknown. The FRA must explain why this has not been investigated further and determine if this event could impact the platform.	Add justification and further evidence for approach taken in FRA.	2	GD	01/07/2020	Assessment of on-site flood risk under the credible maximum coastal scenarios undertaken and discussed in the FRA Addendum (section 4.4)
9.3	Sizewell C Tidal Breach and Coastal Inundation Modelling Update Report	6.4.8	Report identifies that a breach at the Sizewell Gap could result in a reduction in flood levels over the Sizewell Belts area. Only the 2190 epoch was modelled for the Sizewell Gap breach.	0.5% 2190 breach at Sizewell Gap was only event modelled, however, we know greatest change between pre and post scheme for Tank Traps was the earlier epoch. Perhaps this would be similar for the Sizewell Gap breach scenario? It appears as though a clear comparison between the breach scenarios chosen for Tank Traps and Sizewell Gap cannot be made, and that perhaps comparing outputs for 2030 modelling for each may yield different conclusions? 6.4.13 explains reduction in levels between pre-and with scheme within Sizewell Belts (0.1 to 0.01m reduction). 6.4.14 states no increased flood risk to property or infrastructure. There is no mention within the FRA of the potential environmental impacts of reduced depths in a breach event.	Fully assess the implications of a breach at the Sizewell Gap upon the receptors, including environmental receptors. Discuss implications with Natural England	2	GD	01/07/2020	The slight reduction in flood depth within the Sizewell Belts area would not have an impact on the environmental receptors and therefore further assessment of a breach at Sizewell Gap has not been assessed. Breach at Tank Traps is more likely to occur due to coastal processes along the frontage and condition of the existing defences.
	Sizewell C Tidal Breach and Coastal Inundation Modelling Update Report	6.4.9, Table 6.7	The breach modelling for a breach at tank traps in the with scheme scenario appears to increase flood risk to 1 residential property in the 0.1% 2030 epoch event. No assessment of the potential impacts of this on the property itself, or any mitigation for this has been proposed	Tanks Traps Breach: Change to flood hazard rating illustrated in Plates 6.20 and 6.21. Para 6.4.5-6.4.7 describe the change in hazard rating in the context of minor changes to flood extent, depth and velocity. Impacts on receptors discussed in 6.4.8 and illustrated in Tables 6.7 and 6.8. Table 6.7 shows with scheme appears to reduce flood risk to one residential property for 0.5% tank traps breach event in 2030 and 2190 and in 2190 0.1% event. Appears to increase flood risk to one residential property in 2030 0.1% event. What does this increase mean for the owners/occupiers? No change to the numbers of non residential property in a with scheme breach at tank traps. 6.4.9 states flood risk under the 1 in 1,000-year event at 2030 epoch, that is a property in Leiston, with a change of depth of approximately 46mm (from 0.078-0.124m). The FRA has assessed no change in hazard rating and the property remains as low hazard. NOTE this is a residual breach event for the extreme 0.1% scenario. Indicates no mitigation required. Advice to be sought from our National team to ensure consistency in approach.	A property threshold survey would determine whether the property would actually be at increased risk given the change in flood depth to 0.124m. This will determine whether mitigation for this residual risk could be required. There does not appear to be any discussion or consideration of those areas which may experience reduced flood depths over SSSI. This should be noted and discussion with Natural England undertaken.	2	GD	01/07/2020	Mitigation has been embedded into the updated design. Further assessment undertaken and discussed in the FRA Addendum (section 3).

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	Sizewell C Main Development Site FRA	9.1.9- 9.1.12, 9.2.6-9.2.9 and Fig 54	FRA indicates the temporary water storage area on the northern boundary of the Temp Construction area is not within areas at risk of flooding from fluvial (9.2.6-9.2.8), coastal or tidal breach or overtopping (9.1.9-9.1.12). However, the feature would be partly flooded in 1000yr +25%.	Fig 54 illustrates how part of the storage feature lies within the 1000yr with 25% flood extent. This has not been adequately considered within the FRA.	The FRA should make it clear that water storage facilities will be located outside of current flood zones, there must be no increased flood risk elsewhere, and the storage facility will maintain capacity to store water, even at times of flood.	2	GD	Jul-20	The water resource storage area design/location has been revised. Updated discussion provided in the FRA Addendum (section 5).
	Sizewell C Main Development Site FRA	11.6.2-11.6.3	A new reservoir flood risk has been identified, although the potential flood risk impacts have not been made clear.	11.6.3identifies a potential new reservoir flood risk to property associated with a breach of the raised defences of the temporary water resource storage area on the northern boundary. It is considered that one property downstream in the Minsmere Levels could be at residual risk of flooding from this breach. The FRA indicates that this would be "explored further as part of the detailed design".	11.6.2 refers to a review which has been undertaken, although no data, information or evidence base appears to have been incorporated within the FRA. Please provide the evidence base upon which this judgement has been made, together with a description and explanation. Sufficient information should be provided to demonstrate the nature of the potential flood risk and potential impacts, as well as proposals for any necessary mitigation. Consideration should be given to the Reservoirs Act.	2	GD	01/07/2020	The water resource storage area design/location has been revised. Updated discussion provided in the FRA Addendum (section 5).
1.8	Sizewell C Main Development Site FRA	9.2.14, 9.3.23, 12.5	Details of specifics of proposed water management at Fen Meadows.	We previously asked for FRA and acknowledgement of requirement of FRAP for Fen Meadow compensatory habitat. Fen Meadows is referenced in 9.2.14, 9.3.23 and12.5. No detail has been provided regarding the specific mechanisms of water management. No assessment of flood risk has been undertaken and any potential off site impacts have not been considered. Flood Risk Activity Permit will be required.	To be addressed in the FRAP application and determination process.	3	CS	6.12.19	Further discussion provided in the FRA Addendum (section 5) FRAP will be prepared at appropriate stage.
5.2	Sizewell C Main Development Site FRA	7.1.24 and 7.1.39	The beach landing facility is on the seaward side of the defence. There is limited assessment of the flood risk posed to this area and how people using this facility will remain safe in a flood event.	Para numbering change! 7.1.24 (construction phase) and 7.1.39 (operational phase) both refer to the Beach Landing Facility, stating it will be operational in summer months and suitable conditions, and initially during winter months the decking area will be removed and stored on MDS. In operational phase, use is likely to be in summer time approx every 5 years only.	Assess the flood risk posed to the BLF and illustrate the risk. It should be made clear how the flood risk here will be mitigated to ensure people using the site are safe.	3	CS	15/01/2020	Further discussion provided in the FRA Addendum (section 5) and Appendix F (the FREP).
7.9	Sizewell C Main Development Site Fluvial Model Update Report	Plate 3.4	Plate 3.4 is misleading and should be updated to reflect the proposals.	3.3.15 states that the "temporary earth (acoustic) bund, where the bund would end around the extent of the Nursery Covert and therefore would not run along the Leiston Drain as illustrated" in Plate 3.4.	Update Plate 3.4	3	GD	03/07/2020	This is not located in an area at risk of flooding, therefore it has no impact on the modelling results and conclusions.
5.4 and 5.6	Sizewell C Main Development Site FRA	Plate 7.3	Plate does not clearly show proposed Sizewell Drain realignment	The plate does not show where the existing and proposed Sizewell Drain are located. The description in para 7.3.6 indicates that the drain will be diverted to flow northwards along the western boundary of the main platform, to enter into the Leiston Drain (which runs eastwards at the north of the platform area. The IDB should also be involved in any works to the drain as the risk management authority.	Please provide a clearer plate showing the existing and proposed arrangement for the Sizewell Drain so it is clear to the reader what is being proposed. Ensure the East Suffolk IDB are consulted on works to the Sizewell Drain.	3	CS	15/01/2020	Plate 7.3 provides the most up to date concept design for the realignment of Sizewell Drain. This will be updated at the next stage of design.
			Coastal Inundation modelling indicates possible changes in water levels as a result of the proposals.	Coastal Inundation modelling indicates overall increase in flood depth within the Minsmere marshes of up to 0.1m, whereas the decrease in flood levels within Sizewell Belts area is up to 0.17m for the 1 in 1,000-year event at 2030 epoch. Has an assessment of the impacts of changes in depth on SSSI been undertaken? There is no reference to Natural England having been consulted.	Natural England must be consulted for advice regarding these potential water level changes	3	GD	03/07/2020	Consultation with Natural England ongoing.

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2.1	Sizewell C Main Development Site FRA	**4.1.12**	Sea Level Rise has not been considered for the full construction period up to 2034. 4 years are not accounted for. The FRA states this is negligible.	The FRA does not explain how an increase in sea level rise of 30mm been determined to be negligible.	Provide evidence that an additional 30m will not impact coastal flooding on the site during construction. Particularly in reference to the removal of the northern mound.	2	CS	06/12/2019	Construction phase assessed in the FRA Addendum (section 4 and Appendix F). Further details included (i.e. temporary coastal defence with minimum crest at 7.3m AOD and temporary bailey bridge at SSSI crossing with level above 2m AOD. According to the DoD and associated Construction Method Statement, the coastal defence is planned to be completed by Phase 4 of the construction. Assuming start of construction at 2022, the defence would be raised to the permanent design level before 2030.
8.7	Sizewell C Tidal Breach and Coastal Inundation Modelling Update Report	**Plate 2.5**	It is unclear if temporary SSSI crossing is included in the breach and tidal inundation modelling.	Plate 2.5 shows the permanent and temporary features included in the model but they are not labelled as individual features as they are in the fluvial model report. The temporary bridge crossing must be included in the tidal modelling to understand its impact.	Confirm and update Plate 2.5	1	CS	15/01/2020	Construction phase assessed in the FRA Addendum (section 4 and Appendix F). Further details included (i.e. temporary coastal defence with minimum crest at 7.3m AOD and temporary bailey bridge at SSSI crossing with level above 2m AOD.
10.7	Sizewell C Coastal Modelling Update Report	**5.3.3**	Tolerable overtopping rates for main platform not stated.	Report states that the tolerable overtopping rates for the SSSI crossing are 5l/s/m but it does not state what the tolerable rate for the platform is. Table 5.5 suggests it should be 0.3 l/s/m.	Explain in report.	2	CS	15/01/2020	The platform would be set back from the coastal defence and therefore overtopping threshold for people at seawall crest (0.3l/s/m) is considered too conservative. Further assessment on risk (depth, velocity and hazard) on the platform discussed in the FRA Addendum (section 4) and Appendix E (section 5.3).
Fluvial Modelling and Hydrology									
1.1	Hydraulic model - SZC_MDS_005_TXXX_121SD_ccXXpc.tcf	n/a - model build	Mismatch between SSSI z shape deck position and position of 2d HX lines	The SSSI crossing (2d_zsh_SSSI_crossing_v1_R) position does not appear to line up well with the positioning of the HX lines (2d_bc_hxe_Sizewell_050). Consequently a portion of the deck is not raised as expected and lies within the deactivated area of the 2d model domain. This was raised in the previous review	Agree that this is not likely to change the conclusions of the study. It is however an error with the model and should be corrected. A sensitivity run to verify that the impacts are limited should be undertaken and reported on.	2	PS	14/09/2020	Issue checked and corrected. Sensitivity runs carried out for key return period event. Results presented in the FRA Addendum (section 2.2) and Appendix C (section 4.2).
1.2	SZC FRA - Hydrology Review and Design Event Methodology and BC_DBASE - bc_dbase_All_Runs.csv	Table 4.1 and BC_DBASE file bc_dbase_All_runs.csv	Discrepancy in flows applied in the hydraulic model and flows reported in table 4.1 page 45 of the hydrology report	Raised in the previous review but further detail added here. Flows in the BC Database files e.g 005Y_121SD.csv, 020Y_121SD.csv, 100Y_121SD.csv, and 1000Y_121SD.csv are the same as those reported in table 4.1 of the hydrology report, however, MINS_EASTBR is not present in bc_dbase_All_Runs.csv or 2d_bc_inflows_002.TAB. Consequently no flow is applied to the model at this location. This should be checked and corrected. If it is deemed that impacts are small this should be qualified by a check run.	bc_dbase_All_Runs.csv and 2d_bc_inflows_002.TAB should be updated to include MINS_EASTBR. A test run should be undertaken and reported on to confirm the extent of any impact as a result of missing this inflow from the previous model runs	2	PS	14/09/2020	Inflow for the Eastbridge subcatchment has been included in 1D model instead of 2D model.
1.3	Hydraulic model - SZC_MDS_005_TXXX_121SD_ccXXpc.tcf	n/a - model build	Phasing of fluvial and tidal peaks within the hydraulic model	Phasing of the peak tidal and peak fluvial flooding needs to be improved: 2D model outputs indicate that peak water levels on the floodplain occur at time ~123.7hr, at least 2hrs later than the peak tidal level. Peak tidal level for T_2017_100yr = 1.69 (@ t = 121.25hr) while the tidal levels are around 0.6mAOD when the water levels on the floodplain are max.	Some detail on timing discrepancies is provided in section 4.3.8 of the model report since the previous review. Testing and reporting on fluvial/tidal timing variations should be undertaken	2	JBA	14/09/2020	Sensitivity runs carried out for key return period event. Results presented in the FRA Addendum (section 2.2) and Appendix C (section 4.3).
1.4	Hydraulic model	n/a - model build	Blockages of structures, for example the SSSI crossing culvert and the residual risk to the development site	No blockage assessment has been undertaken. The SSSI crossing culvert is adjacent to the main development site platform. It is acknowledged that the opening to the SSSI crossing is quite large, however, it would be sensible to consider the residual risk posed by blockage of structures to the main development site	Blockage assessment needs to be carried out and reported on to understand any residual risks to the development	2	PS	14/09/2020	Blockage has been assessed for key return period event. Results presented in the FRA Addendum (section 2.2) and Appendix C (section 4.5).
1.5	Hydraulic model results	n/a - model build	Water levels keep rising to the end of the simulation on Scotts Hall ditch in the 5% plus 80% CC scenario	On the Scotts Hall Ditch water levels continue to rise to the end of the simulation in the 20% (1 in 5) plus 80% CC scenario. This is the case both in the baseline and 'with scheme' scenarios and is evident at sections SCOT_0929 through to SCOT_0000	Test impact of increased simulation time	2	JBA	14/09/2020	Sensitivity runs carried out for the affected model runs. Results presented in the FRA Addendum (section 2.2) and Appendix C (section 4.4).

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1.6	SZC FRA - Hydrology Revie and Design Event Methodology, March 2020 (page 17 onwards of SZC_Bk5_5.2_Appx1_7_MDS_Flood_Risk_Assessment_Part_6_of_14)	Section 2.3 and Section 2.5	Estimation of QMED at gauge G5 and derivation of RR parameters	The hydrology report implies that hydrological data collection ended in late 2016 (section 2.5). Even if this is so, the period of record collected would have been about 3 years, double what was used in the analysis. More confident estimates of the rainfall-runoff model parameters would strengthen not only the FRA but also the Nuclear Safety Case. G5 was used as a donor to adjust rainfall-runoff model parameters over a large proportion of the catchment and so estimates of the parameters at G5 need to be as good as possible. In addition, use of a longer record would improve confidence in the estimate of QMED at G5 and potentially the resultantant statistical flow estimates which are used as a comparison	QMED and Rainfall Runoff parameters derived from G5 Should be revisited and checked using the full dataset. Check with Hydrologic what is available, is it only 18 months? If this is the case it needs to be explicitly clear in the report what data is available. If only 18 months worth of data is available then can the analysis not be supplemented/verified using gauges 1, 3, 4 6 or 7a?	1	JBA	14/09/2020	QMED estimation revised with longer records for the temporary gauging station. Results presented in the FRA Addendum (section 2.2) and Appendix C (section 3.2).
1.7	Atkins Sizewell Monitoring J3328 Velocity and Index Ratings Report December 2014	5.3 Results	Gauge data at G5	The report notes that the high flow data for G5 need to be treated as suspect due to "extreme high flow values". This point does not appear to be brought through to the hydrology report. The analysis should reflect this limitation. In contrast, the high flow data is not described as suspect for gauges 1, 3, 4 6 or 7a. Yet the hydrology report only makes use of data from G5. It is unfortunate that the gauge judged to be most usefully located for the hydrological analysis is the one gauge for which high flow data is classed as suspect. This raises the question of why apparently no analysis was carried out of the data recorded at the other five flow gauges, for example to check the parameters derived from G5.	If the data at G5 is to be treated as suspect why was no analysis undertaken for gauges 1, 3, 4 6 or 7a. Could this not supplement and support the analysis at G5? See above comment around rainfall runoff parameters (and QMED) needing to be robust as possible	1	JBA	14/09/2020	Further data has been obtained for all available temporary gauging stations. Further analysis suggests and confirms previous conclusion that G5 tempaory gauging station is the most suitable and reliable to use in the hydrological assessment. Further discussion is provided in the FRA Addendum (section 2.2) and Appendix C (section 3.2).
1.8	SZC FRA - Hydrology Revie and Design Event Methodology, March 2020 (page 17 onwards of SZC_Bk5_5.2_Appx1_7_MDS_Flood_Risk_Assessment_Part_6_of_14)	Section 3.2.1	Choice of method - FEH Rainfall Runoff	The river flows were estimated using the FEH rainfall-runoff (FEH RR) method. This was superseded in 2005 for most applications by the revitalised flood hydrograph method, ReFH, which in turn has been superseded by ReFH2. We agree with the decision not to recommend the results of ReFH in this area, due to the high permeability. However, this limitation does not apply to ReFH2. Since ReFH2 is based on more recent research and offers the opportunity to incorporate the FEH13 rainfall statistics.	Refh2 should be treated as a preferred method. At the very least a sensitivity test should be undertaken to confirm the impact on model results if ReFH2 were favoured. ReFH2 parameters should be estimated from local hydrometric data rather than from catchment descriptors to allow for fair comparison against the FEH-RR approach	1	JBA	14/09/2020	ReFH2 has been tested and results compared with currently adopted FEH method. Results presented in the FRA Addendum (section 2.2) and Appendix C (section 3.5).
1.9	SZC FRA - Hydrology Revie and Design Event Methodology, March 2020 (page 17 onwards of SZC_Bk5_5.2_Appx1_7_MDS_Flood_Risk_Assessment_Part_6_of_14)	Table 3.3 Section 3.2.1	Choice of method - FEH Rainfall Runoff	The report states that ReFH produces unrealistic runoff volumes for long duration storms. It provides some analysis of flood volumes from ReFH in support of this. It mentions that similar concerns remain over application of ReFH2 but does not provide an equivalent analysis of volumes calculated by ReFH2. In ReFH2 improvements were made to the closure of water balance in v2.1 (released in 2015) and further improvements were made in version 2.3 (released in 2019). The report does not provide a balanced discussion of the pro and cons of the various methods available	Update table 3.3 to include volumes from REFH2 and properly substantiate why ReFH2 has been discounted. It may be that the hydrological assessment was undertaken before ReFH2 was widely available however the impacts on conclusions of the FRA need to be properly understood in light of more up to date and appropriate methods	1	JBA	14/09/2020	See response above.
2	Appendix C - Sizewell-EA-Calculation-Record-FEH-Rainfall-Runoff-Method	Appendix C - Sizewell-EA-Calculation-Record-FEH-Rainfall-Runoff-Method	Percentage runoff values	The calculation record reveals that the 50% value was adopted for the SPR parameter in the FEH Rainfall-runoff method at every sub-catchment, with no attempt to distinguish between the catchments on the basis of soil properties or geology. This is inadequate and not good practice.	Estimate runoff rates using observed flows in conjunction with rainfall, or, failing that, the losses component of the ReFH model. Given the uncertainty associated with the runoff percentages, they should be included in sensitivity testing of the model.	1	JBA	14/09/2020	Sensitivity tests with adjusted percentage runoff values have been carried out. Results presented in the FRA Addendum (section 2.2) and Appendix C (section 3.6).
2.1	SZC FRA - Hydrology Revie and Design Event Methodology, March 2020 (page 17 onwards of SZC_Bk5_5.2_Appx1_7_MDS_Flood_Risk_Assessment_Part_6_of_14)	Section 3.1.3	Selection of events for Percentage Runoff calculations at Middleton and G5	It seems highly unlikely that only 3 events are available at Middleton considering hourly water level data is available from 1967 and 15 minute data is available from 1993. There should be ample events in the historic record to fulfil this requirement at Middleton and if G5 continued to operate after 2015.	The analysis should be expanded to match the requirements set out in the FEH (at least 5 events). If this is not possible due to the reported lack of available data this should be properly qualified as given the gauge record length, particularly at Middleton, this seems very unlikely	1	JBA	14/09/2020	Minsmere outfall structure was refurbished in 2015, only one suitable event since refurbishment (Jan 2016) was found at the time of the model calibration (early 2016). Further records have been obtained and checked. Discussion provided in the FRA Addendum (section 2.2) and Appendix C (section 3.3).

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2.2	SZC FRA - Hydrology Revie and Design Event Methodology, March 2020 (page 17 onwards of SZC_Bk5_5.2_Appx1_7_MDS_Flood_Risk_Assessment_Part_6_of_14)	Section 3.1.3	Flood event analysis additional information required	Section 3.1.3 gives a brief overview of the flood event analysis but does not provide a full audit trail. We recommend that, as a minimum, a table is provided that lists, for each flood event, the start and end times, event rainfall depth, API5 , SMD , resulting CWI , PR , DPR and SPR. The time to peak for each derived unit hydrograph should also be provided. Without this information it is not possible to scrutinise the calculations, which are foundational for the FRA. The report appears not to distinguish between PR and SPR in this section, which is a cause for concern. The flood event analysis should calculate the SPR parameter, as per the FEH procedure. The report should state the source of SMD data that was used in this calculation. This improved estimate of SPR should then be combined with the design value of CWI to give a PR suitable for modelling design floods. These calculations should be laid out for both gauges: Middleton and G5.	We recommend that, as a minimum, a table is provided that lists, for each flood event, the start and end times, event rainfall depth, API5, SMD, resulting CWI, PR, DPR and SPR. The time to peak for each derived unit hydrograph should also be provided. The flood event analysis should calculate the SPR parameter, as per the FEH procedure. The report should state the source of SMD data that was used in this calculation. This improved estimate of SPR should then be combined with the design value of CWI to give a PR suitable for modelling design floods. These calculations should be laid out for both gauges: Middleton and G5.	2	JBA	14/09/2020	Further details on flood event analysis is provided in the FRA Addendum (section 2.2) and Appendix C (section 3.3).
2.3	SZC FRA - Hydrology Revie and Design Event Methodology, March 2020 (page 17 onwards of SZC_Bk5_5.2_Appx1_7_MDS_Flood_Risk_Assessment_Part_6_of_14)	Section 3.2.3	Direct rainfall modelling in lowland areas	Percentage runoff was set to 50% in the upper floodplain and 90% in the lower floodplain. The report provides some justification for the two runoff rates, mentioning higher runoff due to saturation of the floodplain in the lower catchment. But the numbers still come across as subjective choices. A more objective approach would be to estimate runoff rates using observed flows in conjunction with rainfall, or, failing that, the losses component of the ReFH model.	Given the uncertainty associated with the runoff percentages, they should be included in sensitivity testing of the model.	2	JBA	14/09/2020	Sensitivity tests with adjusted percentage runoff values have been carried out. Results presented in the FRA Addendum (section 2.2) and Appendix C (section 3.6).
2.4	SZC FRA - Hydrology Revie and Design Event Methodology, March 2020 (page 17 onwards of SZC_Bk5_5.2_Appx1_7_MDS_Flood_Risk_Assessment_Part_6_of_14)	Section 3.2.2	the flood frequency analysis was based on version 3.3.4 of the NRFA peak flow dataset.	Version 3.3.4 was released in 2014 containing data up to 2012, and there have been five subsequent updates. Updating the analysis would be a minor task that would allow the inclusion of six more years of flow data across the UK gauge network, as well as improvements in ratings at some gauges. We note that the extreme sea level analysis has been updated to include a dataset released in 2018. It does not seem appropriate for an FRA for new nuclear station to include analysis based on a dataset that is so many years out of date.	Update the statistical assessment using the latest version of the NRFA dataset.	2	JBA	14/09/2020	Review of the NRFA dataset undertaken. Results are discussed in the FRA Addendum (section 2.2) and Appendix C (section 3.4)
2.5	PB6582_RP_001_SZC_Hydrology_Report_D.10	Section 2.3	Plotting and interpretation of temporary flow data	The study would benefit from plotting and interpretation of data from the temporary river gauges, along with other rainfall and flow data, in order to demonstrate how they aid understanding of the catchment hydrology." This has not yet been addressed	Update the report to include information from temporary river gauges. Use this information to substantiate information within the report regarding catchment hydrology and response	3	JBA	16/02/2020	Additional records obtained. Further discussion provided in the FRA Addendum (section 2.2) and Appendix C (section 3.2).
2.6	PB6582_RP_001_SZC_Hydrology_Report_D.10	Section 2.4	Model calibration	The model has been calibrated using a single event (Jan 2016). This is not good practice. Are there really no other suitable events?	Consider additional events for model calibration	2	JBA	16/02/2020	Further details on flood event analysis is provided in the FRA Addendum (section 2.2) and Appendix C (section 3.3).
Coastal Inundation & Tidal Breach Modelling									
1.4	SZC MDS Breach Modelling Update_v2.pdf	n/a - model buil	Representation of Leiston Drain Culvert No 1	There is currently a slight disconnect between the culvert and the channel	The watercourse or location of culvert 1 should be adjusted slightly so that the SX boundary cell being modified by the culvert sits in the lowered channel (Figure 1).	3	JBA	06/01/2019	Alignment has been improved. Sensitivity test has been carried out. Results are discussed in the FRA Addendum (section 2.3) and Appendix D (section 2.3).
1.5	SZC MDS Breach Modelling Update_v2.pdf	n/a - model buil	Representation of base topography	ZHC ALL command remains in control files - not clear or detailed in report if sensitivity testing was undertaken without command. Need for sensitivity testing was agreed in previous review.	Provide details of sensitivity testing for this command	2	JBA	07/01/2019	Sensitivity test has been carried out. Results are discussed in the FRA Addendum (section 2.3) and Appendix D (section 2.3).
1.6	SZC MDS Breach Modelling Update_v2.pdf	n/a - model buil	Representation of minor watercourses in base topography	Some of the smaller watercourses have been burnt into the DEM using a THICK line, such as the 2d_zln_River_Bed_L.shp. The line has been drawn such that it has been zig zagged to try and form a continuous flow path, but in some places it hasn't - refer to Figure 3 as an example where the lowered cells are corner to corner while TUFLOW can only transfers flow via the cell sides/faces.	Consider improved schematisation to ensure continuous flow path	3	JBA	08/01/2019	Alignment has been improved. Sensitivity test has been carried out. Results are discussed in the FRA Addendum (section 2.3) and Appendix D (section 2.3).
1.8	SZC MDS Breach Modelling Update_v2.pdf	n/a - model buil	Representation of raised defences in base topography	In some cases there are still drains/watercourses overwriting raised defences - in several locations. For example, the 2d_zln_Drains_8m_004.MIF is overwriting the 2d_zln_Embankments_004_L.shp near the embankment to the north of the model (Figure 5) meaning flow is not constrained to the channel for the smaller events when it should be.	Consider improving model schematisation	3	JBA	10/01/2019	Alignment has been improved. Sensitivity test has been carried out. Results are discussed in the FRA Addendum (section 2.3) and Appendix D (section 2.3).
1.9	SZC MDS Breach Modelling Update_v2.pdf	n/a - model buil	Model warnings and error messages	During the 2190 event the warning messages have been reduced from ~3,000, but ~600 still remain.	A lot of these messages would be corrected if the overtopping boundary line is reconsidered where the secondary defence line is, as discussed in item 1.7.	3	JBA	11/01/2019	Alignment has been improved. Sensitivity test has been carried out. Results are discussed in the FRA Addendum (section 2.3) and Appendix D (section 2.3).

No.	Document Title	Paragraph number	Issue	Comment	Suggested solution	Priority	Raised By	Date Raised	SZC Co. Response

Priority	Description
1	*Showstopper or potential showstopper* A significant technical issue / deficiency. If this issue is not resolved we would object to the DCO application.
2	*Significantly below the level we would expect of an application or notable technical issues* Incomplete / inaccurate or inadequately substantiated information. We would be likely to request further information prior to the determination of the DCO application or - where appropriate - recommend Requirements be attached to the order to ensure sufficient details are submitted and agreed prior to the commencement of development.
3	*Other* • Information is correct but low quality; or • Minor inaccuracies and lack of clarity Further information / work to resolve these issues will aid our understanding and help us to better inform the DCO determination process.

APPENDIX C: FLUVIAL MODELLING REPORT ADDENDUM

CONTENTS

TABLES

PLATES

FIGURES

APPENDICES

1 INTRODUCTION

1.1.1 As Part of the Sizewell C Project Development Consent Order (DCO) application ('the Application') submitted in May 2020 a **Main Development Site (MDS) Flood Risk Assessment** (Doc Ref. 5.2) [APP-093] was prepared. The **MDS Flood Risk Assessment** describes flood risk from all sources of flooding, to the proposed main development site and the predicted impact of the development on flood risk elsewhere.

1.1.2 To inform the **MDS Flood Risk Assessment**, hydraulic modelling for fluvial, coastal inundation and tidal breach flooding was undertaken to assess flood risk for a range of return period events and climate change scenarios. This report focuses on fluvial modelling and hydrology, and forms **Appendix C** of the **Main Development Site (MDS) Flood Risk Assessment (FRA) Addendum** (Doc Ref. 5.2(A)Ad C), hereafter referred to as the **MDS FRA Addendum**. Flood risk from coastal inundation and tidal breach are discussed separately in **Appendix D** of the **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad D).

1.1.3 Details of the fluvial hydraulic modelling undertaken for the Application and corresponding results are provided in **Appendix 2** of the **MDS Flood Risk Assessment** (Doc Ref. 5.2) [APP-094].

