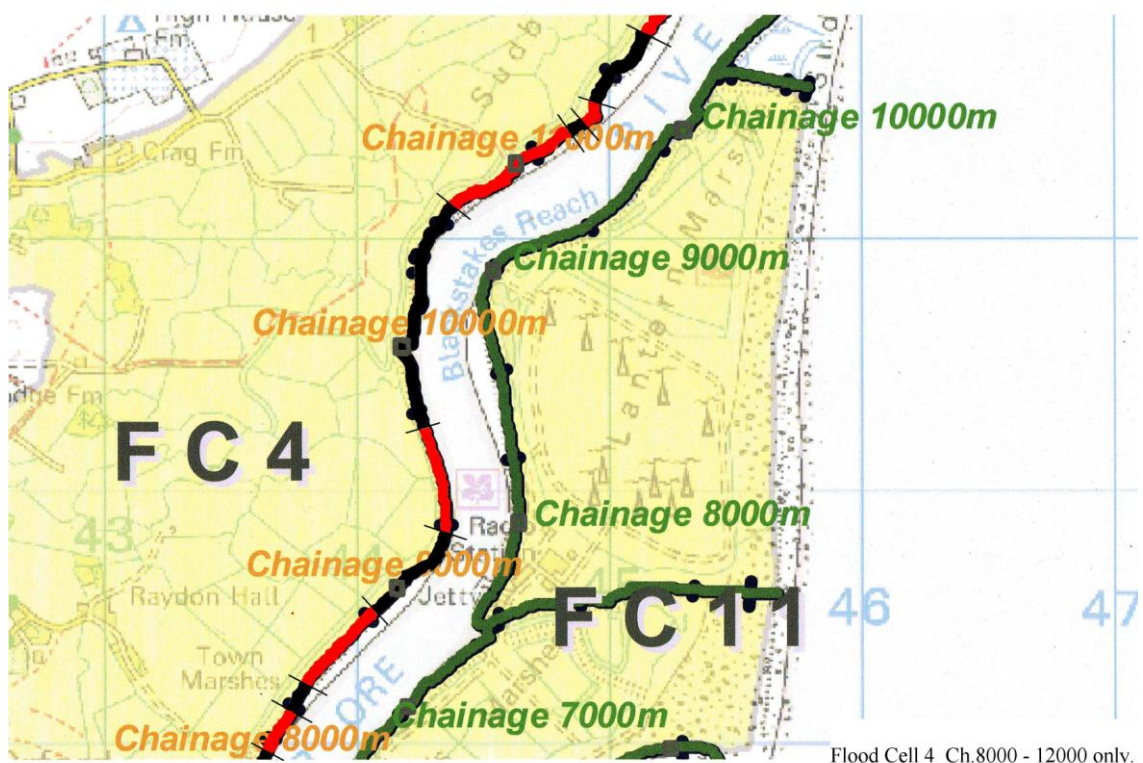
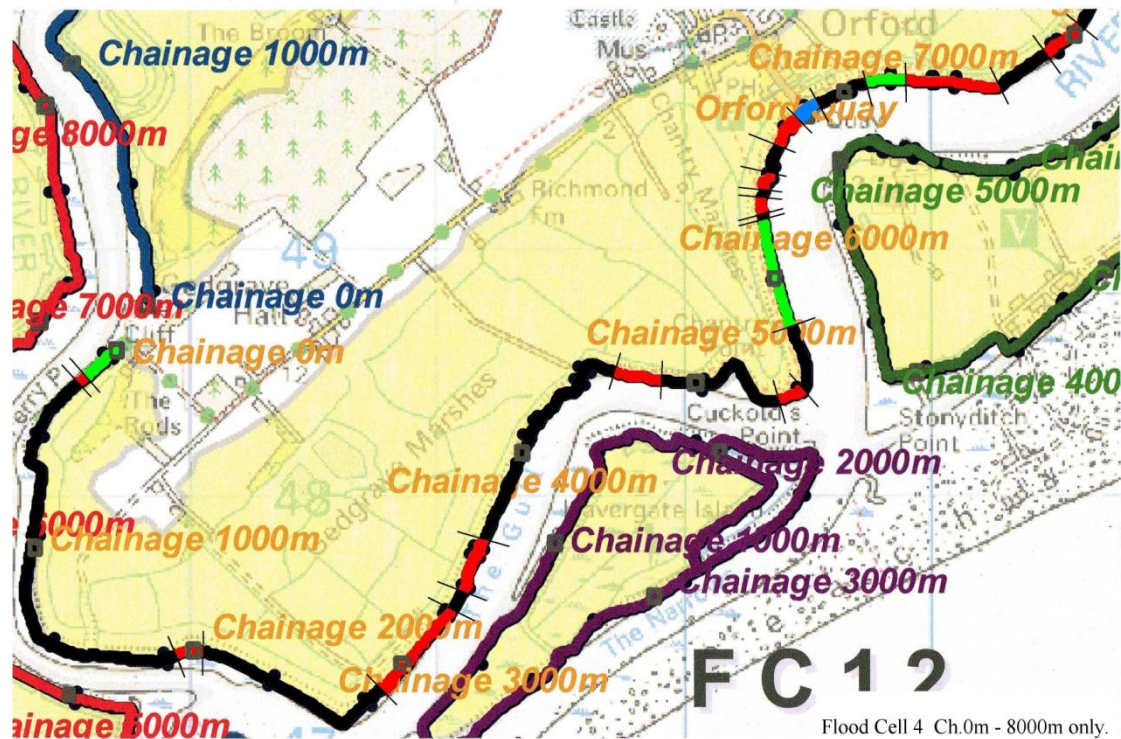


