

River Wall Defences on the Deben – Recent History

General: This article describes the recent history of the river walls which protect the land along the River Deben. I am grateful to David Kemp of the Environment Agency for his advice and contribution.

At present the walls protect many acres of arable land. In addition there are several places on the Deben where they protect the abstraction points for the inland freshwater reservoirs. Breaching of a river wall could have a catastrophic effect on fresh water dependant features. It is very much in the interest of landowners to maintain the river walls and resist the idea of ‘managed retreat’, which still appears to be the intention of Natural England (NE). Measurements that the RDA Saltmarsh Research Group have taken since 2014 show that the saltmarshes in the Deben Estuary are rising, due to the depositing of natural sediment, at the same rate as sea level rise. This largely demonstrates that the concept of ‘Coastal Squeeze’ in the Deben Estuary is incorrect. Erosion of the saltmarsh is taking place but not because the saltmarshes are drowning.

At present the Environment Agency (EA) does not have the responsibility for repair work but has permissive powers to do so. The implementation of these powers has varied greatly over time, from little implementation in the 1930s to greater intervention in the 40s and 50s (due to food shortages!) and back to less intervention today. Typically its funding for maintenance work has reduced to mainly cover those areas where there are a significant number of dwellings (e.g. Woodbridge, Felixstowe Ferry). In around 2008 the Country Land and Business Association established that land owners should be permitted to protect their land. There remains the clash between the concept of preserving the habitat for wild life, which leads to ‘managed retreat’ and the need to maintain the river walls to protect the arable lands and the abstraction points for the freshwater reservoirs.

These changes have been reflected through the publication of the Deben Estuary Plan (2015). This was led by the community based Deben Estuary Partnership (DEP) in partnership with representatives from the EA and Suffolk Coast and Heaths AONB. The Deben Estuary Plan makes it clear that the responsibility for maintaining most of the river walls on the Deben now lies chiefly with the landowners. Much of the coordination of this has now passed to the East Suffolk Internal Drainage Board (ESIDB).

For the last ten years the local objective for protecting river walls, proposed by Andrew Hawes, is on making the walls survivable in a flood. The primary requirement for this is to ensure an adequate height. In order to achieve a sensible result at an acceptable cost it is important to prevent breaching, but to design them to survive limited overtopping. Overtopping of up to 300mm (equivalent to up to 2 hours flow) has been accepted as a reasonable limit. For a smooth flow of water this requires that the batter on the land side to be set at 1 in 2.5 or more. In many situations this can be achieved by increasing the base width. Other requirements are introduced to ensure ease of future maintenance and to allow footpaths along the top. An idealised section through the river wall is shown in Figure 1.

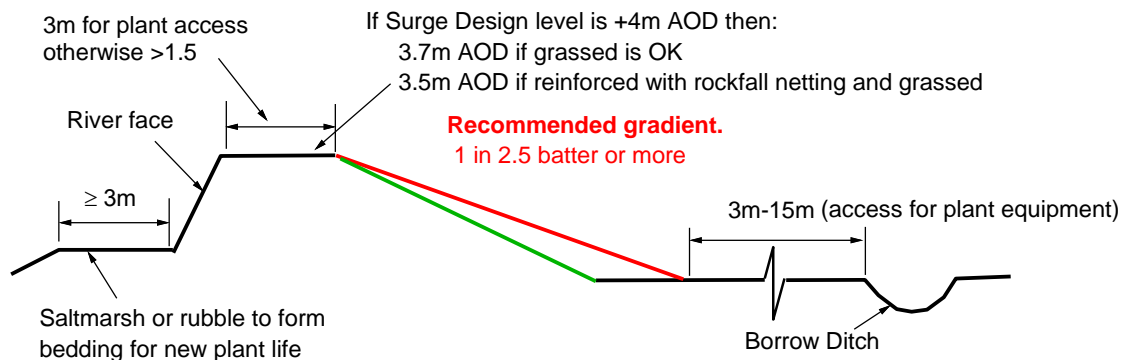


Figure 1: Idealised section through river wall

An alternative to providing more clay to an existing wall is the laying of rockfall netting over the top of the wall. This provides 1hour extra time for overtopping, equivalent to 200mm extra height of wall. For situations where the existing wall height is 0.5m below the design level (+4.0m AOD for the Deben) it can be used instead of adding more earth/clay to the wall. It can also be used in situations where the wall is not stable enough to take the extra weight of earth/clay (e.g. sandy wall) as it does not add significant weight. In addition it provides ecological mitigation i.e. if it is applied instead of adding earth/clay there should be no concern about the habitat of the wild life. One drawback of this type of solution is the difficulty of maintenance of the bank. Grass cutting equipment can be damaged by the rockfall netting.

