Review of Sheppey Airport Proposal

December 2003

Halcrow Group Ltd

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1 Introduction

1.1 Introduction

This note presents the passenger forecasts and the results of the economic appraisal of the Sheppey airport proposal. The proposed airport has up to four runways on a low platform on the Isle of Sheppey. The proposals for Sheppey Airport are modelled on Changi Airport in Singapore. The proposals have been described in a limited way in documentation received from Sheppey Airport Limited (SAL) by DfT and in a report prepared for SAL by Meinhardt (UK) Ltd.

The SAL documents reviewed are:

- Airports in the South East: Response to Green Paper, November 2002
- Submission to the Transport Committee of the House of Commons on Aviation, February 2003
- Further Evaluation of the Option of Developing an Airport on the Isle of Sheppey, June 2003.

1.2 Document Structure

This document is structured as follows:

- Chapter 2 deals with issues relating to the airport layout and capital costs and the operation of the airport
- Chapter 3 deals with issues relating to airport access
- Chapter 4 deals with the forecasting of potential traffic at Sheppey and with the economic appraisal of the proposal

2 Airport Layout and Capital Costs

2.1 Airport Layout

This is a review of the development proposals made by Sheppey Airport Limited, principally as set out in documentation prepared by Meinhardt (UK) Ltd in 2002 and 2003. Those documents provide limited technical detail. The latest document received from SAL has no more additional detail on key impacts of the proposal (eg, the number of properties to be taken, planning guidance compliance, effects on heritage sites, effects on air traffic control) but focuses on a comparison of options at Heathrow, Gatwick and Stansted with the proposal at Sheppey. The salient features of the Sheppey proposal are therefore largely taken from earlier documentation.

Up to four runways are proposed on a low platform over an area generally of farmland. The site area is approximately 12 sq km, around the same size as the current Heathrow site (12 sq km) but considerably smaller than the Cliffe proposal (26 sq km). The proposed layout at Sheppey is fashioned after Singapore Changi Airport. The runways are oriented 09 – 27 in two close parallel pairs. Separations appear to be approximately 1200m and 400m. The 3rd and 4th runways would only take place after 2030. The runways are shorter than the 4,000m runways at Cliffe.

Stand numbers are not given but the site appears to indicate in the range of 60 – 220 stands. A number of stands towards the top end of that range would be needed to accommodate SAL's forecasts of up to 110 mppa. The original proposal, superseded in the June 2003 document, was that the runways would come on stream and provide capacity and generate traffic as shown in Table 2.1.

Table 2.1: Original Proposed Sheppey Development Plan

Year	Runways	Capacity, mppa	Forecast, mppa
2009	2	77	58
2020	3	93	80
2030	4	113	110

The June 2003 proposal envisages only the first two runways and three terminals being in place by 2030. That development plan is summarised in Table 2.2. For the purposes of preparing passenger forecasts, the principal assumptions made by SERAS following discussion with SAL were: two runways to come on stream in 2011, with passenger capacity of 75 mppa and ATM capacity of 530,000 per year.

Table 2.2: June 2003 Proposed Sheppey Development Plan

Year	Runways	Terminals	Capacity, mppa
2012	2	1	25
2020	2	2	50
2030	2	3	75

The proposed layout of Sheppey Airport closely matches that of Changi Airport. The site area is said to be the same and the arrangement of terminals, hangars and cargo facilities is said to closely resemble that at Changi.

The site area is approximately 4 km * 3 km or 12 sq km, comparable to Heathrow (currently 12 sq km) but small in comparison with the proposal at Cliffe (26 sq km), and small in the context of 4 runways.

The site is formed essentially on existing ground levels, at around 7 metres above mean sea level. Tunnel spoil could be used to provide peripheral flood protection. No major earthworks are envisaged until 3rd and 4th runways are needed when some higher ground would need to be levelled.

One advantage claimed for the Sheppey site is its remoteness from populated areas. It is claimed by SAL that no more than 15 residential properties would need to be demolished to make way for the airport and that most of the 35,000 population on the Isle of Sheppey is in the north west of the island, some 12 km from the airport. PSZs are likely to be clear of significant population.

Bird strike hazard has been assessed through a desk study of the bird populations in the vicinity of the proposed airport and a modelling exercise comparable to that in the assessment of bird strike risk at Cliffe. On the basis of these exercises, the Central Science Laboratories (CSL) concur that the bird strike risk is less than at Cliffe and that the probability of hull loss could be comparable to that for existing coastal airports, which has been assessed to be about one hull loss every 400 years.

