



**National Infrastructure Planning
Cleve Hill Solar Park
CPRE Kent (Reference 20022146)**

STATEMENT TO FROM OPEN FLOOR HEARING 10 September 2019 10 am.

I am Richard Francis

- A Member of the Institution of Civil Engineers 1975
- A Chartered Engineer
- A member of the Excellent Order for the British Empire for services to Flood Relief in Kent (Queen's Birthday Honours List 2001)

I was the Operations Engineer with responsibility for the maintenance and operation of the sea defences and land drainage of the North Kent Marshes including Graveney, working for the Southern Water Authority, National Rivers Authority and Environment Agency 1986- 1995.

My comments will all relate to flood risk matters:

1. The flood risk assessment and modelling only relate to flood depth within the site, and not flood elevation to Ordnance Datum. This is contrary to industry best practice and is unprofessional. This is a significant criticism of CHSs work because no attempt was made to compare the impact of the modeled flooding with that of historical recorded flooding. Such comparison provides a means of benchmarking the accuracy of the flood modelling. In effect I argue that the reports have not received validation and any results should be viewed with extreme caution and are basically unscientific.
2. Managed realignment as proposed by the Environment Agency's Medway Estuary and Swale Strategy (MEASS), has the potential to reduce flood risk at Faversham. I have estimated the benefit to Faversham of the order of 0.5-1.0 metres depth reduction in flooding, i.e. 0.1% AEP event reduced in elevation from 5.85m OD to 5.0m OD. In probability terms this means that Faversham Town is spared any inundation until the storm events exceed 4.0m OD (a 1 in 25 year event) at year 2017. The benefits increase with time due to climate change sea level rise.

The Kent branch of the Campaign to protect Rural England exists to protect the beauty, tranquillity and diversity of the Kent countryside

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Calculation for maintenance costs of Graveney Wall and Nagden Sluice

Length of defence 9.7 km (Faversham to Seasalter) (See Annex 1)

Papers from MRA 1991/92 on maintenance budgets state:
Actual spend – 90/91 £549,208 for defence of length 112 km

Unit rate/km of defence = $\frac{549208}{112} = £4,903/\text{km}$

So, for Faversham to Seasalter (9.7 km)

Total cost (90/91) = $9.7 \times 4,903 = £47,560$

At 2020 prices on construction indices

Year	Index
1990	90
2000	100
2020	180

= 2 x 90/91 prices, so annual cost = £95,130

Add cost of Nagden sluice annual maintenance: allow £5,000 p annum.

So total annual cost \approx £100,000 over 40 years at today's prices \approx £4m (0% inflation). Does not include storm damage.

Calculation to estimate reduction in flood risk in Faversham town due to managed realignment of Graveney marshes sea defence.

1. Managed realignment storage volumes

Every storm event is different in magnitude and shape of hydrological characteristics. So, a typical event is assumed. I have used the one described in Table 1 of section 3.1.1 of Arcus report (May 2018), year 2070 at 0.1% AEP, i.e. Flood elevation 5.92mOD. This gave a modelled predicted depth of water over the marshes as an average of 3.0 metres (max depth 4.85m) (see Fig. 3-17 and 3-18) as undefended. This is a conservative assumption regarding the marshes ability to store flood waters.

Now the marshes have a plan area of some 4,920,000 m² so the minimum storage available for flood water = 3.0 x 4,920,000 = 14,760,000 m³

2. Distribution calculation to estimate where the reduction of flood surge occurs. (See Figure 1)

The distribution has been estimated as pro rata on the channel width. Total flow is 14.76 m³

Flow distribution pathway	Width of channel in metres	% of flow diverted into storage	Relief Volume.Mm ³
Swale	1,250	90	13.3
Oare Creek	65	5	0.69
Faversham Creek	65	5	0.69
Total	1,380	100	14.76

Equates to reduction of flow in Faversham Creek of 32 cumecs over 6 hours.

3. How this distribution of flow relief affects Faversham Creek. (See Figure 2)

Creek channel length 5,000m, so plan area of creek channel = 5, 000 x 65 = 325,000 m² land outside creek channel that is inundated.

Length 3.000m.

Assume flood plain ≈ average 150m wide in Faversham. (See Figure 3)

Plan area of inundated part of flood plain.

$$\approx 3,000 \times 150\text{m} = 450,000\text{m}^2$$

Total plan area of flood plain

$$= 325,000 + 450,000 = 775,000\text{m}^2$$

Now reduction in volume of inundation is 0.69Mm³

4. Benefit to Faversham town.

So, reduction in depth of flooding $\approx \frac{0.69 \times 10^6 \text{ m}}{775,000} = 0.89\text{m}$

5. In estimate terms the benefit to Faversham in the order 0.5 – 1.0m depth reduction of flooding. i.e. 0.1% AEP event reduced in level from 5.85mOD to 5.0mOD. In probability terms this means that Faversham Town is spared inundation until storm events exceed 4.0m OD (1 in 25-year events). Year 2070.