1.1.4 The **MDS Flood Risk Assessment** for the Application (Doc Ref. 5.2) [APP-093] concluded that the overall change in fluvial flood levels as a result of the proposed development was a maximum of 0.015m, with up to 6 residential properties and 10 commercial properties experiencing slight increase in flood levels. It was previously reported that five of these were 'newly' flooded non-residential properties with a flood depth of up to 0.002m for the 1 in 100-year with 35% and 65% climate change allowance.

1.1.5 Following their review of the model and reports issued as a part of the Application submission, the Environment Agency provided comments in relation to the hydraulic modelling, including some queries on general model schematisation, hydrological assessment and suggested sensitivity testing. These comments are collated in **Appendix B** of the **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad B).

1.1.6 Further fluvial modelling and sensitivity testing has been carried out in response to the Environment Agency's comments. The details and outcomes of this assessment are presented in this report.

1.1.7 Following the Application submission in May 2020, the design of some elements of the scheme, in particular the SSSI crossing, have been updated. The revisions have been made to improve hydraulic performance and further reduce environmental and flood risk impacts. Also, further works have been carried out to consider potential flood mitigation options, which have now been embedded into the design.

1.1.8 This report provides details of the fluvial modelling undertaken, results with the updated scheme design and the assessment of the impact of the development on any change in flood risk to off-site receptors.

1.1.9 This report will form **Appendix C** to the main development site **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad C).

2 ASSESSMENT ACTIVITIES

2.1.1 As discussed in **section 1**, sensitivity testing was identified as being required to address the Environment Agency's comments. Further checks and sensitivity testing were then carried out for the hydrological assessment and the hydraulic modelling. These are as follows:

- Hydrological assessment comments, clarifications, checks and sensitivity testing (**section 3**);
- Sensitivity testing of the hydraulic model parameters and schematisation (**section 4.1 - 4.4**);
- Blockage assessment (**section 4.5**); and
- Assessment of SSSI Crossing impact – to determine impact of the crossing and the main platform without the crossing (**section 4.6**).

2.1.2 To aid the assessment of potential impacts of the sensitivity testing, the model results were compared at selected points within the 1D and 2D model domains, as illustrated in **Plate 2.1**. These will be referenced throughout the report.

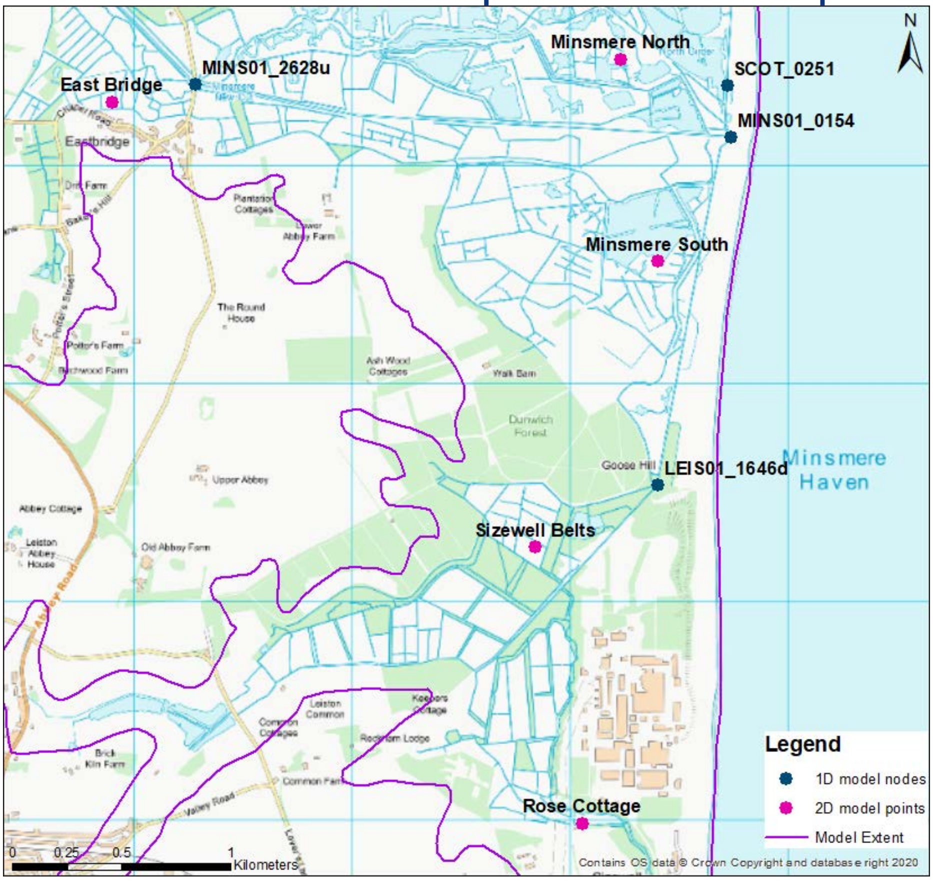
2.1.3 Further modelling was then carried out to update the assessment of flood risk and to reflect the proposed changes to the design, i.e. SSSI crossing and the flood mitigation area. This was undertaken for a series of return period events and climate change allowances to cover a wide range of scenarios.

2.1.4 Results from the updated scheme design modelling were analysed to confirm the level of flood risk to the development itself and determine the impact of the development on any change in flood risk for off-site receptors with the focus on residential and non-residential properties, where changes in flood extent, depth, velocity and hazard were assessed.

2.1.5 Details of the revised design elements, corresponding modelling results and impact of the scheme are presented in the following sections:

- Revised design of the SSSI crossing – **section 5.1**;
- Flood mitigation area – **section 5.2**;
- Model results with updated scheme design – **section 5.3**; and
- Assessment of impact of the updated scheme design – **section 5.4**.

Plate 2.1: Selected model node points for results comparison



3 HYDROLOGY CHECKS

3.1 Overview

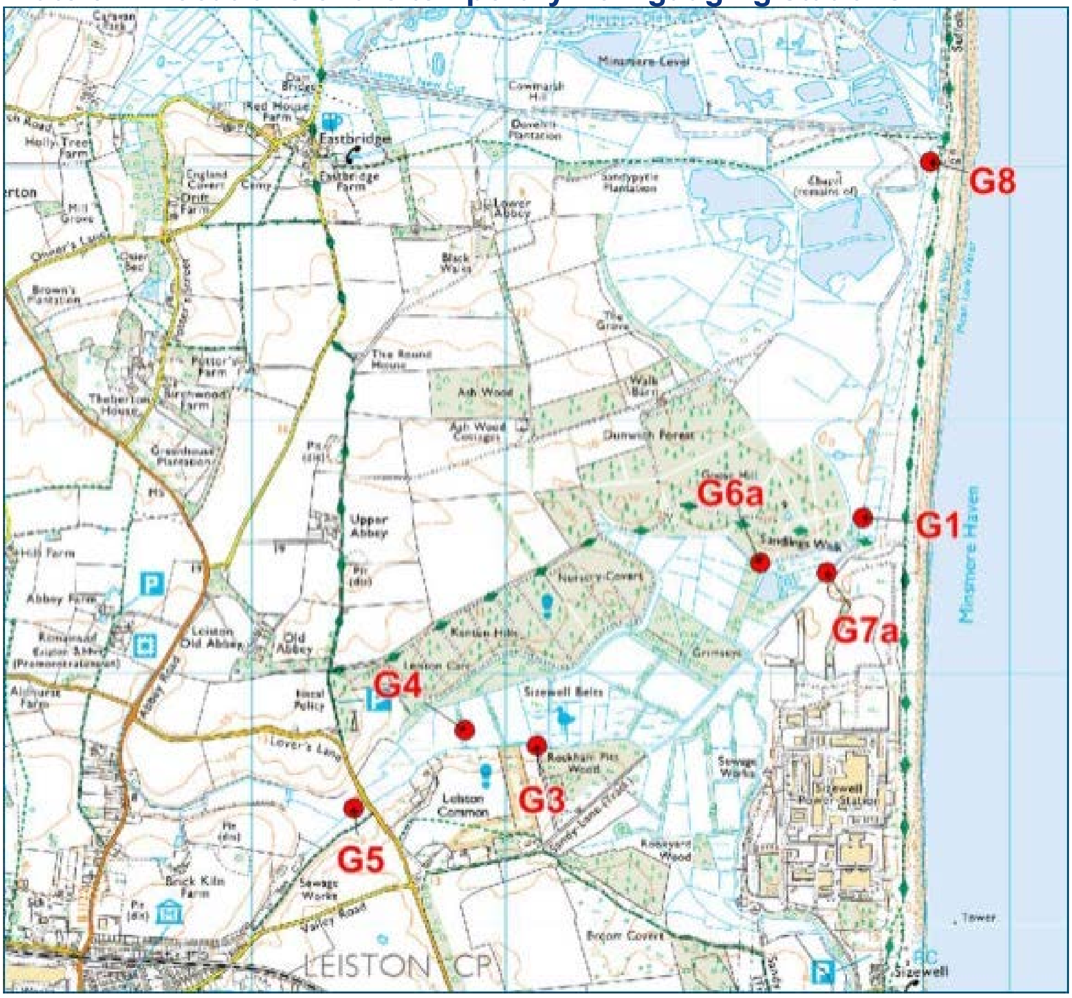
3.1.1 The hydrological assessment for the Sizewell C project has been developed over a number of years, with the main analysis undertaken in 2015 prior to hydraulic modelling. Since then, the Environment Agency has raised a number of comments and provided suggestions to undertake sensitivity testing. The majority of the comments were addressed or clarified within the Hydrology Report for the Application, as explained in **Appendix 3** of the **MDS Flood Risk Assessment** (Doc Ref. 5.2) [APP-099].

3.1.2 This report focuses on the outstanding comments raised by the Environment Agency following the Application submission, which are collated in **Appendix B** of the **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad B). Subsequent sections discuss the specific comments and present the outcomes of any related checks or additional analysis, as required. Where there is overlap in the comments provided, then multiple comments have been addressed together for ease of review.

3.2 Review of temporary flow gauging stations

3.2.1 A number of comments were raised by the Environment Agency in relation to the availability of data from the temporary gauging stations installed as part of the Sizewell C project. The locations of these temporary gauging stations are presented in **Plate 3.1**.

Plate 3.1: Locations of the temporary flow gauging stations



3.2.2 One of the comments raised by the Environment Agency (comment 1.6 in **Appendix B** of the **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad B)) states:

> *"QMED and Rainfall Runoff parameters derived from G5 should be revisited and checked using the full dataset."*

3.2.3 Furthermore, the Environment Agency raised a comment (comment 1.7 in **Appendix B** of the **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad B)) nothing:

> *"Gauge data at G5. If the data at G5 is to be treated as suspect why was no analysis undertaken for gauges 1, 3, 4, 6 or 7a. Could this not supplement and support the analysis at G5? See above comment around rainfall runoff parameters … needing to be robust as possible."*

a) Availability of additional data

3.2.4 A review of the data available for each of the temporary gauging stations has been carried out for the intervening period since the main hydrological analysis (i.e. from 2016 through to 2019). This review confirmed that additional data is available for all of the temporary gauging stations. The data has been obtained and analysed to determine its suitability for the hydrological assessment.

3.2.5 A review of the quality of the additional data has been carried out and summarised in **Table 3.1**. As part of the review the times series data for each of the temporary gauging stations was plotted and reviewed. **Figure 1** - **Figure 6** present the times series plot of the data sets for each of the temporary gauging stations from 2013 through to 2019.

Table 3.1: Review of data gaps and comments on data quality at all temporary gauging stations

Temporary Gauge ID	Significant Data Gaps	General Comments
G1	February 2014 – June 2014 December 2016 – April 2017 March 2018 – September 2018	Repeated examples of negative flow recorded and significant gaps in record
G3	June 2016 – April 2017 December 2017 – September 2018	Significant periods of missing data in record, long periods of data flatlining, flow only recorded above 0.952m stage
G4	December 2016 – April 2017 January 2018 – September 2018	Reasonable quality but has two long periods of missing data
G5	January 2018 – September 2018 December 2018 – January 2019	The most consistent time series record with limited gaps in record

Temporary Gauge ID	Significant Data Gaps	General Comments
G6a	December 2016 – July 2017 April 2018 – October 2018	Reasonable quality data record with periods of missing data
G7a	December 2016 – April 2017 April 2018 – October 2018	Very spikey, gaps in record, preiods of data flatlining, issues with debris on velocity sensor noted

3.2.6 The review of the most recent and updated time-series data record retrieved from the temporary gauges found that the data at the G5 temporary gauging station remains the most reliable and dependable of the gauges installed, with the fewest gaps in the data record or reliability issues.

3.2.7 On the basis of this review it is considered appropriate to continue to use the data from the G5 temporary gauging station as it remains the most favourable gauge from the group. G4 and G6a temporary gauging stations have relatively reliable data however, both of these have longer periods of missing data than that displayed by the G5 temporary gauging station.

3.2.8 Therefore, the conclusions drawn within the Application in terms of availability and reliability of data from the temporary gauging stations to support or improve assessment from the G5 temporary gauging station still stands and the other temporary gauging stations have not been considered further in the current hydrological review. Where additional data for the G5 temporary gauging station was available it has been reviewed (see following section) to understand potential impacts on parameters used within the hydraulic modelling.

b) Review of QMED utilising data from G5 temporary gauging station

3.2.9 The G5 temporary gauging station on the Leiston Drain is the most important of the temporary monitoring gauges as it captures all flow draining from the catchment to the west of the Sizewell system.

3.2.10 At that location, the Median Flood (QMED) in the original hydrology study was derived using a "Peaks over Threshold" (POT) data series collated from 18 months of monitoring data (i.e. November 2013 to May 2015). At the time of the study this was the only available data record and it was acknowledged that it was not an ideal to derive a confident QMED value from a relatively short data record despite the POT approach being the preferred method, when there are fewer than 14 years of flow record.

3.2.11 As noted above, an additional time-series dataset has been made available for the G5 temporary gauging station extending the period of record from November 2013 to July 2019, i.e. just short of 6 years (**Plate 3.2**).

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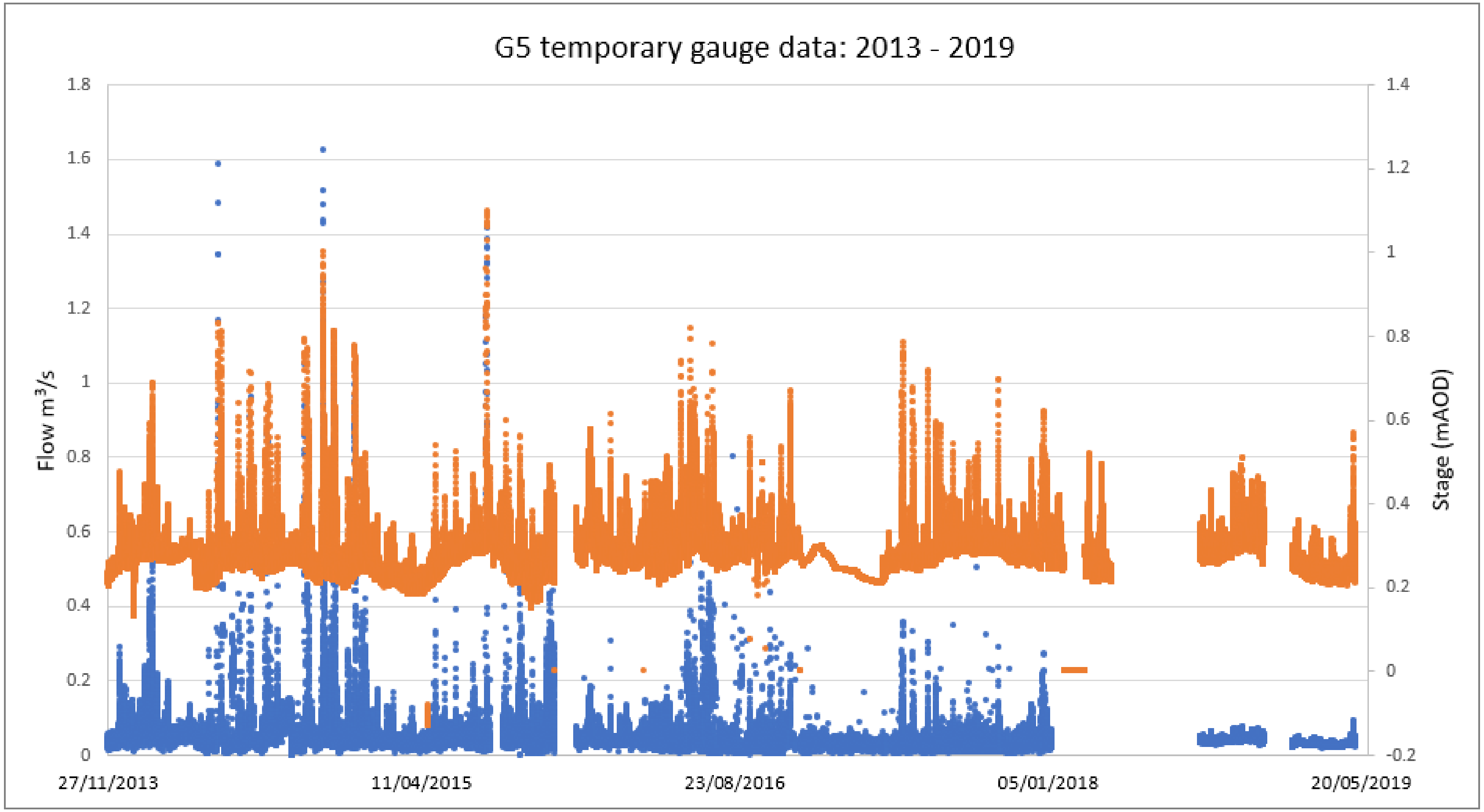
Plate 3.2: G5 temporary gauging station recorded flow and stage data from 2013 – 2019



3.2.12 In line with the Environment Agency comment, it was indicated that the extended record show in **Plate 3.2** should provide additional value and improved confidence to the POT data series and the derivation of QMED using the G5 temporary gauging station dataset.

3.2.13 Following Flood Estimation Handbook (FEH) guidance when adopting the POT approach, only 'complete' data years should be used for analysis and unfortunately out of the 6 recorded years only 4 can be considered as complete years of data record. These are summarised as:

- October 2013 –September 2014;
- October 2014 – September 2015;
- October 2015 –September 2016; and
- October 2016 – September 2017.

3.2.14 Following the principles and guidance set out in the Flood Estimation Handbook (FEH) Volume 3: Statistical procedures for flood frequency estimation (Ref. 1) and using the most recently available record of the POT data series, an updated QMED value has been calculated for the G5 temporary gauging station as 1.4 m^3/s.

3.2.15 This is comparable with the original estimate of QMED for the G5 temporary gauging station which was reported in **Appendix 3** of the **MDS Flood Risk Assessment** (Doc Ref. 5.2) [APP-099] as being 1.6 m^3/s and therefore is still considered to be a representative value within the hydrological analysis.

3.3 Flood event and input parameter analysis

3.3.1 Further comments related to the flood event analysis and review of the data used within the hydrological analysis and hydraulic modelling were raised by the Environment Agency. This included comments on the events used in the calibration and assessment process and the derivation of parameters. These comments are as follows (comment 2.1 in **Appendix B** of the **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad B)):

> *"Selection of events for Percentage Runoff calculations at Middleton and G5. It seems highly unlikely that only 3 events are available at Middleton considering hourly water level data is available from 1967 and 15 minute data is available from 1993. There should be ample events in the historic record to fulfil this requirement at Middleton and if G5 continued to operate after 2015."*

3.3.2 Additionally, the Environment Agency provided comment (comment 2.2 in **Appendix B** of the **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad B)) on the flood event analysis and parameters utilised within the model as follows:

> *"Flood event analysis additional information required. We recommend that, as a minimum, a table is provided that lists, for each flood event, the start and end times, event rainfall depth, API5, SMD, resulting CWI, PR, DPR and SPR. The time to peak for each derived unit hydrograph should also be provided. The flood event analysis should calculate the SPR parameter, as per the FEH procedure. The report should state the source of SMD data that was used in this calculation. This improved estimate of SPR should then be combined with the design value of CWI to give a PR suitable for modelling design floods. These calculations should be laid out for both gauges: Middleton and G5."*

3.3.3 A review was carried out for the extended dataset available for the Middleton gauge and this found a number of discrete high flow events.

3.3.4 Since January 2016 there have been approximately 39 events observed at the Middleton gauge where the stage exceeded the 0.4m non-modular level.

3.3.5 As was carried out in the original hydrological analysis (**Appendix 3** of the **MDS Flood Risk Assessment** (Doc Ref. 5.2) [APP-099]) the updated rating curve equation derived for the gauge was used to extrapolate the flow values beyond the non-modular stage of 0.4m in order to derive the peak and event hydrograph shape. This comprises a different equation for different stages of the rating curve.

3.3.6 The event which occurred over the period of the 20th – 22nd December 2019 is the largest event recorded within the extended time-series dataset and is comparable to the previous events from January 2003 and January 2016 which were used in the original model calibration analysis.

3.3.7 This review found that the shape of the runoff event hydrographs extracted from the extended time-series exhibit the same general shape and characteristics (i.e. gradient of rising and falling limbs, time to peak, etc.) as the previous examples used in the original analysis i.e. 2003, 2010 and 2016 presented in **Appendix 3** of the **MDS Flood Risk Assessment** (Doc Ref. 5.2) [APP-099].

3.3.8 The following event hydrographs (**Plate 3.3**, **Plate 3.4** and **Plate 3.5**) illustrate the similarities in shape from the event hydrographs extracted from the extended time-series dataset.

Plate 3.3: Flow data (m^3/s) for Middleton – April 2018

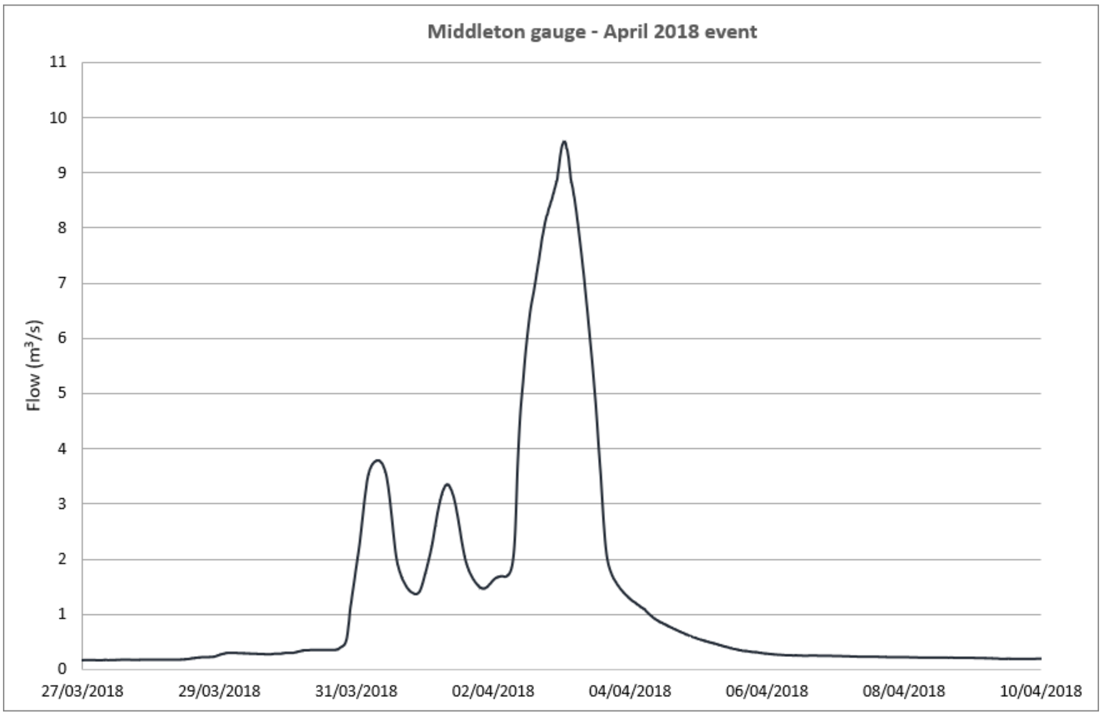


Plate 3.4: Flow data (m^3/s) for Middleton – November 2019

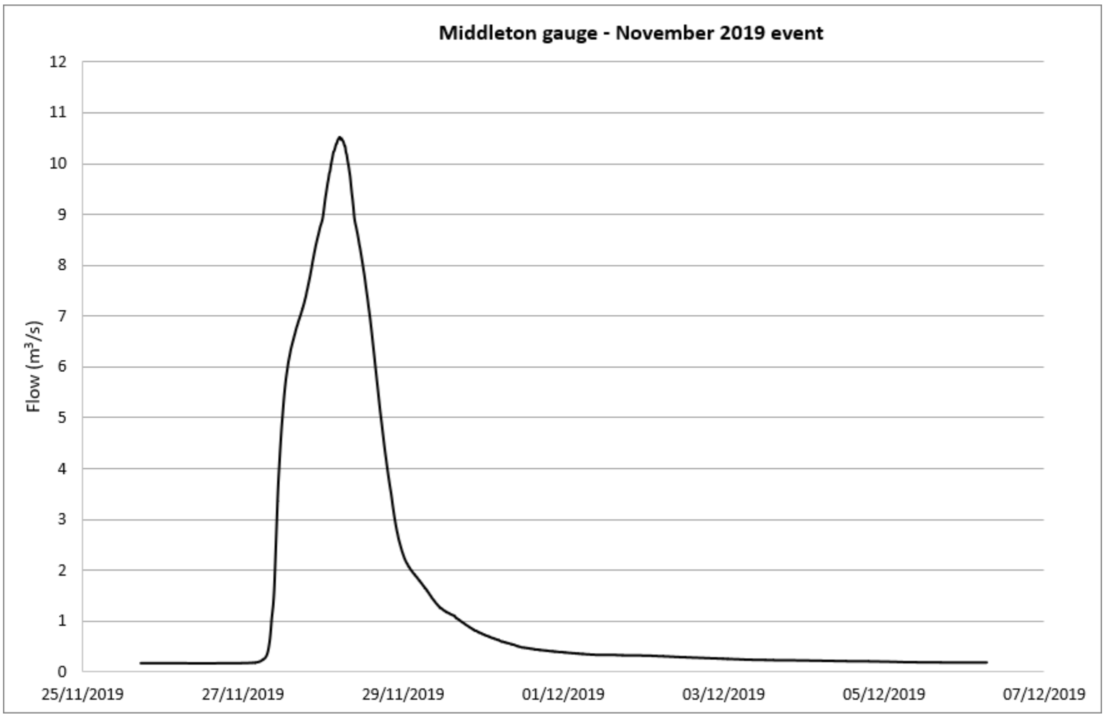
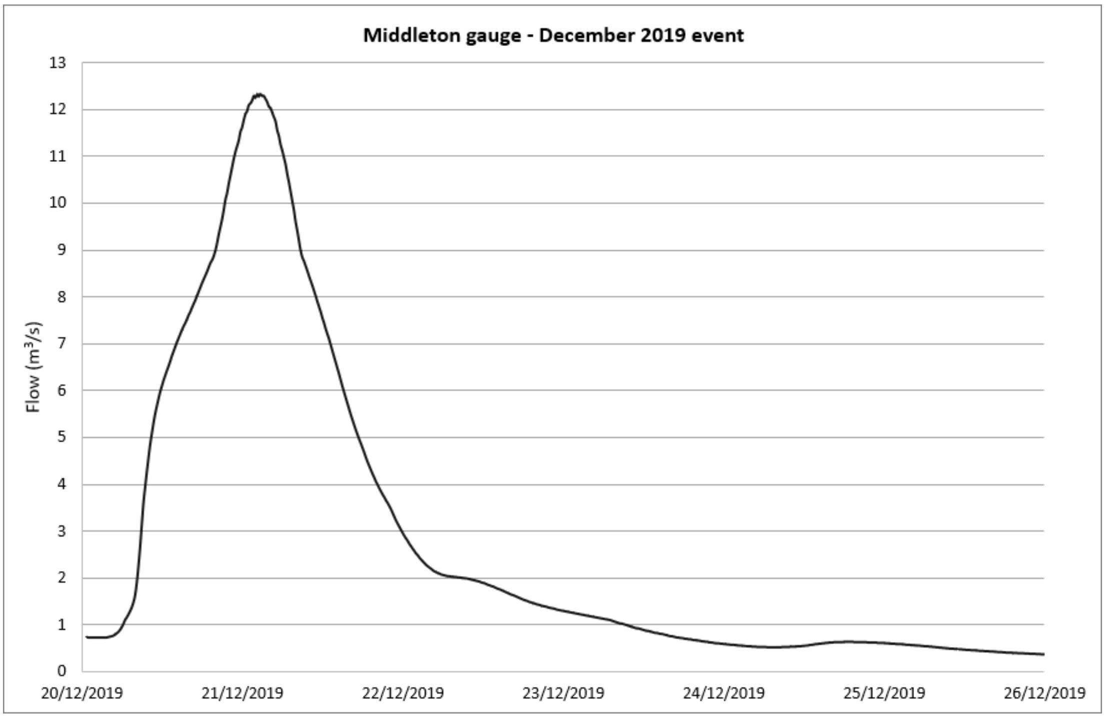


Plate 3.5: Flow data (m^3/s) for Middleton – December 2019



3.3.9 Following a review of the additional event data from the Middleton gauge it is considered that there is no requirement to utilise additional event hydrograph data to recalibrate the hydraulic model. This is because the observed event hydrographs from the Middleton gauge exhibit the same unit hydrograph shape and characteristic as those used in the original model calibration and therefore there would be little or no difference to the results of the calibration exercise.

