28 DESCRIPTION OF THE PROJECT

28.1 INTRODUCTION

28.1.1 The AMEP described in *Chapter 4* will lead to losses of intertidal and subtidal habitat within the internationally designated Humber Estuary SAC, SPA and Ramsar sites. There will also be the loss of undesignated fields that are used for roosting and feeding by birds that feed on the Humber SPA and Ramsar site.

28.1.2 Following a site selection exercise described in *Chapter 30,* a site on the north bank of the Humber almost opposite the AMEP was chosen for the provision of intertidal habitat to provide compensation for the losses identified above and for any increased disturbance. The site location is described in *Section 25.2*. In addition, the creation of wet grassland habitat at Old Little Humber Farm is proposed to provide functional habitat for wildfowl and wading birds until the intertidal habitat has developed sufficiently to perform this function.

28.1.3 The proposed layout of the Cherry Cobb Sands site is illustrated in *Figure 28-1*. The layout provides at least 100 ha of new intertidal habitat. This total provides compensation for the AMEP development at greater than 1:1 ratio for the direct loss of estuary feature (13.5 ha). The site should also maximise the long term creation of intertidal mudflat, a specific SAC feature by creating in excess of 38 ha of sustainable mudflat with a target of developing 76 ha of sustainable mudflat (a 2:1 ratio of creation : loss). Detailed design will be carried out in consultation with Natural England to develop a ground profile that maximises the long term creation of intertidal mudflat by seeking to create substantially in excess of 38 ha. Within the intertidal site, compensation for the direct saltmarsh loss that will arise to allow the tide to gain access to the Cherry Cobb Sands breach will also be provided within the 13.5 ha for loss of estuary feature.

28.1.4 In addition, 38 ha of wet grassland will be provided at Old Little Humber Farm on existing agricultural land 1.5 km inland between Cherry Cobb Sands and Paull Holme Strays. This grassland will provide a temporary additional feeding resource for black-tailed godwits, as well as for other bird species whilst the habitats at Cherry Cobb Sands become established. The proposed layout of Old Little Humber Farm is illustrated in *Figure 28-2.*

