The Community Forum has been working on a full report of options to submit to the Cuckmere Estuary Partnership. A version of the report was edited, with the agreement of the author, to focus specifically on the option descriptions as an aid to discussion at the workshop held on 14 December 2010. The full report will be brought in to the discussion when the wider public have had an opportunity to hear the results of the Pathfinder commissioned focus studies. Please find the version used in the 14 December workshop below.

Cuckmere Estuary Community Forum

Seven Options: Joint Report for the Working Group by the Options, Landscape, Geomorphology and Tourism Groups

1. INTRODUCTION

1.1 The purpose of this paper is to identify and describe seven options for the estuary's future.

1.2 This document is presented in nine sections:

1. Introduction
2. Option A: Partial breach managed realignment (EA Option 3a)
3. Option B: Full breach managed realignment (EA option 3b)
4. Option C: Engineered reactivation of meanders & meandering creeks
5. Option D: Maintain the existing defences (EA Option 2a)
6. Option E: Sustain the existing defences (EA Option 2b)
7. Option F: Sustain the existing defences
8. Option G: Tidal flood barrier
9. West Beach revetment

Appendix A – map 1 for Option A
Appendix B – map 2 for Option B
Appendix C – map 3 for Option C
Appendix E – picture of tidal tilting gate for Option G
Appendix F – picture of tidal V lock gate to go with Option G

Note: all maps and illustrations provided by the Community Forum Options Group.

2. OPTION A: PARTIAL BREACH MANAGED REALIGNMENT (Environment Agency 2007 option 3a)

2.1 Description

2.1.1 Partial breach realignment involves the admission of tidal water into cells B & C through artificially created breaches in the existing embankments, which are otherwise to be left intact. The four arrows on the EA's map

indicate possible locations for the breaches in the embankments, though they could be in different places. The purpose of this scheme is to encourage saltmarsh development in cells B & C and allow siltation in an upwarping saltmarsh environment; this will keep the land level building up at the same rate as the rising sea level.

2.1.2 An additional embankment 200m long would connect the current east bank of the river to the eastern valley side, to stop the tidal water that enters cell C from flooding cell A and also give flood protection to the Foxhole valley. The existing east bank of the Cuckmere would require raising and strengthening twice – once at the start and once after 50 years; it would also require annual maintenance. The area of the canoe barn and meanders, cell A, would be left entirely unchanged, including the footpath access.

3. OPTION B: FULL BREACH MANAGED REALIGNMENT (Environment Agency 2007 option 3b)

3.1 Description

3.1.1. Full breach realignment involves the admission of tidal water into cells B & C as above but also cell A (the area of the floodplain containing the canoe barn and canoe lake). Tidal water would be admitted by way of restricted breach points in the embankments. Otherwise, the embankments will be left intact; it is envisaged that the embankments will create a more sheltered environment for saltmarsh to develop. The breach point for cell A would be at the southern end of the canoe lake, admitting water into the meanders and flanking floodplain, with the aim of fostering saltmarsh development there. Arrows on the EA's map are suggested locations for breaches, not finally decided.

3.1.2. It also involves the creation of a major new embankment running across the floodplain from approximately 30m south of Exceat Bridge to the eastern valley side about 100m SE of the Visitor Centre. The intention is to prevent tidal water from reaching the A259, form a northern boundary for cell A and (perhaps incidentally) leave a small segment of the meanders as a truncated canoe lake. A second new bank would be created to separate cells A and C, following a different route from the bank in Option 1 and allowing inundation of the Foxhole valley.

3.1.3. An area at the western edge of cell C will be excavated to create a reservoir that will enlarge the Cuckmere's tidal compartment [volume of water stored at high tide] and help to increase flow at the river mouth on a falling neap tide. It is envisaged by the EA that the river mouth would maintain itself in its present position, because of the larger volume of water flowing through it.

3.1.4. Diversions of valley-side rights of way would be necessary, as in Option A. Short footbridges could ensure continuing access along the two valley-centre rights of way.

4. OPTION C: ENGINEERED REACTIVATION OF MEANDERS AND SALTMARSH CREEKS

4.1 Description

4.1.1 The valley floor would be restored as a fully functioning tidal estuary, complete with active tidal river meanders and branching networks of tidal creeks with flanking saltmarshes. The landscape would retain much of its present visual appeal (meanders crossing a vegetated floodplain), together with branching networks of small meandering creeks nested within the larger meanders of the tidal river channel. It would be geomorphologically, hydrologically and ecologically diverse – and therefore of great tourist and educational interest. There would be improved access along both sides of the valley to the beach, though the two valley-centre rights of way would be lost.