Hawes Associates

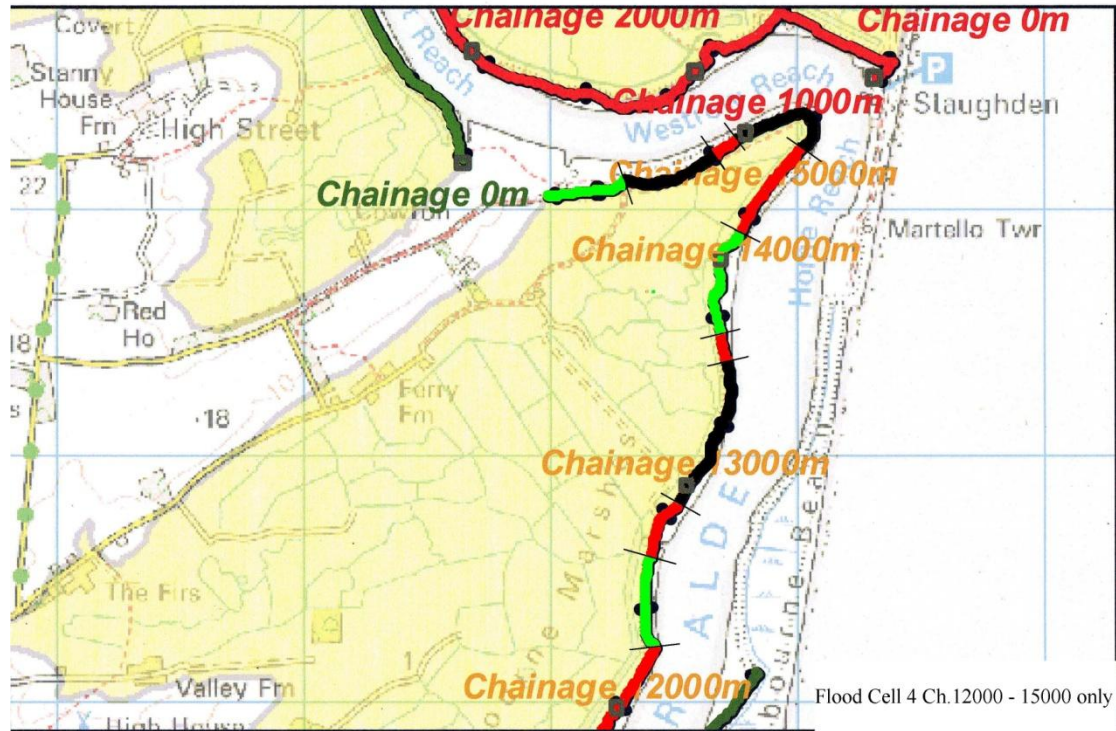
11 Church Walk, Aldeburgh, Suffolk, IP15 5DU
Tel 01728 452535
Email hawes@hawes99.fsnet.co.uk

June 10, 2013

AOEP Flood Cell 04 defence upgrade designs.



Andrew Hawes
BSc Hons Eng Geology & Geotechnics
FGS CEng MICE Supervising Panel 1975 Reservoirs Act



Introduction.

Measures detailed below and on the enclosed drawings are to provide a design upgrade in the form of providing defence survivability during a 1 : 200 surge event in the year 2050 (as defined by the Environment Agency surge modelling 2011). Where the defence already meets or exceeds this criteria no detail is provided.

With reference to the Environment Agency Flood Cell level and chainage data FC 4 extends from Ch 0 – Ch 15,880.

This design report details improvement work required, its position and extent along the flood cell levee or dyke. The detail enclosed is suitable to provide to nominated contractors for costing.

Increasing height of levees.

Raising of crest level to 1 : 200 surge level in 2050, less 300mm, the survivable overtopping depth.

Method: See design section “**Flood Cell 04, examples of heightening**”
05/06/2013

Phase 1.

Scrape 100m topsoil from footprint of proposed clay fill and clay borrow. Stockpile adjacent to works.

Phase 2.

Dig shallow clay and compact into landward toe of new earthworks, deep clay may need to be stockpiled to dry. All fill to be layered in with loaded plant and trimmed with blade and sheep's foot. All plant to run along fill layers parallel to line of bank.

Phase 3.

Complete filling to required crest level and final shaping.

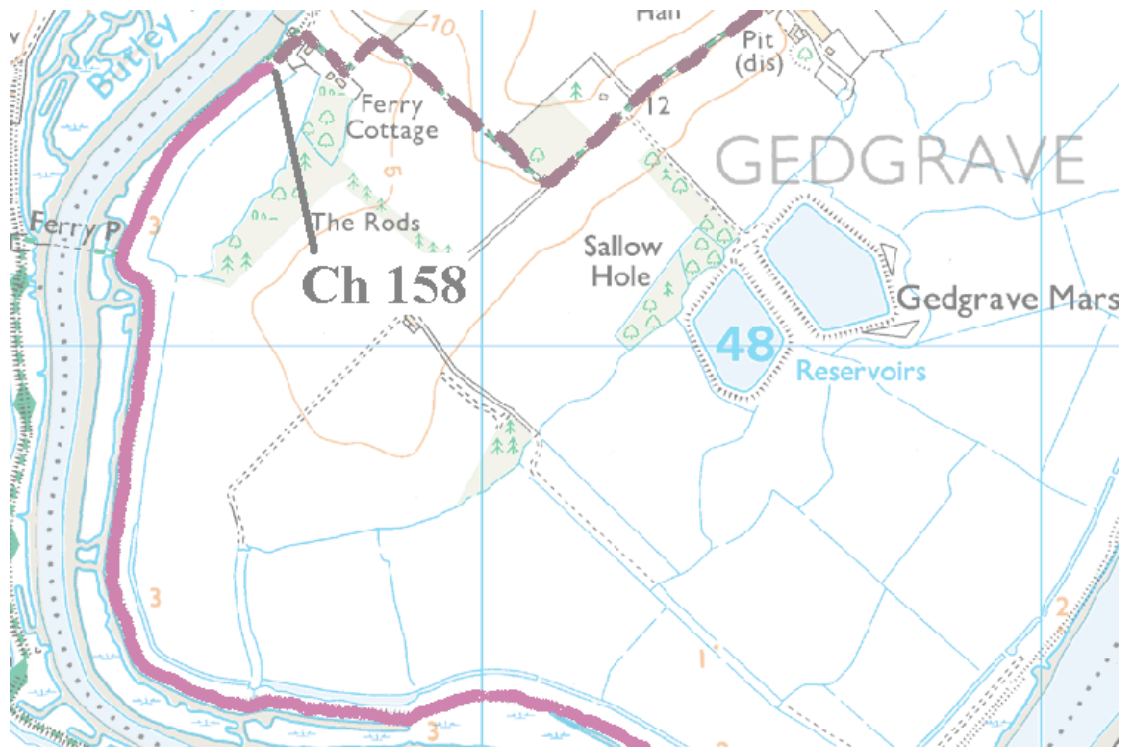
Phase 4.

Place layer of smoothed topsoil to depth of 100mm, hydro seed crest and landward slope.