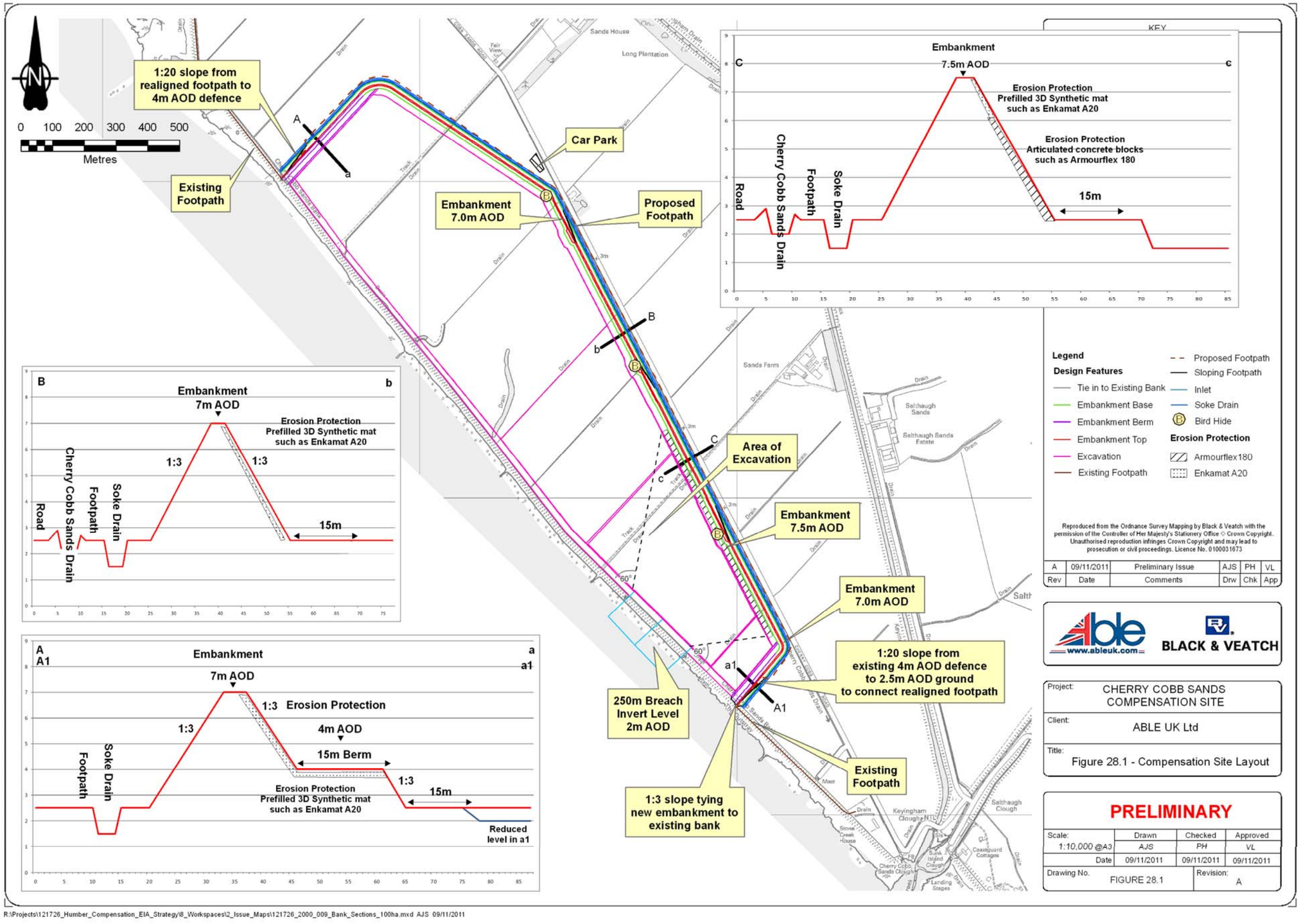

Figure 28-1Cherry Cobb Sands site layout

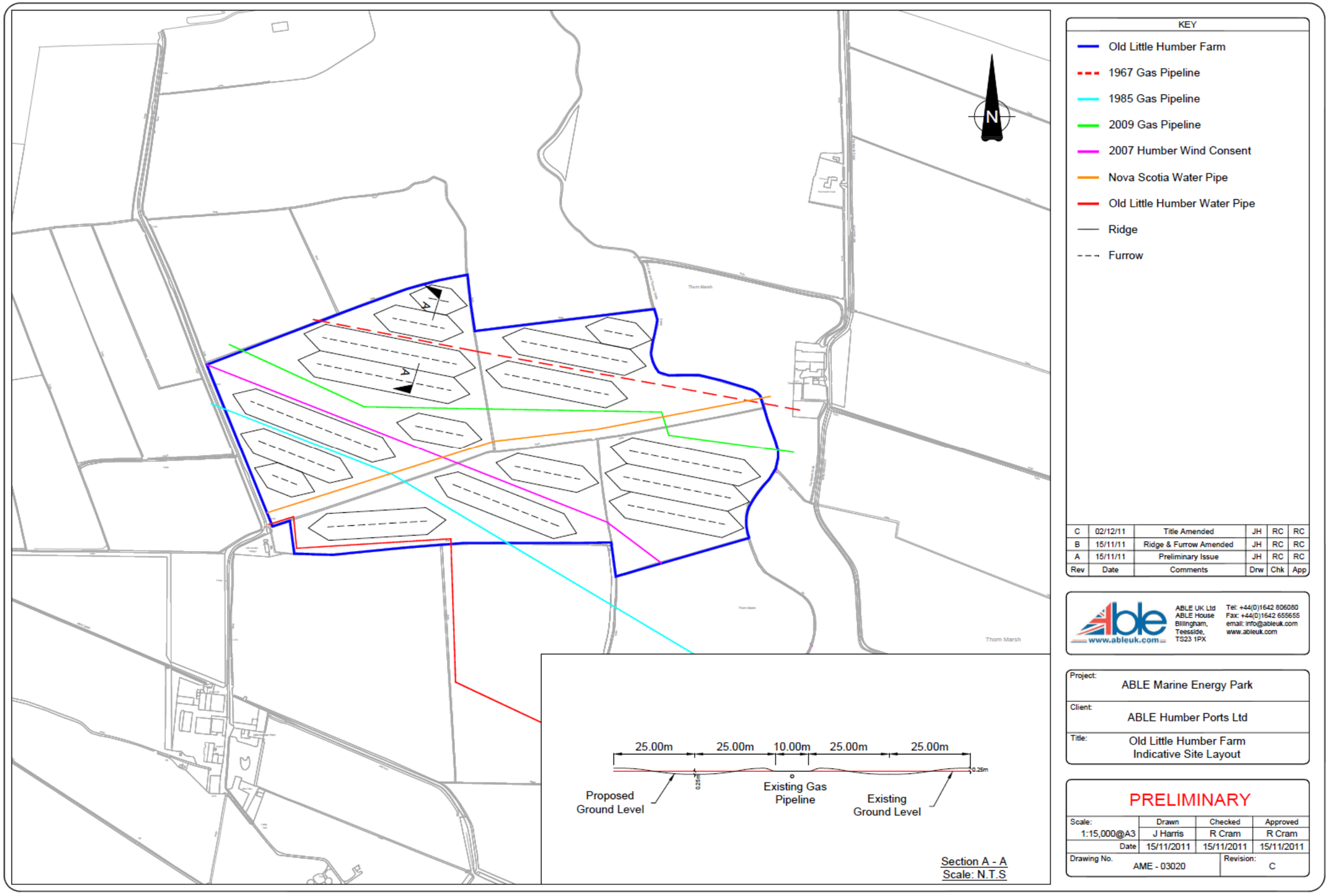

Figure 28-2 Old Little Humber Farm site layout

28.2 DESCRIPTION OF THE COMPENSATION SITE

Overview

28.2.1 Construction and operation of the Compensation Site will involve the following elements, described in more detail in the subsections below:

- New flood embankment at Cherry Cobb Sands;
- Erosion protection for the Cherry Cobb Sands flood embankment;
- Profile of the Compensation Site;
- Public Rights of Way;
- Informal recreation at Cherry Cobb Sands
- Breach at Cherry Cobb Sands;
- Habitats within the Compensation Site
- Monitoring and Compensation Site management

New flood embankment at Cherry Cobb Sands

28.2.2 The new flood embankment around the perimeter of the Cherry Cobb Sands site will be approximately 3 km long with a crest width of 4 m to comply with Environment Agency Health and Safety Guidelines for embankments adjacent to water. Geotechnical analyses of the material within the Cherry Cobb Sands site that will be reused as embankment fill *(Annex 31.3)* shows that an embankment side slope of 1:3 gradient will satisfy normal engineering stability criteria. The crest level of the new embankment will generally be at 7.0 mAOD with the section exposed to wave attack through the breach at the higher level of 7.5 mAOD. At its highest point, the embankment crest will be approximately 5.0 m above existing ground level (typically around 2.5 mAOD).

28.2.3 The embankment will be constructed to a 1:200 year standard of protection (0.5 percent annual exceedance probability) as agreed with the Environment Agency. This is a high standard of flood protection compared to usual standards in rural locations. This is because the land at risk of flooding if these sea defences breach includes a large area of Sunk Island and land to the north that potentially includes the communities of Thorngumbald and Hedon and could extend to the east side of Hull. The Environment Agency require that this standard of protection is maintained for the next century taking account of anticipated sea level rise as currently predicted in *PPS25* (see *Chapter 13*). This will lead to an increased standard of protection than currently afforded by the existing defences, which are reported to have a 1:80 year standard of protection (1.25 percent annual exceedance probability) (Environment Agency, 2008).