A similar concept to that at Cliffe is proposed for the rehabitation of birds away from the airport site. Further investigation is needed in order to find out how reliable this concept is.

The airspace impacts of an airport at Sheppey are claimed to be better than Cliffe on the grounds that overflight of London is avoided, there will be less interference with other traffic and there is stacking space over the North Sea. These claims are likely to be valid in principle. It is reasonable to assume that traffic could be accommodated with any necessary airport changes.

2.2 Capital Costs

Table 2.3 summarises the Sheppey and Cliffe A2(2) two runway cost estimates. WT Partnership has been appointed by SAL to give cost planning advice. The cost of a 75 mppa capacity airport at Sheppey is estimated at £6.9 billion.

Table 2.3: Sheppey and Cliffe A2(2) Outline Cost Comparison

Item	Sheppey	Cliffe A2(2)
Terminals & Satellites	1,677	1,479
Aircraft Pavements	299	686
Enabling & Infrastructure	1,001	2,730
Navigational Aids	72	72
Cargo & Maintenance	283	283
Support Facilities etc.	494	494
On costs (25%)	957	1,436
Contingency (25%)	1,197	1,795
Airport development costs	**5,980**	**8,975**
Land acquisition	96	189
Total including land	**6,079**	**9,164**
Landside road access	800	221
Landside rail access		461
Total including access	**6,879**	**9,846**

Table 2.4 compares costs between Cliffe and Sheppey on the basis of cost per 1mppa of added capacity. For the Cliffe option used here, the added capacity is 77 mppa off two wide spaced parallel runways: for Sheppey it is 75 mppa.

Table 2.4 Costs per Unit of Capacity Added

	Sheppey	Cliffe A2(2)
Claimed capacity added	**75**	**77**
Airport Costs	6,079	9,164
£m/mppa	**81.1**	**119.0**
Costs including surface access	6,879	9,846
£m/mppa	**91.7**	**127.9**

The Sheppey costs per mppa are almost 30% lower than the Cliffe costs, with aircraft pavements and enabling works & infrastructure costs causing the Sheppey costs to be lower.

Aircraft pavements: The Sheppey proposal is based on 301,500 sq m of new runways and 2,500,000 sq m of taxiways, around 2.8 million sq m of pavement in total. The Cliffe A2(2) pavement costs are based on 640,000 sq m of new runways, 485,000 sq m of taxiways, 468,000 sq m of aircraft stands and 3,680,700 sq m of new aprons. This amounts to almost 5.3 million sq m in total. More information about the Sheppey proposal would be needed to understand whether the Shepepy estimates can be considered as reasonable.

Enabling costs are dominated at Cliffe by earthworks costs: 119 million m^3 of excavation and of fill are assumed at a cost of £1.6 billion. At Sheppey the equivalent quantities are 36 m^3 at a cost of £0.5 billion. The size of the proposed Sheppey site and its elevation above mean sea level have been commented on above. Again more information would be needed to confirm the reasonableness of the Sheppey assumptions.

3 Airport Access

3.1 Rail Access

The SAL proposal is predicated on large scale use of rail to access the airport. The June 2003 submission refers to:

- Discussions held with London and Continental Railways and Union Rail
- An assessment of the capacity of the Channel Tunnel Rail Link (CTRL) and its ability to handle a maximum of 67% of airport passengers accessing the airport by rail
- A statement that Union Rail has confirmed that CTRL line capacity and St Pancras station capacity would be able to accommodate such a loading
- Journey times of between 28 and 32 minutes between St Pancras and Sheppey and 10 minutes longer to Waterloo
- Provision for Park & Ride at remote airport 'terminals' over rail stations at Ebbsfleet 'and other accessible stations on CTRL'
- Remote airport terminals will be built above stations on the CTRL at Ebbsfleet, Ashford and Farningham (where the M25 crosses CTRL) and at St Pancras Stratford and Waterloo
- Passengers will be directed to these remote terminals for check-in. Checked-in baggage will travel separately from passengers in sealed compartments. Passport and security controls will be completed on the train. Passengers will be airside when they arrive at the airport.