4.1.2 The scheme goes further than other MR schemes in reconnecting and restoring remnants of the historic creek system. Micro-engineering the floodplain, would re-create a landscape that was (and can again be) an integrated and fully working hydrological system.

4.1.3 The following engineering works would be needed:
1. Raise the A259 causeway by 2m (to 5.7mOD). Revet the causeway's seaward slope.
2. Raise the concrete road on the east side of the valley by 2.5m and continue it along the floodplain edge to the beach.
3. Raise the middle section of the Vanguard Way by 2.5m (to 5-5.5m OD), to ensure that it is above flood level. Make its surface usable by wheelchairs, pushchairs and emergency service vehicles.
4. Dredge the canoe lake of accumulated silt down to current river bed level.
5. Reconnect the meandering reach at upper and lower ends, re-establishing river flow round the meanders.
6. Revet the outer bank of the river bend at Exceat Bridge to ensure flow is diverted into the meandering reach.
7. Backfill the 1846 cut using material from the embankments on each side.
8. Topography creation. Excavate the floors of silted 'fossil' creeks and reconnect the creeks to the river. Create artificial creeks where the original creeks have been effaced. Raise selected areas between the creeks, creating subdued local relief where lower saltmarsh, upper saltmarsh and safe higher nesting sites can be generated.

5. OPTION D: MAINTAIN THE EXISTING DEFENCES (Environment Agency 2007 Option 2a)

5.1 Description

5.1.1 The existing flood embankments along the river would be maintained at their present height by carrying on maintenance work as at present [cost]. Beach sediment would be regularly artificially recycled from the river mouth to the West Beach as at present to keep the river mouth clear of shingle and nourish the West Beach [cost]. Beach nourishment would be required in the future on the East Beach [cost]. The training groynes at the river mouth and the groynes on the West Beach would be maintained as at present [cost], though long-term the training walls at the river mouth will need to be replaced [cost]. In 2008, the Environment Agency estimated the total present-value cost over the next 100 years as £6,290,000 (EA 2008), though this sounds very high and maybe should be recalculated.

5.1.2 According to the Environment Agency, continuing maintenance as at present can only be short-term. As a result of climate change there will be increased numbers of storms and sea level will rise, so the risk of overtopping will increase; in time, even if maintained, the present defences will become inadequate to prevent flooding.

5.1.3 An addendum to this option by the Working Group Chairman deals with the pragmatic maintenance of the flood defences. The proposal is to achieve the continuing maintenance of river embankments by spreading the financial responsibility for the task. It would require riparian landowners to meet their customary obligations; it would similarly require statutory bodies to meet their statutory obligations. This means less public funding, maintains the status quo in landscape terms and keeps options open while we wait and see what happens to sea level, about which there is uncertainty.

Recent observation indicates neglect of the flood embankments. In places the soil and rubble surface of the bank crest has been both worn down vertically and broken away at the edges by pedestrians walking along the bank-crest footpaths and by livestock trampling. At these weak points in the banks overtopping could occur on a very high tide accompanied by very low atmospheric pressure or a south wind. Once overtopped, such points would quickly erode, allowing large volumes of water out onto the floodplain. They could easily be repaired, and relatively cheaply. The concrete revetments reinforcing the channel have similarly been allowed to break up in some places: these would be more expensive to repair. In some places the soil and rubble bank has become eroded behind and underneath the revetment, leaving the revetment suspended and weakened: these could easily be repaired.

6. OPTION E: SUSTAIN THE EXISTING DEFENCES (Environment Agency 2007 Option 2b)

6.1 Description

6.1.1 The river embankments would be built up to accommodate the expected future sea level rise. Raising the height and increasing the bulk of the existing defences would counteract the increasing flood risk as sea level rises. River embankments would be made higher and wider. They would be raised by 300mm at the beginning, with the addition of stone or concrete revetments in places vulnerable to erosion [cost]. In the medium term (20-50 years) the channel would be reinforced with concrete walls or sheet piling to support the second phase of bank-raising, a further 300mm to make 600mm in all, to meet the expected rise in sea level indicated in Defra guidelines [cost]. Sea defences would be added, such as a rock revetment to reinforce the West Beach [cost]. Substantial and repeated engineering works would be needed and the groynes would have to be replaced [cost]. The landscape of the floodplain could be kept looking much the same as now, except that the meanders would gradually be lost through silting (though the silt could be dredged from them in order to ensure their survival [cost]), and after rain there would be pools of standing water on the floodplain. Confining the river between flood banks as sea level rises will lead to an increase in river volume and the erosion and destruction of the saltmarsh areas developing in the channel.