3.3.10 It is acknowledged that if a reliable data record, signifying a suitable high flow event, is available from a local gauge this can help refine the Rainfall Runoff (RR) parameters of Time to peak (Tp) and Percentage Runoff (PR) and subsequently improve confidence in the estimates of design peak flows.

3.3.11 This requires hydrologically similar catchments that have not only adequate gauged flow data, but also a local rainfall gauge that samples at an hourly (if not sub-hourly) time step with appropriate spatial variability of the rainfall event across the study catchment.

3.3.12 For the other target upland sub-catchments, the G5 temporary gauging station was used as a donor site for deriving the parameters adopted in the hydrological boundary units in the model. As the other upland sub-catchments are hydrologically similar to the G5 catchment it is appropriate to use the G5 gauge as a 'donor site' and adopt the data transfer method in the estimation of QMED.

3.3.13 A review of the high flow events, as well as the extended time series dataset, at the G5 temporary gauging station recognises that whilst more recent high flow events have occurred over the extended monitoring period (2016 – 2019) the response of the catchment is likely to be similar i.e. there have been no significant changes within the catchment that would alter its hydrological characteristics. Therefore, the underlying hydrological behaviour such as Baseflow and Unit Hydrograph shape also remain similar.

3.3.14 As previously noted, the updated estimation of QMED (1.4 m^3/s) is comparable with the original estimate of QMED for the G5 temporary gauging station, which was reported in **Appendix 3** of the **MDS Flood Risk Assessment** (Doc Ref. 5.2) [APP-099] as being 1.6 m^3/s. The original estimate is therefore still considered to be a representative value within the hydrological analysis. Therefore, it would be expected that the Rainfall Runoff (RR) parameters would remain similar and no subsequent adjustment required.

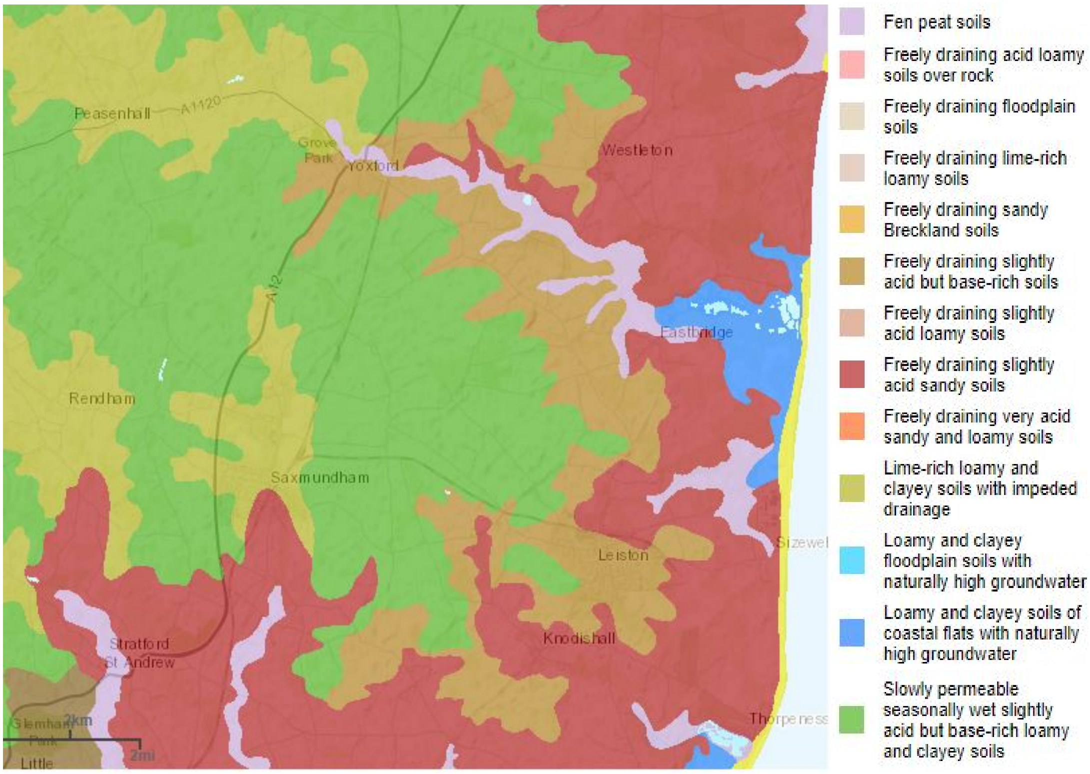
3.3.15 The additional data from the G5 temporary gauging station has improved confidence in the QMED estimation at the G5 location and subsequently there can be increased confidence in the RR parameters generated by the STRIP_UH model and subsequently utilised in the hydrological analysis.

3.3.16 The hydraulic model boundary units with the RR parameters were derived from the STRIP_UH model based on observed event data (2013 – 2015) transferred from the G5 temporary gauging station and the Thorpeness rain gauge records to generate the parameters from a Unit Hydrograph.

3.3.17 To address concerns with the parameters considered within the hydraulic modelling, runoff values and the representative nature of the G5 temporary gauging station, a review of the characteristics of the sub-catchments was carried out.

3.3.18 A review of the soils and geology was carried out for the upland sub-catchments. The underlying soil type mapping (**Plate 3.6**) from the National Soils Research Institute (Cranfield University) web service (Ref. 2) shows that the upland sub-catchments share similar compositions of soil types and drainage properties. The soil types within the upland sub-catchments consist mostly of freely draining slightly acidic soils.

Plate 3.6: Soil type mapping for the Sizewell study area (reproduced from NSRI Soilscapes web service, Ref. 2)



3.3.19 Additionally, the sub-catchments across the Sizewell study area are underlain predominantly by a mixture of Sand and Gravel and Diamicton deposits (Lowestoft Formation) suggesting relatively moderate to high permeability. This is reflected in the FEH BFIHOST values and indicates that fluvial systems throughout the study area are largely dominated by a significant baseflow component as opposed to surface water runoff.

3.3.20 The soils and superficial geology mapping show that the G5 temporary gauging station catchment is broadly representative of the other upland sub-catchments. As such it is acceptable to use the G5 temporary gauging station site as a donor catchment.

3.3.21 Based on the more recent up to date review of the latest available time series record from the G5 temporary gauging station and sub-catchment characteristics it is considered unnecessary to undertake subsequent adjustments to the FEH Rainfall Runoff parameters derived from the G5 flow record.

3.3.22 To further address concerns with the Percentage Runoff (PR) and RR parameters a sensitivity testing exercise was carried out within the hydraulic model, and the approach and results of this are set out in **section 3.6**.

3.4 Review of the National River Flow Archive (NRFA) dataset

3.4.1 One of the comments raised by the Environment Agency with regard to the flood frequency analysis (comment 2.4 in **Appendix B** of the **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad B)) states that:

> *"The flood frequency analysis was based on version 3.3.4 of the NRFA peak flow dataset. Update the statistical assessment using the latest version of the NRFA dataset."*

3.4.2 It is acknowledged that the National River Flow Archive (NRFA) dataset is subject to regular updates. However, it is also important to note that the Middleton gauging station is no longer active within the NRFA dataset.

3.4.3 The Middleton gauge on the River Minsmere continues to be discounted, based on a review of the latest version of the NRFA Peak Flows Dataset Version 8 (released September 2019) due to drowning and bypassing at higher flows. As stated in the original hydrology report (**Appendix 3** of the **MDS Flood Risk Assessment** (Doc Ref. 5.2) [APP-099]) the Middleton gauge is bypassed and becomes non-modular (drowned) at 0.4m stage, consequently meaning any flow record with stage higher than 0.4m is unreliable and an adjusted rating curve equation was developed.

3.4.4 Adhering to good hydrological practice and following the principles and guidance set out within the FEH methods, it remains that the Middleton gauge record should not to be used as a 'donor' for the data transfer method in the undertaking of statistical analysis at other ungauged subject sites (namely the upland sub-catchments) within the study area.

3.4.5 Additionally, **Appendix 3** of the **MDS Flood Risk Assessment** (Doc Ref. 5.2) [APP-099] previously confirmed that the absence of reliable data meant that the Statistical Method (single site or enhanced single site) was not preferred and therefore was not considered further in the hydrological assessment.

3.4.6 As a result, the Statistical Method was not progressed to the final hydrology and the rainfall-runoff methods were adopted within the fluvial hydraulic modelling. Therefore, the use of the most up to date NRFA dataset is not of direct relevance to the hydrological assessment for the project.

3.5 ReFH2 method

3.5.1 One of the comments raised on the hydrological assessment relates to the adopted rainfall-runoff method. The latest guidance suggests using the ReFH2 method, unless other methods are more appropriate due to the specific characteristics of the catchment. For the Sizewell C project, the FEH method was adopted, this was on the basis that the ReFH2 method was not released at the time of the initial assessment, and therefore FEH was considered at the time the most appropriate method based on catchment characteristics.

3.5.2 However, it is acknowledged that sensitivity testing should be carried out with the ReFH2 method. This is in line with the comment raised by the Environment Agency (comment 1.8 in **Appendix B** of the **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad B)) which states:

> *"Refh2 should be treated as a preferred method. At the very least a sensitivity test should be undertaken to confirm the impact on model results if ReFH2 were favoured. "*

3.5.3 Another comment from the Environment Agency relating to the ReFH2 method (comment 1.9 in **Appendix B** of the **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad B)) states:

> *"The report states that ReFH produces unrealistic runoff volumes for long duration storms… but does not provide an equivalent analysis of volumes calculated by ReFH2."*

3.5.4 To address the above comments, the ReFH2 method was tested in the hydraulic model and results compared with those produced by the FEH method. The FEH inflow boundaries in the 1D model (Flood Modeller) were replaced with ReFH2 boundary nodes. To allow direct comparison, the same catchment descriptors were used, although some parameters (such as the time step interval in the rainfall tab) had to be adjusted due to the specific requirements of the ReFH2 method.

3.5.5 Similarly, hydrographs for inflow points within the 2D Tuflow model domain were also derived using ReFH2 method so that all hydrological boundaries for the tested scenario were based on the same approach.

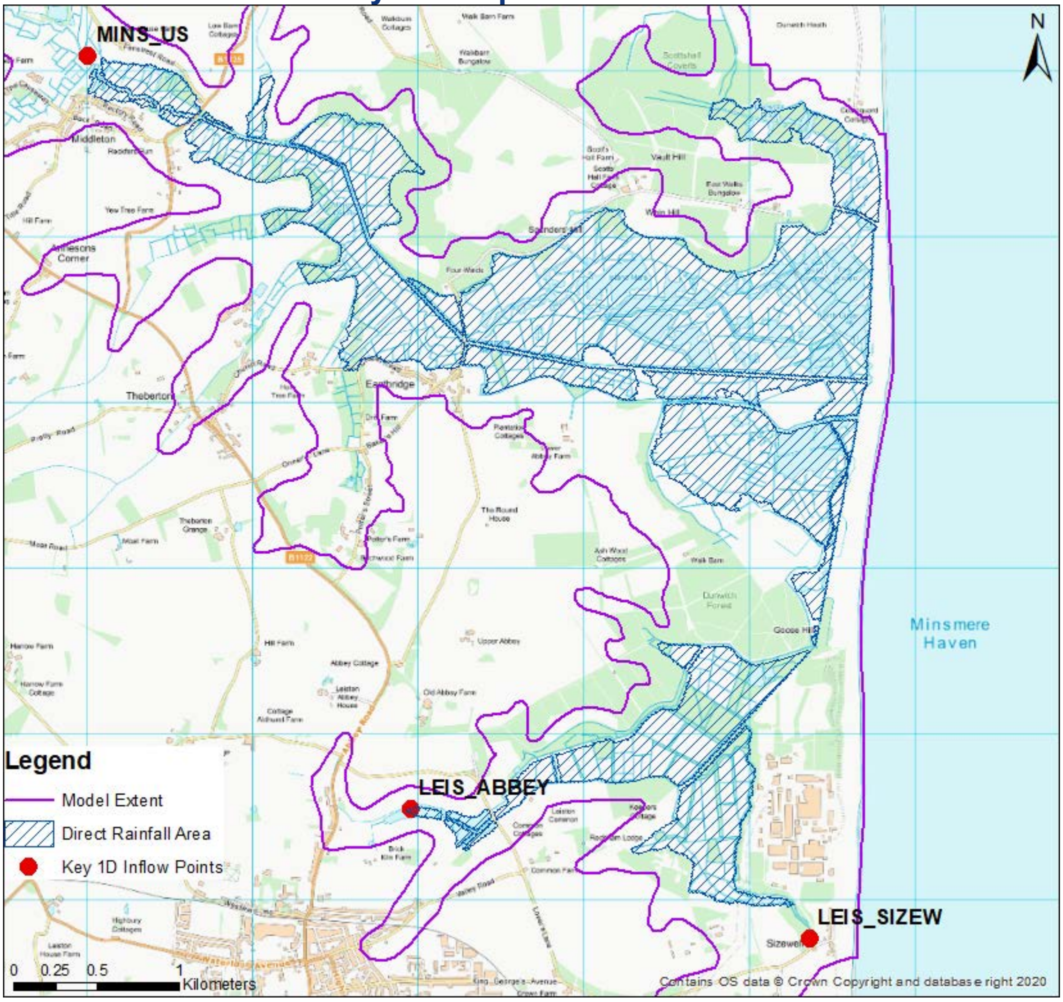
3.5.6 This sensitivity test was carried out for the baseline 121-hour storm duration 1 in 100-year return period event present day scenario with scheme. This scenario was chosen in order to determine the overall model response to different hydrographs and its impact on maximum flood depths within the catchment without introducing extreme climate change allowances.

3.5.7 **Table 3.2** provides derived peak flows and volumes for the main model inflow points (illustrated in **Plate 3.7**) for both the ReFH2 and FEH methods. The comparison indicates that the FEH method produces much higher peak flows and volumes and therefore is more conservative.

Table 3.2: Comparison of FEH and ReFH2 peak flows and volumes at key model inflow points – 121-hour storm duration 1 in 100-year present-day event

Inflow Points	Peak Flow (m^3/s)		Total Volume (m^3)	
Model Node	**FEH**	**ReFH2**	**FEH**	**ReFH2**
MINS_US	18.64	12.80	974	672
LEIS_ABBEY	0.28	0.32	17	15
LEIS_SIZEW	0.18	0.05	9	2

Plate 3.7: Location of key inflow points



3.5.8 A comparison of model results between FEH and ReFH2 for the baseline 100-year return period event with 121-hour storm duration for the present day scenario at selected points within 1D and 2D model domains (location shown in **Plate 2.1**) is presented in **Table 3.3**.

Table 3.3: Comparison of FEH and ReFH2 peak flood depth at selected model points - 1 in 100-year present-day event with 121-hour storm duration

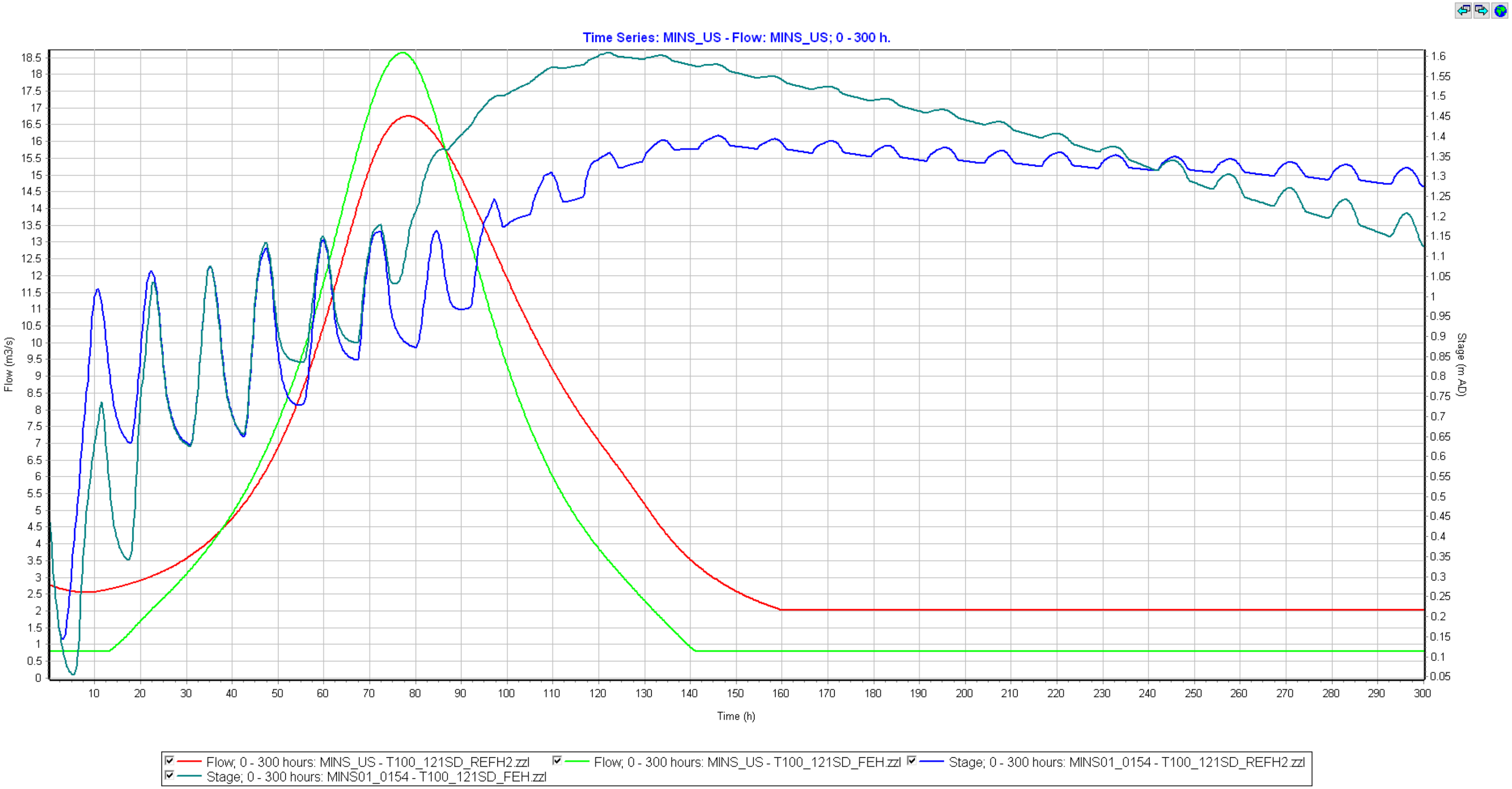
Comparison Point	Peak flood depth (m)	
Point Location	**FEH**	**ReFH2**
MINS01_2628u	2.14	1.94
MINS01_0154	2.27	2.06
SCOT_0251	2.85	2.64
LEIS01_1646d	2.59	2.38
SIZE01_1764	1.72	1.52
East Bridge	1.18	0.97
Minsmere North	0.79	0.59
Minsmere South	1.61	1.40
Sizewell Belts	0.96	0.75
Rose Cottage	0.66	0.45

3.5.9 **Table 3.3** shows that the FEH method consistently produces higher peak flood depth (by 0.20 – 0.21m) across the comparison points within both the 1D and 2D model domains.

3.5.10 Comparison of modelled time series of flow and water level at two 1D model nodes, i.e. inflow point at the upstream extent of Minsmere River (MINS_US) and the last downstream point on Minsmere River before the outfall (MINS01_0154, shown in **Plate 2.1**) is presented in **Plate 3.8** below. These results show that the FEH method produces significantly higher peak flow when compared to the ReFH2 method and results in higher peak water levels at the downstream end of the model.

3.5.11 Based on the results from this sensitivity test the FEH method is considered to produce more conservative results than the ReFH2 method, and therefore was continued to be adopted in the modelling analysis for the Sizewell C project.

Plate 3.8: Modelled time series results for the FEH and ReFH2 methods at two 1D model nodes (Minsmere River)



3.6 Percentage Runoff values

3.6.1 Two comments were raised by the Environment Agency with regard to the Percentage Runoff (PR) values applied (comment 2.0 and 2.3 in **Appendix B** of the **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad B)). Both comments state:

> *"Given the uncertainty associated with the runoff percentages, they should be included in sensitivity testing of the model."*

3.6.2 Sensitivity test was carried out with PR values at each inflow boundary model node increased to 75% from 50% adopted within the Application. The model was run for the 121-hour storm duration 1 in 100-year return period and event with 80% allowance for climate change (2190 epoch) to assess the potential impact on model results at the end of the development lifetime.

3.6.3 **Table 3.4** presents comparison of modelled peak flood levels at selected locations within 1D and 2D model domain (illustrated in **Plate 2.1**) between the scenario with 50% and 75% PR values respectively.

Table 3.4: Peak flood depth at the selected points for the PR value scenarios - 121-hour storm duration 1 in 100-year event with 80% climate change allowance

Comparison Point	Peak flood depth (m)	
Point Location	**50% PR**	**75% PR**
MINS01_2628u	2.70	2.83
MINS01_0154	2.83	2.95
SCOT_0251	3.41	3.53
LEIS01_1646d	3.14	3.25
SIZE01_1764	2.28	2.39
East Bridge	1.36	1.49
Minsmere North	1.74	1.86
Minsmere South	2.17	2.29
Sizewell Belts	1.51	1.62
Rose Cottage	1.22	1.32

3.6.4 The results set out above show that the increased PR value produces higher peak flood depths, as expected, due to the increased proportion (percentage) of rainfall depth at the model boundaries. The increase in 1D model points is up to 5%, whereas in the 2D domain it is between 5%-9%

with higher values at the more upstream points on Minsmere River, Leiston Drain and Sizewell Drain. Lower increases are found toward the downstream end of the model.

3.6.5 Overall the test results show some differences in peak flood levels between the two assessed PR values, although it should be noted that the tested PR value of 75% is relatively high, often used for smooth (urban) areas and therefore the increase in flood levels was expected. Nevertheless, 25% increase in PR values results only in 5%-9% increase in peak flood depth.

3.6.6 It is noted that this sensitivity run was carried out for an extreme event at 2190 epoch and therefore it is anticipated that the difference in peak flood levels due to increased PR values would be less for lower return period events and climate change scenarios. For consistency, the PR values in further modelling analysis were not changed from those adopted in the study for the Application.

4 SENSITIVITY TESTING

4.1 Overview

4.1.1 Following review of the hydraulic modelling undertaken for the Sizewell C project (pre and post Application submission) the Environment Agency raised comments with regard to model schematisation, representation of the Minsmere outfall structure and other model set-up parameters. To address these comments, a series of sensitivity tests were carried out and discussed in detail in the following **sections 4.2** - **4.4**.

4.1.2 The assessment of residual risk to the development in an event should the key structure be blocked is discussed in **section 4.5**.

4.1.3 To obtain a better understanding of the individual impacts of the key development elements, i.e. main platform and SSSI crossing, on change in flood risk in the area, an additional sensitivity test was carried out with only the platform included in the model. The aim was to determine the impact of the platform itself and consequently determine the impact of the SSSI crossing when comparing the baseline with the full scheme scenarios. Further details on the approach and results obtained from this sensitivity test are discussed in **section 4.6**.

4.1.4 Results from the sensitivity tests were analysed at selected points within the 1D and 2D model domain (shown in **Plate 2.1**) to determine the potential impact on the peak flood levels across the model. For some tests other tables or plots were provided to aid discussion on the results.

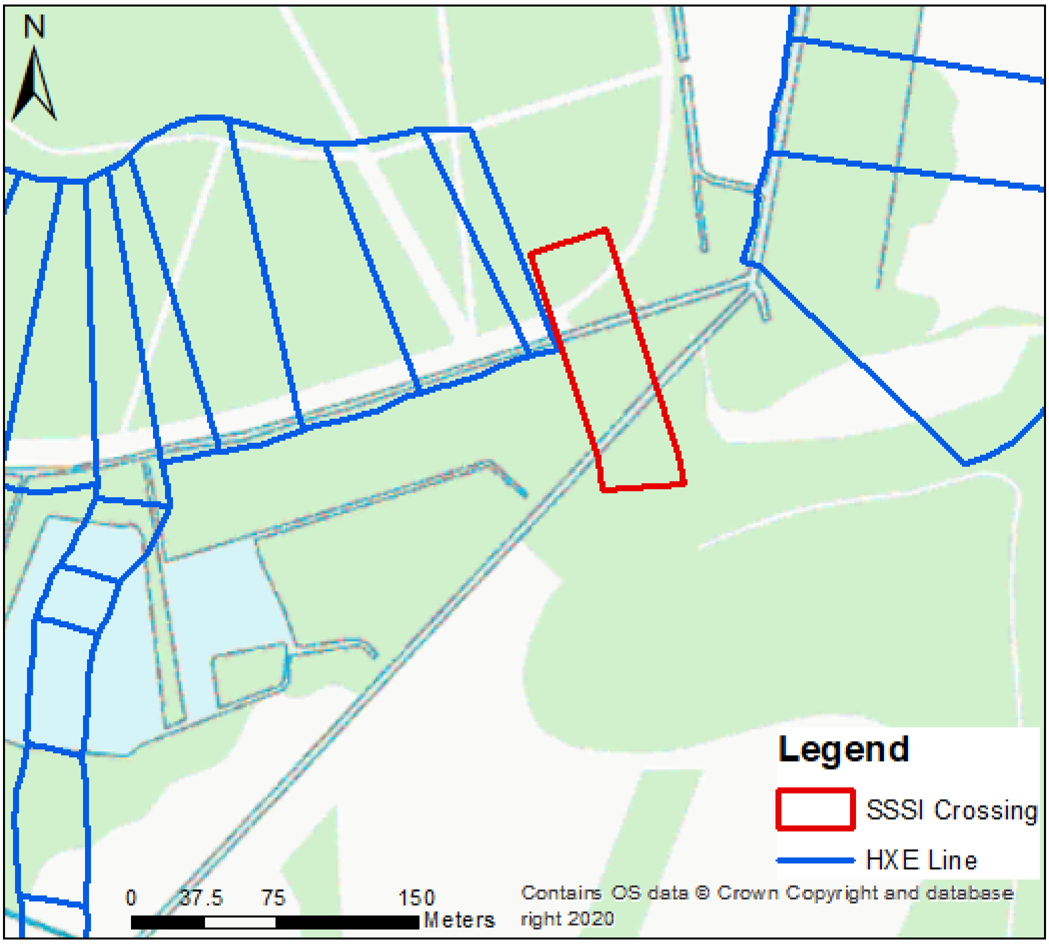
4.2 Schematisation updates

4.2.1 Following model review post Application submission, the Environment Agency raised one comment with regard to the general model schematisation (comment 1.1 in **Appendix B** of the **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad B)) which states:

> *"The SSSI crossing (2d_zsh_SSSI_crossing_v1_R) position does not appear to line up well with the positioning of the HX lines (2d_bc_hxe_Sizewell_050). Consequently a portion of the deck is not raised as expected and lies within the deactivated area of the 2d model domain."*

4.2.2 Model schematisation was updated in line with the comment above by re-aligning the HX and CD lines within the HXE layer in the 2D Tuflow model domain to ensure that the footprint of the proposed development is more accurately represented. The corrected alignment is shown in **Plate 4.1**.

Plate 4.1: Corrected alignment of HX line around the SSSI crossing



4.2.3 To test the potential impact of the corrected alignment the model was run for the with scheme scenario, i.e. 1 in 100-year return period event with 65% climate change allowance, as this is a key scenario in the assessment of on-site flood risk. Results were compared at selected locations within 1D and 2D model domains (shown in **Plate 2.1**) and are presented in **Table 4.1** below.

Table 4.1: Peak flood depth comparison for the HXE layer alignment sensitivity test for with scheme 1 in 100-year return period event with 65% climate change allowance

Comparison Point	Peak flood depth (m)	
Point Location	**The Application**	**Updated HXE layer**
MINS01_2628u	2.67	2.67
MINS01_0154	2.80	2.80
SCOT_0251	3.37	3.37
LEIS01_1646d	3.11	3.11
SIZE01_1764	2.25	2.24
East Bridge	1.32	1.32
Minsmere North	1.70	1.70
Minsmere South	2.14	2.14
Sizewell Belts	1.48	1.48
Rose Cottage	1.18	1.18

4.2.4 The above results show that the corrected alignment of the HX line in the HXE layer in the 2D Tuflow model domain did not have a significant impact on the peak flood depth across all selected points in 1D or 2D domain.

4.2.5 Although the updated alignment does not have a significant impact on model results, as best practice, the revised model schematisation was used in all following sensitivity tests and any further assessment.

4.3 Tidal and fluvial peak timing

4.3.1 For the assessment for the Application, 121-hour storm duration of fluvial flows was determined as resulting in the highest flood levels. This was based on the peak tide levels at the downstream boundary with which it was set to coincide. Following their review, the Environment Agency raised a comment (comment 1.3 in **Appendix B** of the **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad B)) which states:

"Phasing of the peak tidal and peak fluvial flooding needs to be improved… 2D model outputs indicate that peak water levels on the floodplain occur at time ~123.7hr, at least 2hrs later than the peak tidal level. Peak tidal level for T_2017_100yr = 1.69 (@ t = 121.25hr) while the tidal levels are around 0.6mAOD when the water levels on the floodplain are max… Testing and reporting on fluvial/tidal timing variations should be undertaken."

4.3.2 Sensitivity test was therefore carried out with adjusted timing of peak tide levels moving it forward by 2 hours so that it coincides with the peak levels on the floodplain, i.e. to ~ 123.5 hrs. This model was run for the baseline 1 in 100-year return period event present day scenario.

4.3.3 In addition, a second test was carried out for the with scheme 1 in 100-year return period event with 65% climate change allowance, as the key scenario for on-site flood risk assessment. For this scenario, results within the Application show the peak flood levels within the floodplain at around 101 hours and so the tide peak was adjusted to coincide with that time, by ~20.5 hours.

