Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009
Regulation 5(2) [a]
Document reference: TR030001/APP/14b

Able Marine Energy Park Environmental Statement

Change in Flood Risk to Properties on the North Bank

Explanatory Note EX 36.3

May 2012
Revision: 0
Able UK Ltd

APPROVAL & REVISION REGISTER

	NAME	SIGNATURE	DATE
Originator:	R Cram		25-5-12
Checked by:	D Keiller		28-5-12
Approved by:	R Cram		25-5-12

REVISION	COMMENTS	DATE
A	Issued in responses to RR's	22-6-12

CONTENTS

1 EXPLANATORY NOTE

1.1.1 The development of Able Marine Energy Park (AMEP) includes for the development of a managed realignment site on the north bank of the Humber Estuary. In effect a new flood defence will be constructed landward of existing flood defences and as a consequence of this, some properties will be closer to the new defence than they are to the existing. This matter is addressed within the Flood Risk Assessment (FRA) for the Compensation Site which is included in the ES at Annex 36.1.

1.1.2 Since the submission of the application to the Infrastructure Planning Commission, the Environment Agency has provided the applicant with copies of:

- *'Environment Agency South Holderness Study Tidal Flood Study'*, (Arup, 2011), and
- '*Strategy Development: Phase 2a Sunk Island Asset inspection - Exception Report on asset condition. Flood cells 3 and 4' (Arup 2009)* ('the Arup Study').

These provide more detailed information on the condition of the existing defences at Cheery Cobb Sands. As a result, the FRA has been reviewed and a number of issues are re-addressed below.

2 STANDARD OF PROTECTION OF THE EXISTING DEFENCES

2.1.1 At paragraph 2.2.5 of the FRA it states that, 'The current tidal defence has a SoP (Standard of Protection) of 1 in 80 years'. This was taken from EA's publication, 'Planning for Rising Tides: The Humber Flood Risk Management Strategy', (EA, 2008). However, the Arup 2011 records the following (refer to figure 1):

- SoP 2010: <0.5% annual exceedance probability (AEP)
- SoP 2060: <1-1.3% AEP
- SoP 2110: <4-10% AEP

2.1.2 Thus, whilst the current SoP provided by the defences exceeds 1:200 years, it will reduce over time to a minimum value of 1:10 years. In other words, in any year, sections of the defence have a 10% probability of being overtopped. This reduction is the result of predicted sea level rise.

2.1.3 In addition to the above, the existing condition of the defences was assessed to be Grade 5, or very poor by the Environment Agency (see Figure 1), while Arup in their Asset inspection assigned this length of defence as Grade 4 or poor (see Figure 2), although acknowledging that the Environment Agency had classified it as Grade 5. Arup comment (Arup 2009) that 'Condition Grade 5 suggests that the asset is past its serviceable life – there is no clear evidence that this is the *case although some depressions appear to exist along the crest*'.

3 EFFECT OF NEW DEVELOPMENT ON THE PROBABILITY OF BREACHING

3.1.1 The FRA addresses this matter in paragraphs 2.4.9 et seq. Whilst the existing SoP is actually 1:200 rather than 1:80, the statements remain valid since the initial SoP of the new defence would be significantly greater than 1:200 given that it will provide an SoP of 1:200 years after allowing for 100 years of sea level rise.

4 FLOOD HAZARD ASSOCIATED WITH BREACHING

4.1.1 The FRA addresses this matter in paragraphs 2.4.12 et seq. The assessment is affected slightly by the existing SoP being 1:200 rather than 1:80 and paragraphs 2.4.12 – 2.4.19 are amended as follows:

4.1.2 The other residual risk associated with breaching of the new defence at Cherry Cobb Sands is that the new defence is set back from the existing defence and so closer to nearby properties and infrastructure than the existing defences.

4.1.3 Figure 6 maps the existing Flood Hazard Zones from the mapping in the SFRA. The effect of realigning the flood defence on the Flood Hazard Zones is shown in Figure 7. The width of each Flood Hazard Zone is unchanged as the tidal water level and ground level are the same for the existing and realigned defences. The Flood Hazard Zones have been moved to reflect the changed alignment of the defences. Table 1 indicates the number of properties in each zone with the existing defence and with the realigned. The changed alignment of the flood defence moves 11 properties from the 'Danger to Most' category to the 'Danger to All' category because of proximity to the realigned defence.

