

THURROCK FLEXIBLE GENERATION PLANT: ADDITIONAL ANALYSIS OF BIRD DATA

Contents

1	INTRODUCTION	2
2	ASSESSMENT OF IMPACTS ON MUCKING FLATS SSSI COMPONENT OF SPA	4
2.1	Habitat loss.....	4
2.2	Assessment of potential effects on ‘bird days’ from construction / use of the causeway	5
	Avocet.....	5
	Dunlin.....	7
	Redshank.....	8
	Ringed Plover	9
3	ASSESSMENT OF IMPACTS ON MUCKING FLATS SSSI AND SOUTH SHORE COMPONENTS OF SPA	11
3.1	Habitat loss.....	11
3.2	Assessment of potential effects on ‘bird days’ from construction / use of the causeway	12
	Avocet.....	12
	Dunlin.....	14
	Redshank.....	15
	Ringed Plover	16
4	COMPARISON OF ANALYSES	18
4.1	Habitat loss assessment	18
4.2	Assessment of effects on ‘bird days’ from construction and use of the causeway	19
	Avocet.....	19
	Dunlin.....	20
	Redshank.....	22
	Ringed Plover	23
4.3	Assessment of potential effects on ‘bird days’ from presence of the causeway.....	24
5	SUMMARY	25
5.1	Approach to supplemental assessment.....	25
5.2	Conclusions.....	25

1 INTRODUCTION

This document has been produced following discussions between the Applicant and Natural England regarding the Habitats Regulations Assessment (HRA) report (REP2-022) produced for the TFGP.

Natural England (RR-022, PDD-012, PDD-013, REP2-097) have raised concerns regarding the appropriate level against which potential impacts from construction, use and retention of the causeway on the Thames Estuary & Marshes SPA should be assessed. Natural England consider that the impacts of the causeway should be assessed against populations of birds associated with Mucking Flats SSSI in addition to the analysis carried out for the SPA-wide population.

The Applicant maintains its position that the appropriate level at which impacts should be assessed for HRA is the SPA-wide populations of birds which are Qualifying Features (which Natural England has agreed is a technically correct approach) – see pages 44-54 of PDC-001, Comment 1a of REP2-056 and Comment 1 of REP3-009.

Nevertheless, in the interests of seeking to reach agreement about the significance of any impact and without prejudice to the Applicant's position that its approach is correct, further analysis of the causeway impacts has been undertaken.

This document presents the results of that analysis. For ease of reference to the current HRAR, tables have been reproduced from the HRAR, but amended where numbers change as a result of the different scale of assessment. Where numbers have been changed from the HRAR in this additional analysis, these have been highlighted with **red text** for ease of reference and comparison with the HRAR.

This document presents two separate additional analyses:

- 1) Mudflat loss and impacts on 'bird days'¹ is assessed in comparison to mudflat extent and bird numbers from Mucking Flats SSSI only.
- 2) Mudflat loss and impacts on 'bird days' is assessed in comparison to mudflat extent within the SPA on both sides of the Thames up to approx. 7.3 km from the causeway. This additional analysis has been undertaken because the Applicant considers that there is no obvious reason why a bird present in Mucking Flats SSSI at the furthest distance from the causeway (which is approximately 7.3 km at the northern tip of Mucking Flats) would utilise the foreshore in the vicinity of the causeway, but a bird present in the SPA (but outside of the Mucking Flats SSSI) on the south shore of the Thames within the same distance of the causeway would not.

The Applicant's view is that if it were accepted that impacts should be assessed against a subset of the SPA population only, then it is the second analysis which should be used, as there is no reason to assume that birds from the south shore would not cross the Thames to forage on mudflats in the vicinity of the causeway.

On this basis, additional WeBS data was obtained to derive a 5-year peak mean monthly count of the four bird species assessed in the HRA for:

- 1) Mucking Flats SSSI; and

¹ To examine the potential effect of construction and use of the causeway, the use of the site by Avocet, Dunlin, Redshank and Ringed Plover has been assessed in terms of the potential number of 'bird days' lost assuming that birds are displaced from the causeway and an impact area of between 100-500m from the causeway and works area.