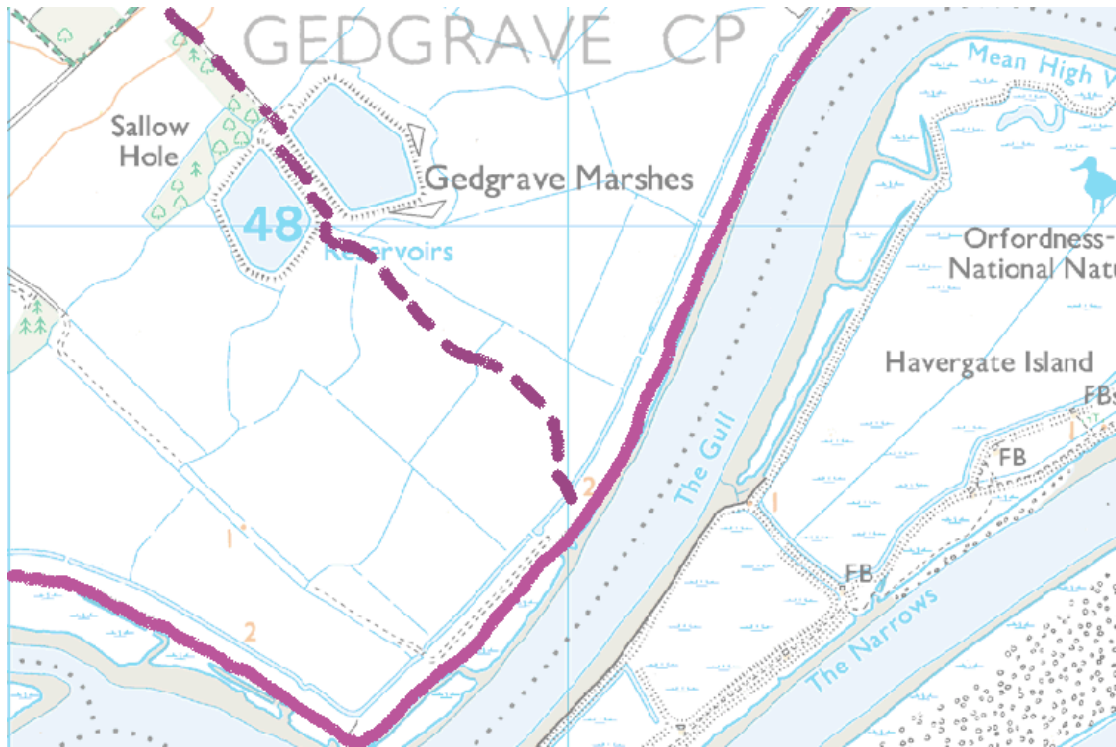
Chainages	Length
158 - 5864	5706
6234 - 6600	366
7261 - 8495	1234
8797 - 9333	536
9568 – 10670	1102
11261 – 11811	550
12932 – 13555	623
14443 – 14600	157

Total = 10,274m

Solid line, length of levee to be raised, dashed line access route:



View south from Ch 158.



View west north west from Ch 2300 showing clay stockpile.



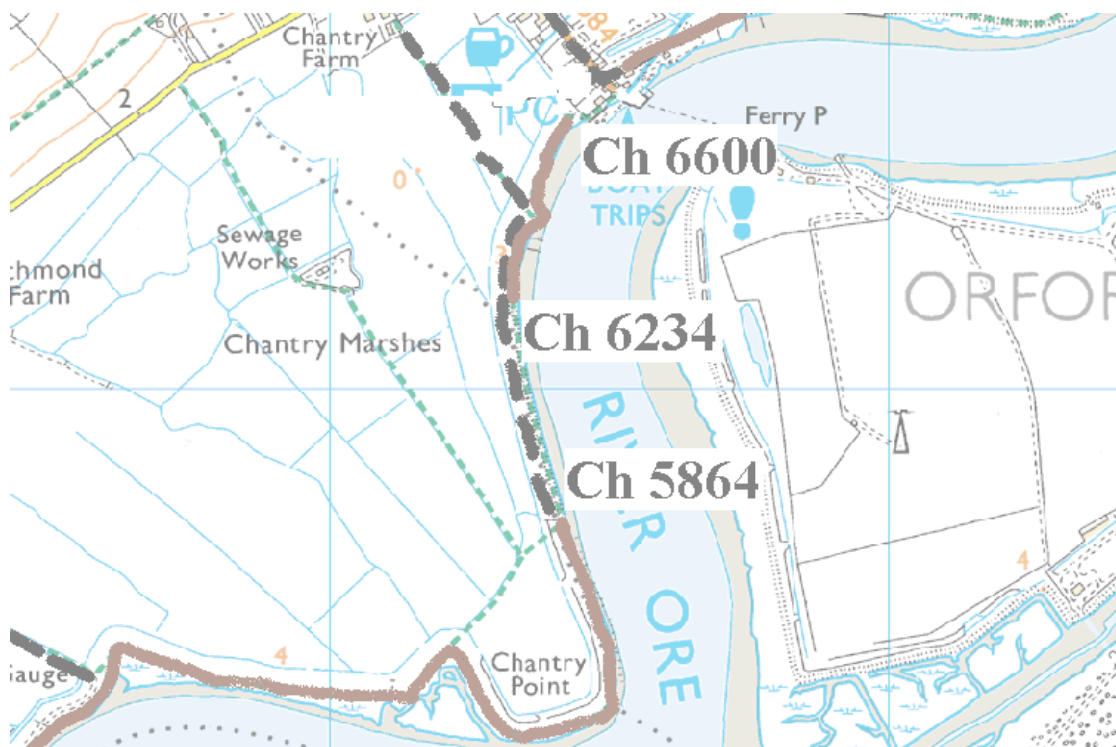
View north east from Ch 2800 showing borrow ditch and windrowed clay drying for use in levee.



View north east from Ch 3100.



View north east from Ch 4200 showing dead men anchoring for pile wall along the seaward side of the levee.