Where possible it is important to build the river walls up to the same level. This ensures that overtopping occurs simultaneously over the full length of walls and creates a large temporary flood plain. It is essential for this concept to be coupled with the efficient performance of sluices to drain the flooded areas as soon as the flood waters subside.

The placing of Essex Blocks at the foot of the river side wall have been carried out where there has been no saltmarsh to absorb wave energy at times of flooding.

Work on River Wall near Sutton Hoo – 2008 (described in No 49 edition of *The Deben*) The owners of three houses close to the river below Sutton Hoo agreed in the early 2000s that they should repair the river wall protecting their land. In 2008 EA gave limited consent to carry out work on this section of the river wall (see Figure 2). This was carried out to the owners’ specification for a length of wall of about 1Km, following discussions with a number of experts (including Andrew Hawes and people in the Essex Coast Organisation):

- Raise the height, where it was low, to at least the minimum recommended level of 4.0m AOD. This made allowance for 200mm settlement.
- Clay was brought in since the existing soil in the marsh land was not considered acceptable quality.
- A land side batter of 1:2.5 was created.
- The wall was planted with grass. This is intended to ensure that the wall can survive overtopping without breaching.
- At some of the places in the past, owing to lack of saltmarsh, Essex blocks had been placed at the base of the wall on the riverside. Erosion had taken place behind the blocks. In these places the blocks had been broken up and mixed with hardcore to form a wave resistant armour (see Detail to Figure 2). This has allowed spartina grass to grow quickly and create a grass barrier.

The cost of this work was in the order of £110/m.

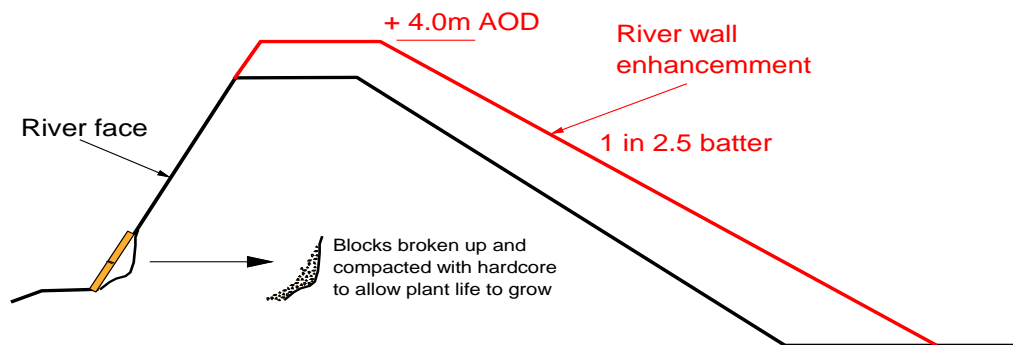


Figure 2: Work on River Wall near Sutton Hoo – 2008

Work on the breach in the river wall just downstream from Martlesham Creek – 2014 (described in No. 51 edition of *The Deben*): Prior to the 2013 tidal surge the landowner of this section of the river wall had realised that the wall was vulnerable and had sought to improve the outlet for the sluice into Martlesham Creek. This was carried out through a joint agreement with the Environment Agency. At the same time the river wall was repaired except for one stretch which Natural England insisted should be left to preserve the habitat of a particular type of rare snail. Unfortunately this is where the breach in the wall occurred during the 2013 tidal surge. The flow of water through the breach caused a deep hole (three to four metres) to form at the line of the wall. Even after the surge level had subsided water flowed in and out through the breach freely with each tide, for the next three months. As a result the grass in the pastureland was destroyed and it became covered with a centimetre of silt. Within three months after the pasture has been drained the grass has re-grown.

After much discussion it was decided to construct a sill along the 70m length of the breach. This has been built to a level of 3.3m AOD, and allows overtopping at exceptional high tides and flooding of the pastureland. The sluice leading from the pastureland into Martlesham Creek will drain the land as soon as the tide falls and thus major damage to the pastureland is now avoided. The scheme also has the advantage that, when another major surge occurs, the effect of the water rushing into this pastureland will mitigate the effect of the surge upstream.