28.2.4 Although the new embankment will be to a higher standard than the current embankment, the standard of protection offered to properties in the floodplain will only rise marginally as all the other defences which contribute to the flood management system at Sunk Island will be unchanged. The new embankment will bring the flood hazard closer to some of the neighbouring properties. The effects of this on flood hazard and the risk to people are considered in *Chapter 36* and *Annex 36.1*, the Flood Risk Assessment.

Erosion protection for the Cherry Cobb Sands flood embankment

28.2.5 The flood embankment will be subject to wave attack if there is a combination of a strong wind and a surge tide. The height of the embankment has been designed to limit overtopping during a 1:200 year return period event in 100 years time to 10 l/s per metre length of embankment. This embankment design overtopping rate is the limit recommended for grass covered clay embankments by current guidance (EurOtop 2007) in areas remote from people and buildings. In the first year before the grass cover becomes established, the rate of overtopping in a 1:200 year event is predicted to be less than 0.1 l/s per metre.

28.2.6 In the section of the new embankment that is at risk of attack from waves travelling through the breach, an embankment crest level of 7.5 mAOD and articulated concrete block (or similar) erosion protection is required. The articulated concrete blocks will extend from existing ground level at 2.5 mAOD to 5.0 mAOD. Above this level there will be less wave energy; therefore grass cover reinforced by a prefilled three dimensional synthetic mat is proposed. This section of the embankment is identified on *Figure 28.1*. These articulated concrete blocks with suitable toe details will also be sufficient to protect this section of embankment against the high tidal currents that are predicted in *Annex 32.4* along this section of embankment.

28.2.7 Elsewhere around the embankment, wave energy is less as waves will only be generated by winds that blow across the intertidal area. As a result the embankment crest level can be lowered to 7.0 mAOD, and adequate erosion protection can be provided by grass cover that will be reinforced by a prefilled three dimensional synthetic mat. This prefilled synthetic mat will be particularly important during the first year of operation before the grass has had time to become fully established. Thereafter the mat will provide enhanced protection during the most severe storms.

28.2.8 At the north and south ends of the intertidal area, wave energy is greater because of the long fetch over which winds may blow. In these areas shown on *Figure 28.1* a 15 m wide berm covered with grass that is reinforced with the same prefilled three dimensional synthetic mat will be provided. This berm will be set at a level of 4.0 mAOD to avoid the need for more intrusive concrete erosion protection. The mat will be laid over the whole slope including the berm as illustrated on *Figure 28.1*. The berm is designed to break the largest waves before they can reach the new flood embankment.

Profile of the Compensation Site

28.2.9 Existing ground levels within the Cherry Cobb Sands site are fairly flat with an average level 2.5 mAOD. The construction of the new embankment will be carried out by excavating around 300 000 m^3 of material sourced from the site. The areas of the site that will be excavated to obtain this fill will be determined from a detailed Site Investigation and from on site testing of material as construction takes place. The indications from the interpretation of Site Investigation reported in *Annex 31.3* are that suitable fill is most likely to be obtained from the southern part of the site.

28.2.10 The finished ground levels within the intertidal site will be profiled to maximise the provision of long term intertidal mudflat. For this purpose, ground levels within the site will be profiled between 3.5 and 1.5 mAOD with the lowest levels likely to be near to the breach location. The actual finished ground levels will be determined following further detailed modelling studies in consultation with Natural England.

28.2.11 Topsoil stripped from the excavation will be removed, stockpiled and replaced within the excavation to help form the agreed initial profile of the site. As the site evolves the processes of erosion and accretion within the site will influence the future ground levels. A preliminary estimate of ground levels after five years is given in *Figure 28.3*, though this will be refined by further detailed modelling to increase the accuracy of the predicted area of mudflat that is likely to be created.