The estimated 100-year present-value cost of this option according to the Environment Agency is £6,947,000 (EA 2008). Once again, a recalculation would appear to be called for, as this figure is only slightly higher than the figure quoted for Option D, yet Option E requires a great deal more in the way of engineering works.

7. OPTION F: SUSTAIN EXISTING DEFENCES

7.1 Description

7.1.1 This scheme differs from Option E in envisaging a single raising of the river's flood banks by 300mm at the outset, to cater for predicted sea level rise during the next 50 years. The engineering aspects have been worked out in detail by EAS, engineering consultants. Surveys of river bank level, computer modelling and flood risk assessment have been carried out as well. The existing banks are seen as sound enough to accept being raised by 300mm, to cope with the raised water levels in 50 years' time as envisaged in current climate change predictions. The proposed design (EAS 2004) involves raising the river's flood embankments by 300mm while maintaining a minimum crest width of 1.5m.

7.1.2 To achieve a minimum crest width of 1.5m, EAS acknowledge that the banks would need to be widened locally: specifically, the short stretch of

bank running along the southern edge of the old boating pool near the Golden Galleon. An impermeable core to the banks would need to be created (EAS 2004, p 3, 3.5), but it is not clear how that will be done. It is not considered by EAS that piping failure due to increased hydraulic pressure would be very likely to happen (p 4, 3.6). There would be some construction and maintenance difficulties, resulting from the narrowness of the bank crest. In spite of the narrowing of the bank crest, EAS believe that armouring will not be necessary, except 'where the main flow of the river is adjacent to the bank and where the width for flow is narrow. . . principally at the north end of the eastern bank.' (p 4, 3.7). The raised banks are thought capable of accommodating a 1 in 200 years flood event.

8. OPTION G: TIDAL FLOOD BARRIER

8.1 Description

8.1.1. A tidal barrier would be installed near the mouth of the Cuckmere. Two alternative designs have been put forward, each providing a dual waterway. Providing two gates separated by a concrete pier would make routine maintenance work easier: one channel can be shut for maintenance, while the river continues to use the other. It is assumed that the current gap between the training walls is the required/ desired width of channel, but the gap could be wider: the EA would need to specify a width in line with the long term goals.

Initially it was proposed that the tidal barrier be located at the inner end of the training works; later it was proposed it be moved to a location 100m upstream. The position of the barrier is critical because, if placed 100m upstream from the inner end of the present training walls, it would necessitate raising the banks and sea defences downstream of the barrier to the altitude of the highest tide level [additional cost].

8.1.2. The first design offered is a tidal tilting gate, consisting of two bottom-hinged gates normally resting flat on the riverbed. The gates would be open most of the time, allowing water in on rising tides and out on falling tides as at present. On very high tides threatening flooding, the barrier could be raised from the river bed, removing the flood danger. With predicted climate change and associated sea level rise, the number of occasions when the barrier would need to be closed to keep the sea out will increase.

8.1.3. The second design is a tidal V lock gate, a vertically-hinged gate system that is regularly used in dry docks and entry into marinas. A tidal V lock gate has been installed at Sovereign Harbour. The gates in both designs would be operated by electrically-powered hydraulic rams.

8.1.4. The principle is the same as for the Thames Barrier, the scale is much smaller. The purpose is to allow the entire floodplain floor behind the flood

barrier to remain in its present state and continue to be used exactly as at present.