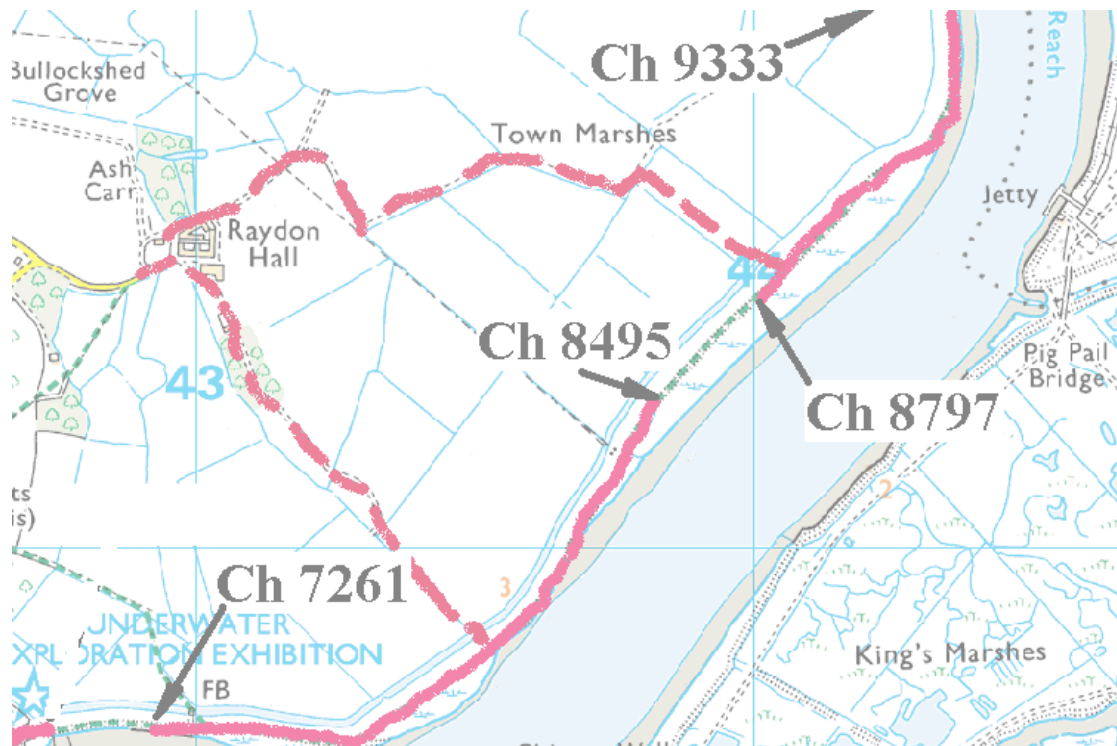




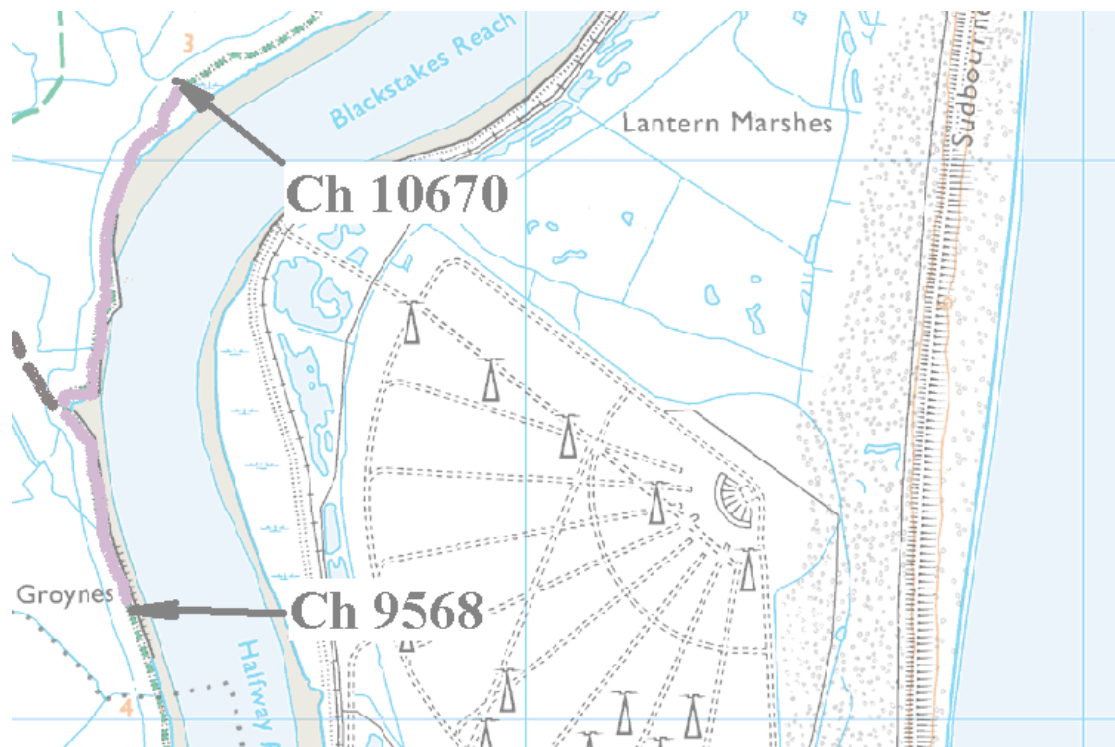
View north east from Ch 4500 showing contrast in grass condition from sheep grazed to un grazed.



View north east along footpath bypassing Chantry Point.



View north east from Ch 7700.



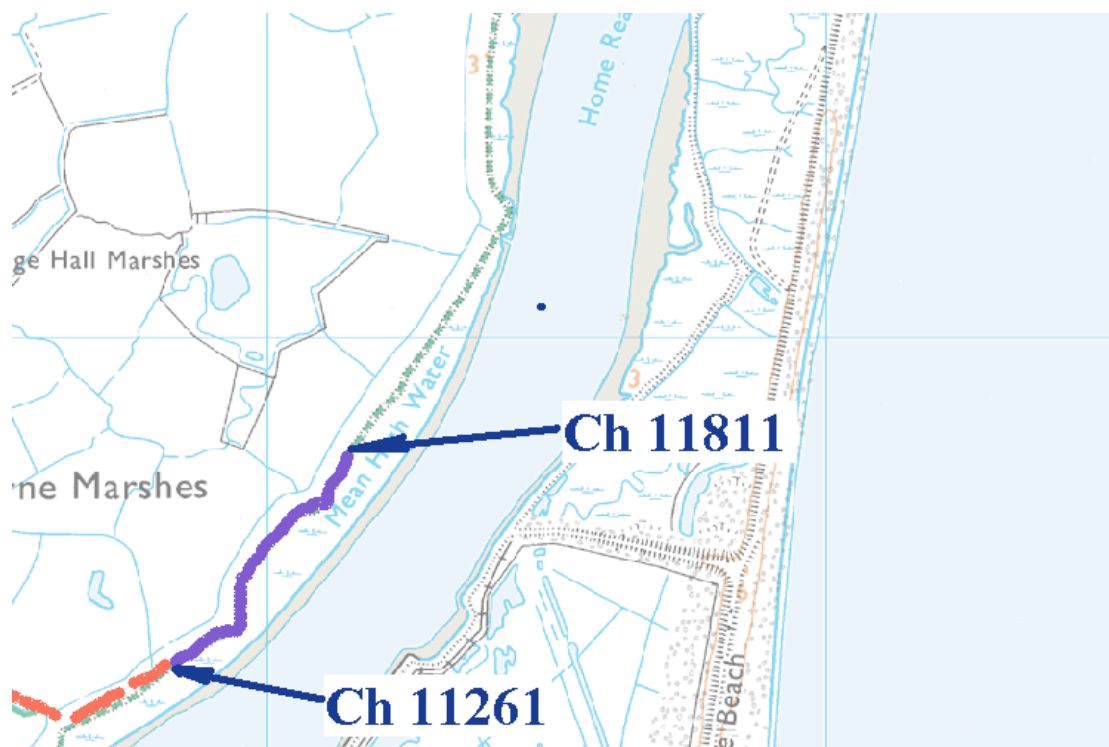
View north from Ch 9200.