The peak count of each species recorded in any given month is converted to 'bird days' by multiplying the peak count for a given month by the number of days in that month. This gives a precautionary estimate (because the metric is based on the peak count recorded by surveys) of the number of bird days potentially affected in each month, and summing the total number of affected bird days for each month provides a total number of affected bird days for each of the construction scenarios.

- 2) Mucking Flats SSSI and all south shore SPA count sections falling wholly within 7.3 km of the causeway.

The two analyses are presented in full separately in Sections 2 and 3. Section 4 then shows the results of both of these analyses alongside the results presented in the HRAR, allowing comparison between them, and sets out the Applicant's conclusions on the results of these analyses in terms of the assessment of an Adverse Effect on Integrity (AEOI).

2 ASSESSMENT OF IMPACTS ON MUCKING FLATS SSSI COMPONENT OF SPA

2.1 Habitat loss

This section presents the mudflat loss and impacts on 'bird days' in comparison to mudflat extent and bird numbers from Mucking Flats SSSI only, as requested by Natural England.

However, for the reasons set out in the introduction, the Applicant considers that, if its approach of analysing impacts on a SPA-wide basis is not accepted (despite Natural England agreeing that it is technically correct), the more appropriate analysis is that of impacts in comparison with Mucking Flats SSSI and all south shore SPA count sections falling within 7.3 km of the causeway, which is given in Section 3.

A summary of the mudflat area measurements is provided in Table 1, based on Table 5.1 from the HRAR (REP2-022). Differences to the HRAR analysis are shown in **red text**.

Table 1. Mudflat areas in the vicinity of the TFGP

	NE 'Mudflat' Priority Habitat layer (ha)	Additional mudflat to MLW (ha)	Total mudflat
			(ha)
Causeway (habitat loss for duration of causeway life)			0.38
Barge pocket (habitat loss for c 2 years after use of causeway before dredged barge pocket recovers to mudflat)			1.42
Potential maximum area of mudflat loss to saltmarsh accretion			1.1
Works area excluding causeway, barge pocket and potential saltmarsh accretion area (no habitat loss)			2.4
0-500m east of works area (maximum potential disturbance impact zone) (no habitat loss)	3.26	0.92	4.18
0-500m west of works area (maximum potential disturbance impact zone) (no habitat loss)	2.1	0.11	2.21
North shore east of disturbance zone (outside SPA)	18.83	33.26	52.09
North shore west of disturbance zone (outside SPA)	6.07	0.3	6.37
South shore (outside SPA)	21.52	3.2	24.72
Total			94.87
Mudflat resource in Mucking Flats SSSI			260
Total mudflats Mucking Flats SSSI & FLL combined			354.87

Table 2 summarises the mudflat loss as a percentage of the total Mucking Flats and Functionally Linked Land (FLL) mudflat resource for various combinations of short- and medium-term habitat loss scenarios.

Table 2. Summary of mudflat losses

Scenario	Habitat loss (ha)	Total mudflat	Percentage loss
Habitat loss from causeway and barge pocket as percentage of total mudflat resource (short-term)	1.80	354.87	0.51
Habitat loss from causeway and barge pocket as percentage of FLL mudflat resource (short-term)	1.80	94.87	1.90
Habitat loss from causeway as percentage of total mudflat resource (i.e. lifetime of causeway)	0.38	354.87	0.11
Habitat loss from causeway as percentage of FLL resource (medium-term i.e. lifetime of causeway)	0.38	94.87	0.40
Habitat loss from causeway and max estimate of saltmarsh accretion as percentage of total mudflat resource (medium-term i.e. lifetime of causeway)	1.48	354.87	0.42
Habitat loss from causeway and max estimate of saltmarsh accretion as percentage of FLL resource (medium-term i.e. lifetime of causeway)	1.48	94.87	1.56

Refer to Section 4.1 for comparison with the results from the SPA-wide HRAR (REP2-022).

2.2 Assessment of potential effects on ‘bird days’ from construction / use of the causeway

The sections and tables below provide the results of the analysis as undertaken in the HRAR but applied instead to only the Mucking Flats SSSI component of the SPA. Refer to section 4.2 for a comparison with the results from the SPA-wide HRAR.