4.3.4 Results were compared at selected locations within the 1D and 2D model domains (shown in **Plate 2.1**) and are presented in **Table 4.2** below.

Table 4.2: Peak flood depth comparison for the adjusted tide peak sensitivity test for the two considered scenarios

Comparison Point	Peak flood depth (m) - Baseline 100-year present day		Peak flood depth (m) – With Scheme 100-year +65% climate change allowance	
Point Location	**The Application**	**Adjusted peak tide time**	**The Application**	**Adjusted peak tide time**
MINS01_2628u	2.14	2.14	2.67	2.68
MINS01_0154	2.27	2.27	2.80	2.80
SCOT_0251	2.85	2.85	3.37	3.38
LEIS01_1646d	2.59	2.58	3.11	3.12
SIZE01_1764	1.72	1.72	2.25	2.25
East Bridge	0.79	0.79	1.32	1.33
Minsmere North	1.18	1.17	1.70	1.71
Minsmere South	1.61	1.61	2.14	2.14
Sizewell Belts	0.96	0.96	1.48	1.48
Rose Cottage	0.66	0.66	1.18	1.19

4.3.5 Results in **Table 4.2** show that the adjusted time of peak tide levels has very minimal impact on peak flood levels for the present day baseline and the with scheme +65% climate change allowance scenarios, where the maximum difference within the model is no more than 0.01m. Since the difference is not significant, for consistency in the approach, the timing of the peak tide levels in the further modelling analysis was not changed from that adopted in the study for the Application.

4.4 Extended simulation run time

4.4.1 During review of the hydraulic model outputs following the Application submission, the Environment Agency (comment 1.5 in **Appendix B** of the **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad B)) noted that:

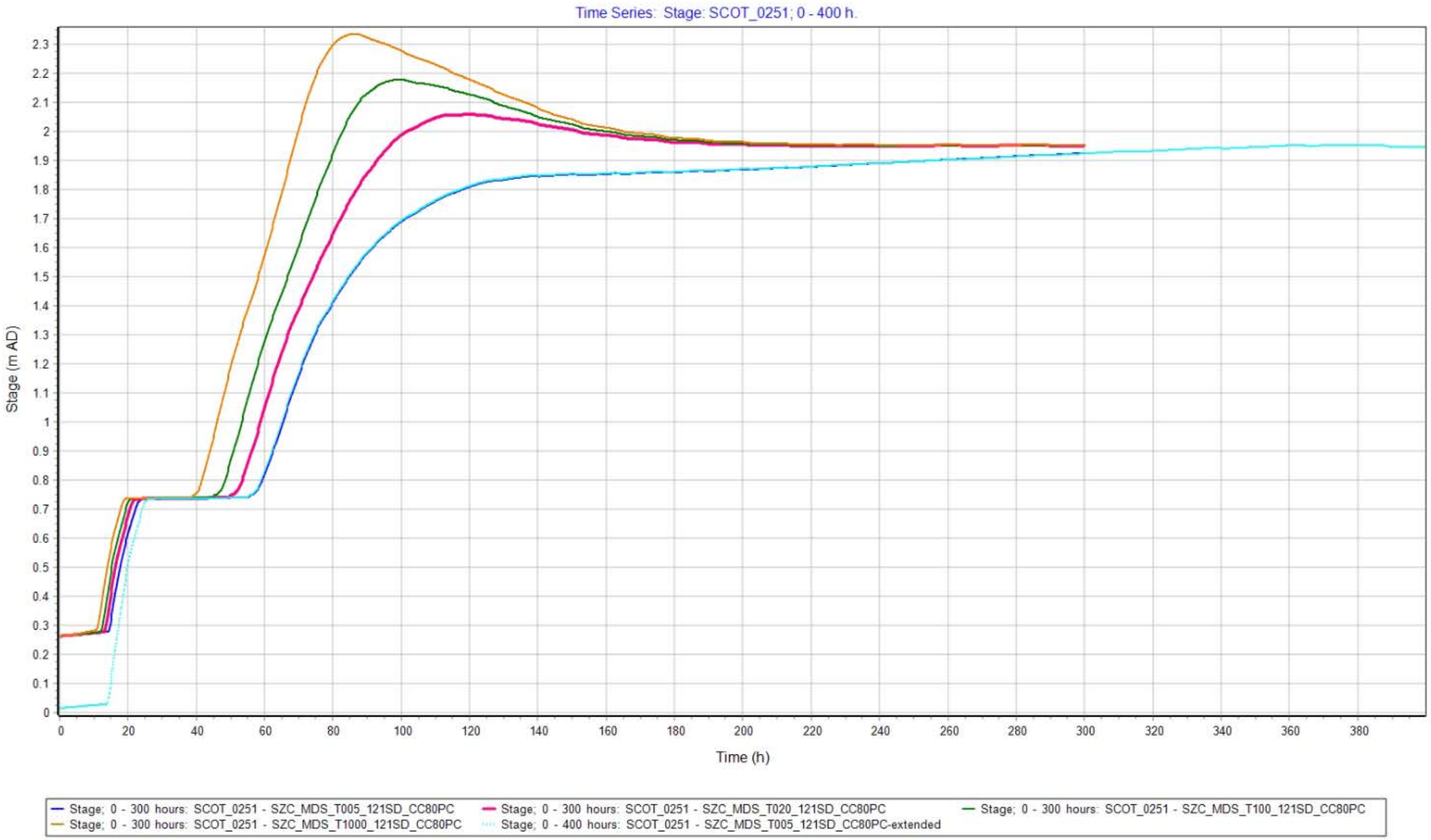
> *"On the Scotts Hall Ditch water levels continue to rise to the end of the simulation in the 20% (1 in 5) plus 80% CC scenario. This is the case both in the baseline and 'with scheme' scenarios and is evident at sections SCOT_0929 through to SCOT_0000"*

4.4.2 To determine the peak flood levels along the Scott's Hall Ditch, the model was run for an extended simulation time from 300 hours to 400 hours for the baseline and with scheme model schematisations 1 in 5-year return period event with 80% climate change allowance.

4.4.3 Results from the extended simulation showed that the flood levels at Scott's Hall Ditch were rising very slightly until the end of the extended simulation time, suggesting that the peak flood level might not have been reached. Further investigation of the results within the Application and the extended simulation indicate that this is caused by the extreme tide levels at 2190 epoch (80% climate change allowance for fluvial flows), where the water ingress is contributing to rising levels within the floodplain rather than fluvial flows.

4.4.4 The above is illustrated in **Plate 4.2** which shows a time series of water levels between the 5-year, 20-year, 100-year and 1,000-year event with 80% climate change allowance for the with scheme model schematisation at 1D model node on Scott's Hall Ditch (SCOT_0251, location shown in **Plate 2.1**).

Plate 4.2: Comparison of time series water levels at Scott's Hall Ditch (SCOT_0251 model node)



4.4.5 When comparing the results within the Application (simulation up to 300 hours), it is clear that for events with return period of 20-years and higher, the peak flood levels are reached well before the end of simulation. However, the water levels at the end of 300 hours are at the same level (even though return period is different) showing the influence of the extreme tide levels at 2190 epoch. For the 5-year return period event, the fluvial flows are much lower and therefore the flood levels are driven by the ingress of the tide.

4.4.6 However, **Plate 4.2** also shows that the flood levels in the extended simulation (400 hours) reach the same level as in the higher return period events and it is very unlikely that they would keep rising further.

4.4.7 To check the impact across the model, results were also compared at selected locations within the 1D and 2D model domains (shown in **Plate 2.1**) and are presented in **Table 4.3**. These show that although the peak flood levels are higher in the extended simulation by around 0.04m, the difference between baseline and with scheme results is not significant (up to 0.01m) and not greater than reported within the Application.

Table 4.3: Peak flood depth comparison for the adjusted tide peak sensitivity test for the two considered scenarios

Comparison Point	Peak flood depth (m) - Baseline		Peak flood depth (m) – With Scheme	
Point Location	**The Application**	**Extended run time**	**The Application**	**Extended run time**
MINS01_2628u	2.44	2.48	2.46	2.48
MINS01_0154	2.57	2.61	2.58	2.61
SCOT_0251	3.15	3.19	3.16	3.19
LEIS01_1646d	2.89	2.92	2.90	2.93
SIZE01_1764	2.02	2.06	2.04	2.07
East Bridge	1.09	1.13	1.11	1.13
Minsmere North	1.48	1.52	1.49	1.52
Minsmere South	1.91	1.95	1.93	1.95
Sizewell Belts	1.26	1.30	1.27	1.30
Rose Cottage	0.96	1.00	0.97	1.00

4.4.8 The above results show that the relative impact of the scheme has not changed as a result of the extended simulation time and slightly higher flood peak levels and therefore the conclusions drawn within the Application are valid.

4.5 Blockage assessment

4.5.1 Blockage assessment was not carried out for the Application as it was assumed that a relatively large opening of the culvert through the SSSI crossing (8m wide with soffit above fluvial flood levels) would be unlikely to block. However, the Environment Agency raised this in their review (comment 1.4 in **Appendix B** of the **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad B)) stating:

> *"No blockage assessment has been undertaken. The SSSI crossing culvert is adjacent to the main development site platform... Blockage assessment needs to be carried out and reported on to understand any residual risks to the development."*

4.5.2 Following the Application submission the design of the SSSI crossing has been updated, and the culvert has been replaced with a single span 30m wide bridge structure. On that basis, it was agreed with the Environment Agency (meeting on 23 November 2020) that blockage of the crossing is highly unlikely and therefore this assessment is no longer required. Details of the updated design of the SSSI crossing are presented in **section 5.2**.

4.5.3 To assess the residual risk to the development itself, a sensitivity test was carried out with blockage of the Minsmere Sluice, as this comprises a key structure within the catchment. The test was undertaken with 70% blockage ratio (in line with Environment Agency guidance, Ref 3), represented by reducing the bore area of orifice units linking each of the channels with the sluice structure. The model was run for the 1 in 100-year return period event with 65% climate change allowance as the key scenario when assessing on-site flood risk.

4.5.4 Results were compared at selected locations within both the 1D and 2D model domains (shown in **Plate 2.1**) and are presented in **Table 4.4** below, showing that blockage scenario results in maximum increase in peak flood depth across the model by up to 0.01m, although the results are very similar to the with scheme results without the blockage. Also, the peak flood levels of 2.14m AOD are still significantly below the platform and SSSI crossing level of 7.3m AOD. On that basis, the residual risk to the development in an event of blockage of the Minsmere Sluice is not significant.

Table 4.4: Peak flood depth comparison for the Minsmere Sluice blockage sensitivity test for the 1 in 100-year return period event with 65% climate change allowance

Comparison Point	Peak flood depth (m)		
Point Location	The Application – Baseline	The Application – With scheme	Blockage Scenario
MINS01_2628u	2.66	2.67	2.67
MINS01_0154	2.79	2.80	2.80
SCOT_0251	3.37	3.37	3.38
LEIS01_1646d	3.10	3.11	3.11
SIZE01_1764	2.24	2.25	2.25
East Bridge	1.31	1.32	1.32
Minsmere North	1.70	1.70	1.71
Minsmere South	2.13	2.14	2.14
Sizewell Belts	1.48	1.48	1.48
Rose Cottage	1.18	1.18	1.18

4.6 SSSI crossing impact

4.6.1 Following the Application submission, further modelling assessment was carried out to better understand the impact of key development elements on change in flood risk by undertaking model simulation without the SSSI crossing in place. That way, individual and relative impacts of the platform and crossing could be investigated when comparing with results with full scheme.

4.6.2 The model was run for the 1 in 100-year and 1 in 1,000-year return period events with 35% climate change allowance as two key scenarios for assessment of off-site impacts.

4.6.3 Results were compared at selected locations within both the 1D and 2D model domains (shown in **Plate 2.1**) and are presented in **Table 4.5** and **Table 4.6** for the 1 in 100-year and 1,000-year return period events respectively.

Table 4.5: Peak flood depth comparison for the sensitivity test without SSSI crossing for the 1 in 100-year return period event with 35% climate change allowance

Comparison Point	Peak flood depth (m)		
Point Location	The Application – Baseline	The Application – With scheme	No SSSI crossing
MINS01_2628u	2.52	2.53	2.53
MINS01_0154	2.65	2.66	2.66
SCOT_0251	3.23	3.24	3.24
LEIS01_1646d	2.97	2.98	2.97
SIZE01_1764	2.10	2.11	2.11
East Bridge	1.17	1.18	1.18
Minsmere North	1.56	1.57	1.57
Minsmere South	1.99	2.00	2.00
Sizewell Belts	1.34	1.35	1.35
Rose Cottage	1.04	1.05	1.05

Table 4.6: Peak flood depth comparison for the sensitivity test without SSSI crossing for the 1 in 1,000-year return period event with 35% climate change allowance

Comparison Point	Peak flood depth (m)		
Point Location	The Application – Baseline	The Application – With scheme	No SSSI crossing
MINS01_2628u	2.73	2.73	2.73
MINS01_0154	2.85	2.86	2.85
SCOT_0251	3.43	3.44	3.43
LEIS01_1646d	3.16	3.17	3.16
SIZE01_1764	2.30	2.30	2.29
East Bridge	1.38	1.39	1.38
Minsmere North	1.76	1.76	1.76
Minsmere South	2.19	2.20	2.19
Sizewell Belts	1.53	1.53	1.53
Rose Cottage	1.23	1.23	1.23

4.6.4 **Table 4.4** shows that, despite complete removal of the SSSI crossing, the scheme still has some impact on peak flood depth across the catchment. This results in an increased flood depth of up to 0.01m, compared with the baseline, and largely occurs due to the loss of floodplain within the main platform area. In the larger 1 in 1,000-year event, as shown in **Table 4.6**, peak flood levels are the same as in the baseline scenario suggesting limited to no impact of the scheme. This is confirmed when analysing the impact on properties, where the number of residential and non-residential properties affected has not changed with the maximum increase in flood depth up to 0.01m when compared to the baseline scenario.

4.6.5 Based on the results above it can be concluded that the SSSI crossing culvert design presented within the Application does not pose a constriction to fluvial flows and rather the impact on fluvial flood levels is driven by loss of floodplain within the main platform area and the SSSI crossing embankments. These conclusions have, to some extent, been superseded due to the updated design of the SSSI crossing, which is discussed in the following section.

5 UPDATED SCHEME DESIGN ASSESSMENT

5.1 Overview

5.1.1 The assessment for the Application concluded that flood risk would slightly increase as a result of the proposed development, with some increase in flood depth to residential and non-residential properties within the wider Minsmere and Leiston catchments. At their review following the Application submission, the Environment Agency (comment 1.5 in **Appendix B** of the **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad B)) noted that:

> *"Although the modelling report has identified an increased off-site fluvial flood risk as a result of the proposed development, adequate mitigation has not been proposed."*

5.1.2 It was recognised that further efforts should be taken to reduce the impact of the scheme, where possible. Therefore, following the Application submission, key elements of the scheme design have been updated to address flood risk and environmental impact concerns.

5.1.3 The design updates relevant to the flood risk assessment included change of the SSSI crossing design, relocation of the water resource storage area outside of the floodplain and using that area to provide habitat and flood mitigation area instead. These are discussed in further detail in **section 5.2** and **section 5.3** respectively.

5.1.4 The hydraulic model was run with the updated scheme design (both changes included) for a number of return period events and climate change scenarios. Results are presented in **section 5.4** and the updated assessment of impacts on flood risk is discussed in **section 5.5**.

5.2 SSSI crossing design

5.2.1 The SSSI crossing provides an essential pedestrian and vehicular connection across Sizewell Marshes SSSI, linking Sizewell C with the new access road. Design of the SSSI crossing within the Application was presented as an 8m wide portal culvert with soffit level at 3.5m AOD. It was designed to provide sufficient capacity to convey extreme fluvial flows, however the embankments occupied a significant portion of the existing floodplain, especially on the right bank (looking downstream). This posed not only a flood risk but also raised terrestrial ecology concerns, as the culvert and embankment option could limit the upstream and downstream migration of numerous species.

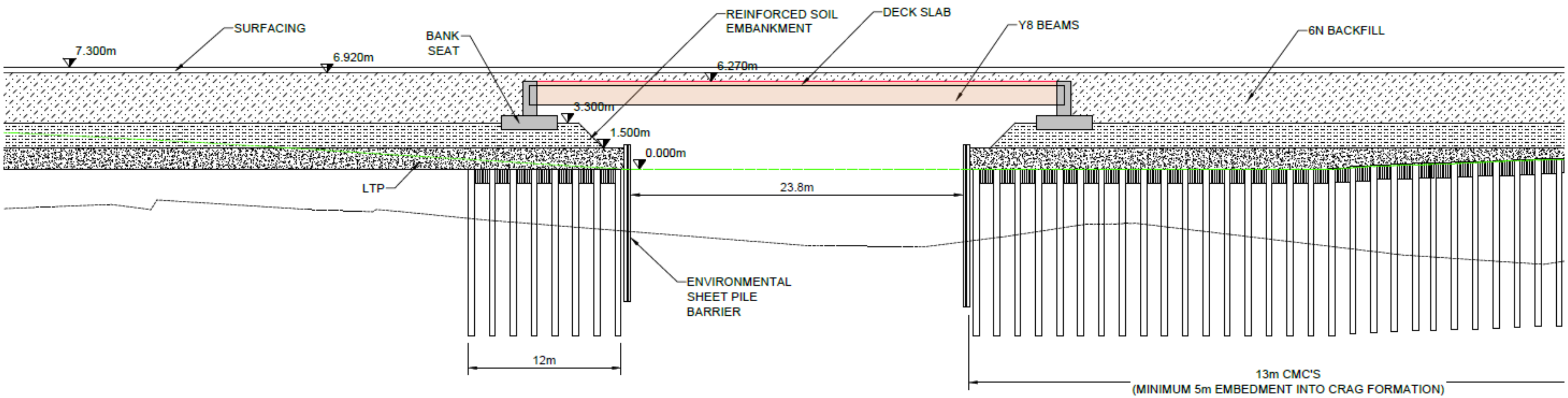
5.2.2 In the Relevant Representation (**Appendix A** of the **MDS FRA Addendum** (Doc Ref. 5.2(A)Ad A)), the Environment Agency stated:

> *"The choice of a culvert is contrary to Environment Agency expectations that watercourses should be crossed by means other than culverts wherever a practical and viable alternative may exist, due to the flood risk implications that culverts present and the overwhelming evidence that they cause harm to the delicate balance of ecosystems that reside within, and along, the watercourse into which the culvert may be placed."*

5.2.3 To address the concerns and reduce the flood risk and environmental impact, the SSSI crossing design was revised and the current design comprises a 30m wide single span bridge with soffit raised to 4.35m AOD. Environmental sheet pile barriers would be installed to separate the existing ground from the embankments, giving a 23.8m wide clear channel and floodplain between the sheet piles.

5.2.4 The cross-section of the updated SSSI crossing design is illustrated in **Plate 5.1**. In the hydraulic model, the updated SSSI crossing was modelled as a river section due to the complexity of both the 1D and 2D model domain connections at the location of the crossing.

Plate 5.1: Cross-section of the updated SSSI crossing design (extract from EDF Energy drawing no. SZC-EW0102-XX-000-DRW-400009 SSSI Section, rev. 01, 30/11/20)



5.2.5 Based on results within the Application, the maximum flood levels are well below the soffit of the new bridge and therefore excluding the deck of the bridge within the model schematisation would not impact the results. However, the sheet pile walls and the embankments have been represented in full as per the drawing in **Plate 5.1**. Manning's n roughness values within the river section were adjusted to appropriately represent the sheet piles and concrete elements of the bridge structure.

5.3 Flood mitigation area

5.3.1 The Application submission included a temporary non-potable water resource storage area that is required for use in the construction activities such as dust suppression on the stockpiles. This area was proposed to be located on the northern boundary of the temporary construction area that would be partly below the existing and partly above the existing ground levels with raised embankments up to approximately 3m in height. The **FRA** (Doc Ref. 5.2) [APP-093]) concluded that this water resource storage area could introduce residual flood risk to the downstream area.

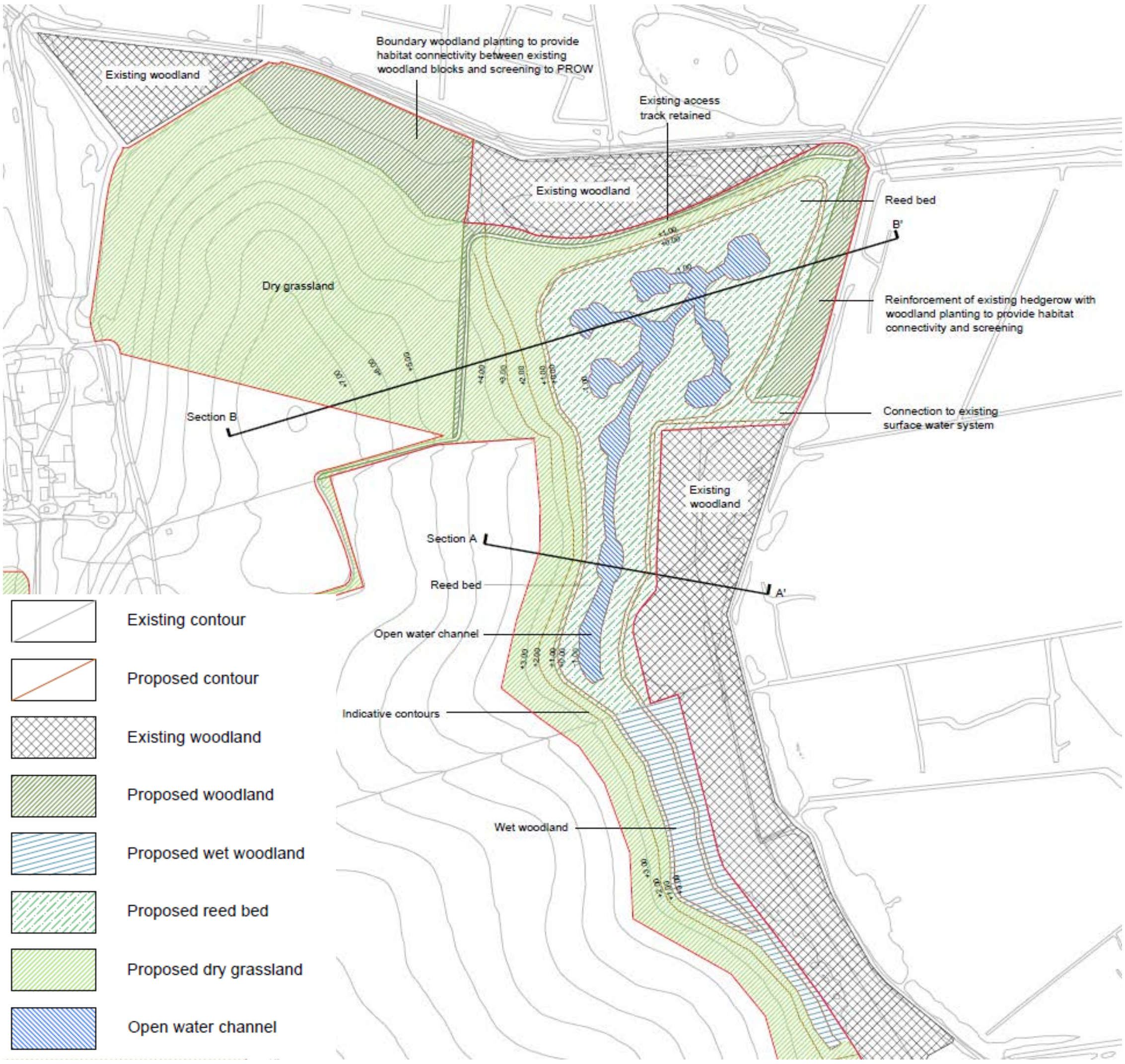
5.3.2 Following the Application submission, further work has identified that the water resource storage area can now be located elsewhere on the construction site, adjacent to a proposed attenuation pond and adjacent to the proposed borrow pits and stockpiles, outside of the floodplain.

5.3.3 This would allow the water resource storage area's original location to instead provide approximately 4,000m^3 of permanent wetland habitat and up to approximately 100,000m^3 of fluvial flood mitigation (considering available storage up to 3m AOD contour line). The wetland habitats would be open water channels and wet reedbeds to provide high quality foraging habitats for marsh harriers.

5.3.4 The flood mitigation area would also be linked to the proposed permanent wetland habitat corridor immediately to the south to create a single integrated wetland feature, as illustrated in **Plate 5.2** below.

5.3.5 The flood mitigation area was therefore included in the assessment as part of the permanent scheme design. For the purpose of hydraulic modelling only the area above 0.00m AOD was included as available storage, on the conservative assumption that areas below this level would be filled for most of the time with groundwater. Results from the modelling with the updated scheme design, including the flood mitigation area are discussed in the following section.

Plate 5.2: Proposed habitat and flood mitigation area (extract from EDF Energy drawing no. 7543_FMA_SK001_C, 21/10/20)

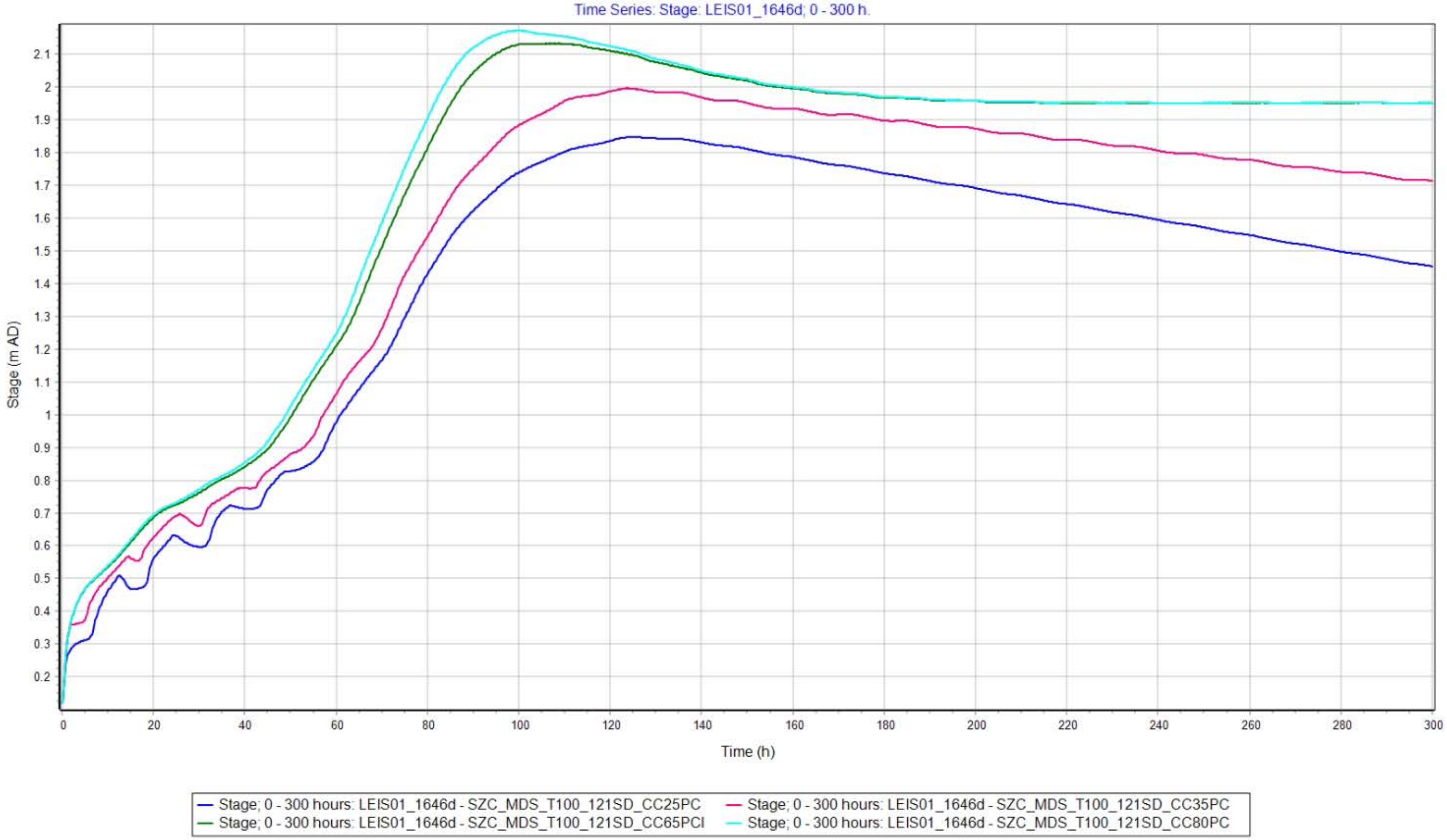


5.4 Updated scheme model results

5.4.1 The hydraulic model with the updated design of scheme development was simulated for 1 in 5-year, 1 in 20-year, 1 in 100-year and 1 in 1,000-year, with climate change allowances of 25%, 35%, 65% and 80%.

5.4.2 **Plate 5.3** presents the time series results of water levels from the with scheme model runs at Leiston Drain immediately downstream of the confluence with Leiston Ditch, 1D model node LEIS01_1646d (downstream of the proposed main platform and the SSSI crossing, location shown in **Plate 2.1**), for the 1 in 100-year return period event with 25%, 35%, 65% and 80% climate change allowance scenarios.