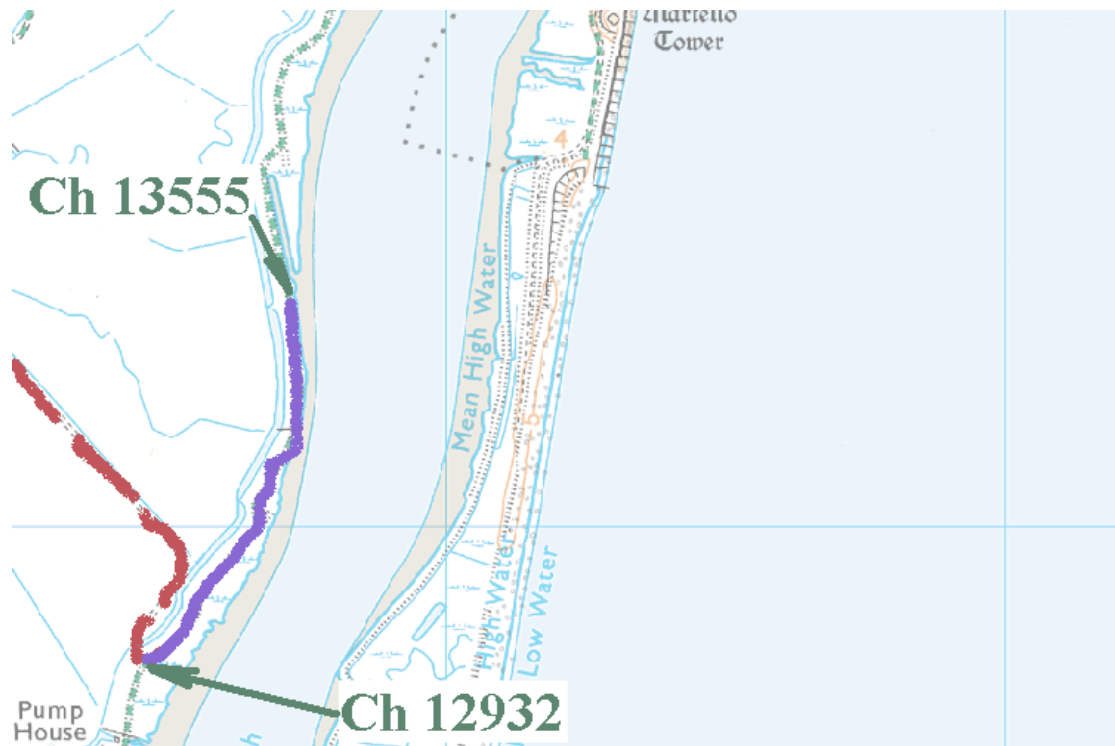
View south from Ch 10000.



View west from Ch 1050, showing derelict sluic



View north east from Ch 11800.



View looking north of Pump House at 12800.



View looking south from Ch 14600 showing reduction in borrow area.

Turf reinforcement and bank strengthening.

Crest level at or above 1 : 200 surge level in 2050, less 500mm, the survivable overtopping depth when turf armoured and bank anchored.

Method: See enclosed design section “Flood Cell 04, design upgrade using turf reinforcement mesh and earth anchors.” 09/06/2013

Phase one.

Cut grass very short on landward bank and crest, collect all cuttings and pile adjacent to borrow ditch.

Phase two.

Re profile landward embankment crest to remove over steepened crest.

Phase three.

Construct 300mm deep anchor trench of mesh along top edge of re profiled landward crest.

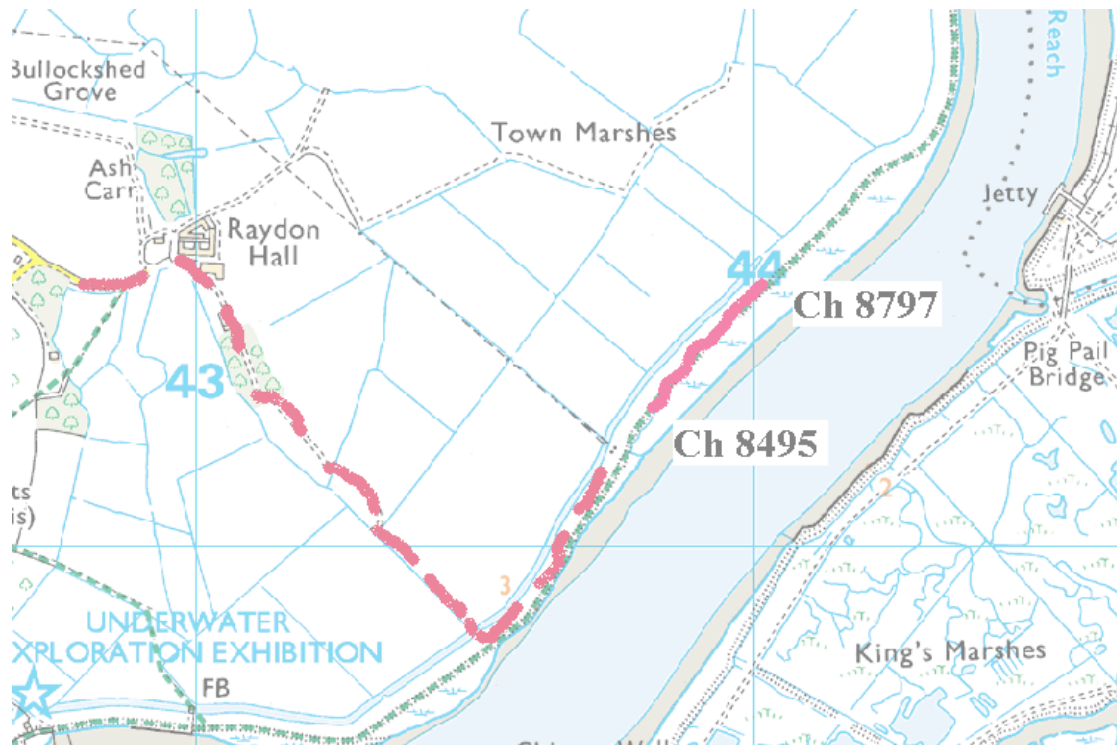
Phase four.