The work to restore the river wall at the breach involved realignment inland around the hole at the breach. Temporary sheet piling was used to block the flow of water and then locally excavated clay was placed either side of the piling until it reached the specified level for the sill. The sheet piling was then removed. The river side and top of the wall were covered with a layer of top soil along the sill. This was reinforced with a GeoTex surface covering (a plastic mesh). This prevents clay loss while the plants and seeds mature. The final sill is formed of the local clay with topsoil and grass to protect the wall during short periods of overtopping. The grass also ensures that the clay does not dry out and crack.

The cost of the work carried out was approximately £110K

In spite of the care taken to build well compacted clay river walls, at times of surge exaggerated high tides have occasionally caused seeping of water through the wall. This was witnessed just upstream of Slaughden Quay during the time of the December 2013 flood surge. This flow although not great was spread throughout a 50m length of the wall. The leak was caused by desiccation cracking. It is possible/probable that the breach in the river wall just downstream from Martlesham Creek during this flood surge may have been caused by desiccation cracking. The flow of water was sufficient to destabilise the wall.

Work on River Wall at Ramsholt – 2014 (described in No. 51 edition of *The Deben*): The work on the river wall at Ramsholt was carried out to Andrew Hawes' specification:

- The work was for a 400m length of wall.
- The wall back slope was set to a minimum batter of 1:2 (see Figure 3).
- The top of the wall was set at 3.8m AOD with allowance for 100mm settlement. The top of the new wall is set back from the existing wall leaving the footpath on the existing wall open (throughout the remedial work).
- The new material was taken from the existing marsh/field on the land side.
- Seeding with suitable grass (Seacoat) was included in the work (The Environment Agency uses a standard 'bank mix'). Unfortunately this has not been entirely successful and problems similar to, but to a lesser extent exist, that for the wall repairs at Kirton Creek (see below).

The cost of the specified work was in the order of £180/m.

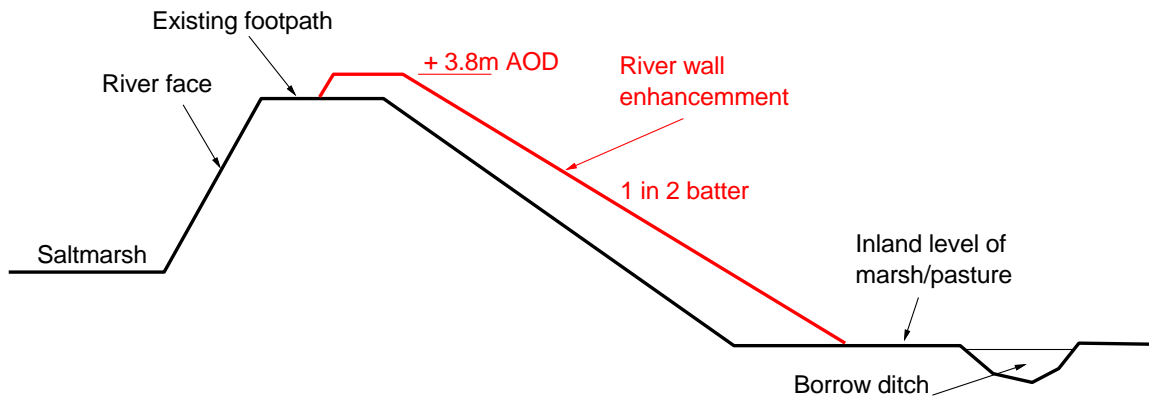


Figure 3: Work on River Wall at Ramsholt – 2014

Work on River Wall at Kirton Creek - Early 2015 (Autumn 2015 edition of *The Deben*): The surge tide of December 2013 overtopped the river wall at the top of Kirton Creek which allowed salt water into the River Mill and a fresh water reservoir. Remedial work was carried out over a third of a kilometre of the river wall to the north of Kirton Creek during the early part of 2015. This was brought up to a level of 3.8m AOD and the batter on the land side has been altered to a slope of 1: 2.5. Originally it was expected to use clay from the adjacent land but this was found to be unsuitable and material from further afield was brought in. The length of wall adjacent to the sluice has a restricted width at the bottom because of the access road/track on the land side. In order to ensure the required batter the width of the top of the wall is reduced. Provided the grass over the top is maintained it is considered that it will not be necessary to provide protective reinforcement.