9. WEST BEACH REVETMENT

9.1 Proposal for a West Beach rock revetment

9.1.1. The proposal is to construct a rock revetment to support the West Beach. The revetment would be about 150 metres long, if straight, running from the eastern end of the private seawall east-northeast to the western training wall, 200 metres long if curved. A problem with the short revetment already under consideration by the EA, running northwards from the eastern end of the seawall towards the tank trap, is that it would create a vulnerable corner where it leads away from the seawall. Corners like this concentrate wave energy as waves are refracted round them; as a result of this concentration of energy erosion is accelerated. A virtue of the new design is that it continues the line of the seawall, or bends seawards rather than landwards; this would have the effect of stretching the waves rather than compressing them, and so slightly reducing wave energy. The structure would have the character of a freestanding rock groyne, mainly buried within the beach, providing it with a spine. Beach sediment would accumulate on its seaward face.

9.1.2. A bolt-on proposal

The emplacement of a rock revetment in the West Beach would remove several areas of uncertainty and jeopardy. Importantly, it entails no commitment to any particular option for the Cuckmere Estuary as a whole and does not pre-empt the discussion about options, as it can be combined with any of them equally. A decision about the proposal can therefore be made independently of the discussion of the main options. Given that the western training wall is in danger of imminent collapse, the proposal should be given urgent consideration.