Lay double twist galvanised UPVC coated mesh (see Specification) into anchor trench and down from crest to landward toe of embankment. Join all edges with Spenax stainless steel rings at 200mm centres. Compact arisings into trench to secure mesh.

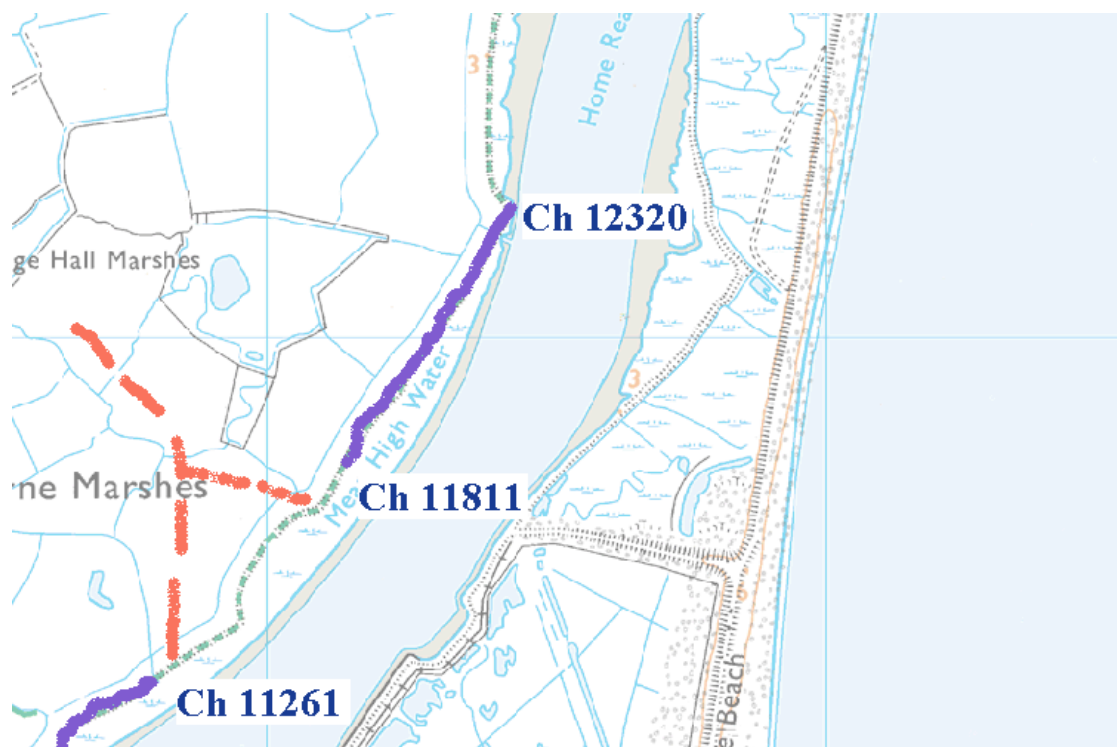
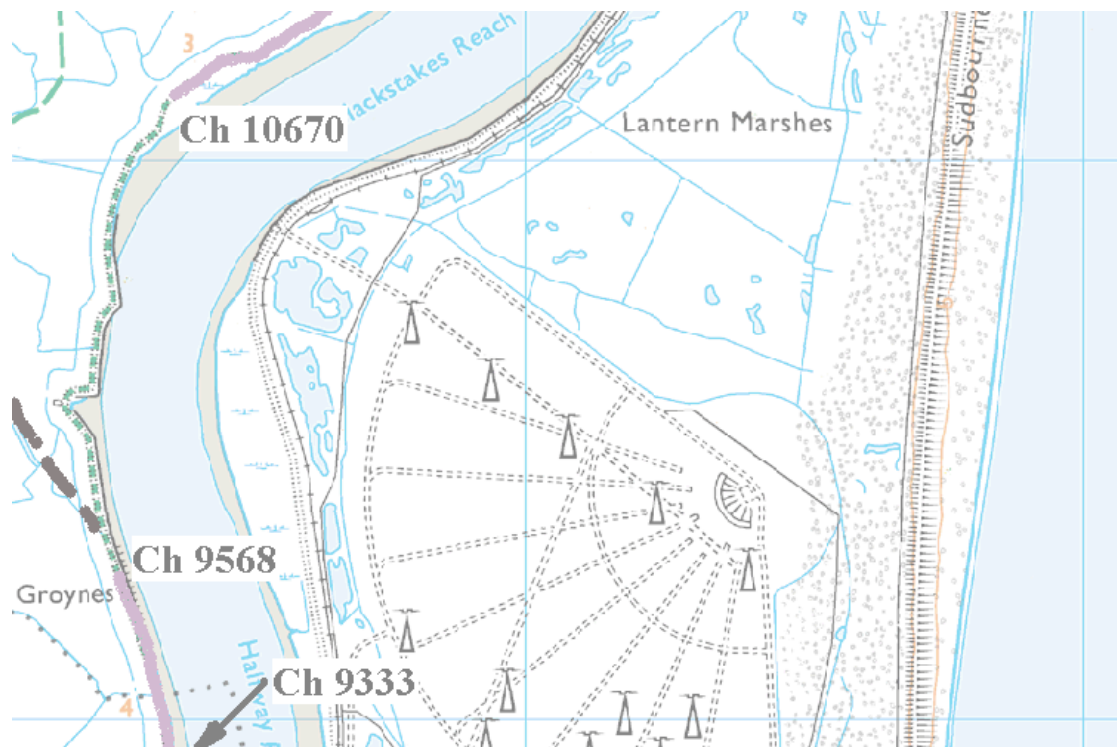
Phase five.