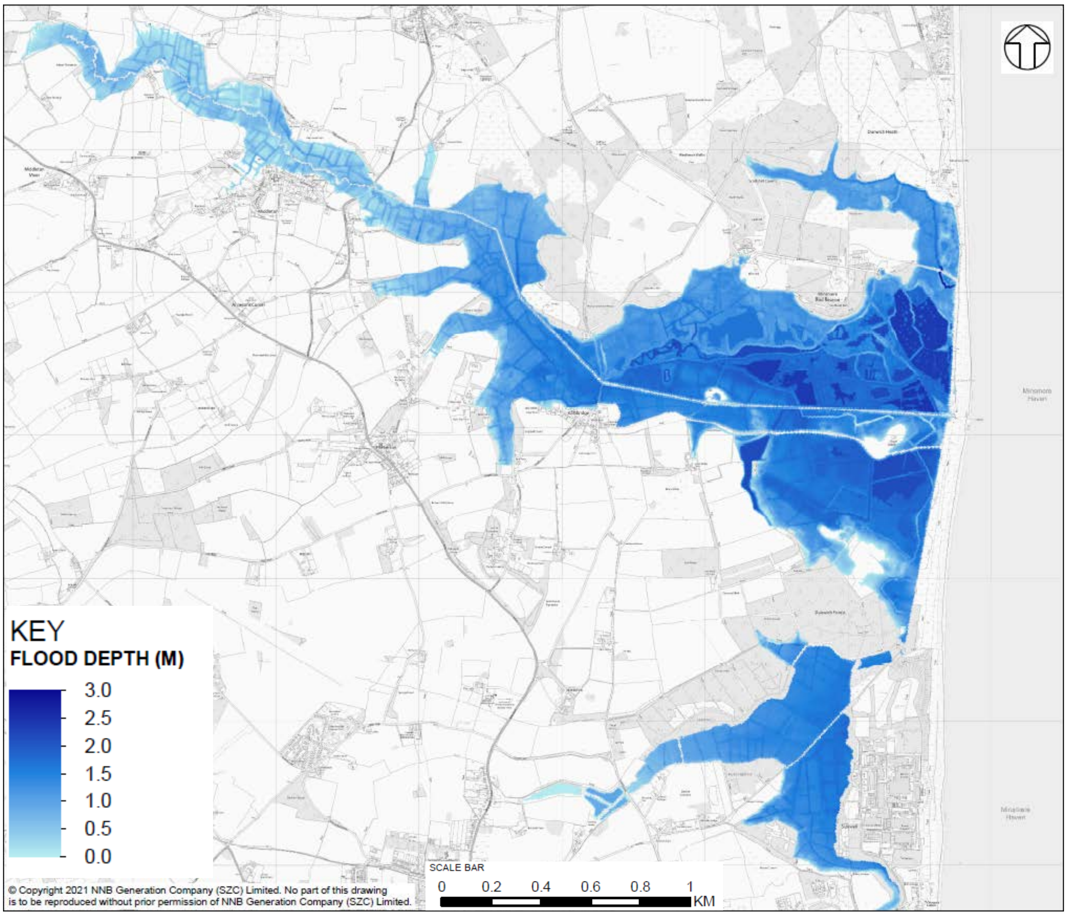
Plate 5.3: Time series of water level at Leiston Drain, downstream of the main platform location (LEIS01_1646d) – 1 in 100-year return period (with 25%, 35% 65% and 80% climate change)



5.4.3 **Plate 5.3** shows that the peak flood levels in the vicinity of the main development site for the 1 in 100-year return period event with climate change allowance up to 80% are well below main platform level and SSSI crossing road level (7.3m AOD) and also well below the soffit of the proposed bridge (4.35m AOD) at the crossing.

5.4.4 **Plate 5.4**, **Plate 5.5** and **Plate 5.6** show the maximum flood depth, velocity and hazard respectively for the for 1 in 100-year return period event with 65% climate change scenario with updated scheme design.

Plate 5.4: Flood depth for the updated scheme design scenario for 1 in 100-year return period event with 65% climate change allowance



5.4.5 **Plate 5.4** shows that the proposed flood mitigation area is flooded to a depth of approximately 2.1m (its full capacity with flood levels of 2.1m AOD) indicating that the area is storing flood water as intended.

Plate 5.5: Flood velocity for the updated scheme design scenario for 1 in 100-year return period event with 65% climate change allowance

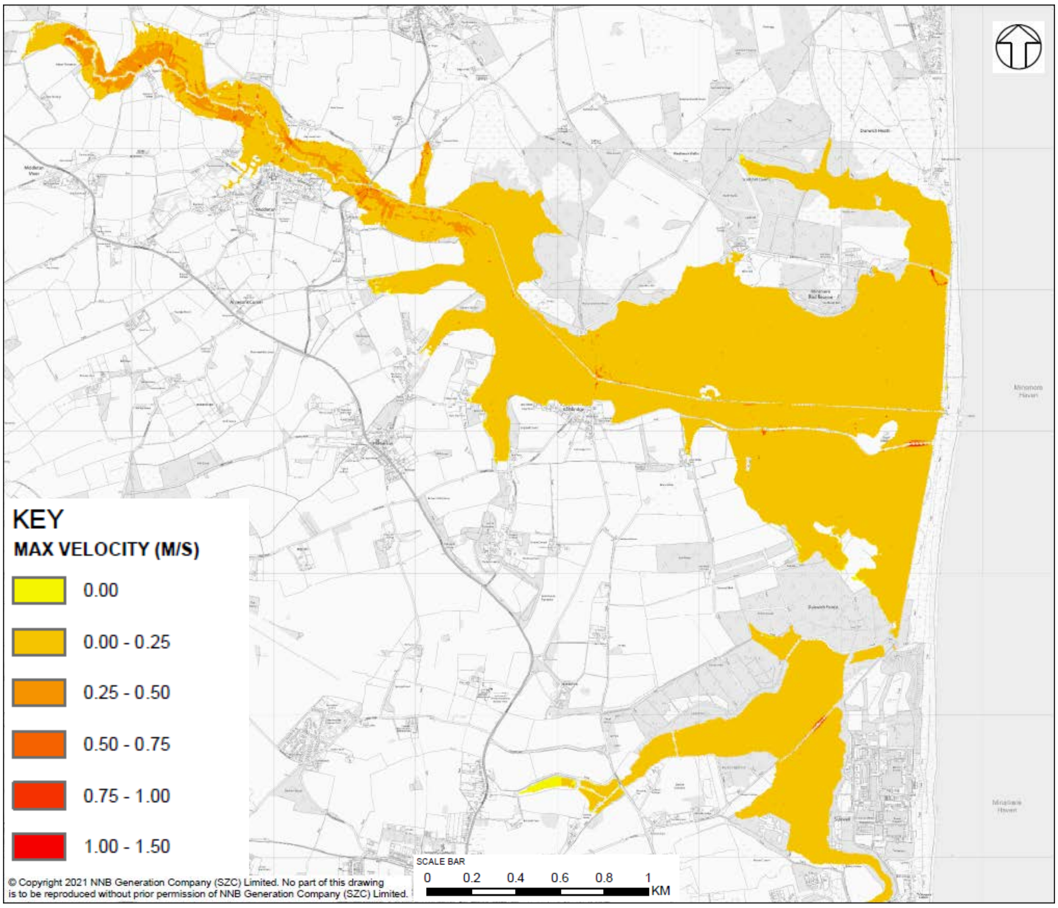
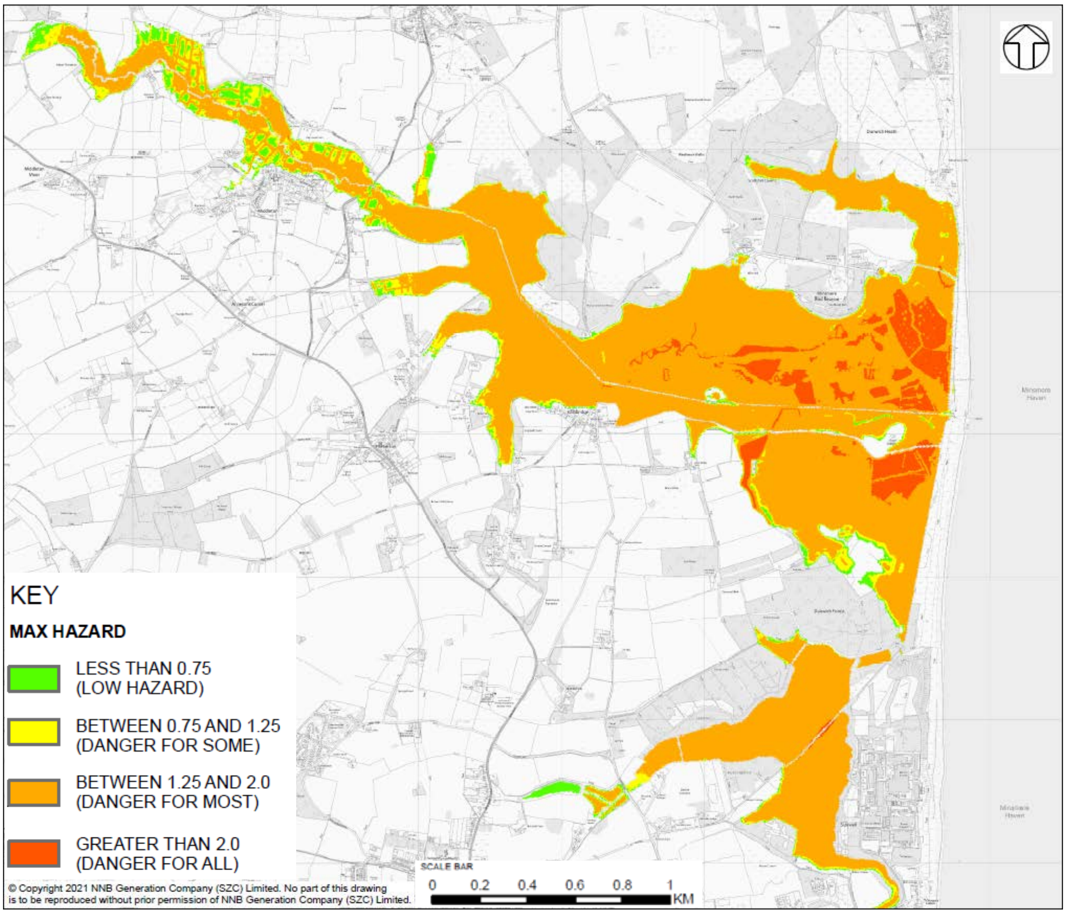


Plate 5.6: Flood hazard for the updated scheme design scenario for 1 in 100-year return period event with 65% climate change allowance



5.4.6 The flood hazard rating presented in **Plate 5.6** shows mostly 'danger for most' or 'danger for all' hazard rating that is driven by the flood depth not the velocity, which as shown in **Plate 5.5** is less than 0.25m/s in the majority of the area. Also, the hazard rating is describing risk to people, whereas most of the low-lying area of the catchment is not developed.

5.4.7 Overall, results above show the main platform and the SSSI crossing areas are not at risk of flooding from the considered extreme fluvial events. This is in accordance with the conclusions within the Application.

5.4.8 Figures illustrating flood depth, hazard and velocity for the 'with scheme' scenario for 1 in 5-year, 1 in 20-year, 1 in 100-year and 1 in 1,000-year return periods with climate change allowances of 35%, 65% and 80% are provided in **APPENDIX A**.

5.5 Impact of the updated scheme design

5.5.1 To assess the impact of the updated design of the development on flood risk to off-site receptors, a comparison has been made to determine the change in flood extent, depth, velocity and hazard throughout the development lifetime.

5.5.2 **Table 5.1** presents comparison of modelled maximum water levels between the baseline and with updated scheme design scenarios for all considered return period events and climate change allowances at the 1D model node located downstream of the proposed main platform and the SSSI crossing (location shown in **Plate 2.1**).

Table 5.1: Difference in maximum water levels at node LEIS01_1646d downstream of SSSI crossing

Return Period	Climate change allowance	Max Water Level (m AOD)		Difference (m)
		Baseline	With scheme	
5-year	25%	1.33	1.33	0.00
	35%	1.45	1.45	0.00
	65%	1.85	1.85	0.00
	80%	1.91	1.92	0.01
20-year	25%	1.56	1.56	0.00
	35%	1.71	1.71	0.00
	65%	2.01	2.01	0.00
	80%	2.05	2.06	0.01
100-year	25%	1.84	1.85	0.01
	35%	1.99	2.00	0.01
	65%	2.13	2.13	0.00
	80%	2.17	2.17	0.00
1,000-year	25%	2.13	2.13	0.00
	35%	2.19	2.19	0.00
	65%	2.29	2.30	0.01
	80%	2.31	2.32	0.01

5.5.3 **Table 5.1** above shows that the maximum increase in peak flood levels as a result of the scheme with the updated design is 0.01m across all considered return period events and climate change scenarios.

5.5.4 To check impact across the Minsmere and Leiston catchments, results of peak flood depth were also compared at several locations within both the 1D and 2D model domains (shown in **Plate 2.1**) and are presented in **Table 5.2** and **Table 5.3** for the 1 in 100-year and 1,000-year return period events with 65% climate change allowance respectively.

Table 5.2: Peak flood depth comparison for the baseline and updated scheme for the 1 in 100-year return period event with 35% climate change allowance

Comparison Point	Peak flood depth (m)		
Point Location	**Baseline**	**Updated scheme design**	**Difference**
MINS01_2628u	2.52	2.53	0.01
MINS01_0154	2.65	2.66	0.01
SCOT_0251	3.23	3.23	0.00
LEIS01_1646d	2.97	2.97	0.00
SIZE01_1764	2.10	2.11	0.01
East Bridge	1.17	1.18	0.01
Minsmere North	1.56	1.56	0.00
Minsmere South	1.99	2.00	0.01
Sizewell Belts	1.34	1.34	0.00
Rose Cottage	1.04	1.05	0.01

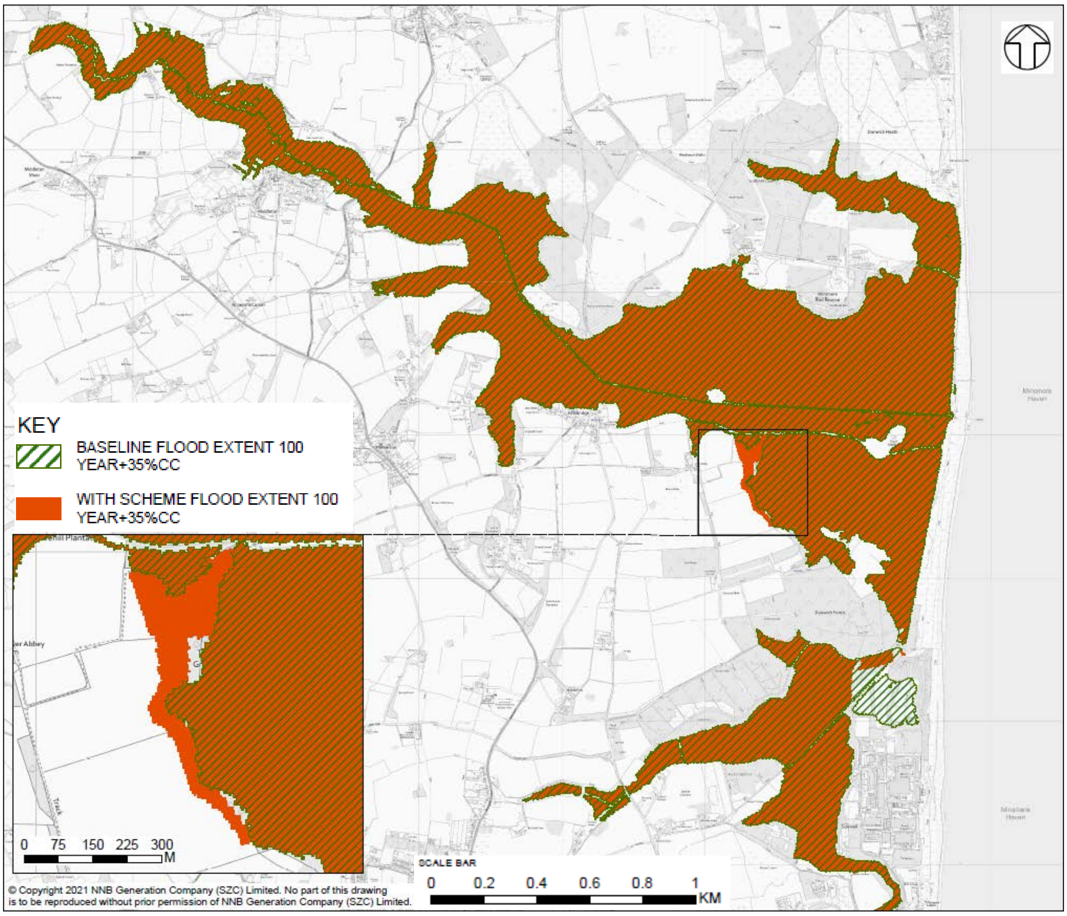
Table 5.3: Peak flood depth comparison for the baseline and updated scheme for the 1 in 1,000-year return period event with 35% climate change allowance

Comparison Point	Peak flood depth (m)		
Point Location	**Baseline**	**Updated scheme design**	**Difference**
MINS01_2628u	2.73	2.73	0.00
MINS01_0154	2.85	2.85	0.00
SCOT_0251	3.43	3.43	0.00
LEIS01_1646d	3.16	3.17	0.01
SIZE01_1764	2.30	2.30	0.00
East Bridge	1.38	1.38	0.00
Minsmere North	1.76	1.76	0.00
Minsmere South	2.19	2.20	0.01
Sizewell Belts	1.53	1.53	0.00
Rose Cottage	1.23	1.23	0.00

5.5.5 **Table 5.2** and **Table 5.3** show a maximum increase in flood depth across the Minsmere and Leiston catchments up to 0.01m for both the 1 in 100-year and 1 in 1,000-year return period event with 35% climate change allowance.

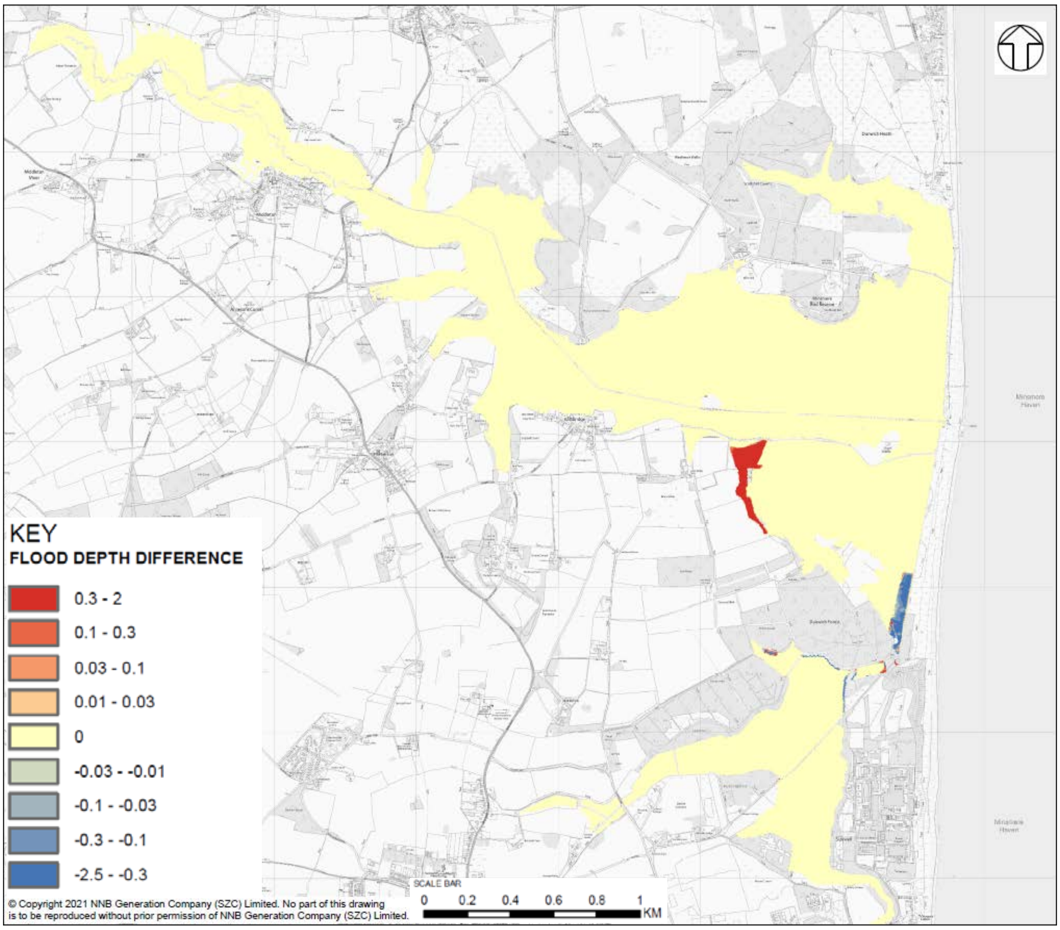
5.5.6 **Plate 5.7** – **Plate 5.10** show difference in flood extent, depth, velocity and hazard respectively for the 1 in 100-year return period event with 35% climate change allowance.

Plate 5.7: Difference in flood extent for the 100-year return period with 35% climate change allowance



5.5.7 **Plate 5.7** shows that the difference in the flood extent is minimal and relates mostly to the added flood mitigation area.

Plate 5.8: Difference in maximum flood depth for the 100-year return period with 35% climate change allowance

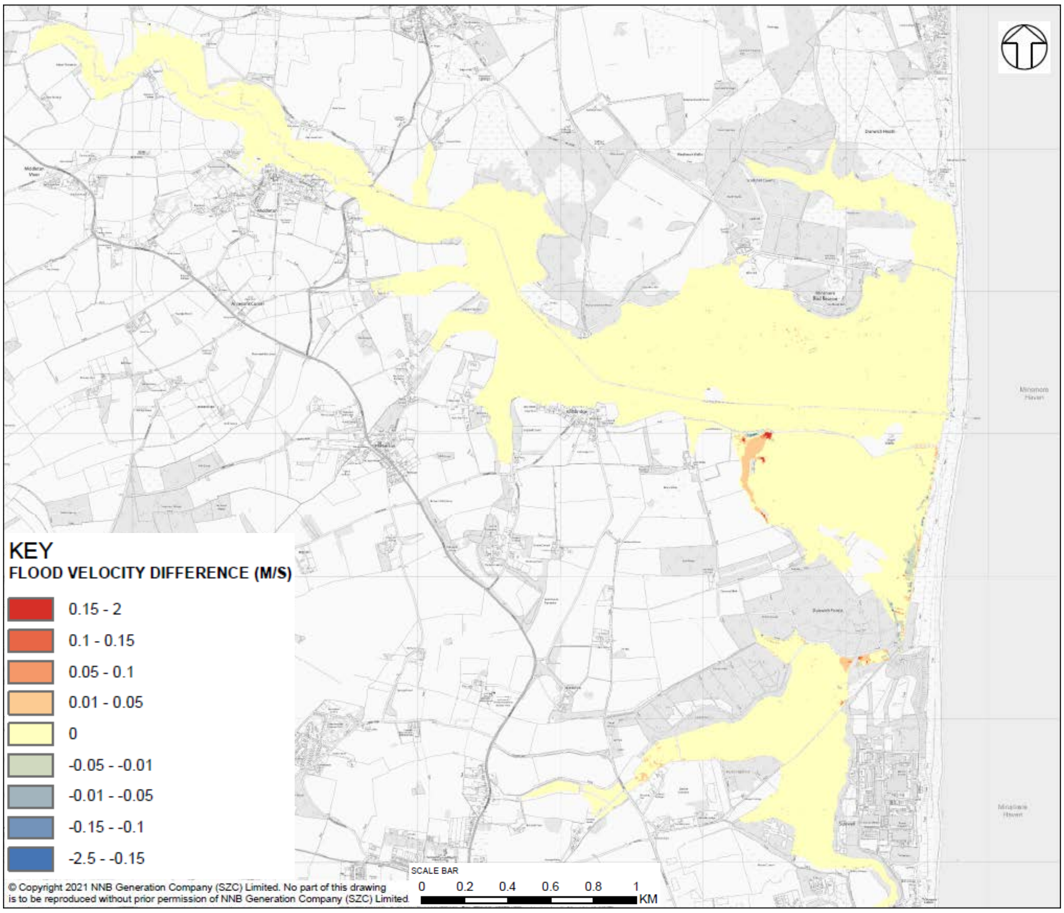


5.5.8 **Plate 5.8** shows that the increase in flood depth is primarily limited to the proposed flood mitigation area and the maximum increase in flood depth in the rest of the catchment is less than 0.01m.

5.5.9 The ‘high change’ (decrease) area on the left bank of the Leiston Drain immediately downstream of the SSSI crossing is caused by differences in representation of extended cross-sections in the 1D between the baseline and with scheme model schematisation (due to the SSSI crossing embankment) and does not represent a true change in flood risk in that area.

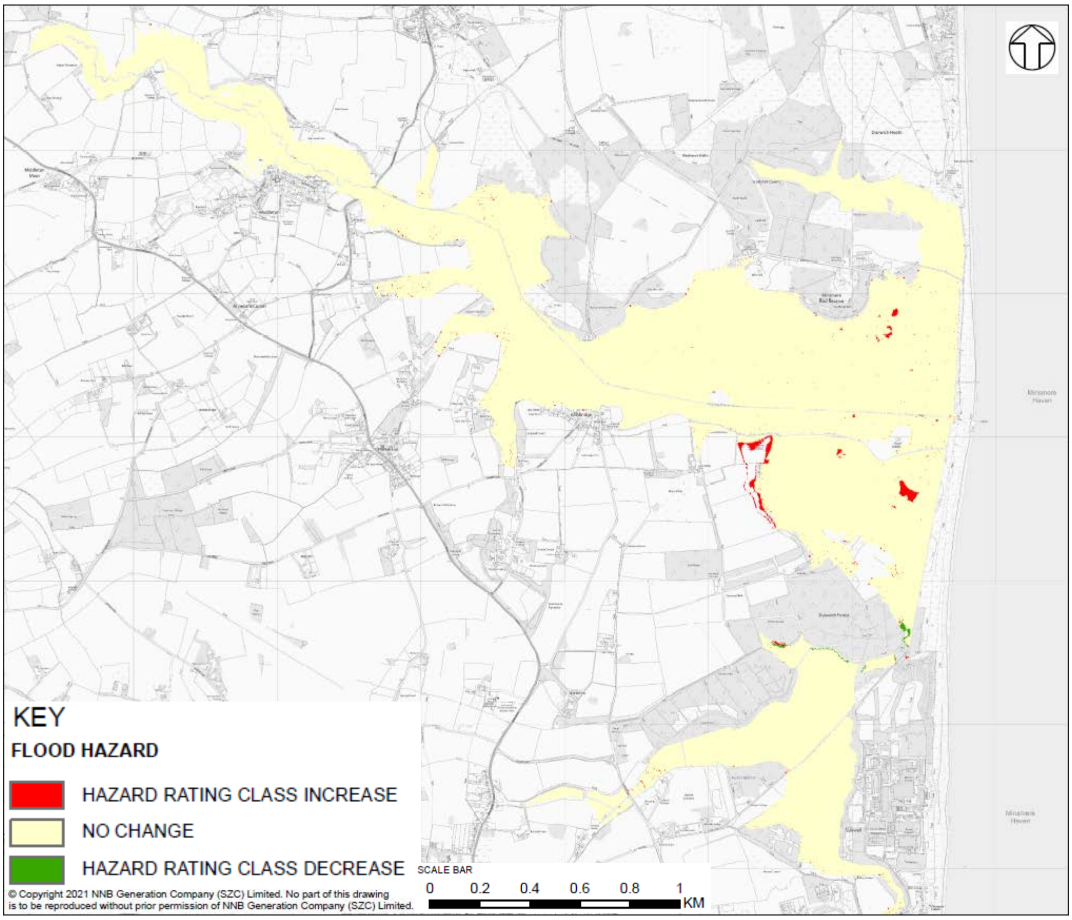
5.5.10 Similarly, the narrow strips of decrease along the north-west corner of the platform and at the edge of the SSSI crossing are caused by grid cell size and alignment of the development features and do not affect the overall model results.

Plate 5.9: Difference in maximum flood velocity for the 100-year return period with 35% climate change allowance



5.5.11 **Plate 5.9** shows that change in velocity is very local, mostly within the proposed flood mitigation area (up to 0.15m/s) and a small area along the Leiston drain, up to +/-0.01m/s. Overall difference in flood velocity is considered not to be significant.

Plate 5.10: Difference in flood hazard rating for the 100-year return period with 35% climate change allowance



5.5.12 **Plate 5.10** shows that difference in flood hazard rating is very localised, mostly within the proposed flood mitigation area and few small areas within Minsmere Levels, where the hazard rating increased due to small increase in flood depth. However, there are no properties located within the areas of increased flood hazard.

5.5.13 An additional set of figures illustrating the difference in flood depth, velocity and hazard between the 'with scheme' and baseline scenarios for other return period events, namely 1 in 5-year, 1 in 20-year, 1 in 100-year and 1 in 1,000-year with climate change allowances of 35%, 65% and 80%, are provided in **APPENDIX B**.

5.5.14 **Table 5.4** – **Table 5.6** present a comparison of flood depth, velocity and hazard rating respectively for the 1 in 100-year return period event with 35% climate change allowance for all residential and non-residential properties at risk of flooding.

