At the southern end of Cleethorpes the sand dunes are protected by gabions. These concrete structures have steel mesh holding large, resistant igneous / metamorphic rocks designed to absorb wave energy.

A close up view to show the good condition of the gabions with the concrete posts, firm wire mesh and rocks designed to absorb wave energy during high tides and storm surges.

On the mud flats beyond the dunes, gabions and beach, small areas of salt marsh are beginning to develop. If this extended it would act as a natural defence.

Further along the dunes are not protected by gabions and there is evidence that high tides and storm waves have begun to erode the soft sand and weaken the defences. The fencing has been constructed to reduce wind strength and encourage the deposition of sand and dune formation.

A larger dune belt with a greater variety of plants which is a considerable natural defence against the sea. Even here, however the front of the dune belt has been eroded.

A new stone fish tailed groyne has been constructed at the southern end of the ‘Fitties’ / Humberston dune belt. The aim was to push a tidal channel further offshore and reduce longshore drift to develop the beach and reduce wave energy.

Unprotected mature dunes have been seriously eroded. The large driftwood is evidence that high tides and storm waves reach here.

Here the eroded dunes have recently been protected with the construction of gabions. This is obviously a serious situation as these are mature dunes as shown by their height and the vegetation they support.

A general view of the coast beyond the Fitties dune belt. here we see both the gabions and the wooden groynes that have been designed to limit loss of sand by longshore drift and build up the beach to act as a natural defence.

Immature sand dunes with limited vegetation and open, bare patches of sand that are not held in place and liable to be lost due to wind erosion and the formation of a blow-out, thus reducing the efficiency of the natural defence.

Here the fencing seems to have been effective in holding the sand and allowing a more mature dune belt to develop. The vegetation shows greater plant cover and plant height making the dunes less likely to be eroded and making a stronger natural defence.

A view of a footpath through the dunes to allow access to the beach. Notice the extensive mudflats found beyond the beach at low tide out to the old fort built during WW1 to protect the estuary. Notice that footfall through the path prevents vegetation colonising the sand making it a weak point liable to erosion by wind and the formation of a blow-out.

The dune ridge to the left and stabilised sand dunes in the centre. To the right are the Fitties holiday chalets. The holiday chalets are designated as at risk of flooding and there is a further defensive embankment, St Anthony's bank, further inland to the right.

Formidable gabions at the north end of fifties dune belt. The beach seems to have been depleted here and large boulders have been placed at the foot of the gabions to prevent undercutting.

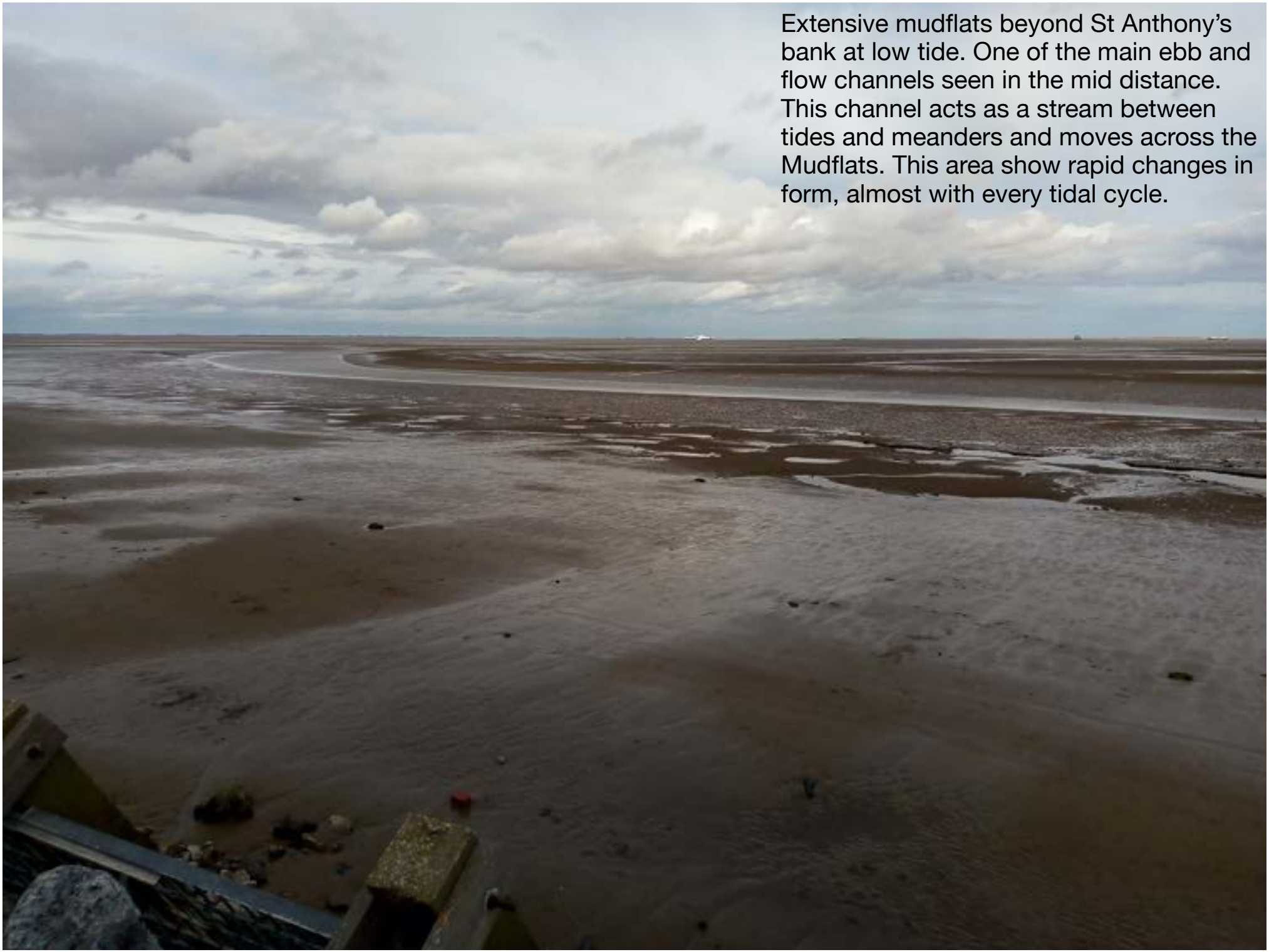
The concrete reinforced defence embankment, St Anthony's bank, with beach access for tourists, and to the right the start of a newly forming dune belt.

Concrete defences of the sand dunes, but the beach here has been depleted and the concreted defences have been undercut.

Sand dune formation in front of St Anthony's bank. These foredunes show the early stages of sand dune formation. The wind blows sand from the extensive beach to the right and it begins to be stabilised by plants like marram grass.

A view from St Anthony’s bank, the defensive embankment, across the salt marsh to the newly formed dune belt on the developing whaleback. Both the dunes and the salt march act as natural, soft defences enhancing and preserving biodiversity at the same time.

A channel outflow cuts through the natural defence offered by the salt marsh. This marsh area is only covered at high tides as seawater enters through the creeks, and over time further sedimentation will mean that it will be covered by fewer and fewer high tides if the progression is allowed to continue.



Extensive mudflats beyond St Anthony's bank at low tide. One of the main ebb and flow channels seen in the mid distance. This channel acts as a stream between tides and meanders and moves across the Mudflats. This area show rapid changes in form, almost with every tidal cycle.