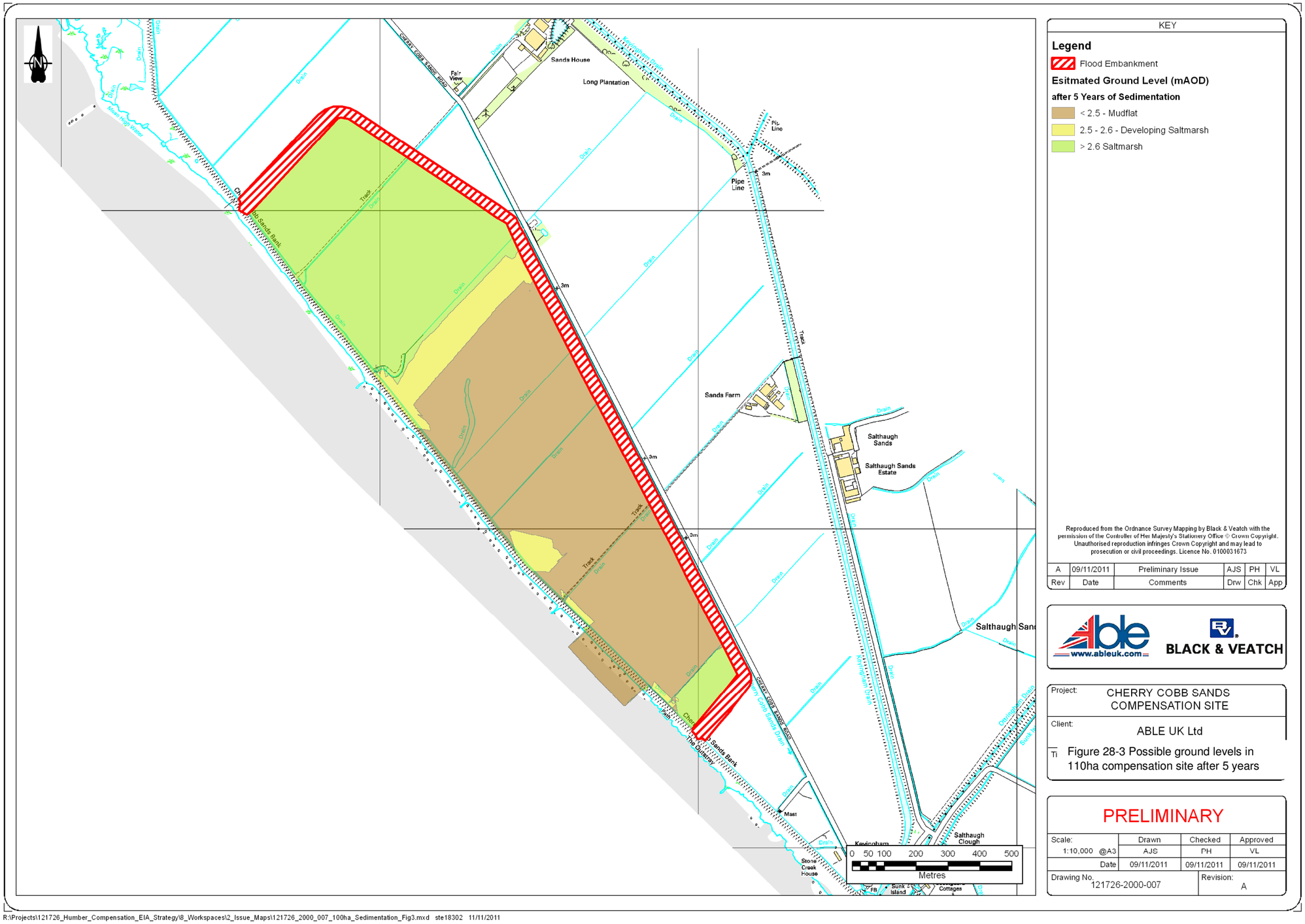

Figure 28-3 Estimated ground levels at Cherry Cobb Sands after five years

28.2.12 On the landward side of the new embankment a soke dyke will be provided to catch seepage water and prevent the risk of saline contamination of Cherry Cobb Sands Drain. This soke dyke will connect to the existing soke dyke at the southern end of the site.

28.2.13 A minimum distance of 4 m will be maintained between the soke dyke and Cherry Cobb Sands Drain. The southern limit of the embankment will be set 250 m north of the access track to the radar mast as indicated on *Figure 28.1* to provide sufficient standoff from Stone Creek House and thereby mitigate potential visual impacts and disturbance during construction.