Install mechanical anchors (see Specification), two rows at 2m horizontal centres, as shown in design sketch. Profile all meshed areas not in contact with ground, allow two U pins/m.

Chainages	Length	
8495 - 8797	302	
9333 – 9568	235	
10670 – 11261	591	
11811 – 12320	509	
12676 – 12932	256	
13555 - 13655	100	
14160 - 14443	283	Total = 2,276m



View north east at Ch 8400 from re vegetated borrow strip, adjacent to borrow ditch, to raised bank on horizon.

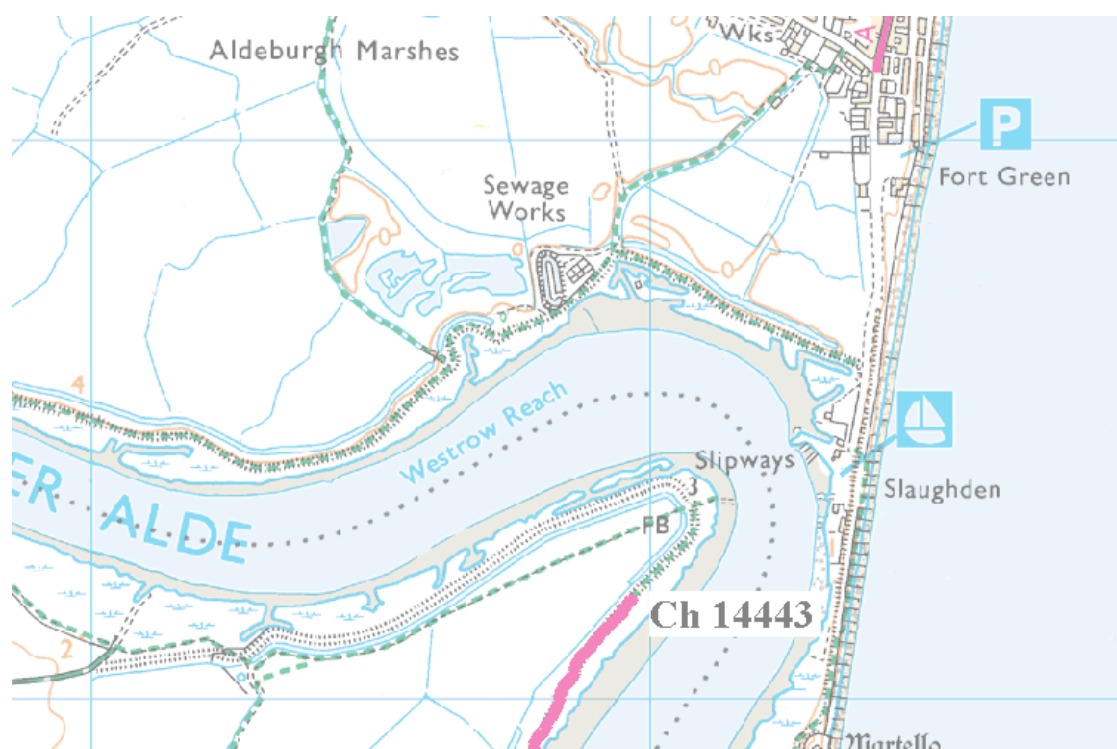
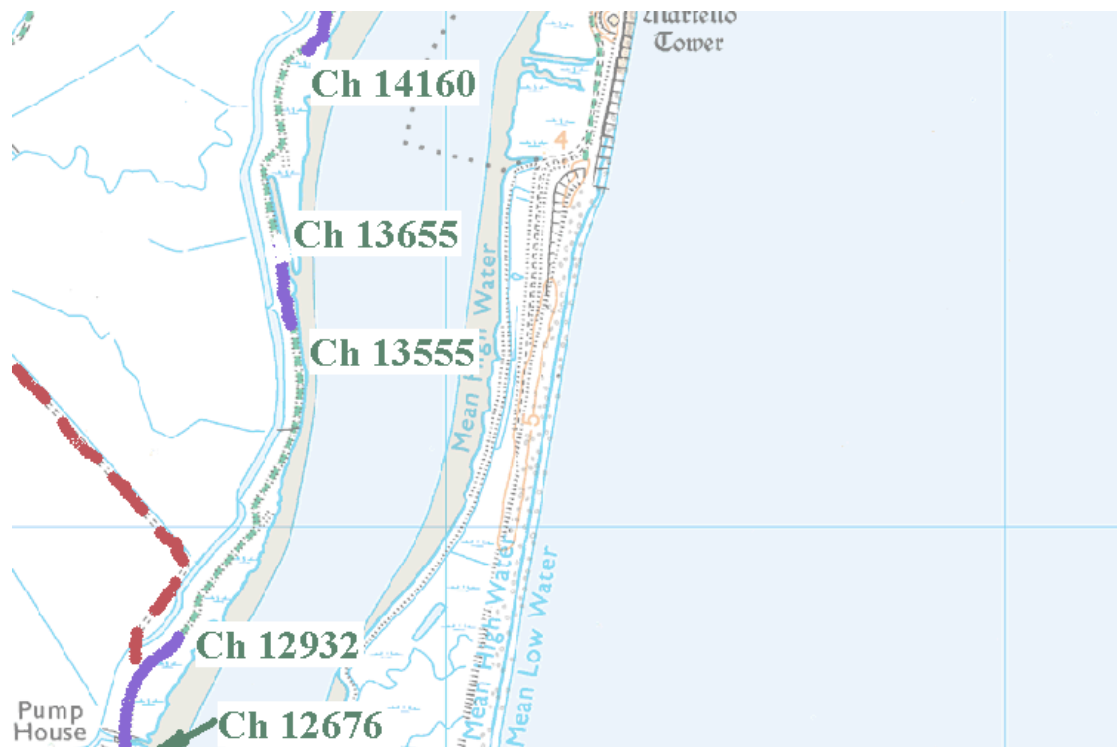




View north east from Ch 12000



View north east from Ch 12200 showing derelict sluice.



Turf reinforcement and bank strengthening with earth anchors and Armorflex blocks.

Crest level at or above 1 : 200 surge level in 2050, less 585mm, the survivable overtopping depth when turf armoured and bank anchored and crest raised with 85mm thick Armorflex blocks.

Method: See design section “Flood Cell 04, design upgrade using Amorflex blocks, turf reinforcement mesh and anchors.” 08/06/2013

Phase one.

Cut levee grass along crest and landward bank very short.

Phase two.