The work was carried out by the land owner with support from the Environment Agency and East Suffolk Inland Drainage Board. The Environment Agency are currently concerned about the difficulty that has occurred in achieving adequate grass cover to ensure that the soil clay in the wall stays moist. This has not been achieved so far and the soil/clay has dried and caused cracks to appear in the wall. It is important that the wall is covered with a suitable grass such as 'Seacoat'. Coverage with a mixed selection of vegetation is significantly inferior, and no cover at all is a serious defect.

The cost of this work was approximately £40K (£100/m).

Work on River Wall on the north side of Martlesham Creek – Summer 2015 (described in No. 51 edition of *The Deben*): The river wall on the north side of Martlesham Creek was breached over a length of 40m. The cross section shape of the entire wall has very steep sides, a batter of 1:1 for both front and back faces. This makes it very vulnerable to breaching, particularly if overtopped.

The concept for the repair has been to allow quick flooding of the 27 acres of pastureland adjacent to the river wall. Once the water levels on each side of the wall become the same the wall should not suffer any damage. This has been achieved by installing two trial spillways at a level of 3.2m AOD with different footpath surfaces. The height of the remaining river wall has been raised to a consistent height of 3.5m AOD. The surface of the inland batter of both spillways has been covered with a turf reinforcement mat. When laid on to earth works this mat allows direct seeding, even with limited topsoil. As the grass grows it incorporates the polypropylene mesh into its roots. This provides resistance to the erosion effects for overtopping velocities of 4m/s and over.

The project was led by the landowners, Notcutts Ltd, and Suffolk County Council. The total cost was approximately £50K (£50/m).

Work on River Wall upstream of Waldringfield – 2015 (described in No. 53 edition of *The Deben*): Phase 2 of the Waldringfield Flood Defence Group’s project involved both increasing the height and reducing the gradient of the land side slope of the wall for a length of 750m of river wall. The work included the creation of an inland wild life sanctuary along a 300m length part of the wall. The specified dimensions of the revised wall are shown in Figure 4. The level of the top of the wall has been raised to 3.8m AOD .

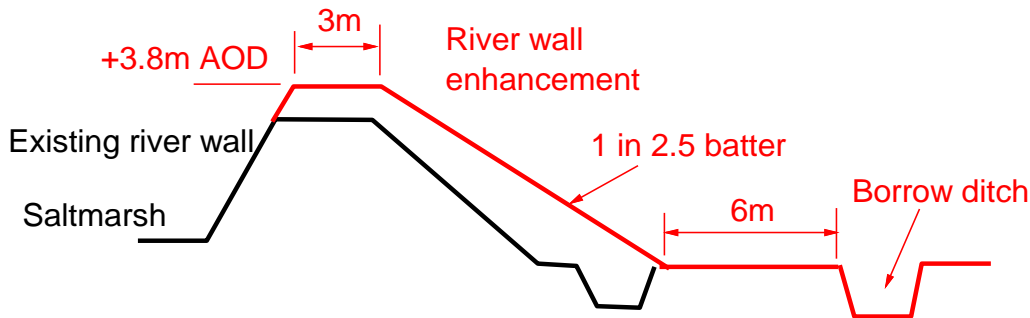


Figure 4: Typical section through new river wall at Waldringfield

In addition extensive work was carried out close to the saltmarsh on the riverside of the wall. This was to provide protection to wall in times of flooding as it dissipates the destructive energy created by wave action. The saltmarsh along this part of the wall has been fragmenting over the last decade. Local dredged sediment has been deposited on it to help it recover its former state. The cost of Phase 2 (excluding the work on the saltmarsh, but including the creation of the wild life sanctuary on the land side of the wall) has been about £300k (£400/m).

Work on the Cross Wall at Felixstowe Ferry – Autumn 2016: The scheme to refurbish the flood defence to provide protection to Felixstowe Ferry hamlet from the Deben Estuary. The works took place along a 500 metre section of flood embankment to the north-west of Ferry Road/Millennium Green and involved removing steel crest piles, raising and widening of 500 metres of bank using imported material. Other improvements works included a new access arrangement for the golf course sluice and a new cabinet to hold the flood boards for use across the road.

The work was completed 1 month ahead of time, and significantly under budget. Final cost was £547,000 (£1,094/m).

Future Work: Two lengths of river wall still require maintenance to bring them to the agreed standard. The wall at Shottisham Creek (Flood Cell 4) and the wall between Bawdsey Ferry and Ramsholt (Flood Cell 1). The Deben Estuary Partnership is co-ordinating the management of these.

rtw 14/5/2018