28.2.14 At Old Little Humber Farm, the land will be re-contoured to enhance its habitat value. Some or all of the existing land drains under the existing fields will be stopped so that rain falling on the site will be retained for as long as possible.

28.2.15 Land profiling at Old Little Humber Farm will not occur within 10 m of any drainage ditches, hedges or similar features to avoid disturbing them and to enhance the diversity of habitats that will be formed on the site. New land levels will be up to 0.25 m higher or lower than the existing land surface. Land profiling will also not occur in a 10 m wide buffer strip centred on each of the gas and water pipelines that cross the site.

Public Rights of Way

28.2.16 A public right of way follows the top of the existing flood embankment at Cherry Cobb Sands (further details of the footpath are provided in *Chapter 42*). It is proposed that this public right of way would be diverted along the base of the landward side of the realigned embankment, at a width of 3 m. It is proposed that the footpath will be reached by ramps from the footpath along the existing embankment at gradients of 1:20 (*Figure 28.1*).

28.2.17 Three options for realignment of this public right of way were originally considered.

- One option was to continue the public right of way along the existing alignment, with a bridge over the breach. However, a bridge over the 250 m breach would require substantial foundations which would impair the correct functioning of the breach. The bridge would also have to be constructed after the embankment was breached, which would incur significant practical difficulties in

construction. Furthermore, the sea defence to be superseded by the realignment is not proposed to be maintained, and the action of rising sea levels means that the existing embankment will have a limited design life of approximately 40 years.

- A second option was to run the public right of way along the top of the realigned embankment. Natural England's view is that users of the footpath could disturb protected bird species that are anticipated to utilise the site following creation of the intertidal habitats.

- The third option (which is being taken forward) is to realign the public right of way to the landward side of the realigned embankment with access to bird hides at the top of the embankment via ramps (as discussed below). This option will minimise disturbance to birds whilst allowing the public to view the estuary and new intertidal area from various vantage points.

28.2.18 There is no public right of way crossing Old Little Humber Farm.

Informal Recreation at Cherry Cobb Sands

28.2.19 It is proposed to install three bird hides on top of the Cherry Cobb Sands embankment to enable views of the bird species that are anticipated to utilise the intertidal area. The hides would be set at regular intervals along the embankment, one of which being opposite the proposed breach to provide wider views of the estuary. The hides would be accessed via ramps of 1:20 ratio. A car park with parking for six cars is proposed adjacent to Cherry Cobb Sands Road for use by those visiting by car. The locations of the hides and car park are shown on *Figure 28.1* and the appearance of these shown in the photomontages in *Annex 41.3*.

Breach at Cherry Cobb Sands

28.2.20 Following construction of the new embankment and reprofiling of the ground inside the site, the existing embankment will be breached to allow tidal waters to enter the site. The material from the breached section of bank will be placed within the intertidal area.

28.2.21 The results of studies investigating the optimum type and location of the breach are included in *Annex 32.3* and have concluded that the optimum location for the single breach will be towards the southern end of the site and should be 250 m long. The location of the breach is shown on *Figure 28.1.*

28.2.22 The precise level of the breach area within the range 2.0 ±0.2 mAOD will be chosen during detailed design to maximise the sustainable creation of intertidal mudflat. The assessment in *Annex 32.6* summarised in *Chapter 32* encompasses the effects associated with the breach level being within this range.

28.2.23 In order to enable water to enter and exit the site a channel will be cut through the saltmarsh fronting the breach. The saltmarsh excavated during this process will be re-laid within the Cherry Cobb Sands site at the same level to encourage the generation of saltmarsh within the site.

28.2.24 An important objective in the design of the breach is to limit the risk that Foul Holme Sand (a sand bank extending 700 m offshore of Cherry Cobb Sands Creek) could be bisected by a new drainage creek. The drainage from Cherry Cobb Sands is instead designed to enter the Humber at low tide through Cherry Cobb Sands Creek (a major tidal creek running parallel to the existing flood embankment that discharges into the Humber around 2.5 km south east of Stone Creek at low tide). The additional drainage water from Cherry Cobb Sands is expected to increase the size of this creek especially between the site of the breach and the existing confluence with the Stone Creek outfalls. The changes to the foreshore arising from the introduction of the Cherry Cobb Sands breach are considered in *Chapter 32* and the modelling studies reported in Annexes *32.3, 32.4 and 32.6*.