Avocet

Table 3 (based on Table 6.4 of the HRAR) shows the peak count within the potential disturbance area for Avocet (works area + 500 m) for each month of the 2019-20 bird surveys and the number of bird days these peak counts represent. This gives a precautionary upper estimate of affected bird days in each month. The table also shows the 5-year monthly mean peak count for the Mucking Flats SSSI component of the SPA from the 2014/15-2018/19 period (obtained from WeBS data), and the number of bird days that this represents. Note that the count data provided by WeBS omitted the 17/18 and 18/19 winter periods as no counts were made at Mucking Flats in either of those winter periods.

Table 3. Avocet use of potential impact area (counts and bird days) 2019-2020

	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Total bird days
Peak count in impact area	0	0	44	49	13	12	23	
Bird days	0	0	1320	1519	403	336	713	4291
5 year monthly mean count for Mucking Flats SSSI (WeBS data)	1061	736	623	661	608	748	1046	
Bird-days	31830	22816	18690	20491	18848	20944	32426	166045

Table 4 (based on Table 6.5 of the HRAR) shows the number of potential bird days affected in each of the 12 potential construction scenarios, and expresses that as a percentage of the total number of bird days determined from the WeBS count data for the Mucking Flats SSSI component of the Thames Estuary and Marshes SPA. The percentages assume that all birds in the potential disturbance area for Avocet (works area + 500 m) are affected by disturbance.

Table 4. Avocet bird days potentially affected in different construction scenarios

Construction period		Sept	Oct	Nov	Dec	Jan	Feb	Mar	Total bird days	Total bird days as % of Mucking Flats SSSI total
Start	Finish									
Apr	Sep	0							0	0
May	Oct	0	0						0	0
Jun	Nov	0	0	1320					1320	0.79
Jul	Dec	0	0	1320	1519				2839	1.71
Aug	Jan	0	0	1320	1519	403			3242	1.95
Sep	Feb	0	0	1320	1519	403	336		3578	2.15
Oct	Mar		0	1320	1519	403	336	713	4291	2.58
Nov	Apr			1320	1519	403	336	713	4291	2.58
Dec	May				1519	403	336	713	2971	1.79
Jan	Jun					403	336	713	1452	0.87
Feb	Jul						336	713	1049	0.63
Mar	Aug							713	713	0.43

Dunlin

Table 5 (based on Table 6.4 of the HRAR) shows the peak count within the potential disturbance area for Dunlin (works area + 200 m) for each month of the 2019-20 bird surveys and the number of bird days these peak counts represent. This gives a precautionary upper estimate of affected bird days in each month. The table also shows the 5-year monthly mean peak count for the Mucking Flats SSSI component of the SPA from the 2014/15-2018/19 period (obtained from WeBS data), and the number of bird days that this represents. Note that the count data provided by WeBS omitted the 17/18 and 18/19 winter periods as no counts were made at Mucking Flats in either of those winter periods.

Table 5. Dunlin use of potential impact area (counts and bird days) 2019-2020

	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Total bird days
Peak count in impact area	0	0	0	124	0	1	0	
Bird days	0	0	0	3844	0	28	0	3872
5 year monthly mean count for Mucking Flats SSSI (WeBS data)	563	884	6750	9525	7140	5975	4740	
Bird-days	16890	27404	202500	295275	221340	167300	146940	1077649

Table 6 (based on Table 6.5 of the HRAR) shows the number of potential bird days affected in each of the 12 potential construction scenarios, and expresses that as a percentage of the total number of bird days determined from the WeBS count data for the Mucking Flats SSSI component of the Thames Estuary and Marshes SPA. The percentages assume that all birds in in the potential disturbance area for Dunlin (works area + 200 m) are affected by disturbance.