Lay double twist galvanised UPVC coated mesh (see Specification) down from crest to landward toe of embankment. Join all edges with Spenax stainless steel rings at 200mm centres.

Phase three.

Install mechanical anchors (see Specification), two rows at 2m horizontal centres, as shown in design sketch.

Phase four.

Profile all meshed areas not in contact with ground, allow two U pins/m.

Phase five.

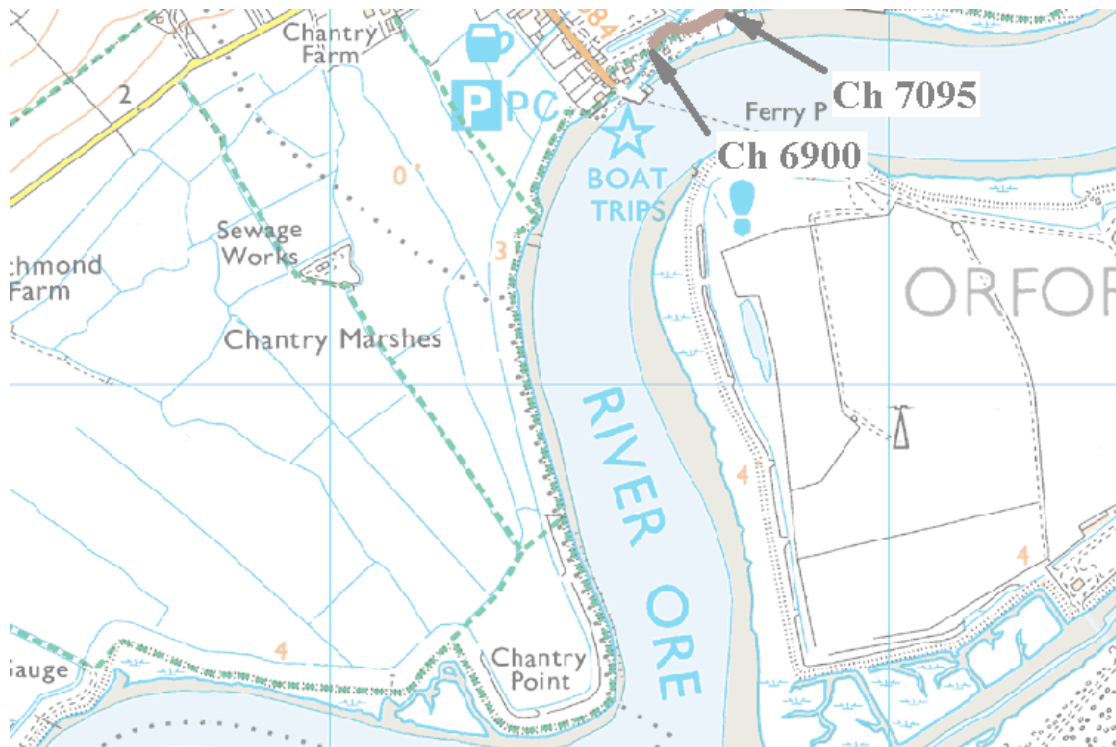
Place Amorflex 140 in two rows, pinning each landward block with rebar pin 500mm long, terminate 20mm below block surface.

Phase six.

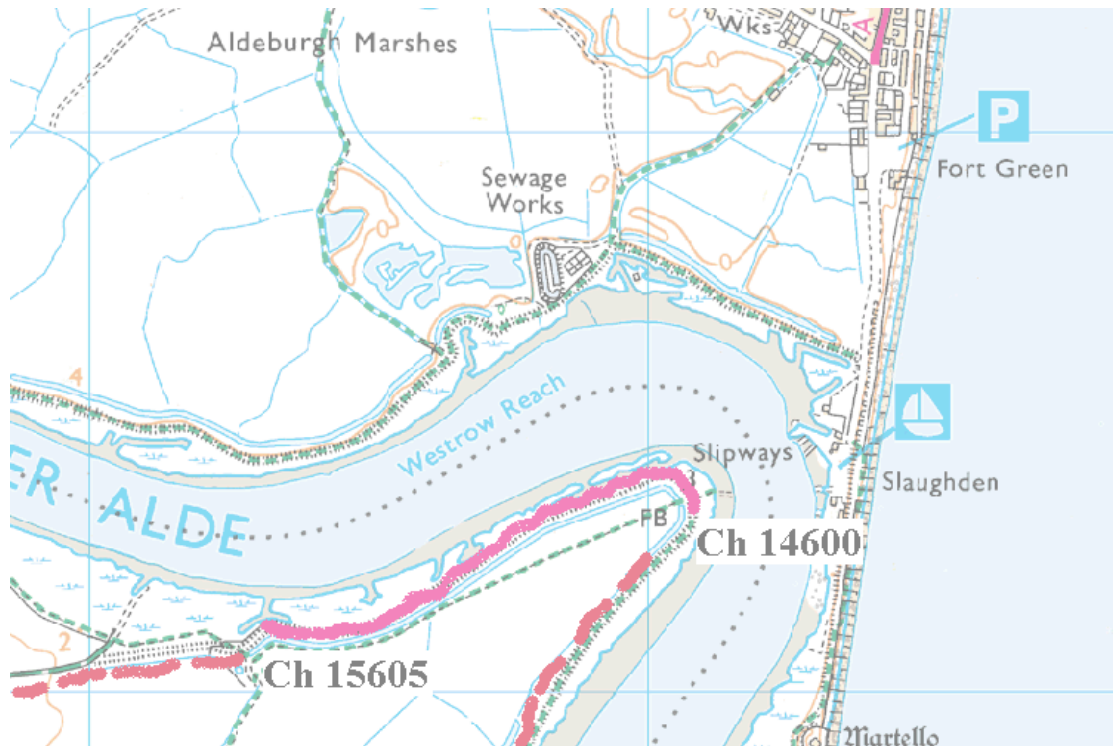
Work turf/topsoil mix, taken from tow, into blocks and surround.

Chainages	Length
6900 – 7095	195
14600 – 15605	1005

Total = 1,200m



View looking east from Ch 6900, no space available for borrow clay and path worn by foot fall.



View looking east from 14700, the Slaughterden Bend, showing space restrictions preventing local borrow. Measures proposed do not result in any encroachment into the level space between the toe of the levee and the existing borrow ditch fence.



View west from Ch 15400.

Andrew Hawes

A handwritten signature in blue ink, which appears to read "Andrew Hawes". The signature is stylized and written on a light-colored, slightly textured background.