Table 1: Numbers of properties in flood hazard zones

Hazard Zone	Existing	Realigned defence
Danger to All	2	13
Danger to Most	11	3
Danger to Some	6	3
Total	19	19

4.2 RESIDUAL RISK TO PEOPLE

4.2.1 The Intermediate method of assessment outlined in FD 2320 provides a method that includes consideration of the probability of inundation within the assessment. Inundation may occur due to overtopping or due to breaching or by a combination of both. For soft defences such as those at Cherry Cobb Sands, a breach will tend to be initiated by relatively low levels of overtopping so that the probability of failure effectively reduces to the probability of overtopping. The Intermediate method identifies how Flood Hazard Zones and probability of inundation can be combined to assess the residual risk to people. The guidance table is reproduced as Table 2 below.

Table 2: Flood risk to people behind defences (Table 12.3 from FD2320)

Danger to People	Annual probability of Inundation			
	Column 1	**Column 2**	**Column 3**	**Column 4**
	Prob ≥ 1%	**1%> prob ≥ 0.5%**	**0.5% >prob ≥ 0.1%**	**Prob ≤0.1%**
Danger to All	High	High	High	Medium
Danger to Most	High	Medium	Medium	Low
Danger to Some	Medium	Medium	Low	Low
Application to this study	Existing defences in +100 years (possibly)	Proposed defence in +100 years Existing defences in +100 years (possibly)	Existing defences	Proposed defence on completion

4.2.2 The existing defence has an annual probability of overtopping that is <0.5 percent (SoP of greater than 1 in 200 years) and so the residual risk to people from overtopping is based on the third column of Table 2. All those living in the area covered by the 'Danger to All' zone are considered to be at High residual risk, while those in the 'Danger to Most' and 'Danger to Some' zones are considered at Medium and Low residual risk respectively. For the existing defence alignment, the first column of Table 3 indicates two properties are in the High Flood Risk to People, 11 properties are in the Medium Flood Risk to People category and six in the Low Flood Risk to People category.

4.2.3 The improved SoP of the proposed defence will reduce the annual probability of failure so that it is very likely to be <0.1 percent (SoP > 1 in 1000 year return period) when first constructed. With rising sea levels, the annual probability of failure will gradually increase, reaching 0.5 percent (1 in 200 year return period) after 100 years, assuming sea levels rise as anticipated in The Technical Guidance to the National Planning Policy Framework, and there is continued maintenance of the realigned defence in accordance with Environment Agency requirements.

4.2.4 The risk assessment with the existing and realigned defence is reported in the second column of Table 3. This identifies that there will be 13 properties at Medium Flood Risk to People and six in the Low Flood Risk to People category immediately after completion, declining after 100 years so that 13 are in the High Risk to People and six in the Medium Risk to People categories.

4.2.5 This risk assessment implicitly assumes that the existing defences adjacent to the realignment would also be raised to the standard of the new defences which cannot be guaranteed; current EA policy does not tend towards high standards of flood protection for sparsely populated areas such as Sunk Island.

4.2.6 The risk assessment in Table 3 shows that initially, risk slightly reduces as a result of the proposed realignment. After 100 years, the effect of the realigned flood defence on the risk to people is likely to increase due to projected sea level rise. Such an effect may happen in any event depending on the level of infrastructure investment and whether and by how much, the existing flood defence is raised in the future.

4.2.7 We conclude that the change in risk to people of the introduction of the managed realignment is likely to be marginal and depend primarily on future investment in the existing flood defences which are currently considered to be in poor or very poor condition. The introduction of the managed realignment will improve the local standard of protection and raise the condition grade of this length of defence, both of which will reduce the risk to people living in nearby properties despite the defence being closer to some adjacent properties.