Budgetary information for Canterbury Area Flood Defence (1990)

National rivers Authority - Southern Region
Canterbury Area

Corporate plan figures

	Actual 90/91	Budget 91/92	Forecast 91/92	Planned 92/93	Planned 93/94
SEA DEFENCE					
Maintenance Cost	£71,457	£52,649	£62,451	£69,486	£72,960
Length of Defences Maintained (km)	33	33	33	33	33
Length of Defences Planned to be maintained	33	33	33	33	33
TIDAL DEFENCE					
Maintenance Cost	£549,208	£534,891	£547,509	£561,424	£589,196
Length of Defences Maintained	112	112	112	112	112
Length of Defences Planned to be maintained	112	112	112	112	112
Length of Main river (Tidal, Swale and Stour)	48	48	48	48	48
MAIN RIVER					
Maintenance Cost	£298,228	£320,160	£340,740	£383,160	£402,318
Length of Main River (km)	221	221	221	221	221

Notes

1. Tech Services Control, Building Maintenance and Fixed Plant not included

Fig. 1. Plan to illustrate distribution of flood flows into Faversham Creek

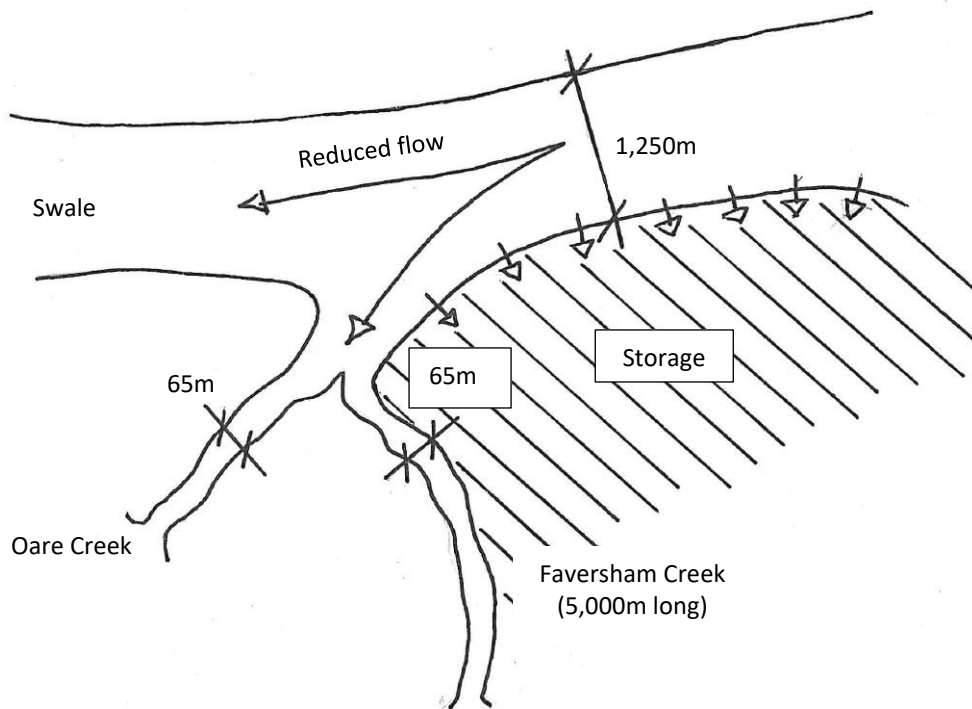


Fig. 2. Cross section of Faversham Creek

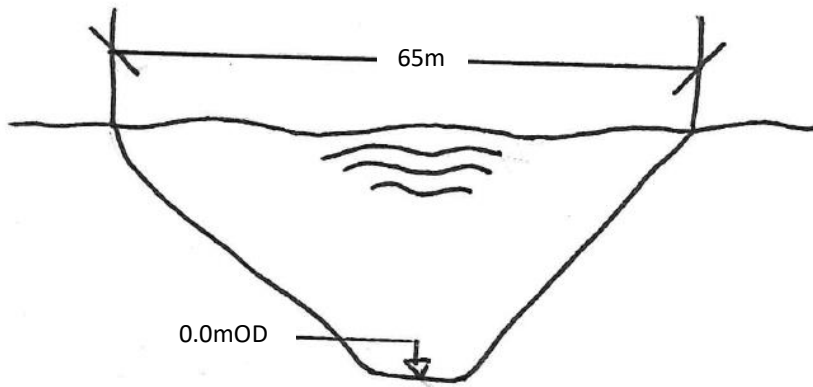


Fig. 3. Plan to illustrate inundated area at Faversham