SAL suggest that one of the benefits of their proposal is that the increased use of the CTRL will reduce the very considerable cost of CTRL to the public purse. The November 2002 submission suggested that CTRL capacity is under-utilised and that Sheppey airport services would make use of the spare capacity on CTRL.

In fact current proposals for Eurostar and domestic services on CTRL mean that 4 tph, a minimum level of service that might be required to provide a level of service to attract and accommodate Sheppey passengers, could only be accommodated by reducing some other frequencies.

Real issues relating to rail journey times and the capacity of CTRL are raised by SAL's station stopping proposals. The proposal is that airport services will, on leaving St Pancras, stop at Stratford, Farningham and Ebbsfleet on their way to Sheppey Airport. The SERAS assumption was that non-stop services between Cliffe and St Pancras would take 26 minutes, but this would increase to 30 minutes with a stop at Stratford. The SAL proposals for two further stops and a more distant airport mean that the proposed 28 to 32 minute journey time is unlikely to be achieved.

Importantly, the additional stops proposed will reduce the capacity of CTRL. More needs to be done to establish:

- required service frequencies on CTRL
- stopping patterns
- running times
- effects on line capacity
- effects on other services.

Once these issues were clear an airport mode split forecast could be made. Claims by SAL that of the order of 50% or up to two thirds of passengers might access the airport by rail could be tested. These proportions are high relative to observed and modelled proportions elsewhere. Observed passenger public transport mode shares (including bus services and courtesy coach services) of around 40% have been observed at airports well served by rail (eg, Stansted, Gatwick, Schipol).

SAL say little about employee access, which more typically is heavily oriented to private transport. At Heathrow, with a large labour catchment close to the airport and extensive local bus services, some 23% of employees are attracted by public transport.

The numbers, whether passengers or employees, wishing to access Sheppey Airport by road are likely to be higher than SAL acknowledge. The SAL proposal relies on access to the airport via a 10 km road link to the A249, currently being upgraded between Iwale and Sheerness with a new bridge onto the Isle of Sheppey. There is thus only one road into the airport and no effective road connection to the north side of the Thames and its large labour catchment areas.

3.2 Surface Access Costs

The surface access costs allowed for in the SAL proposal are £700 million for a rail connection to CTRL and £100 million for the 10 km road link on the Isle of Sheppey.

For a two runway airport at Cliffe, £460 million was allowed for a shorter, at-grade rail connection to CTRL. The Sheppey proposal is longer and in part in tunnel under the North Downs. £221 million was allowed for road access to Cliffe,

More details on the proposed surface access connections to Sheppey would allow the reasonableness of the SAL cost estimates to be checked. The current principal uncertainties are as follows:

- The reasonableness of SAL's cost estimates for road and rail access,
- Whether other infrastructure would be needed and should be costed,
- Rail infrastructure would include: works on CTRL and elsewhere to accommodate new the new stations, terminal facilities and park & ride sites referred to in the SAL proposal as well as any other costs to restore lost capacity,

- Costs associated with local rail services to serve passengers and employees, including access to north of the Thames as necessary, and
- Any additional road facilities needed, either south or north of the river, to provide adequate road access.

The likelihood is that more detailed review will identify the need for additional surface access facilities and costs.

4 Forecasts and Economic Appraisal

4.1 Introduction

This chapter presents the passenger forecasts and the results of the economic appraisal of the Sheppey airport proposal. The airport appraised has up to four runways on a low platform on the Isle of Sheppey.

Two sets of forecasts are presented. The first set assumes the development of a two-runway airport at Sheppey and second runway at Stansted. The second set assumes a four-runway airport is developed at Sheppey with no additional runways at any other South East airport.

The chapter deals first with the forecasting of potential traffic at Sheppey, then with the economic appraisal of the proposal.

4.2 Demand Forecasts

Two sets of forecasts have been produced.

The first set assumes two runways are developed at Sheppey and a new runway developed at Stansted. The second set assumes four runways are developed at Sheppey with no other new runways at any other South East airport.

The June 2003 Sheppey proposal envisages that only the first two of a possible four runways and three terminals would be in place at Sheppey by 2030. That development plan is summarised in Table 4.1: no forecasts were included in the June 2003 proposal. For the purposes of preparing the first set of passenger forecasts, the principal assumptions made by SERAS following discussion with SAL were: two runways to come on stream in 2011, with passenger capacity of 75 mppa and ATM capacity of 530,000 per year.