Table 3: Number of properties in each Flood Risk to People category

Flood risk to People	**Existing Defences** (declining over 100 years to >1%)		**Realigned defence** (Assuming adjacent defences improved to match realigned defence)	
	2012	**+100 years**	**On completion**	**+100 years**
High	2	13	0	13
Medium	11	6	13	3
Low	6	N/A	6	3

5 FIGURES

5.1.1 Figures 1, 2, 6 and 7 are presented on the following pages:

Figure 1: Abstract from 'Environment Agency South Holderness Study Tidal Flood Study', (Arup, 2011)

Figure 2: Abstract from Strategy Development: Phase 2a Sunk Island Asset inspection - Exception Report on asset condition. Flood cells 3 and 4' (Arup 2009)

Figure 6: Current flood zone mapping at Cherry Cobb Sands from ERYC SFRA

Figure 7: Flood zone mapping at Cherry Cobb Sands with realigned defence

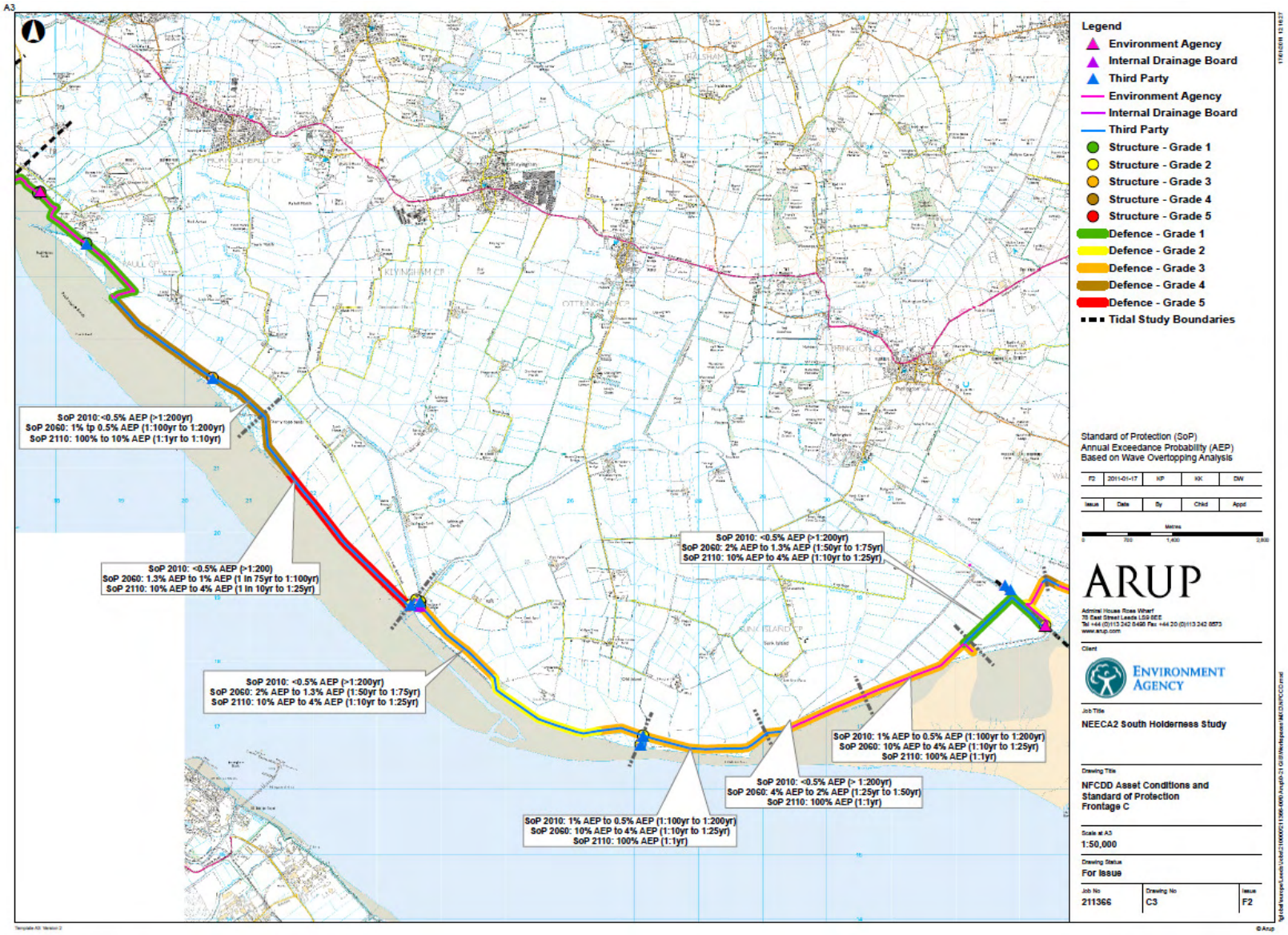

Figure 1: Abstract from 'Environment Agency South Holderness Study Tidal Flood Study', (Arup, 2011)