Table 5.4: Comparison of peak flood depth for the 1 in 100-year event with 35% climate change for residential and non-residential properties at flood risk

Property Type	Object ID	MCM Code	Post Code	Peak Flood Depth (m)		
				The Application – Baseline	Updated scheme	Difference
Residential	2213858	1	IP16 4UJ	0.49	0.49	0.00
	7071704	1	IP16 4SG	0.19	0.20	0.01
	7072172	1	IP16 4SG	0.59	0.59	0.00
	7072175	1	IP16 4SG	0.14	0.14	0.00
	7076694	1	IP16 4UJ	0.36	0.36	0.00
Non-Residential	28732481	999	IP16 4SG	0.42	0.42	0.00
	28732954	999	IP16 4SL	0.20	0.21	0.01

Table 5.5: Comparison of peak flood velocity for the 1 in 100-year event with 35% climate change for residential and non-residential properties at flood risk

Property Type	Object ID	MCM Code	Post Code	Peak Flood velocity (m/s)		
				The Application – Baseline	Updated scheme	Difference
Residential	2213858	1	IP16 4UJ	0.01	0.01	0.00
	7071704	1	IP16 4SG	0.00	0.00	0.00
	7072172	1	IP16 4SG	0.02	0.02	0.00
	7072175	1	IP16 4SG	0.00	0.00	0.00
	7076694	1	IP16 4UJ	0.01	0.01	0.00
Non-Residential	28732481	999	IP16 4SG	0.00	0.00	0.00
	28732933	999	IP16 4SP	0.04	0.04	0.00

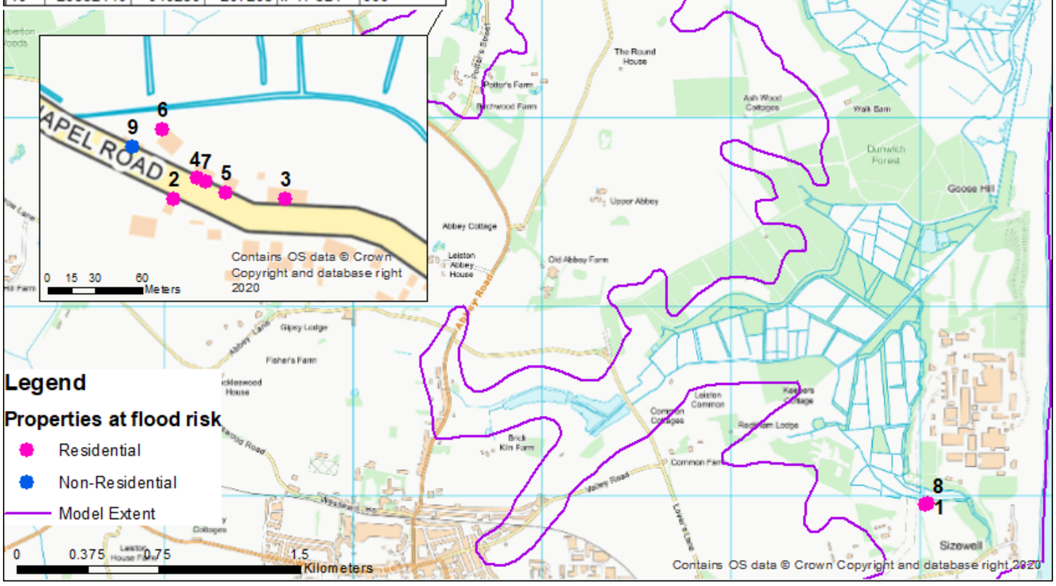
Table 5.6: Comparison of flood hazard rating for the 1 in 100-year event with 35% climate change for residential and non-residential properties at flood risk

Property Type	Object ID	MCM Code	Post Code	Flood Hazard Rating		
				The Application – Baseline	Updated scheme	Difference
Residential	2213858	1	IP16 4UJ	2	2	0
	7071704	1	IP16 4SG	1	1	0
	7072172	1	IP16 4SG	3	3	0
	7072175	1	IP16 4SG	1	1	0
	7076694	1	IP16 4UJ	2	2	0
Non-Residential	28732481	999	IP16 4SG	2	2	0
	28732933	999	IP16 4SP	1	1	0

5.5.15 Modelling results for the 1 in 100-year return period event with 35% climate change allowance show that a total of 5 residential and 2 non-residential are at risk of fluvial flooding. No additional residential or non-residential properties would be at risk of fluvial flooding as a result of the proposed development. **Plate 5.11** illustrates the location of all properties at flood risk up to 1 in 1,000-year event with 80% climate change allowance under both baseline and with scheme scenarios.

Plate 5.11: Location of all properties at fluvial flood risk

No.	Object ID	Easting	Northing	Post code	mcm code
1	2213858	647031	262964	IP16 4UJ	1
2	7071690	644861	266197	IP16 4SQ	1
3	7071691	644932	266197	IP16 4SG	1
4	7071704	644876	266210	IP16 4SG	1
5	7072129	644894	266201	IP16 4SG	1
6	7072172	644854	266241	IP16 4SG	1
7	7072175	644881	266208	IP16 4SG	1
8	7076694	647023	262961	IP16 4UJ	1
9	28732481	644835	266230	IP16 4SG	999
10	28732933	645880	265863	IP16 4SP	999
11	28732935	645897	265851	IP16 4SP	999
12	28732936	645897	265839	IP16 4SP	999
13	28732953	645196	266180	IP16 4SL	999
14	28732954	645200	266194	IP16 4SL	999
15	29832142	646234	267274	IP17 3BY	999
16	29832146	646256	267263	IP17 3BY	999



5.5.16 **Table 5.4** – **Table 5.6** show that out of 5 residential properties at risk only 1 residential property experiences an increase in peak flood depth as a result of the updated scheme design. This is by 0.01m in the 1 in 100-year return period event with 35% climate change allowance (with overall flood depth of approximately 0.5m) and with no change in flood velocity or flood hazard rating. This change relates to property no. 4 shown in **Plate 5.11**.

5.5.17 A summary table with comparison of flood depth, velocity and hazard rating for all properties at flood risk for the assessed return period event and climate change allowances is provided in **APPENDIX B**.

5.5.18 Based on the above it can be concluded that the proposed development with the updated design of the SSSI crossing and added flood mitigation area does not have a significant impact on flood risk to off-site receptors. When compared to results presented within the Application, the updated scheme design has reduced the overall impact of the development on fluvial flood risk elsewhere.

REFERENCES

1. Centre for Ecology & Hydrology. Flood Estimation Handbook. 1999

2. National Soils Research Institute (Cranfield University). Soilscapes. Available form: (http://www.landis.org.uk/soilscapes (11/11/2020)

3. Environment Agency. Blockage management guide: Report – SC110005/R2. November 2019

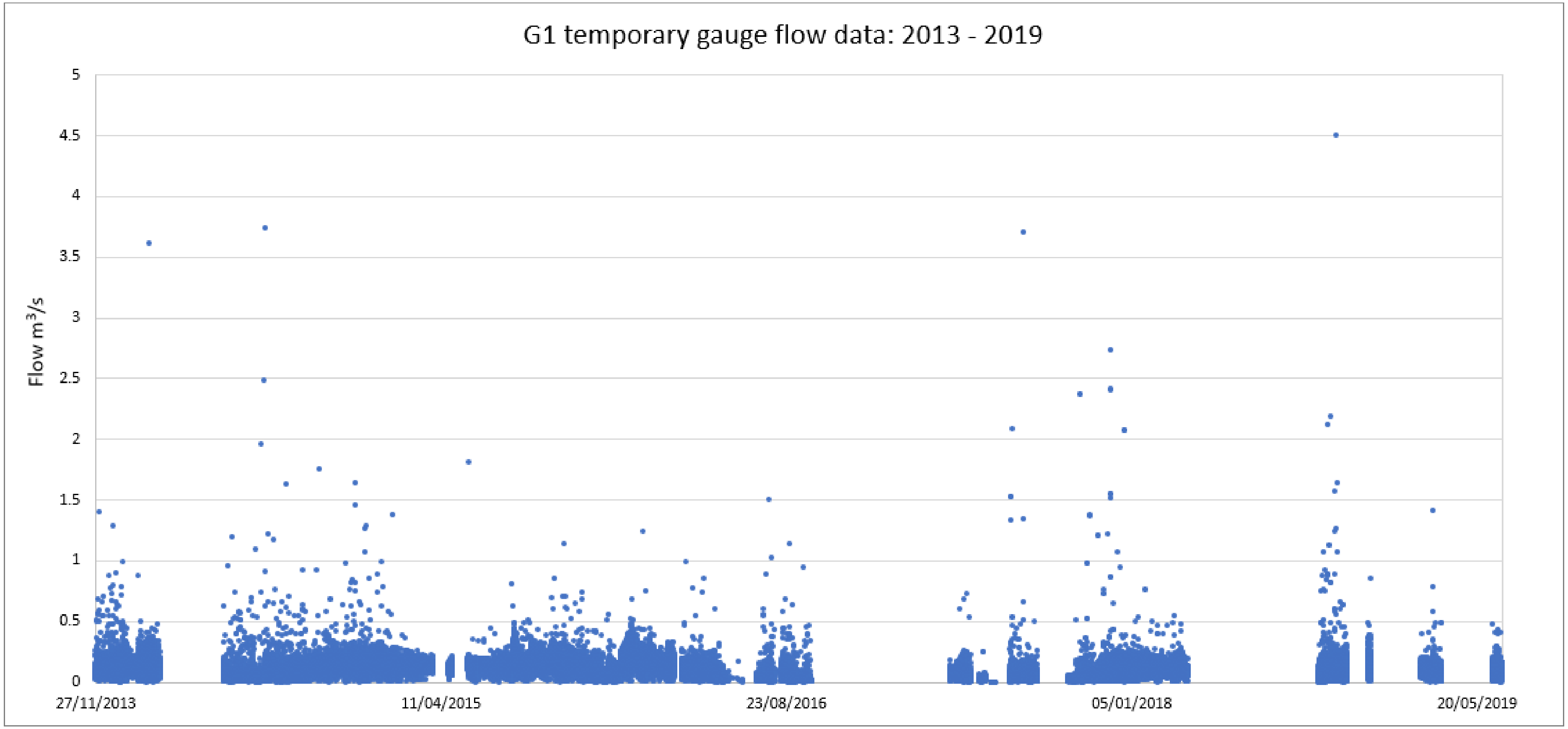


Figure 1: Flow record at G1 temporary gauge

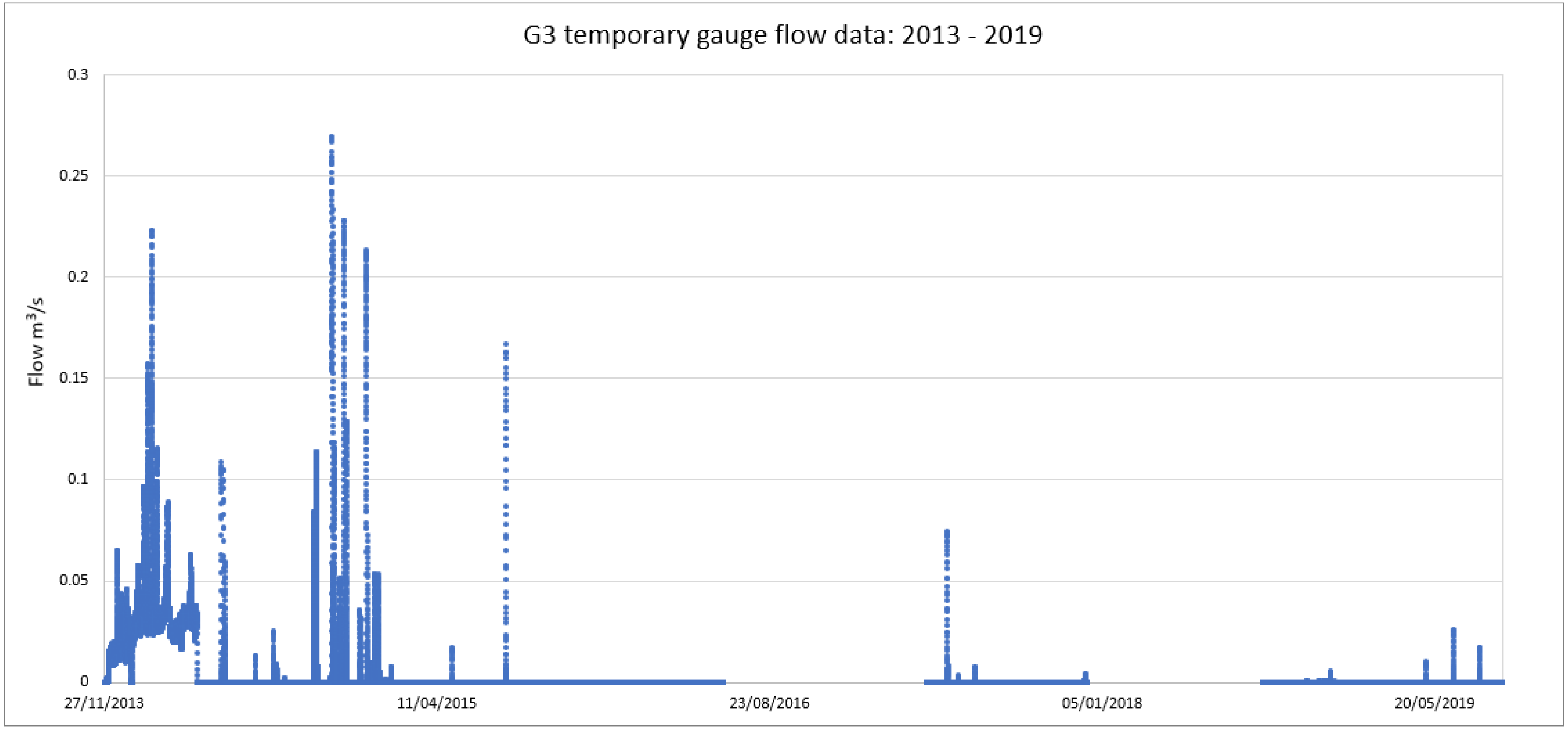


Figure 2: Flow record at G3 temporary gauge

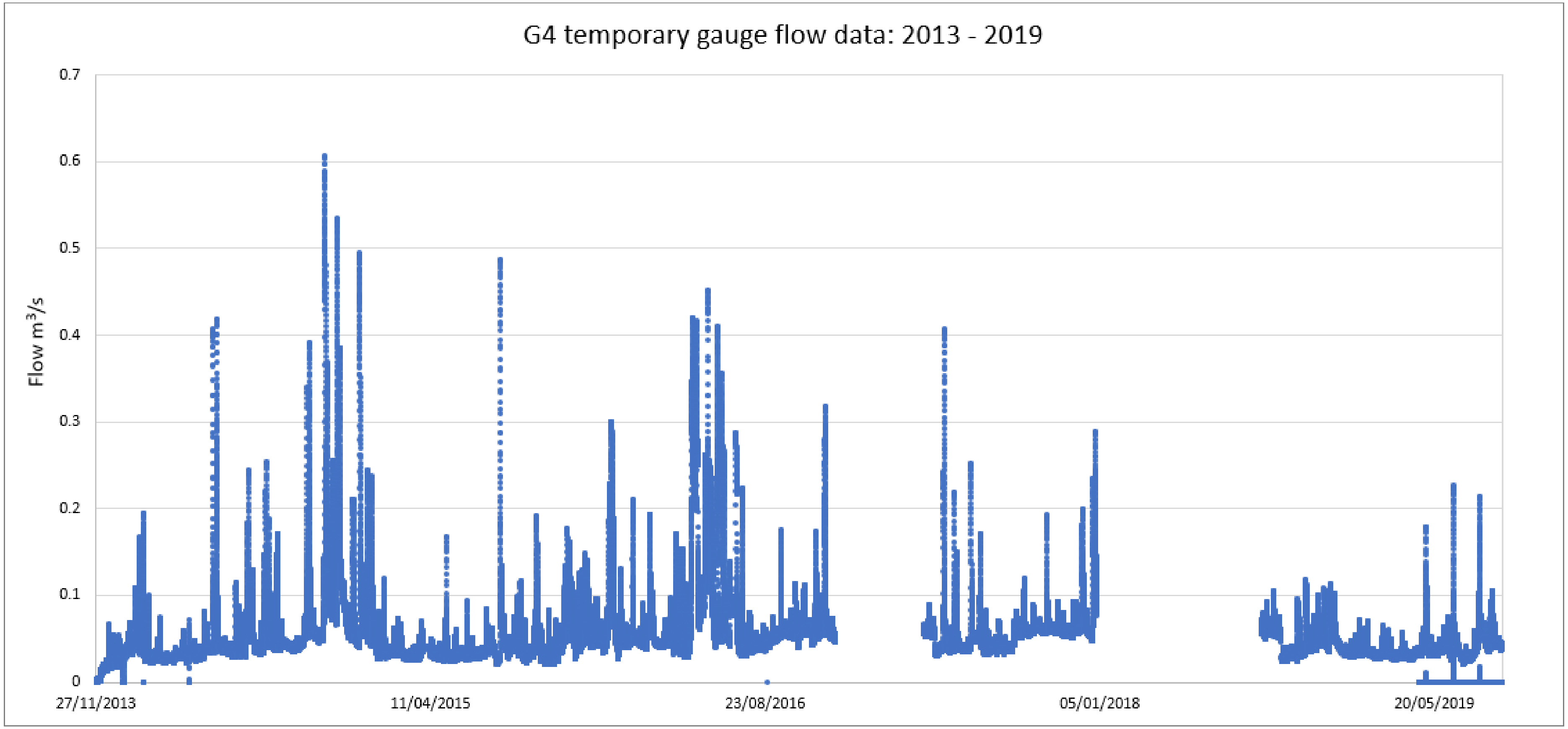


Figure 3: Flow record at G4 temporary gauge

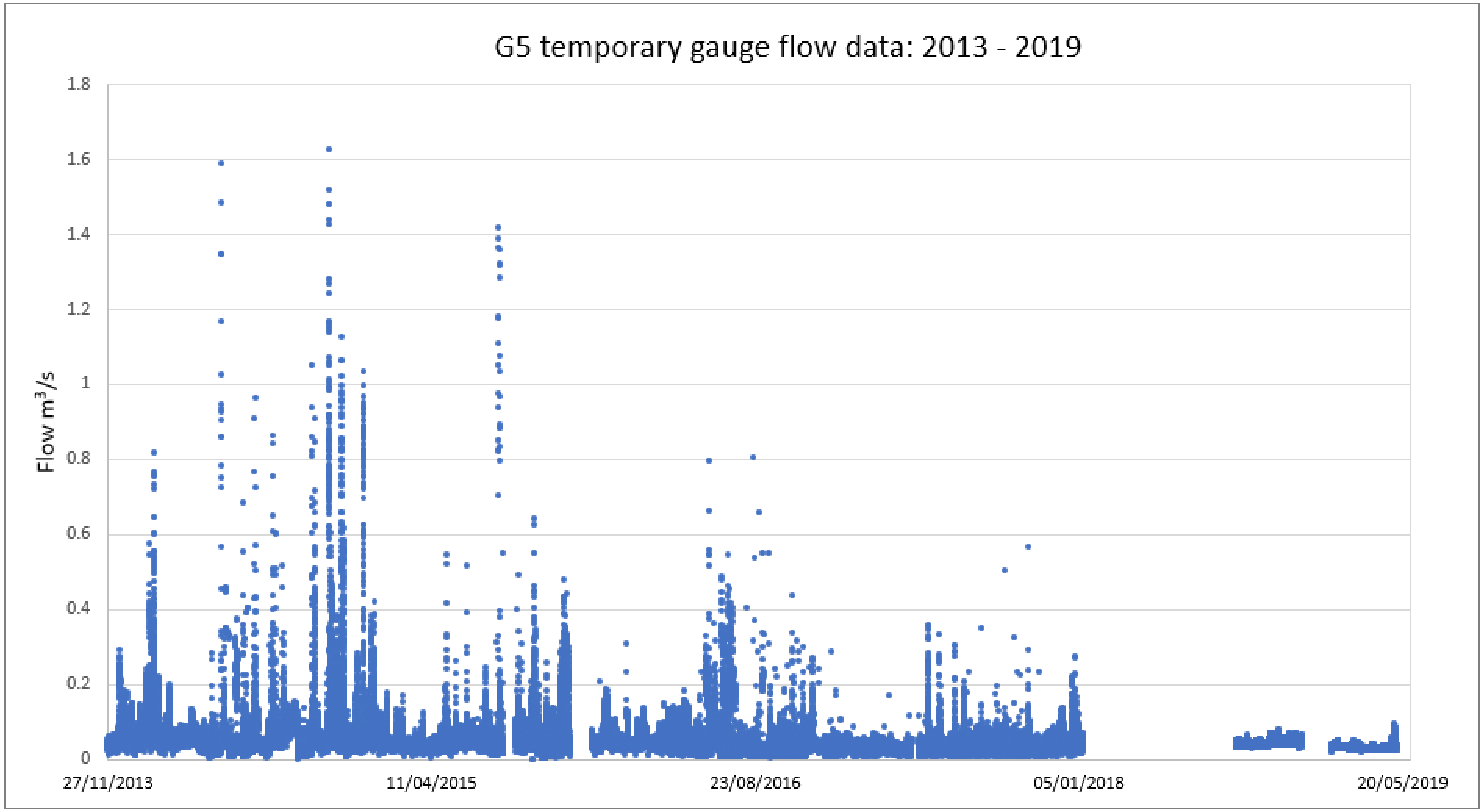


Figure 4: Flow record at G5 temporary gauge

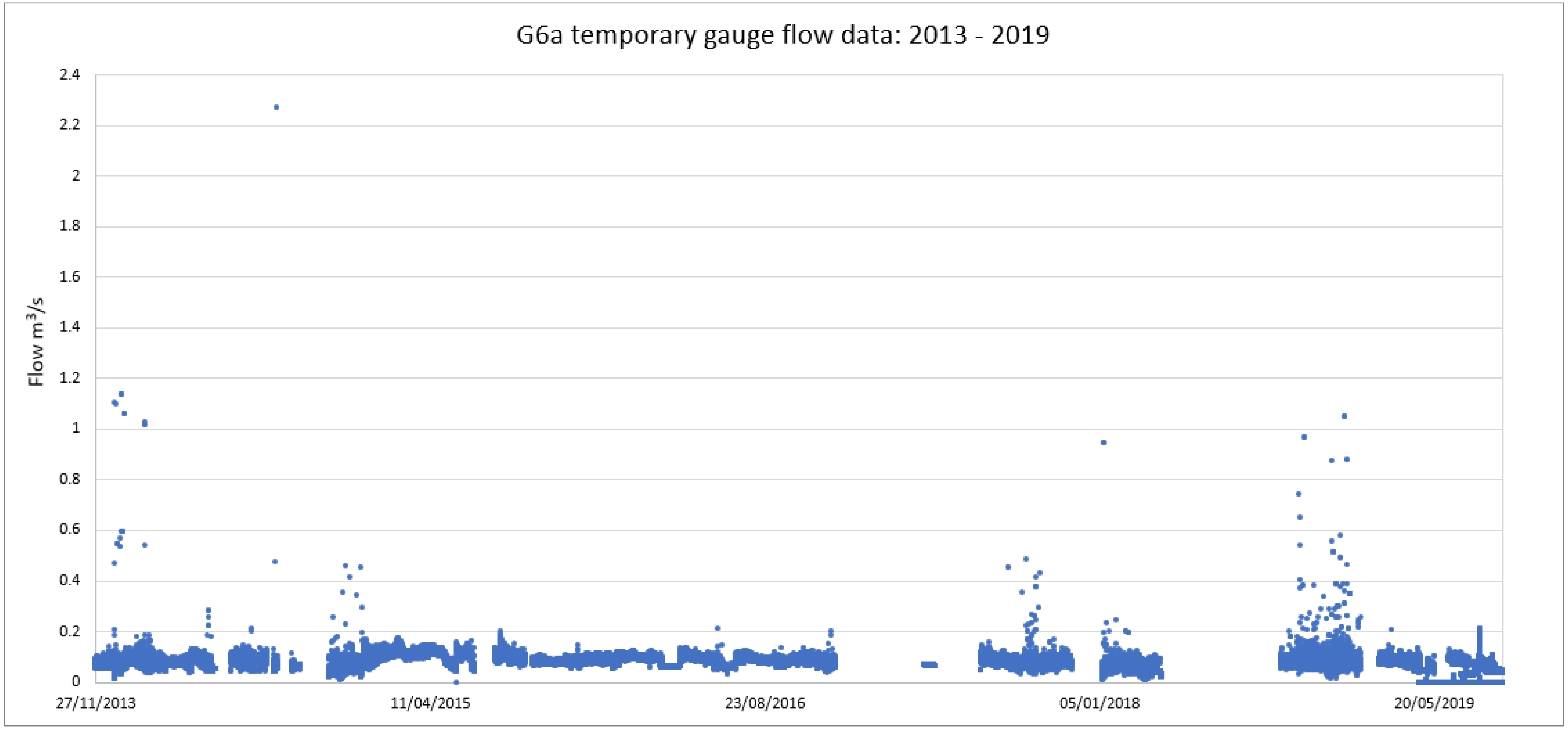


Figure 5: Flow record at G6a temporary gauge

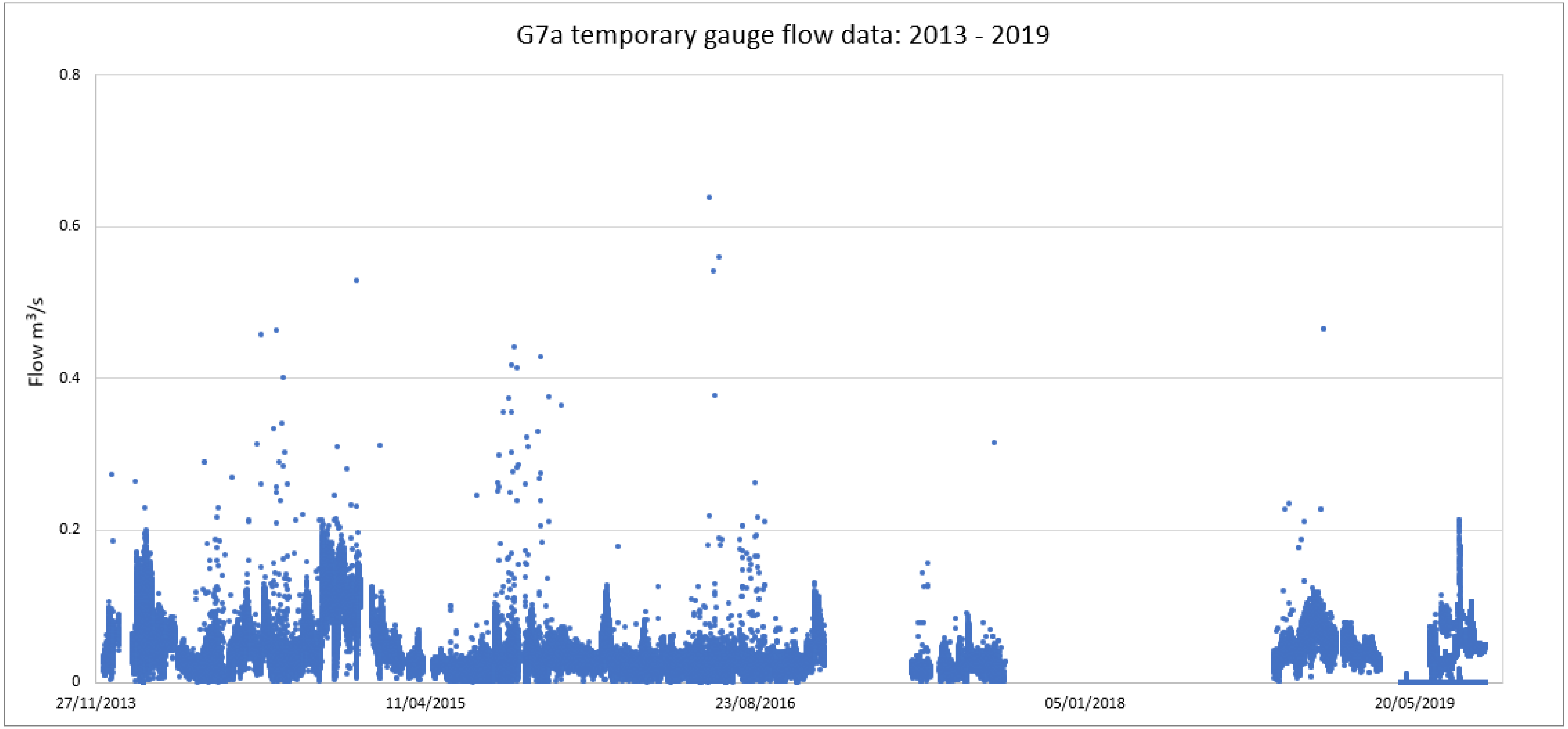
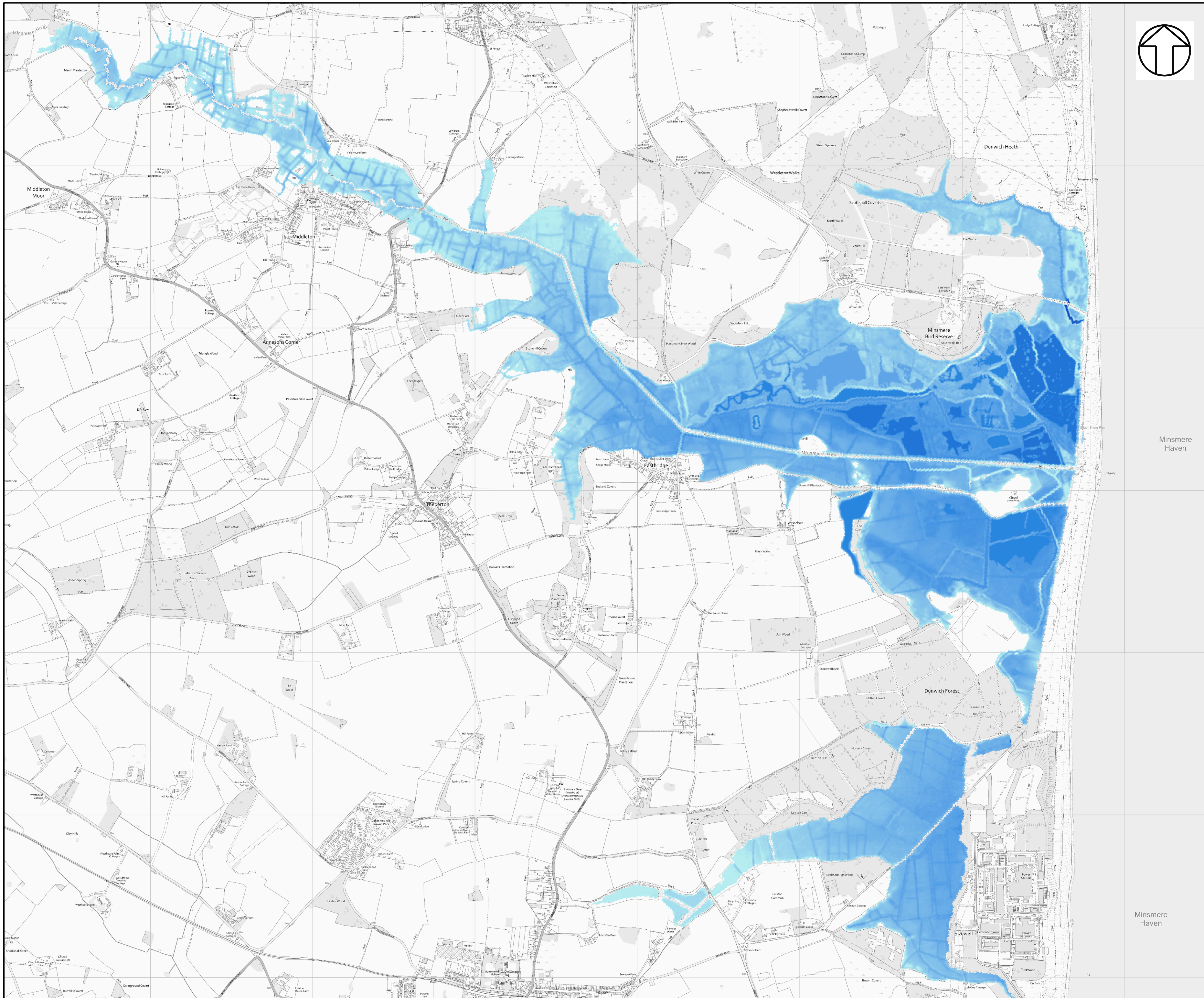