Table 4.1: June 2003 Proposed Sheppey Development Plan

Year	Runways	Terminals	Capacity, mppa
2012	2	1	25
2020	2	2	50
2030	2	3	75

For the second set of forecasts it was assumed that four runways, with ATM capacity of 781,000 and passenger capacity of 113 mppa, would be introduced at Sheppey in 2011.

4.3 Forecasts: Sheppey Two Runways and Stansted One New Runway

The Sheppey Airport passenger forecasts in this scenario are summarised in Table 4.2. These forecasts are derived from the same model and using input assumptions consistent with those used in deriving forecasts for the SERAS options reported in the Consultation Document.

It is assumed that Sheppey is added to a scenario of Maximum Use of the other South East airports, except for Stansted where a new runway is opened in 2011. The promoters of Sheppey envisaged a scenario in which Sheppey developed as a second hub airport in the South East, and Stansted continued to develop as a 'no frills carrier' airport.

Capacity at Sheppey is assumed to come on stream in 2011, with a terminal capacity of 75 mppa and an ATM capacity of 530,000 ATMs. The new runway option at Stansted is the standard wide spaced option that featured in the South East Consultation Document.

The same assumptions of seeded service frequencies have been assumed at Sheppey as at Cliffe for the options that feature in the Consultation Document. That is, 40% of Heathrow's 1998 scheduled services, 23% of Gatwick's 1998 charter services and 11% of Stansted's 2000 low cost services.

In previous appraisal of runway development at Stansted, a degree of seeding at the airport (the long haul element of the 40% of Heathrow's 1998 services) was assumed. As SAL specifically identified Stansted as a 'no frills carrier' airport, it has not been seeded. However, sensitivities have been carried out to test the effect of seeding at Stansted on Sheppey, and the impact on not seeding Sheppey. These are discussed later in this section.

Table 4.2: Sheppey Passenger Forecasts – Sheppey and Stansted 2nd runway added to SERAS Maximum Use in 2011

	2000	2005	2010	2015	2020	2025	2030
Passengers, mppa							
Scheduled				11.7	17.4	23.1	27.8
I to I interlining				10.9	14.0	18.5	21.8
Charter				4.3	5.7	6.8	8.4
Domestic				0.4	0.5	0.6	0.7
Low cost				0.5	0.6	0.6	0.6
Total				27.8	38.2	49.6	59.4
ATMs, '000							
Scheduled				175	229	283	322
Charter				30	39	44	50
Domestic				8	9	9	10
Low cost				5	5	5	5
Total				218	281	342	386
Passengers/PATM							
Scheduled				129	137	147	154
Charter				141	147	155	169
Domestic				55	60	65	69
Low cost				97	111	120	126
Total				127	136	145	154

Scheduled services and passengers dominate Sheppey's forecasts. Around 84% of forecast passengers in 2030 (50 mppa) are on scheduled services with a high proportion of these being I to I interliners. The remaining passengers are mainly charter passengers with a small number of low cost and domestic scheduled passengers.

Of Sheppey's forecast passenger throughput in 2030, 34% are passengers flying on long haul routes and 66% on short haul routes.

Stansted achieves a passenger throughput of 53 mppa in 2030. Of this 53 mppa, over 90% are on short haul scheduled or low cost services, with the rest on charter and domestic scheduled services.

Passengers per ATM at Sheppey increase on average from 127 in 2015 to 154 in 2030. Throughout the 30 year forecast period Sheppey does not reach terminal or runway capacity. In 2030 the forecast number of passengers reaches 59 mppa compared with a capacity of 75 mppa. In 2030, the passenger mix of the airport is dominated by leisure passengers, who account for 78% of total passengers, down from 83% in 2015.

Comparable numbers for the two runway Cliffe option in 2030 are set out in Table 4.3. Throughput at Sheppey is 75% of Cliffe's, with the average P/PATM up by 4 at 154 P/PATM due to the proportionally higher number of long haul services. The proportion of scheduled passengers at both airports is the same at 84%.

Table 4.3: Comparison of Cliffe (two runways) and Sheppey Passenger Forecasts, 2030

	Sheppey	Cliffe
Passengers, mppa	59.4	79.4
Scheduled as % of total	84%	84%
ATM, '000	386	528
Average P/PATM	154	150

Figure 1 shows the demand for air travel by district, and the four quadrants of Greater London plus Central London represented by bars, and the percentage of this demand from each zone that is forecast to use Sheppey in 2030 represented by graduated shading.