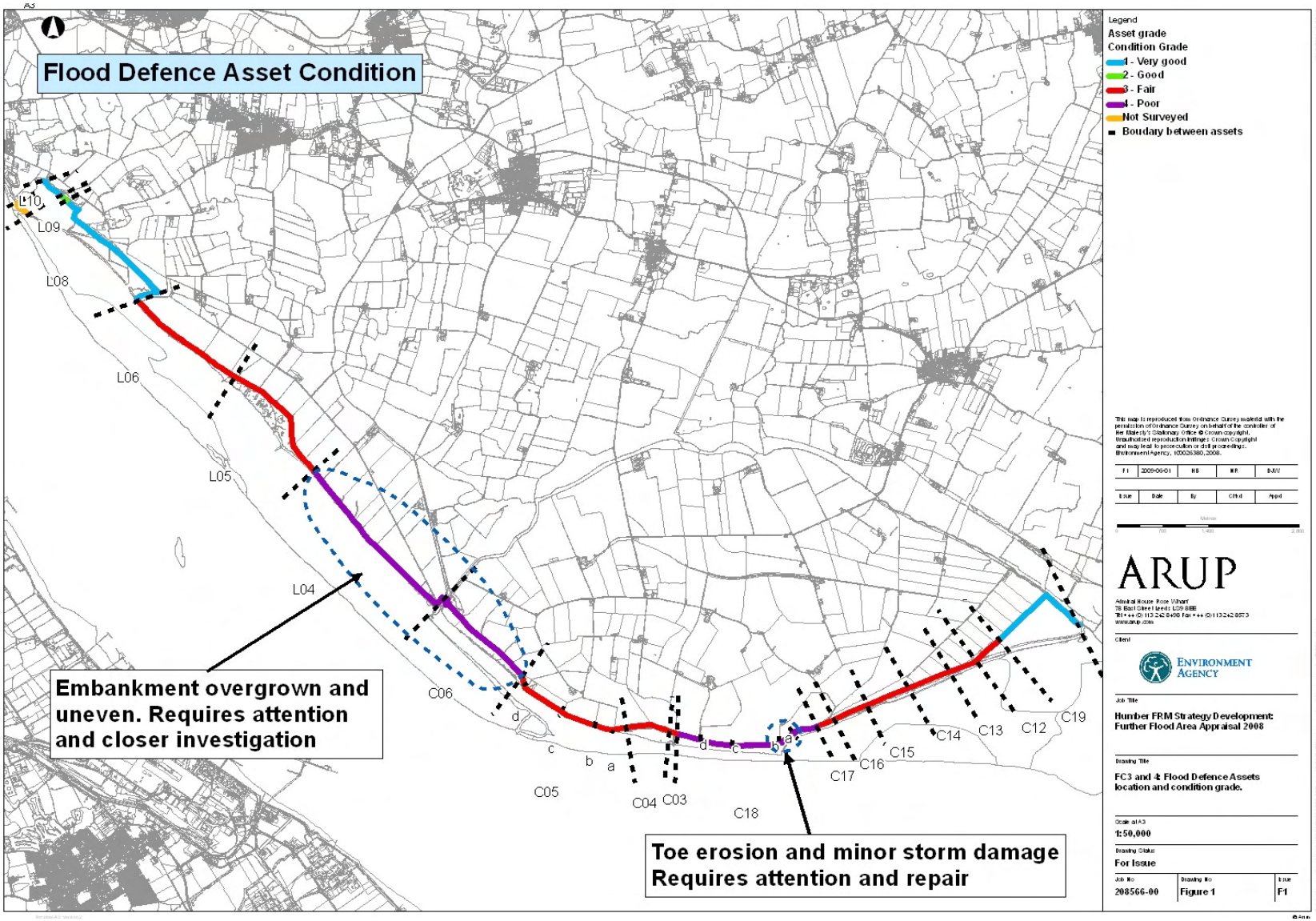

Figure 2: Abstract from Strategy Development: Phase 2a Sunk Island Asset inspection - Exception Report on asset condition. Flood cells 3 and 4' (Arup 2009)