28.2.25 The base and ends of the breached section will not be protected from erosion. The modelling in *Annexes 32.4 and 32.6* suggests that a creek is likely to cut through the breached section within the first five years which will cause the Cherry Cobb Sands site to fully drain.

Habitats within the Compensation Site

28.2.26 As described above, the main aim of the Compensation Site is to create new habitat to compensate for effects of the AMEP upon internationally designated features of the Humber Estuary (described in *Section 10.6*). Sustainable re-creation of these habitats is challenging in a silt laden estuary such as the Humber because natural silt accretion in areas of low velocity can rapidly lead to the formation of saltmarsh, as demonstrated at the existing managed realignment sites in the Humber (reported in *Annex 32.5*).

28.2.27 The Cherry Cobb Sands site will be designed to encourage the retention of intertidal mudflat habitat by developing areas where the tidal velocities inundating the site are high enough to prevent or severely

limit deposition. *Chapter 32 and Annexes 32.4 and 32.6* describe the velocities that are anticipated within the Cherry Cobb Sands site and how these are expected to limit deposition to part of the area. Further design of the ground profile will be carried out to increase the long term retention of intertidal mudflat habitat.

28.2.28 By the fifth year after breaching of the Cherry Cobb Sands site, some of the site especially at the north and south ends is expected to be developing as saltmarsh. This is anticipated in those areas where velocities are low and accretion will occur as experienced at other managed realignment sites in the Humber. In the central part of the site, where velocities are higher, intertidal mudflat will be present. The preliminary modelling results shown in *Figure 28-3* indicate the presence of over 50 ha of intertidal mudflat. Mudflat is expected to develop in those areas below 2.5 mAOD on the basis of the evidence from Paull Holme Strays (*Annex 32.5*). Detailed design will focus on increasing this area substantially by optimising the ground profile.

28.2.29 Given the predicted rates of sea level rise of around 1.0 m over 100 years, foreshore levels within flood embayments (which would include Cherry Cobb Sands) would keep pace with the rate of sea-level rise on the upper foreshore.

28.2.30 The Cherry Cobb Sands site will take some time after initially being breached to provide fully functioning habitat of value to the wading birds and wildfowl that require compensation for the AMEP. To provide compensation while the intertidal habitat develops, wet grassland will be provided at Old Little Humber Farm. This habitat is expected to only be required for a few years, but it will be maintained until the monitoring shows that the intertidal habitat at Cherry Cobb Sands is providing effective compensation for AMEP.

Monitoring and Compensation Site Management

28.2.31 Following the creation of the Compensation Site the key nature conservation interests remaining within the vicinity of the site are likely to be water birds utilising the site. In order to assess the effective implementation of the site, monitoring of the site for bird species and other nature conservation features will be undertaken in accordance with a strategy and programme to be developed in consultation with the Regulators.

28.2.32 Monitoring surveys for wetland bird species and habitats would be broadly similar to those undertaken for this Project, although further tailoring of effort closer to the time would be required.

28.2.33 Able will develop and implement a management plan for the future management and maintenance of the Compensation Site. The management plan will be developed in consultation with Regulators, including Natural England and the local authority.

28.2.34 A plan for the monitoring and maintenance of the flood embankment around Cherry Cobb Sands will be agreed with the Regulators, including the Environment Agency and the local authority.

28.2.35 A plan to monitor the impacts of the Cherry Cobb Sands site on land drainage through the Stone Creek outfalls will be agreed with the Regulators. This plan will identify the circumstances in which Able will carry out mitigation works including dredging of Stone Creek and Cherry Cobb Sands Creek to mitigate any adverse impacts on land drainage identified through the monitoring attributable to the AMEP development. This monitoring will identify and mitigate adverse impacts on land drainage arising from changes to the geomorphology of Cherry Cobb Sands Creek associated with the construction and operation of Cherry Cobb Sands.