Sheppey's prime catchment is South East London and the districts running south through Sussex and Kent, and east across Kent. As it is a little further away from London, Sheppey takes little demand from the other parts of London, including Central London. Cliffe, on the other hand, takes a large share of demand across London and its catchment spreads north of London. Note that this comparison is hampered by the additional runway at Stansted added to the Sheppey option but not to the Cliffe option.

Sensitivity Tests

Table 4.4 shows passenger forecasts at Sheppey and at Stansted under different combinations of seeding. It is clear that the effect of seeding is very powerful, particularly at Sheppey.

Table 4.4: Passenger forecasts at Sheppey and Stansted under different combinations of seeding.

Combination of Seeding	Sheppey (mppa)	Stansted (mppa)
Sheppey seeded/Stansted unseeded	59.4	53.1
Sheppey unseeded/Stansted seeded	22.6	74.2
Sheppey unseeded/Stansted unseeded	17.2	63.1

4.4 Forecasts: Sheppey Four Runways

The forecasts for a four-runway Sheppey coming on-stream in 2011 with no other new runways in the South East are summarised in Table 4.5. Sheppey's forecast traffic grows to 75.8 mppa by 2030, with all but around 10 mppa on scheduled services.

Sheppey's performance as a hub airport is indicated by the large number of international to international interliners, accounting for around one third of all passengers by 2030.

Table 4.5: Sheppey Passenger Forecasts – Sheppey four runways in 2011

	2000	2005	2010	2015	2020	2025	2030
Passengers, mppa							
Scheduled				13.8	24.1	31.4	38.7
I to I interlining				12.2	17.0	21.7	25.8
Charter				4.6	6.9	8.6	9.9
Domestic				0.4	0.5	0.6	0.7
Low cost				0.5	0.6	0.6	0.6
Total				31.6	49.1	63.0	75.8
ATMs, '000							
Scheduled				204	306	371	430
Charter				32	44	52	55
Domestic				8	9	10	10
Low cost				5	5	5	5
Total				250	365	437	500
Passengers/PATM							
Scheduled				127	134	143	150
Charter				143	155	167	182
Domestic				54	57	65	69
Low cost				96	109	118	124
Total				127	135	144	152

In the absence of an additional runway at Stansted, and with capacity at Sheppey to accommodate the forecasts, Sheppey is forecast to attract around 4 mppa more in 2015 and around 16 mppa more in 2030.

Figure 2 shows that demand at Sheppey increases in North East London and throughout East Anglia without a new runway at Stansted.

Comparison with Cliffe

Passenger forecasts at Sheppey and Cliffe are compared in Table 4.6. The same capacities were assumed in both forecasts. The difference in the forecasts is explained by the different accessibilities of the two airports.

Table 4.6: Comparison of Passenger Forecasts at Sheppey and Cliffe

Year	Sheppey (mppa)	Cliffe (mppa)
2015	32	58
2020	49	74
2025	63	104
2030	76	110

The Cliffe forecasts assumed two runways came into use in 2011 and a further two in 2021. The Cliffe forecasts were constrained by the available capacity in each of the years shown in Table 4.6, but, even so, the Cliffe forecasts are some 45% to 80% higher than the Sheppey forecasts.

The 2030 Sheppey forecast has a total of 473 mppa being accommodated at UK airports: the 2030 Cliffe forecast has 477 mppa being accommodated, an extra 4 mppa in total.

4.5 Economic Appraisal

The results of the economic appraisal of the Sheppey Airport proposal are presented in Table 4.7 below. They are based on January 2003 Green Book assumptions: a discount rate of 3.5% (not the 6% used in the economic appraisal of the options that feature in the Consultation Document), an increase to costs of 44% and a three year delay in the receipt of benefits to represent a delay in construction.

Results are presented for the two scenarios modelled: 1) two runways at Sheppey and one at Stansted, and 2) four runways at Sheppey. In each case costs and benefits are presented against a base case of Maximum Use of existing runways. For comparison, the costs and benefits of a four runway airport at Cliffe on the same basis are presented.