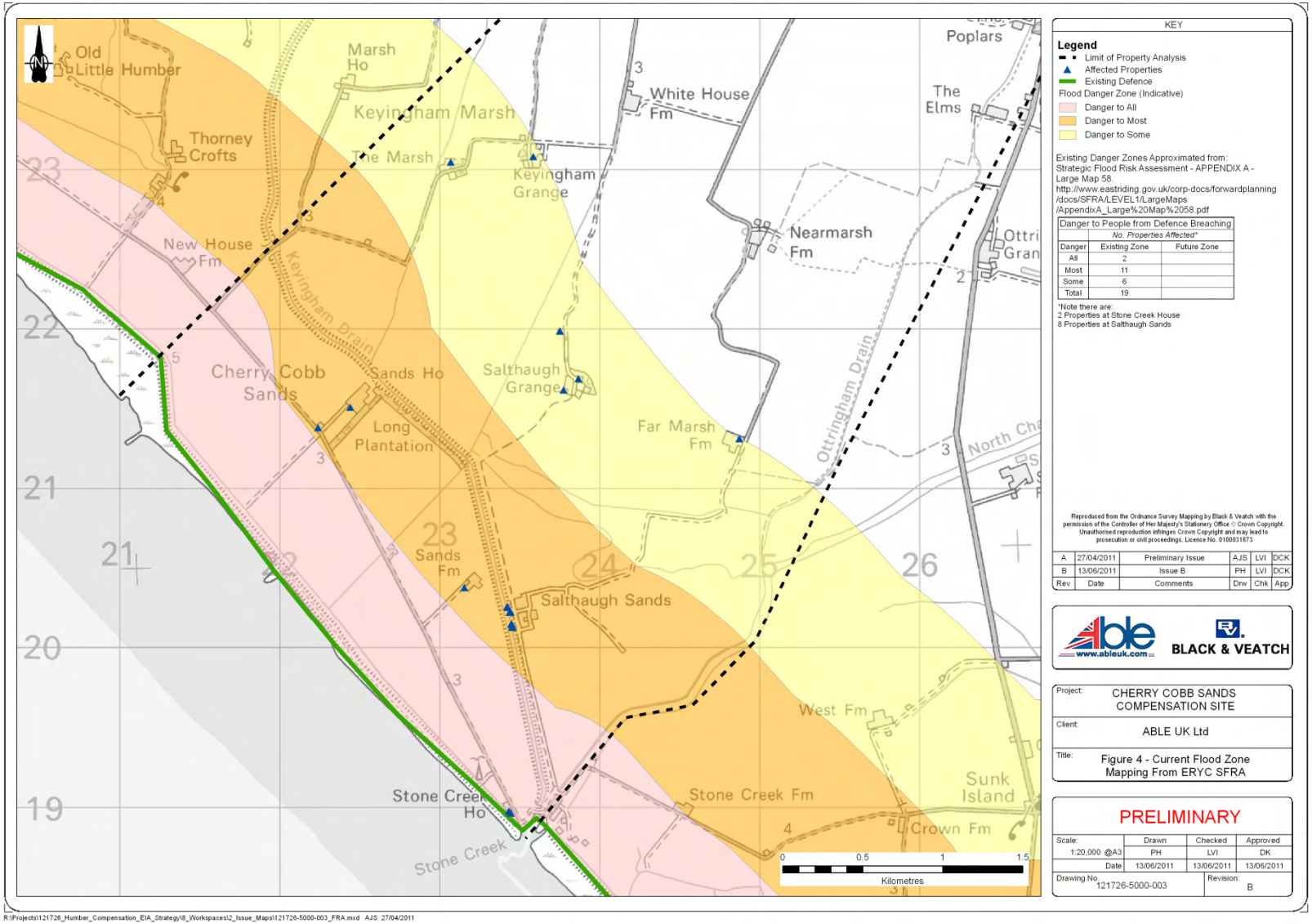

Figure 6: Current Flood Zones mapping at Cherry Cobb Sands from ERYC SFRA