Appendix A

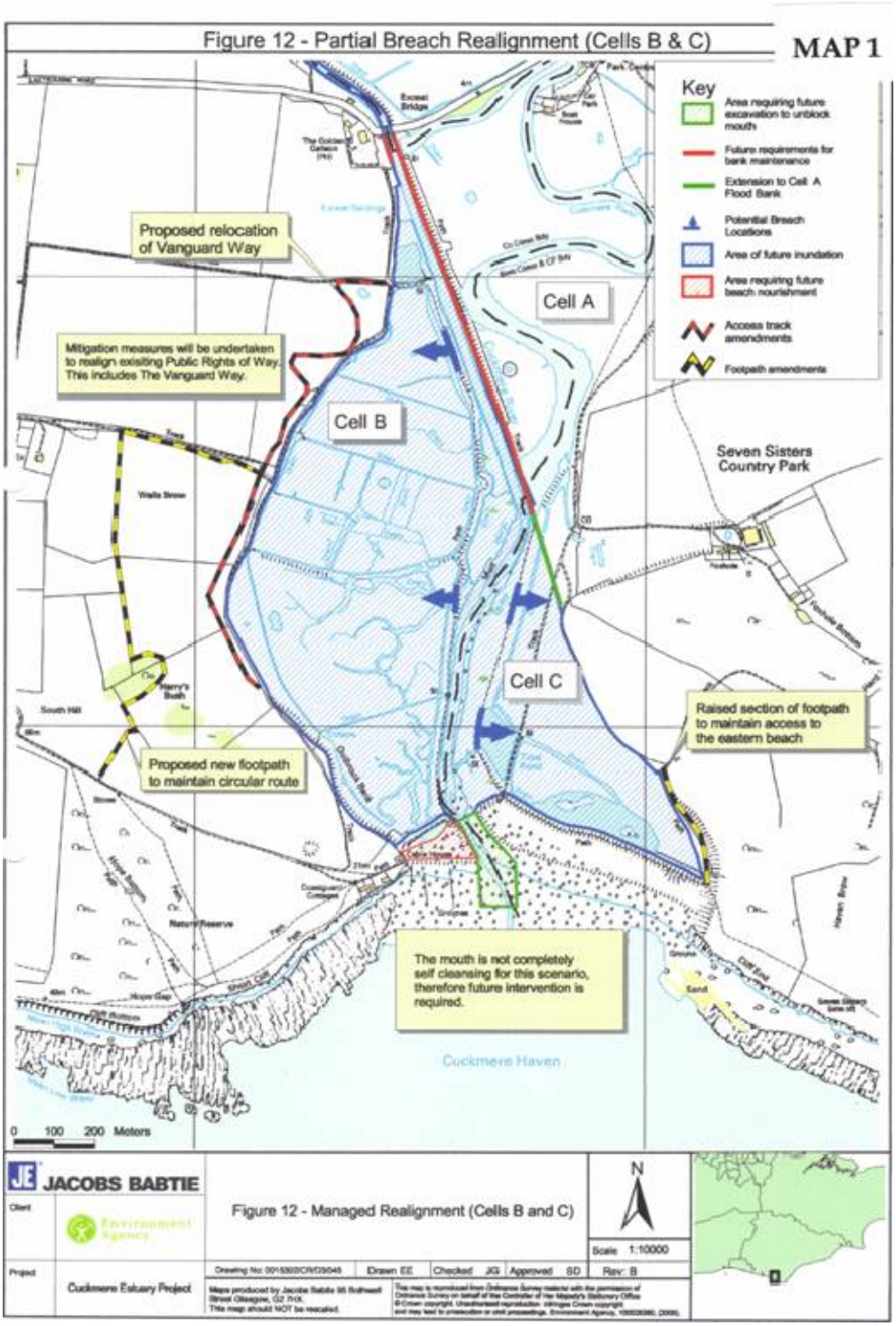


Figure 12 - Partial Breach Realignment (Cells B & C)
MAP 1
Key
Area requiring future excavation to unblock mouth
Future requirements for bank maintenance
Extension to Cell A Flood Bank
Potential Breach Locations
Area of future inundation
Area requiring future beach nourishment
Access track amendments
Footpath amendments
Proposed relocation of Vanguard Way
Mitigation measures will be undertaken to realign existing Public Rights of Way. This includes The Vanguard Way.
Cell A
Cell B
Cell C
Seven Sisters Country Park
Raised section of footpath to maintain access to the eastern beach
Proposed new footpath to maintain circular route
The mouth is not completely self cleansing for this scenario, therefore future intervention is required.
Cuckmere Haven
0 100 200 Meters
JACOBS BABTIE
Environment Agency
Figure 12 - Managed Realignment (Cells B and C)
N
Scale 1:10000
Cuckmere Estuary Project