Figure 6: Flow record at G7a temporary gauge

APPENDIX A: FLUVIAL MODEL RESULTS - 'WITH SCHEME' FLOOD DEPTH, HAZARD AND VELOCITY



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NOTES

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FLUVIAL MODELLING RESULTS

DRAWING TITLE:
WITH SCHEME FLOOD DEPTH
1 IN 5-YEAR +35%CC

DRAWING NO:
FIGURE A.1

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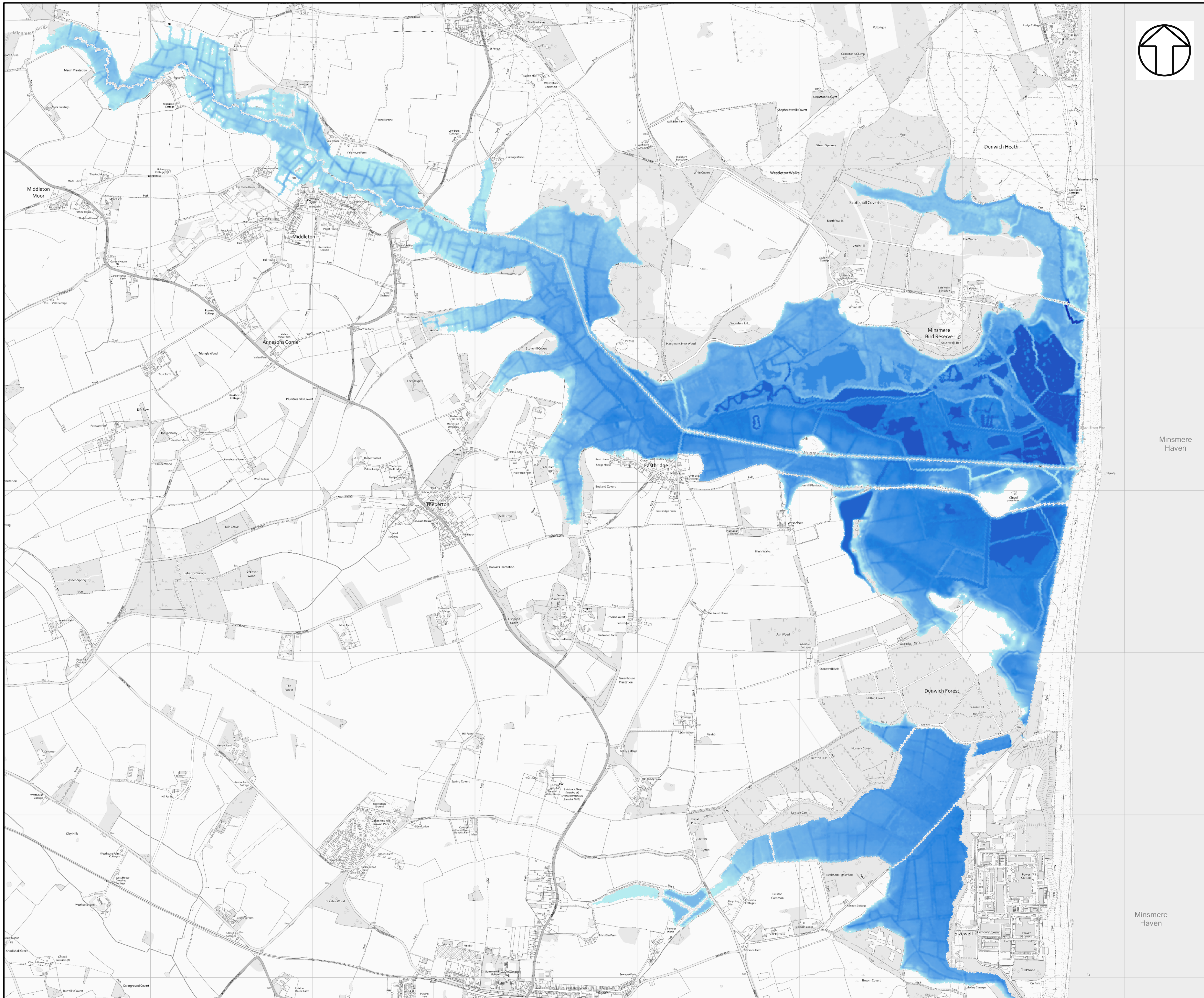

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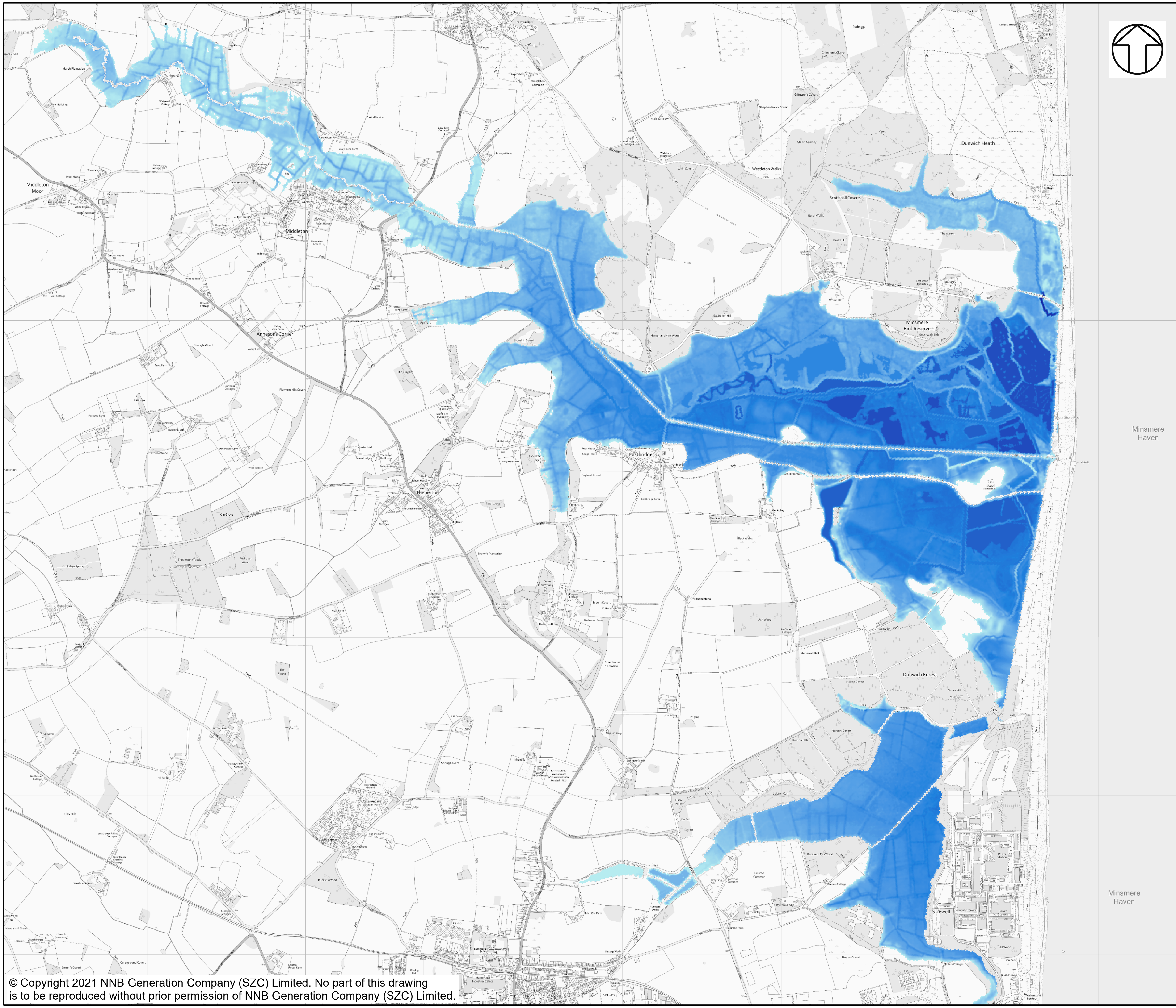

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FIGURE A.3

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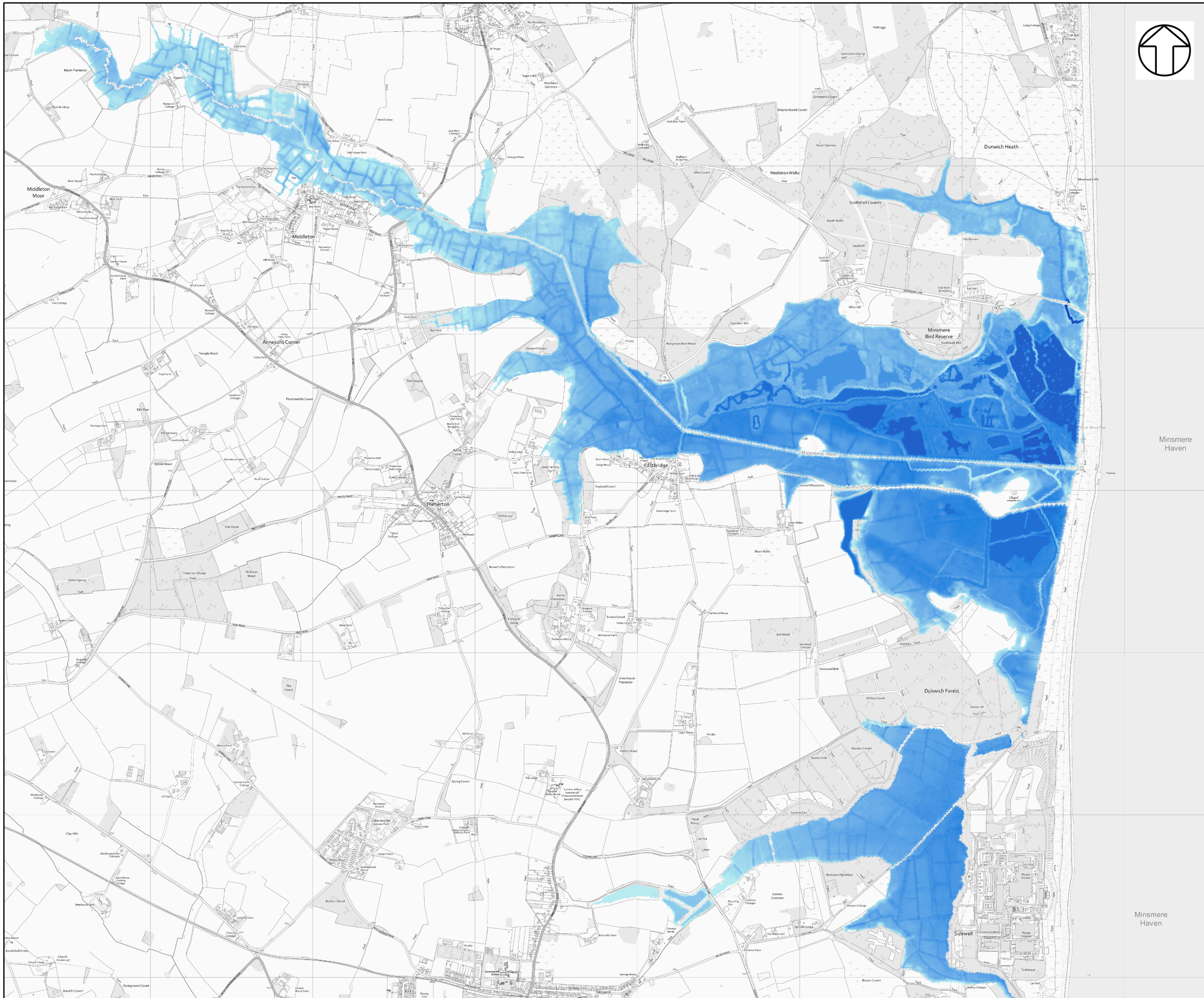

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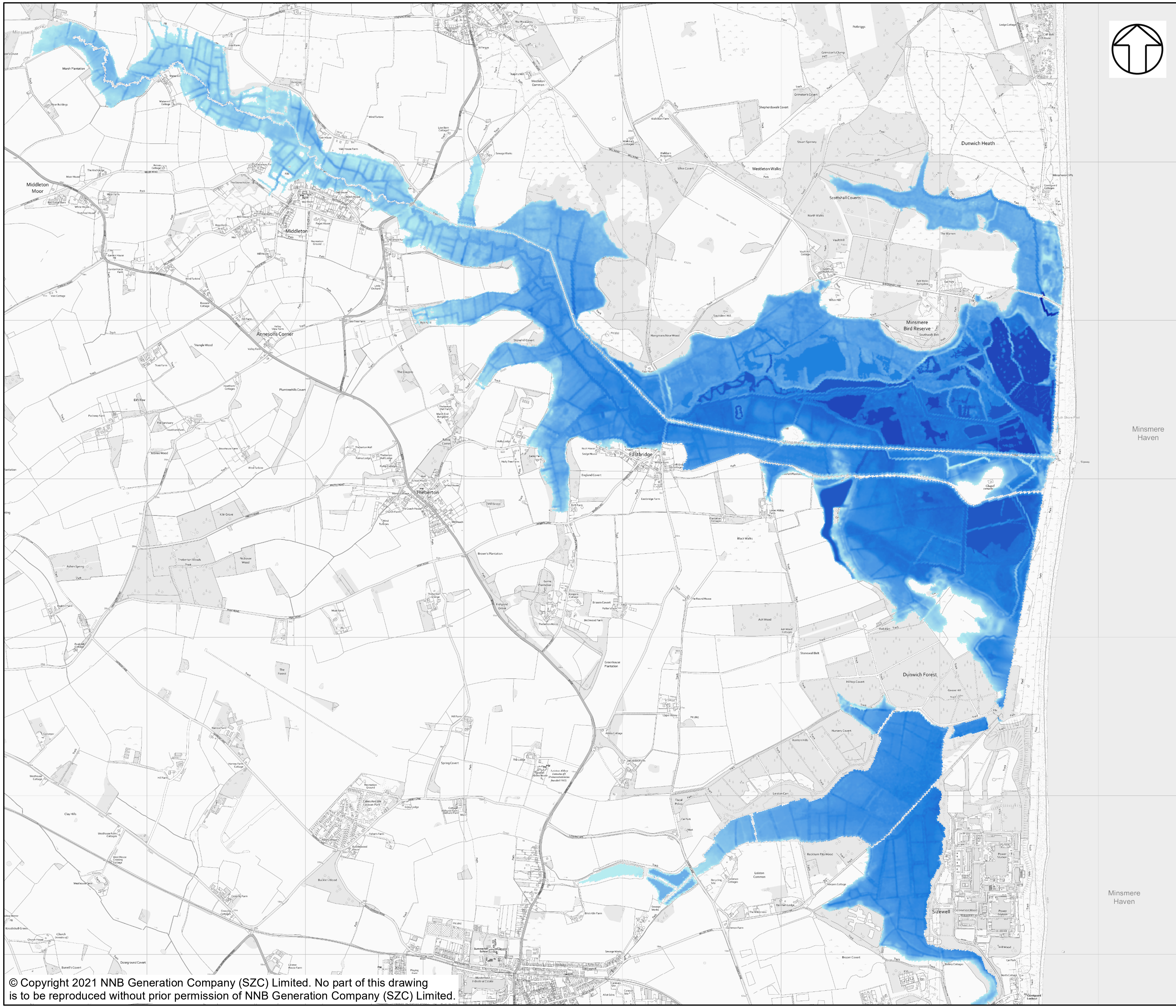

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1 IN 20-YEAR +65%CC

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FIGURE A.5

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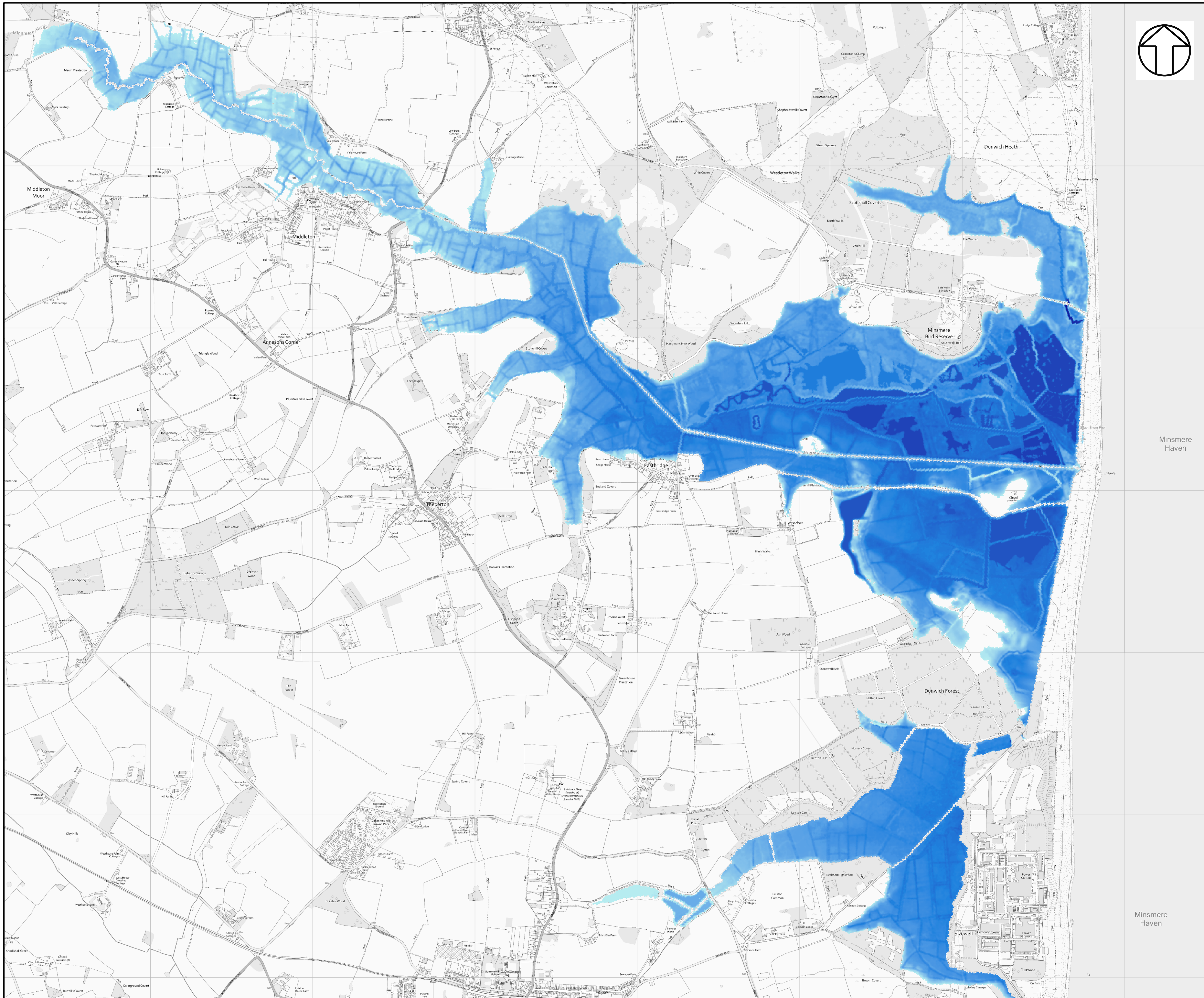

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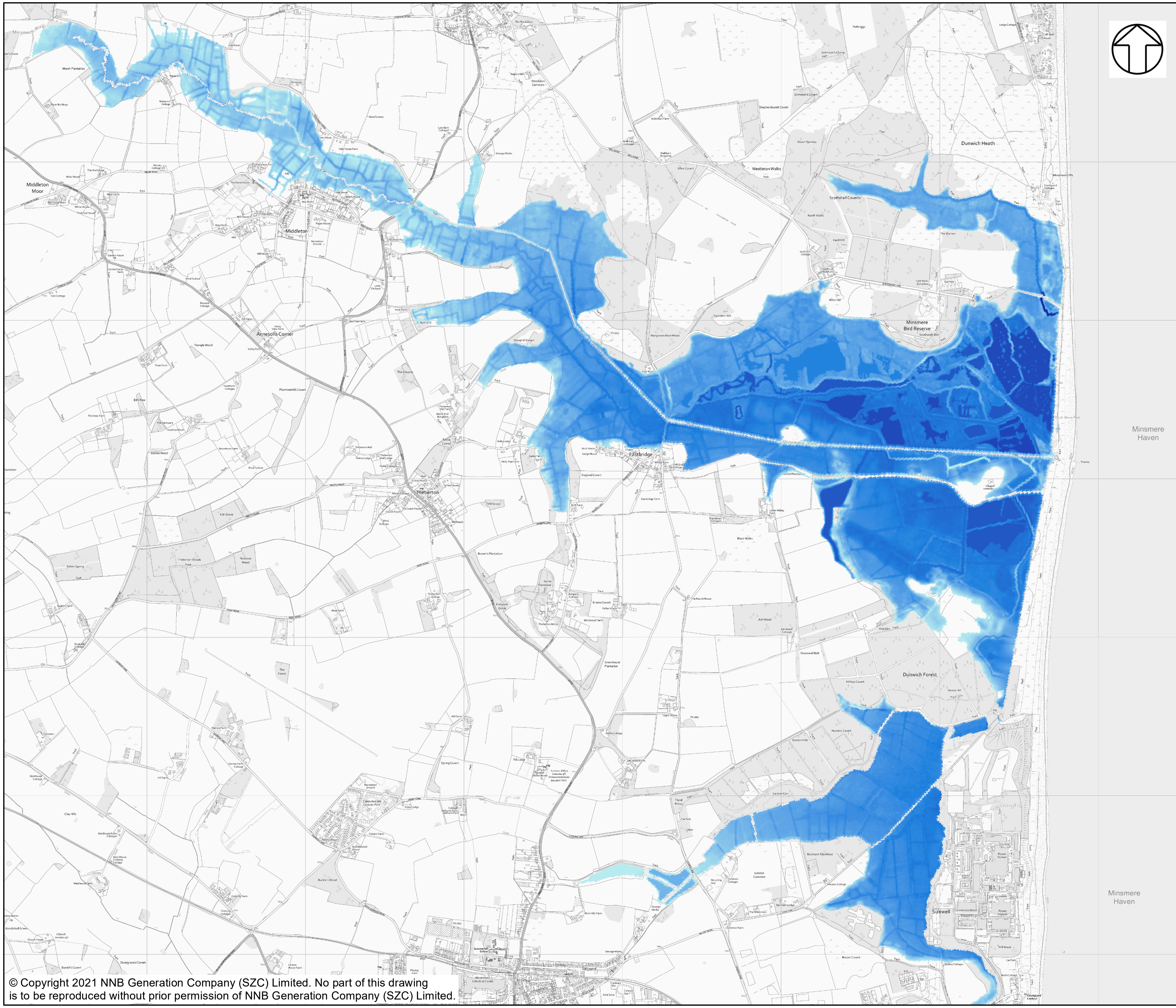
SIZEWELL C
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
WITH SCHEME FLOOD DEPTH
1 IN 20-YEAR +80%CC

DRAWING NO:
FIGURE A.6

DATE:	DRAWN:	SCALE :	REVISION:
JAN 2021	J.T.	1:22,500 @A3	2.0

SCALE BAR
0 0.2 0.4 0.6 0.8 1 KM



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NOTES

KEY

FLOOD DEPTH (M)

3.0
2.5
2.0
1.5
1.0
0.5
0.0

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DOCUMENT:
SIZEWELL C
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

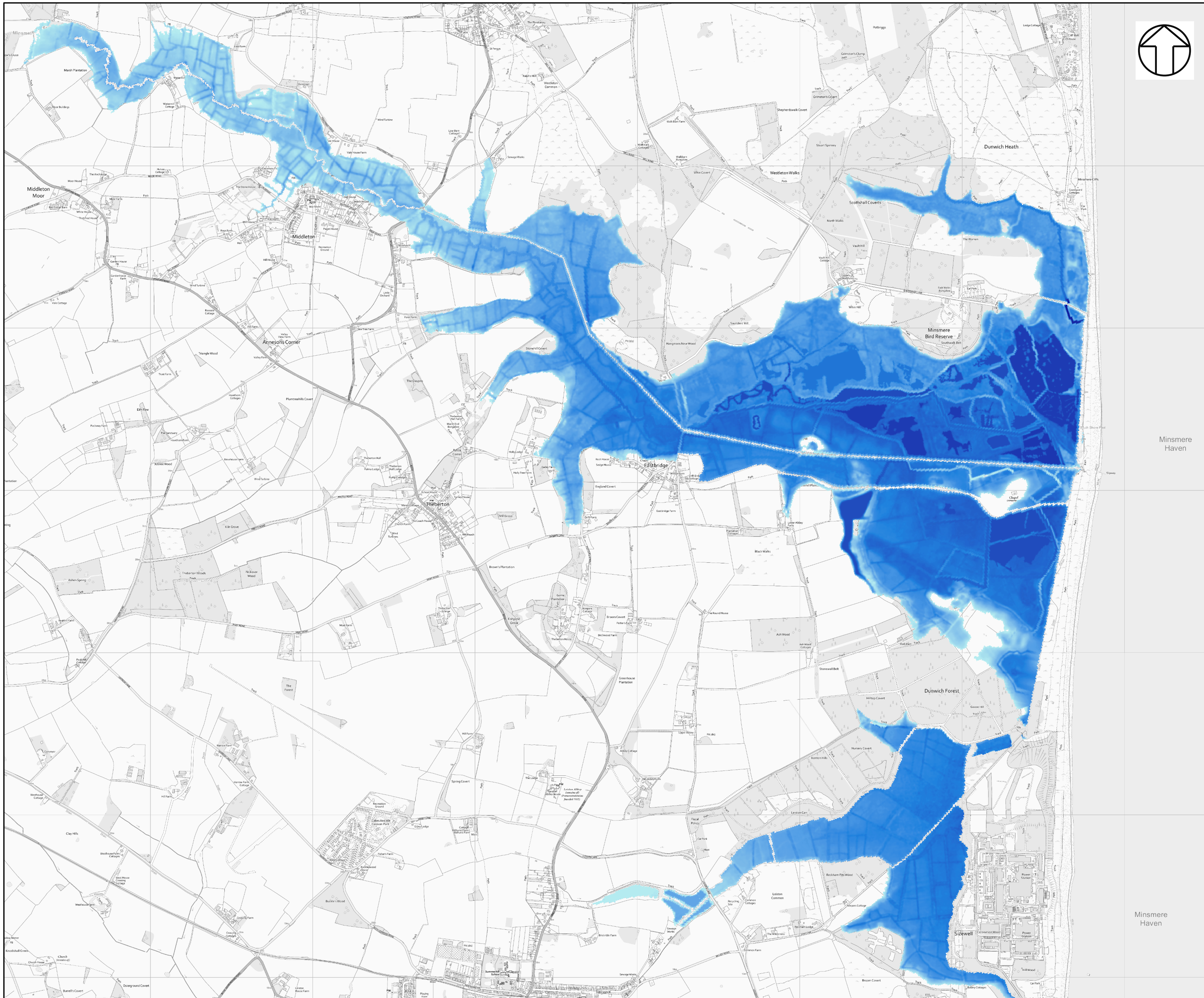
DRAWING TITLE:
WITH SCHEME FLOOD DEPTH
1 IN 100-YEAR +35%CC

DRAWING NO:
FIGURE A.7

DATE:	DRAWN:	SCALE :	REVISION:
JAN 2021	J.T.	1:22,500 @A3	2.0

SCALE BAR

0 0.2 0.4 0.6 0.8 1 KM



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NOTES

KEY

FLOOD DEPTH (M)