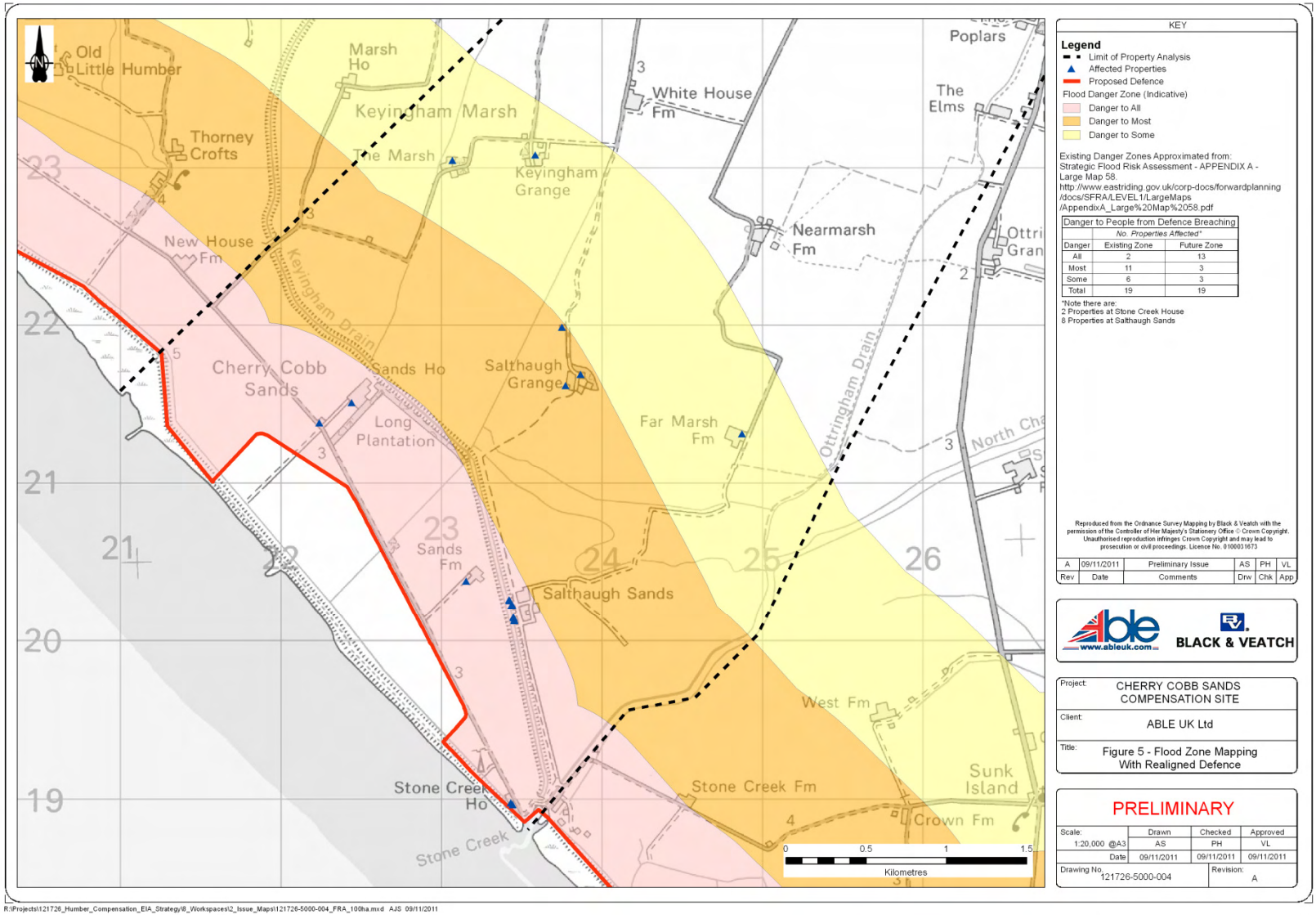

Figure 7: Flood zone mapping at Cherry Cobb Sands with realigned defence