Appendix B

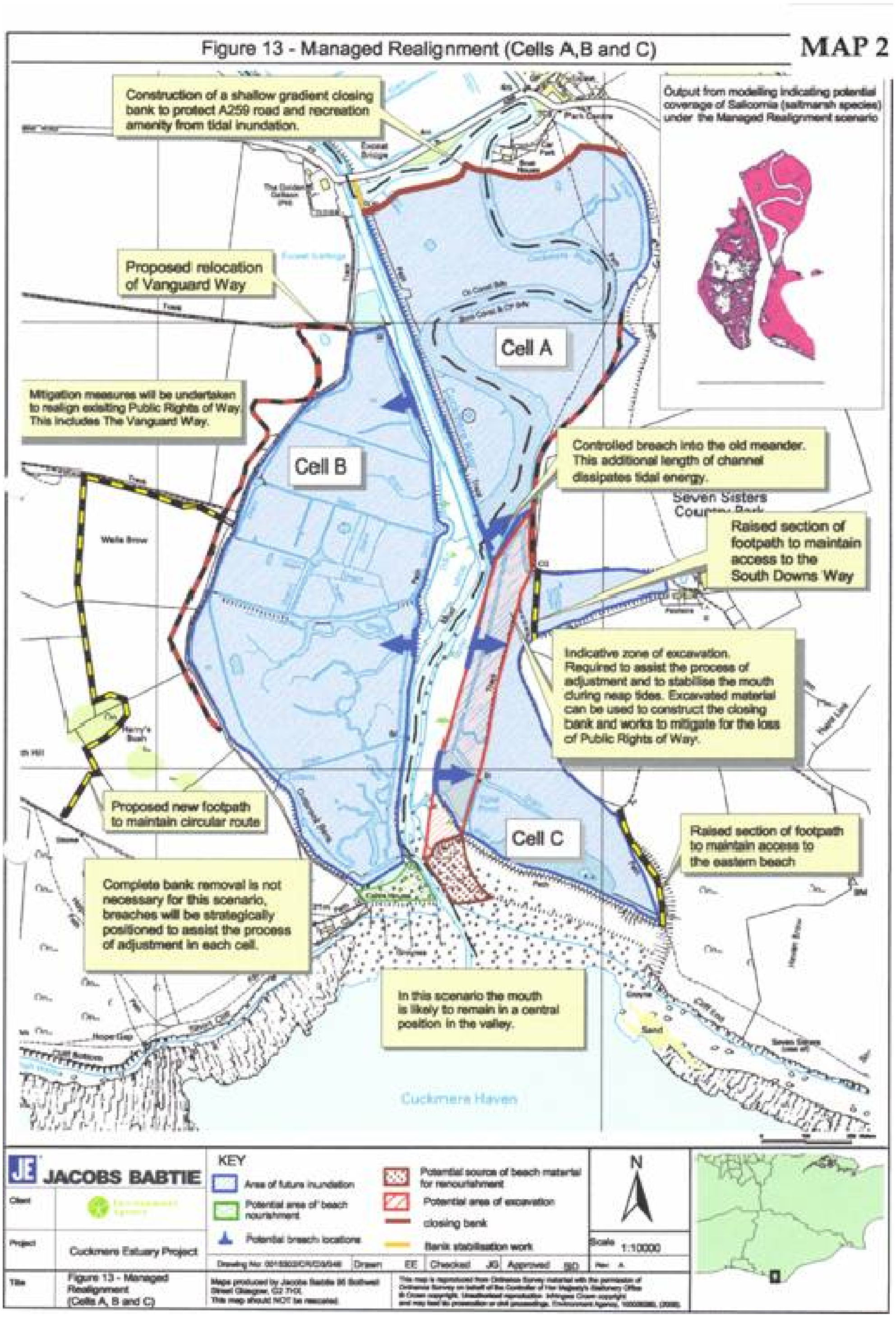
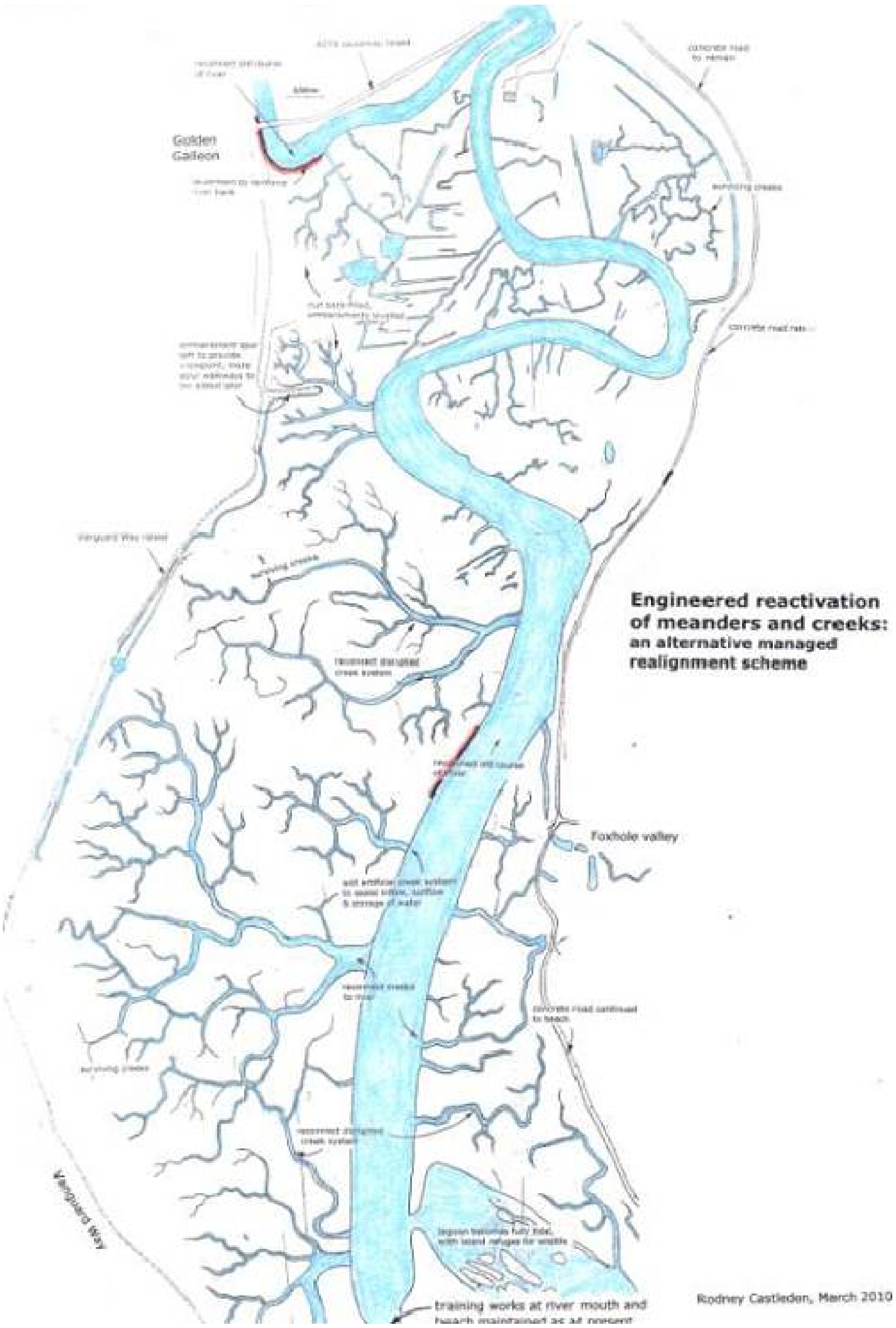