Table 4.7: Costs and Benefits of Sheppey Proposal

Item	Sheppey (2 runways) and Stansted (1 runway)	Sheppey (4 runways)	Cliffe (4 runways)
Increase in capacity over Max Use, mppa	122	113	113
Costs, £bn	11.8	9.1	13.9
Benefits, £bn	29.2	19.5	24.5
Net benefits £bn	17.4	10.4	10.6
Benefit:cost ratio	2.5:1	2.1:1	1.8:1

The Sheppey capital cost estimate provided by the project promoter is considerably lower than that for Cliffe. Cliffe's high earthworks costs mean that Sheppey costs might be expected to be below Cliffe's costs, but even when allowance is made for these costs, the Sheppey cost estimate is around 20% below what might be expected. If the costs of a four-runway Sheppey were 20% higher at £10.9 billion, net benefits would be £8.6 billion and the benefit:cost ratio 1.8:1.

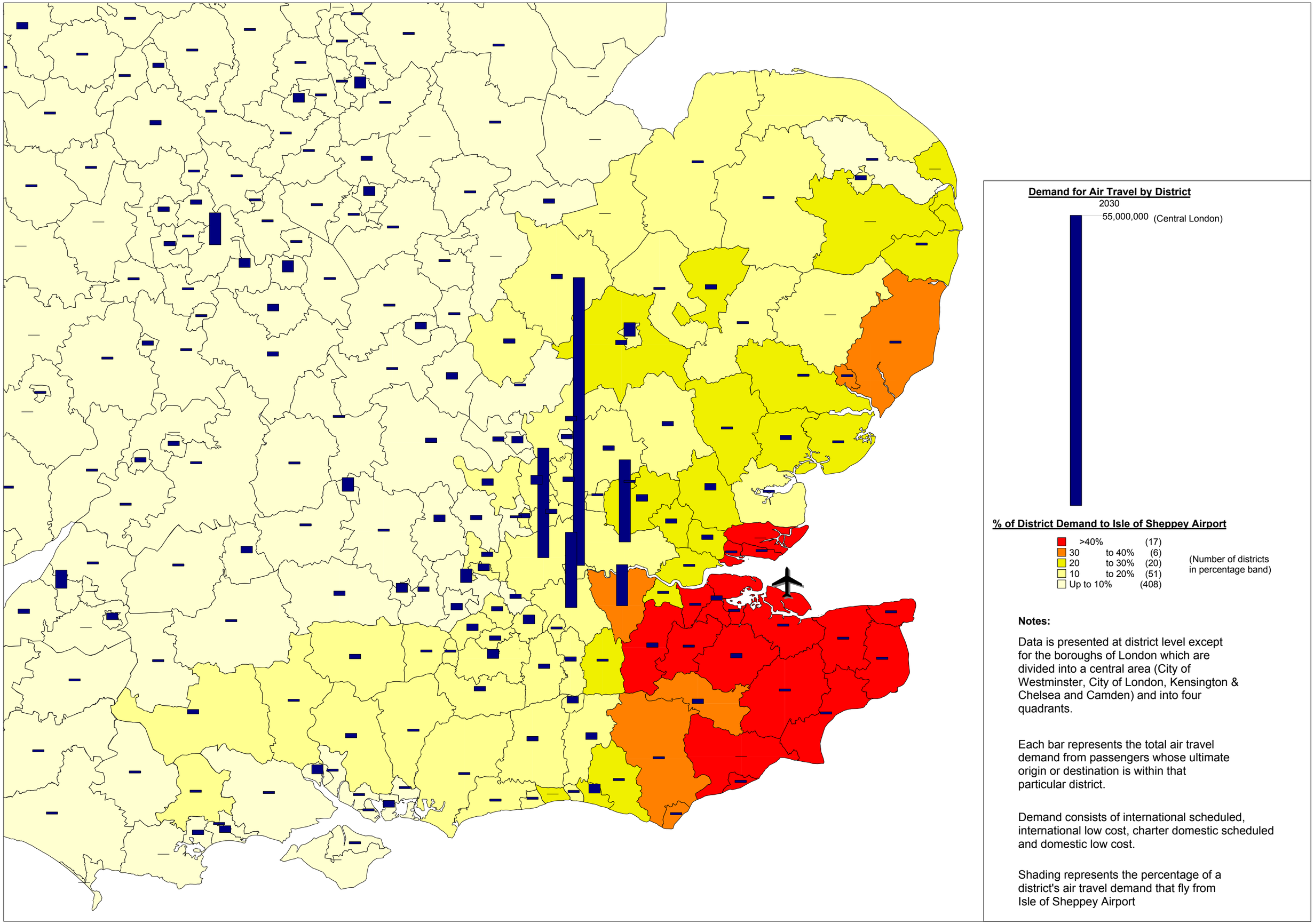

Figure 1 - Demand For Air Travel By District At Two Runway Sheppey Airport (Plus One New Runway at Stansted)