28.3 CONSTRUCTION METHODOLOGY

28.3.1 The construction phase of the Compensation Site is anticipated to be undertaken over two spring/summer periods, with work likely to take place from March to October.

28.3.2 Proposed working hours are detailed in *Table 28.1*.

Table 28-1 Schedule of working hours

Day	Working Hours
Monday to Friday	07:00 to 19:00
Saturday	07:00 to 17:00
Sundays and Bank Holidays	No working anticipated

28.3.11 The new embankment around Cherry Cobb Sands will be constructed by winning material from within the site. It is anticipated that the embankment will be constructed in a single summer season.

28.3.12 Embankment construction would probably proceed at several locations at the same time. The Site Investigation Interpretative Report *(Annex 7.3)* has determined that the soils in the site are too wet for immediate compaction into a flood embankment without pre-treatment. If weather conditions are favourable it may be possible to dry the soils naturally. The favoured alternative method is pre-treatment of the soils by mixing the site won material with about 2 percent of lime or cement before incorporating it into the embankment. This will require the importation of around 9 000 m^3 of lime or cement from an approved source. The amount of additive required will depend on the outcome of site trials to dry and compact the material. A one way traffic management system will be established on the narrow local roads to manage the large number of lorry movements required. This system is described in *Chapter 37*.

28.3.13 Erosion protection material will also be imported to the site using the same one way traffic management system, though the number of lorry movements associated with importing this material will be much less.

28.3.14 Before breaching the existing embankment, the site would be prepared for inundation by, for example, removing the vegetation that would die once exposed to saline water. The 1.75 ha of saltmarsh in front of the breach site would be removed down to the breach level, and the spoil incorporated into the landscaping of Cherry Cobb Sands.

28.3.15 The existing embankment would ideally be breached in the year after it is built to allow time for sufficient grass cover on the new embankment to become established and so ensure the embankment will function as a major flood defence. However, the erosion protection provided will be sufficient to avoid erosion damage to the new embankment from normally occurring rain, tides and waves before the grass cover becomes established, to allow breaching of the embankment at the end of the construction season. If this were done, there would remain a small residual risk of damage if an extremely rare severe wind event coincided with a storm surge. This might cause limited damage to the new embankment particularly if high wind conditions led to wave attack at the northwest or southeast ends of Cherry Cobb Sands. Any damage would be repaired as soon as practicable, but the risk of failure during such an event during this first winter is assessed as very small considering the low probability of the necessary combination of wind and storm surge occurring and the residual risk of damage.

28.3.16 The wet grassland at Old Little Humber Farm will be formed before the start of the main construction work. It will be undertaken over a two

month period so that the grass can develop a good sward by the autumn when this site will be required to provide an additional feeding resource for black-tailed godwits, as well as for other bird species birds displaced from the Killingholme Marshes foreshore before the intertidal habitats at Cherry Cobb Sands become fully established.

28.4 DECOMMISSIONING

28.4.1 It is not intended to decommission Cherry Cobb Sands; rather it is proposed that it will become part of a naturally functioning coastline. Once created, it is anticipated that the intertidal habitats will eventually be incorporated into existing designated nature conservation sites, extending the Humber SAC, SPA and Ramsar site as well as the local designations that currently cover the intertidal habitats offshore of Cherry Cobb Sands.

28.4.2 Old Little Humber Farm will remain as wet grassland for as long as required to ensure that sufficient functional compensation habitat is provided. When, as a result of monitoring, it is demonstrated that the wet grassland area is no longer required as compensation habitat, the land at Old Little Humber Farm will be levelled, the land drainage reinstated and the whole site returned to arable use.

28.5 CONSULTATION

28.5.1 Consultation responses were received in relation to the description of the Cherry Cobb Sands component of the Compensation Site. The consultation responses are provided in *Annex 2.2* together with responses detailing how the comments have been addressed within the Environmental Statement.