Figure 13 - Managed Realignment (Cells A,B and C)
MAP 2
Construction of a shallow gradient closing bank to protect A259 road and recreation amenity from tidal inundation.
Output from modelling indicating potential coverage of Salicornia (saltmarsh species) under the Managed Realignment scenario
Proposed relocation of Vanguard Way
Cell A
Mitigation measures will be undertaken to realign existing Public Rights of Way. This includes The Vanguard Way.
Cell B
Controlled breach into the old meander. This additional length of channel dissipates tidal energy.
Seven Sisters Country Park
Raised section of footpath to maintain access to the South Downs Way
Indicative zone of excavation. Required to assist the process of adjustment and to stabilise the mouth during neap tides. Excavated material can be used to construct the closing bank and works to mitigate for the loss of Public Rights of Way.
Proposed new footpath to maintain circular route
Cell C
Raised section of footpath to maintain access to the eastern beach
Complete bank removal is not necessary for this scenario, breaches will be strategically positioned to assist the process of adjustment in each cell.
In this scenario the mouth is likely to remain in a central position in the valley.
Cuckmere Haven
JACOBS BABTIE
KEY
Area of future inundation
Potential area of beach nourishment
Potential breach locations
Potential source of beach material for renourishment
Potential area of excavation
closing bank
Bank stabilisation work
N
Scale 1:10000
Project Cuckmere Estuary Project
Title Figure 13 - Managed Realignment (Cells A, B and C)
This map should NOT be rescaled.

Appendix C


Golden
Galleon
Engineered reactivation
of meanders and creeks:
an alternative managed
realignment scheme
Foxhole valley
Vanguard Way
training works at river mouth and
beach maintained as at present
Rodney Castleden, March 2010