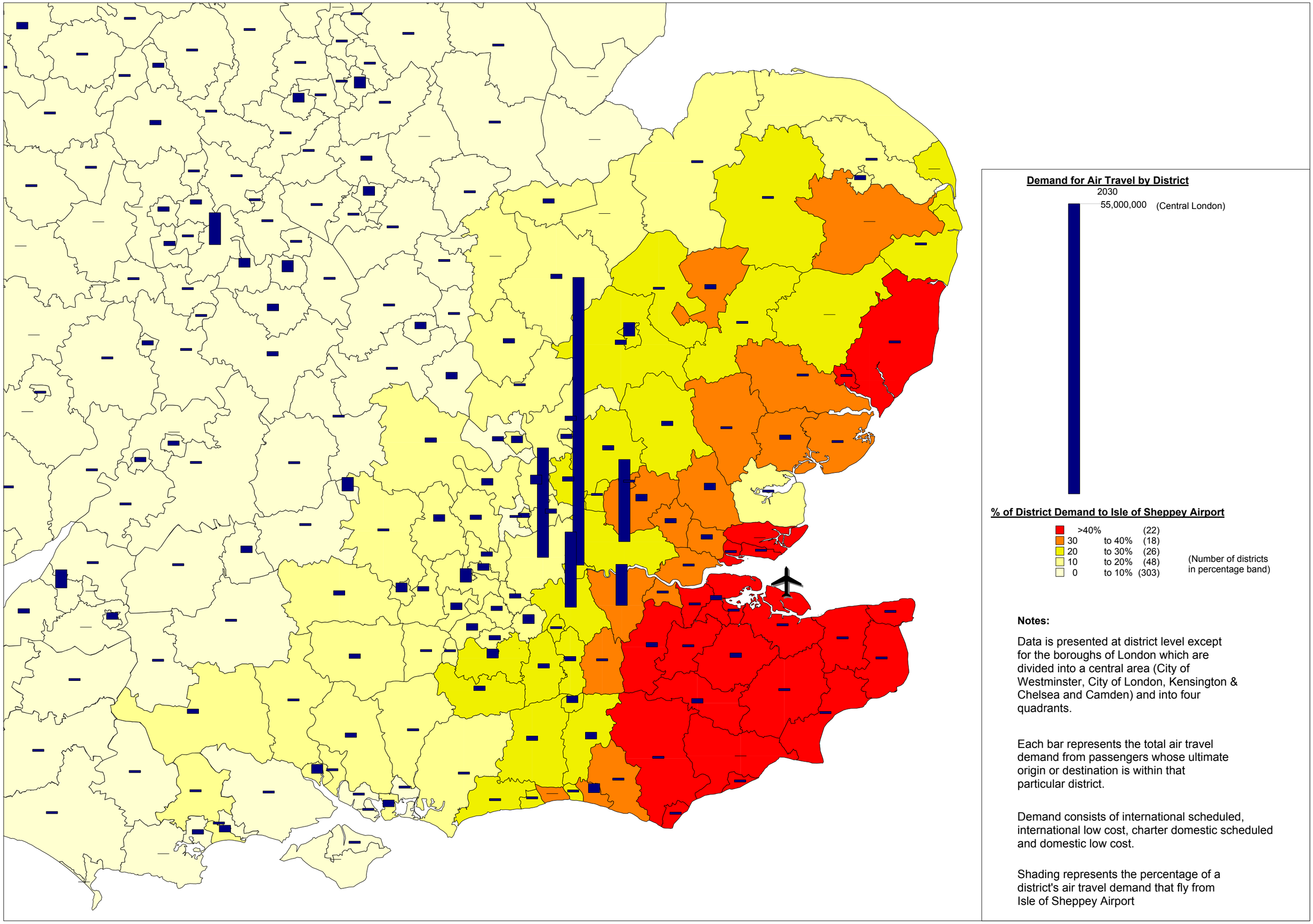

Figure 2 - Demand For Air Travel By District at Sheppey Airport (No New Runway At Stansted)

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