3.0
2.5
2.0
1.5
1.0
0.5
0.0

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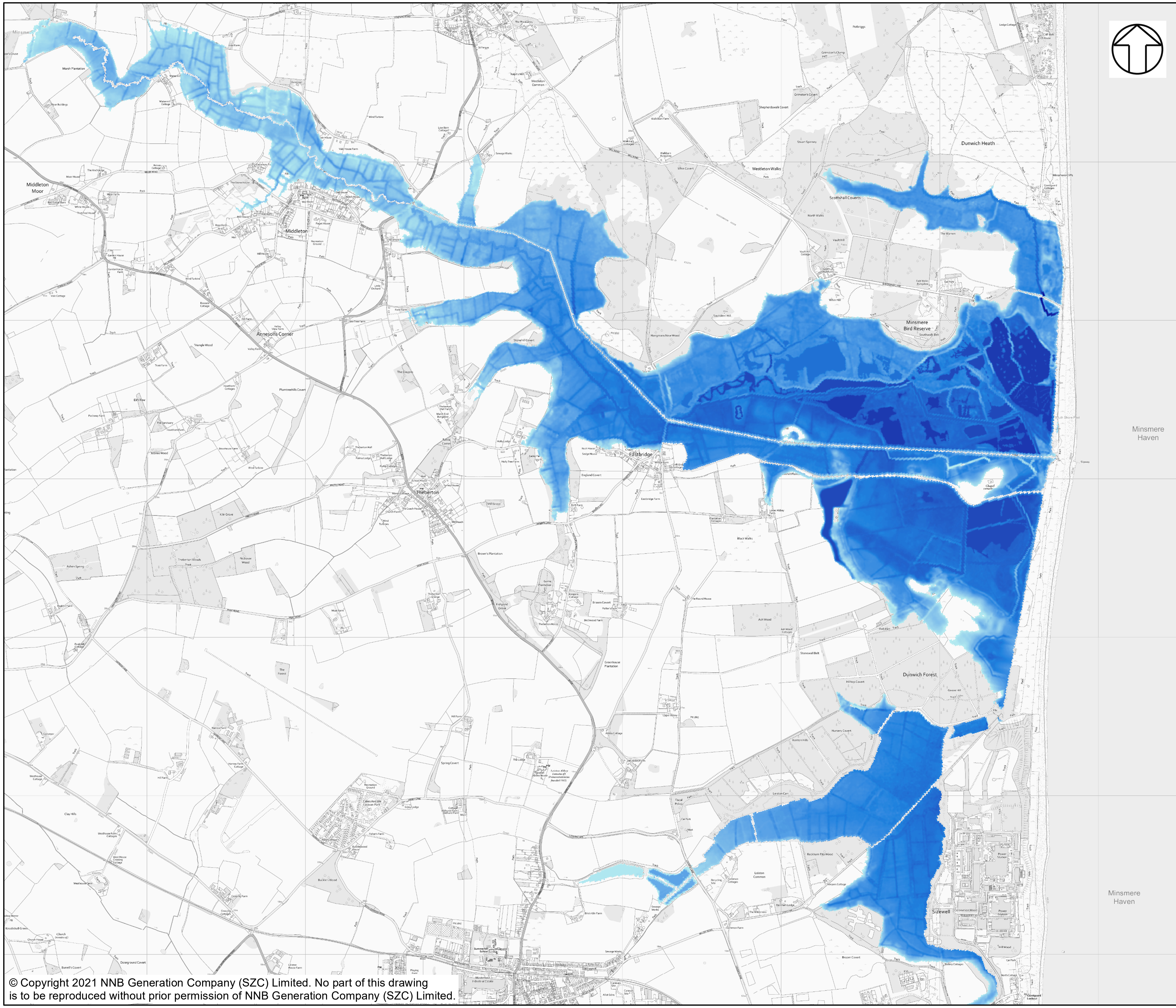
DOCUMENT:
SIZEWELL C
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
WITH SCHEME FLOOD DEPTH
1 IN 100-YEAR +65%CC

DRAWING NO:
FIGURE A.8

DATE:	DRAWN:	SCALE :	REVISION:
JAN 2021	J.T.	1:22,500 @A3	2.0

SCALE BAR
0 0.2 0.4 0.6 0.8 1 KM



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NOTES

KEY

FLOOD DEPTH (M)

3.0
2.5
2.0
1.5
1.0
0.5
0.0

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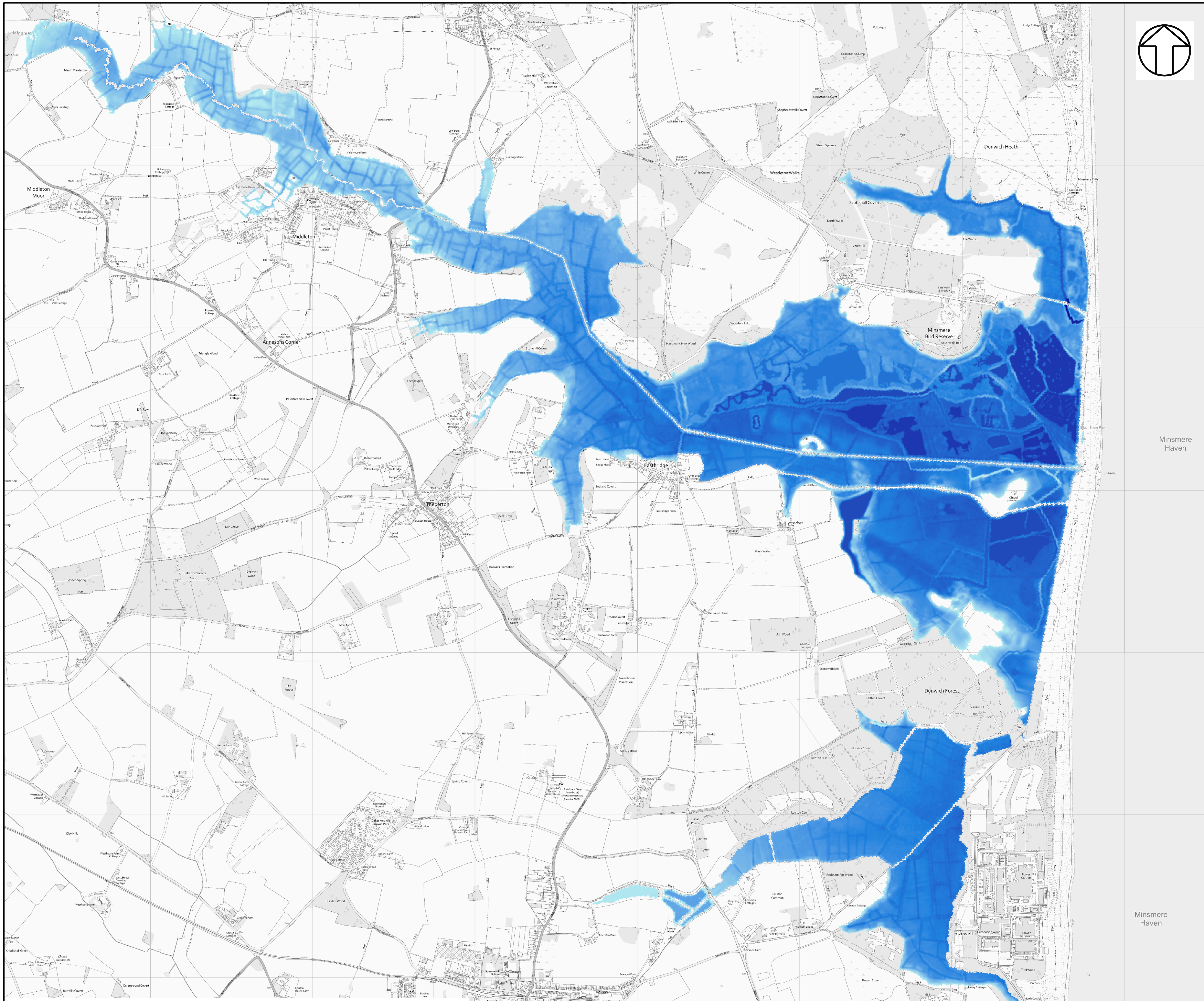
DOCUMENT:
SIZEWELL C
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
WITH SCHEME FLOOD DEPTH
1 IN 100-YEAR +80%CC

DRAWING NO:
FIGURE A.9

DATE:	DRAWN:	SCALE :	REVISION:
JAN 2021	J.T.	1:22,500 @A3	2.0

SCALE BAR
0 0.2 0.4 0.6 0.8 1 KM



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NOTES

KEY

FLOOD DEPTH (M)

3.0
2.5
2.0
1.5
1.0
0.5
0.0

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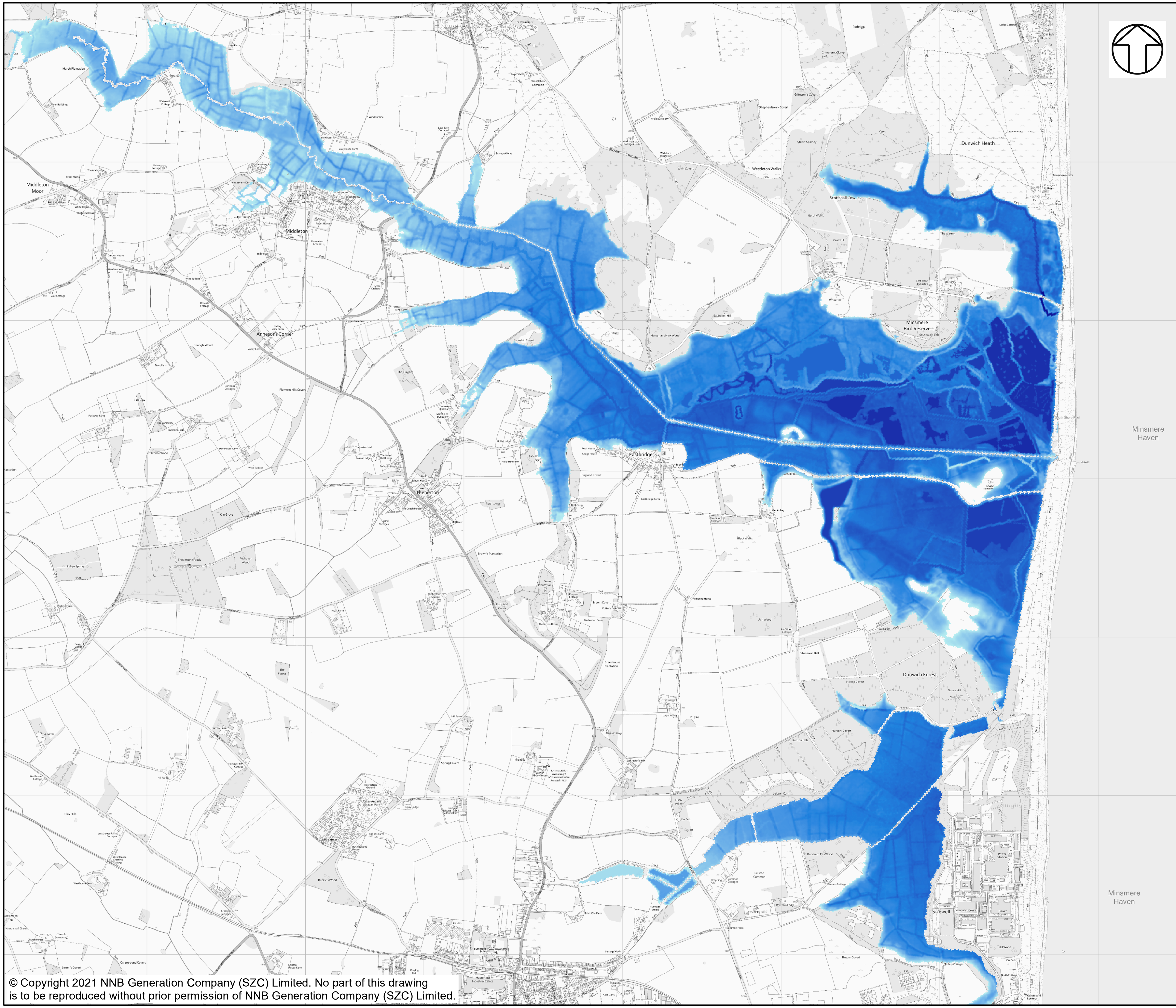
DOCUMENT:
SIZEWELL C
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
WITH SCHEME FLOOD DEPTH
1 IN 1000-YEAR +35%CC

DRAWING NO:
FIGURE A.10

DATE:	DRAWN:	SCALE :	REVISION:
JAN 2021	J.T.	1:22,500 @A3	2.0

SCALE BAR
0 0.2 0.4 0.6 0.8 1 KM



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NOTES

KEY

FLOOD DEPTH (M)

3.0
2.5
2.0
1.5
1.0
0.5
0.0

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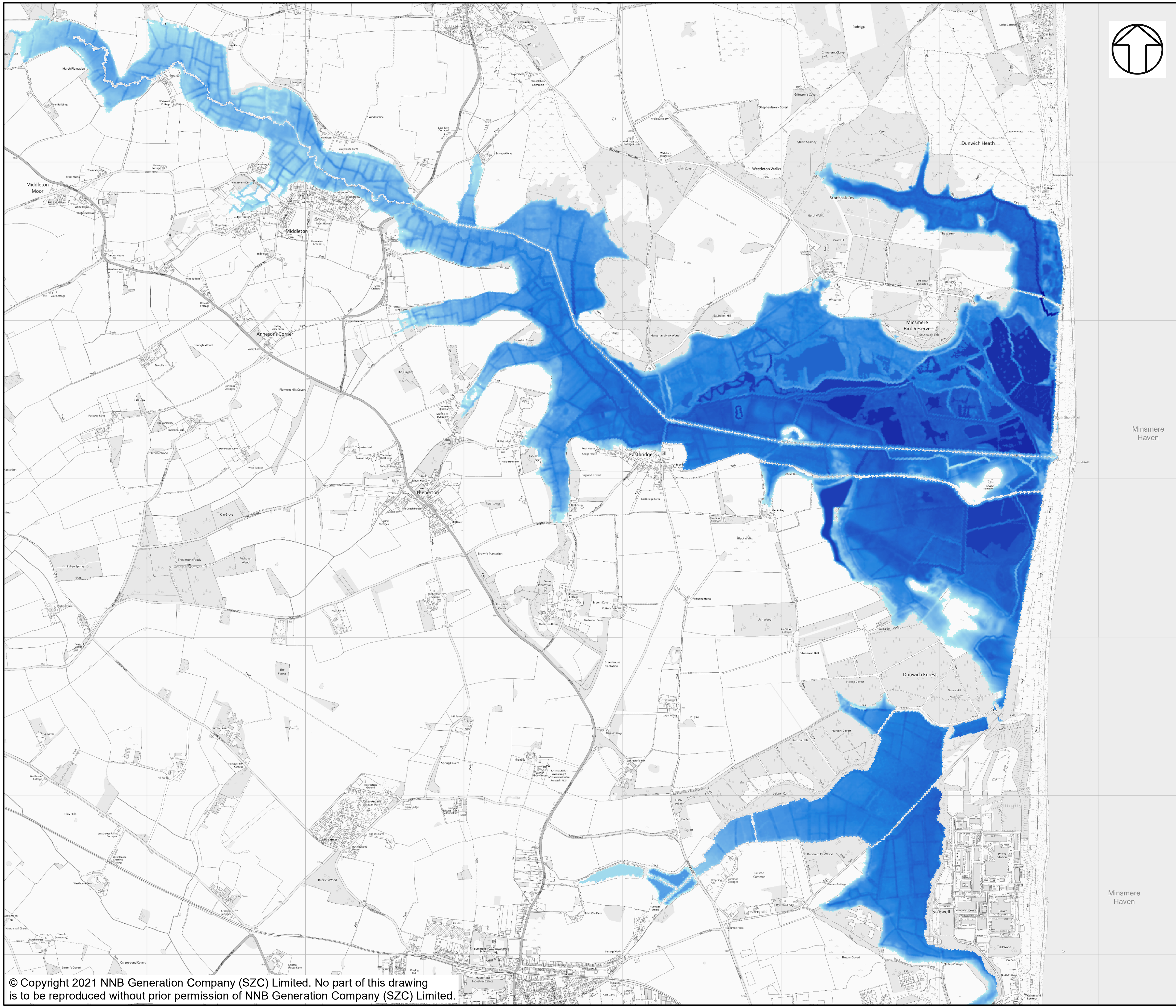
DOCUMENT:
SIZEWELL C
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
WITH SCHEME FLOOD DEPTH
1 IN 1000-YEAR +65%CC

DRAWING NO:
FIGURE A.11

DATE:	DRAWN:	SCALE :	REVISION:
JAN 2021	J.T.	1:22,500 @A3	2.0

SCALE BAR
0 0.2 0.4 0.6 0.8 1 KM



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NOTES

KEY

FLOOD DEPTH (M)

3.0
2.5
2.0
1.5
1.0
0.5
0.0

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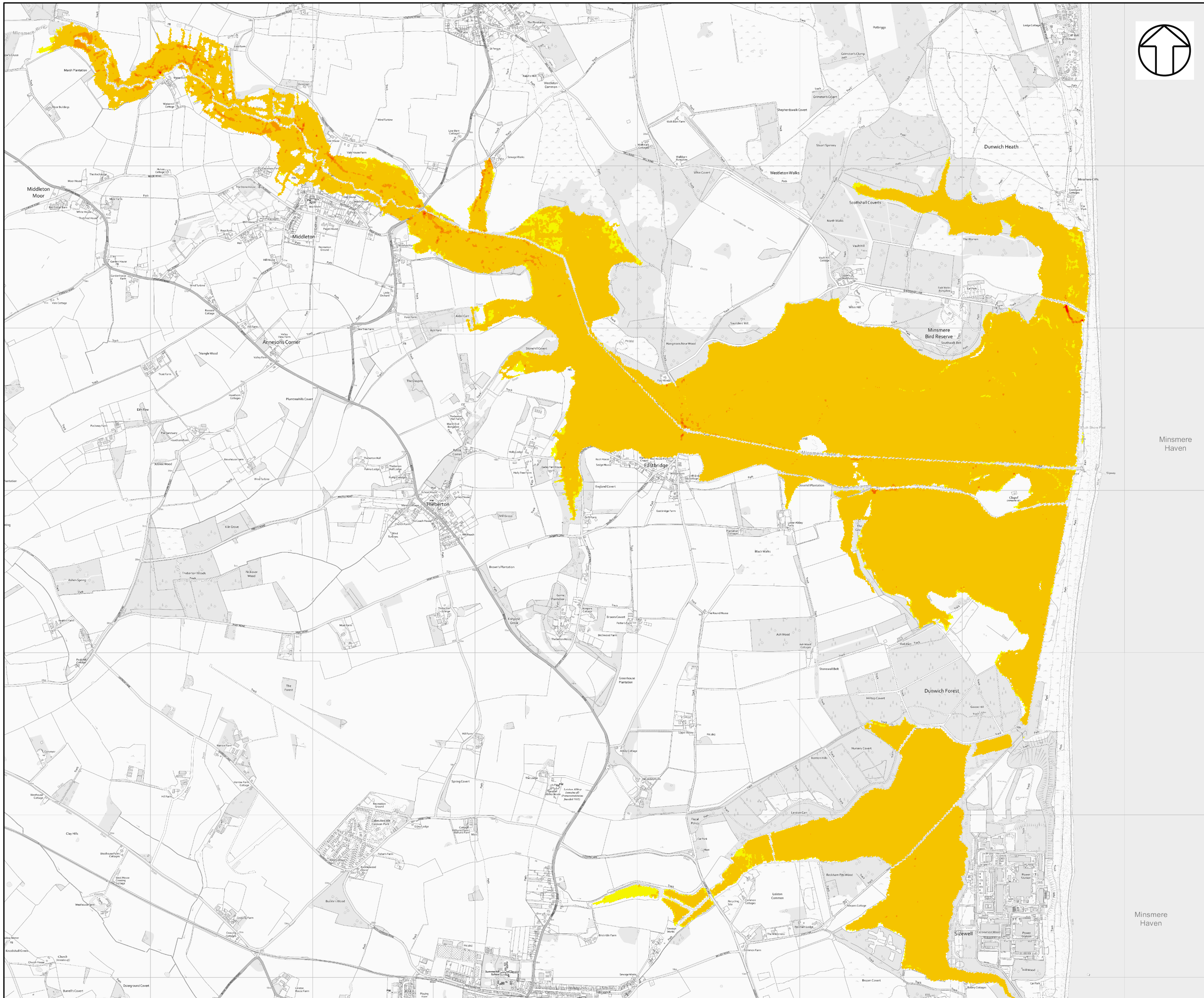
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
WITH SCHEME FLOOD DEPTH
1 IN 1000-YEAR +80%CC

DRAWING NO:
FIGURE A.12

DATE:	DRAWN:	SCALE :	REVISION:
JAN 2021	J.T.	1:22,500 @A3	2.0

SCALE BAR
0 0.2 0.4 0.6 0.8 1 KM



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NOTES

KEY

MAX VELOCITY (M/S)

- 0.00
- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 0.75
- 0.75 - 1.00
- 1.00 - 1.50

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DOCUMENT:
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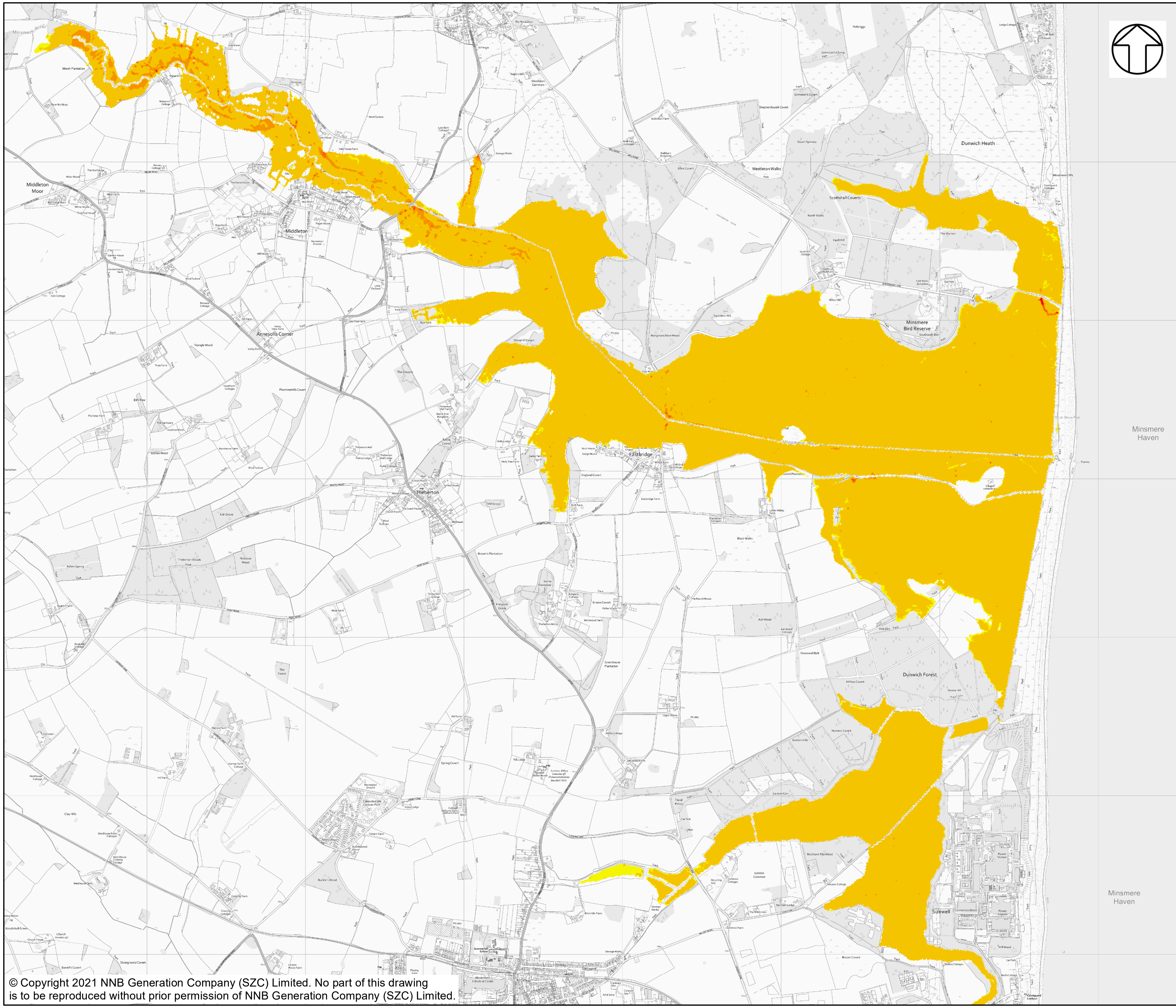
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
WITH SCHEME VELOCITY
1 IN 5-YEAR +35%CC

DRAWING NO:
FIGURE A.13

DATE:	DRAWN:	SCALE :	REVISION:
JAN 2021	J.T.	1:22,500 @A3	2.0

SCALE BAR
0 0.2 0.4 0.6 0.8 1 KM



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NOTES

KEY

MAX VELOCITY (M/S)

- 0.00
- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 0.75
- 0.75 - 1.00
- 1.00 - 1.50

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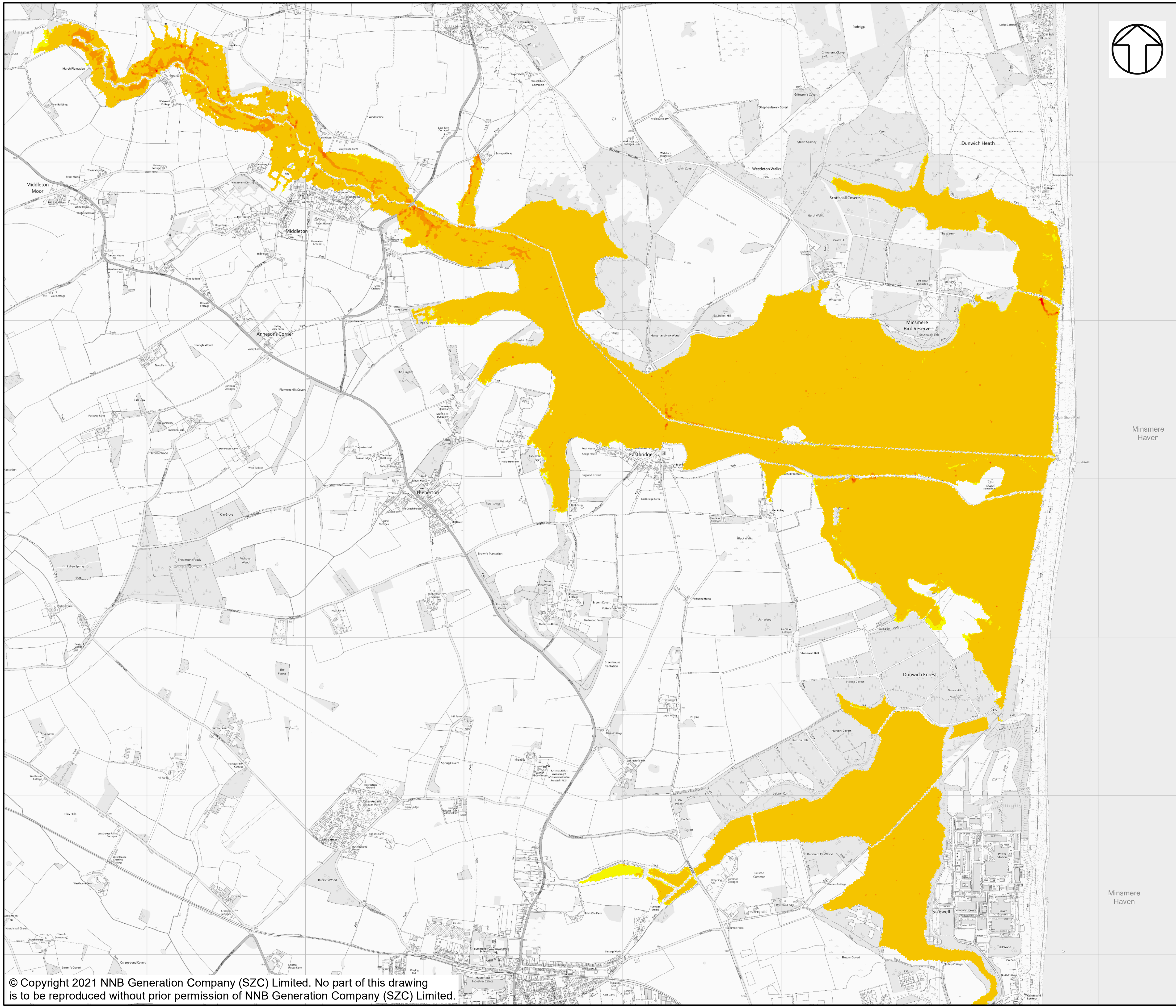
FLOOD RISK ASSESSMENT ADDENDUM
FLUVIAL MODELLING RESULTS

DRAWING TITLE:
WITH SCHEME VELOCITY
1 IN 5-YEAR +65%CC

DRAWING NO:
FIGURE A.14

DATE:	DRAWN:	SCALE :	REVISION:
JAN 2021	J.T.	1:22,500 @A3	2.0

SCALE BAR
0 0.2 0.4 0.6 0.8 1 KM



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NOTES

KEY

MAX VELOCITY (M/S)

- 0.00
- 0.00 - 0.25
- 0.25 - 0.50
- 0.50 - 0.75
- 0.75 - 1.00
- 1.00 - 1.50

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FLUVIAL MODELLING RESULTS

DRAWING TITLE:
WITH SCHEME VELOCITY
1 IN 5-YEAR +80%CC

DRAWING NO:
FIGURE A.15

DATE:	DRAWN:	SCALE :	REVISION:
JAN 2021	J.T.	1:22,500 @A3	2.0

SCALE BAR
0 0.2 0.4 0.6 0.8 1 KM