Appendix D

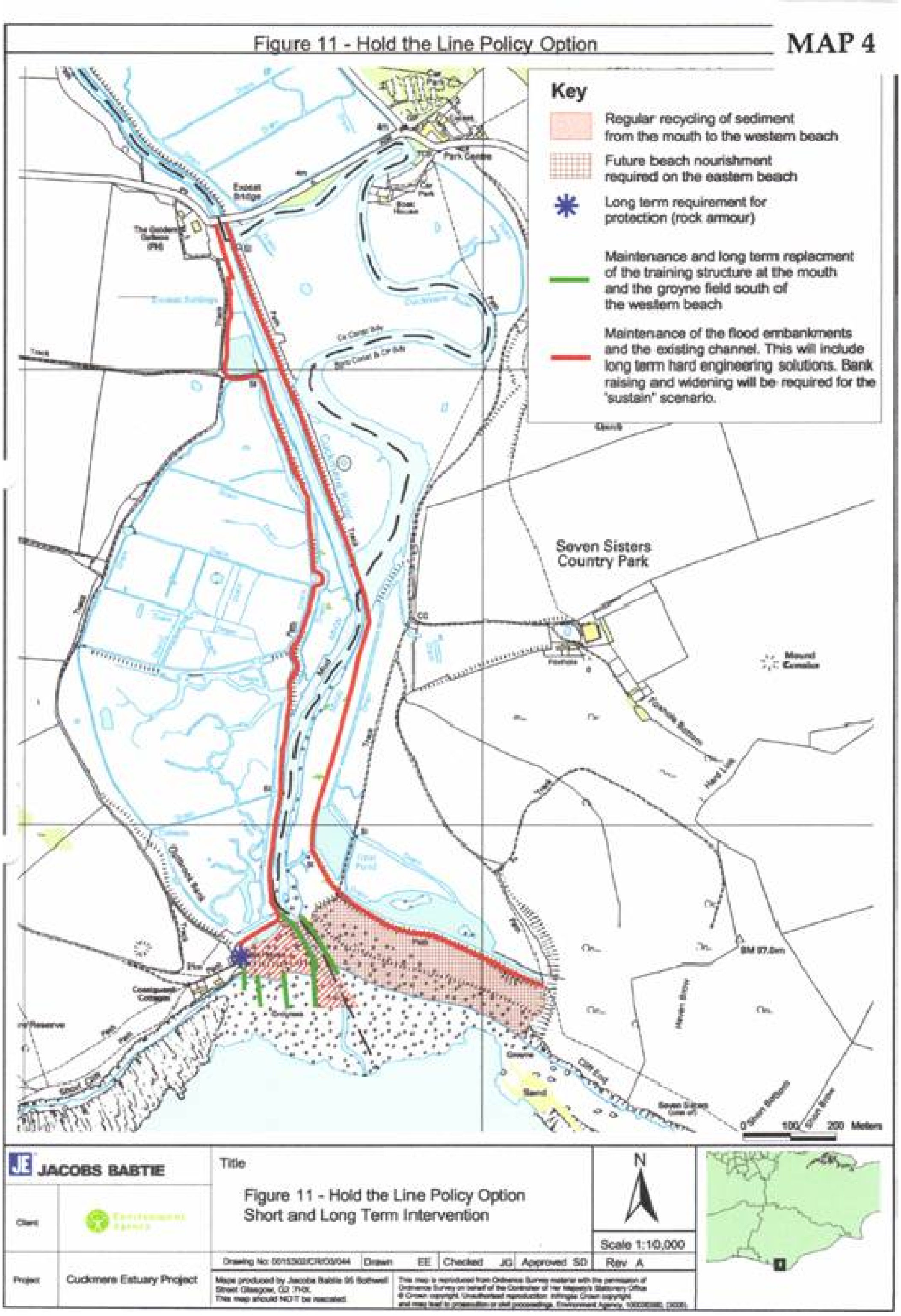
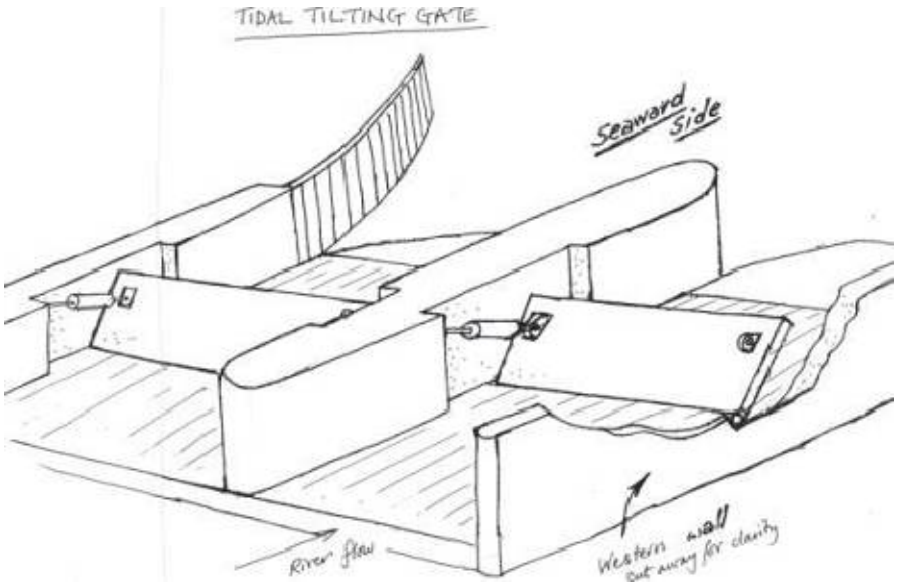


Figure 11 - Hold the Line Policy Option
MAP 4
Key
Regular recycling of sediment from the mouth to the western beach
Future beach nourishment required on the eastern beach
Long term requirement for protection (rock armour)
Maintenance and long term replacment of the training structure at the mouth and the groyne field south of the western beach
Maintenance of the flood embankments and the existing channel. This will include long term hard engineering solutions. Bank raising and widening will be required for the 'sustain' scenario.
Seven Sisters Country Park
0 100 200 Meters
JACOBS BABTIE
Title
Figure 11 - Hold the Line Policy Option
Short and Long Term Intervention
N
Scale 1:10,000
Rev A
Project
Cuckmere Estuary Project

Appendix E



Appendix F