Table 6. Dunlin bird days potentially affected in different construction scenarios

Construction period		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total bird days	Total bird days as % of Mucking Flats SSSI total
Start	Finish									
Apr	Sep	0							0	0
May	Oct	0	0						0	0
Jun	Nov	0	0	0					0	0
Jul	Dec	0	0	0	3844				3844	0.36
Aug	Jan	0	0	0	3844	0			3844	0.36
Sep	Feb	0	0	0	3844	0	28		3872	0.36
Oct	Mar		0	0	3844	0	28	0	3872	0.36
Nov	Apr			0	3844	0	28	0	3872	0.36
Dec	May				3844	0	28	0	3872	0.36
Jan	Jun					0	28	0	28	0.003
Feb	Jul						28	0	28	0.003
Mar	Aug							0	0	0

Redshank

Table 7 (based on Table 6.4 of the HRAR) shows the peak count within the potential disturbance area for Redshank (works area + 200 m) for each month of the 2019-20 bird surveys and the number of bird days these peak counts represent. This gives a precautionary upper estimate of affected bird days in each month. The table also shows the 5-year monthly mean peak count for the **Mucking Flats SSSI component of the SPA from** the 2014/15-2018/19 period (obtained from WeBS data), and the number of bird days that this represents. Note that the count data provided by WeBS omitted the 17/18 and 18/19 winter periods as no counts were made at Mucking Flats in either of those winter periods.

Table 7. Redshank use of potential impact area (counts and bird days) 2019-2020

	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Total bird days
Peak count in impact area	0	0	0	2	0	0	0	
Bird days	0	0	0	62	0	0	0	62
5 year monthly mean count for Mucking Flats SSSI (WeBS data)	16	6	38	31	51	46	13	
Bird-days	480	186	1140	961	1581	1288	403	6039

Table 8 (based on Table 6.5 of the HRAR) shows the number of potential bird days affected in each of the 12 potential construction scenarios, and expresses that as a percentage of the total number of bird days determined from the WeBS count data for the Mucking Flats SSSI component of the Thames Estuary and Marshes SPA. The percentages assume that all birds in the potential disturbance area for Redshank (works area + 200 m) are affected by disturbance.

Table 8. Redshank bird days potentially affected in different construction scenarios

Construction period		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total bird days	Total bird days as % of Mucking Flats SSSI total
Start	Finish									
Apr	Sep	0							0	0
May	Oct	0	0						0	0
Jun	Nov	0	0	0					0	0
Jul	Dec	0	0	0	62				62	1.03
Aug	Jan	0	0	0	62	0			62	1.03
Sep	Feb	0	0	0	62	0	0		62	1.03
Oct	Mar		0	0	62	0	0	0	62	1.03
Nov	Apr			0	62	0	0	0	62	1.03
Dec	May				62	0	0	0	62	1.03
Jan	Jun					0	0	0	0	0
Feb	Jul						0	0	0	0
Mar	Aug							0	0	0

Ringed Plover

Table 9 (based on Table 6.4 of the HRAR) shows the peak count within the potential disturbance area for Ringed Plover (works area + 100 m) for each month of the 2019-20 bird surveys and the number of bird days these peak counts represent. This gives a precautionary upper estimate of affected bird days in each month. The table also shows the 5-year monthly mean peak count for the Mucking Flats SSSI component of the SPA from the 2014/15-2018/19 period (obtained from WeBS data), and the number of bird days that this represents. Note that the count data provided by WeBS omitted the 17/18 and 18/19 winter periods as no counts were made at Mucking Flats in either of those winter periods.

Table 9. Ringed Plover use of potential impact area (counts and bird days) 2019-2020

	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Total bird days
Peak count in impact area	18	0	0	0	0	0	0	
Bird days	540	0	0	0	0	0	0	540
5 year monthly mean count for Mucking Flats SSSI (WeBS data)	242	79	66	51	16	20	10	
Bird-days	7260	2449	1980	1581	496	560	310	14636

Table 10 (based on Table 6.5 of the HRAR) shows the number of potential bird days affected in each of the 12 potential construction scenarios, and expresses that as a percentage of the total number of bird days determined from the WeBS count data for the Mucking Flats SSSI component of the Thames Estuary and Marshes SPA. The percentages assume that all birds in the potential disturbance area for Redshank (works area + 100 m) are affected by disturbance.

Table 10. Ringed Plover bird days potentially affected in different construction scenarios

Construction period		Sept	Oct	Nov	Dec	Jan	Feb	Mar	Total bird days	Total bird days as % of Mucking Flats SSSI total
Start	Finish									
Apr	Sep	540							540	3.69
May	Oct	540	0						540	3.69
Jun	Nov	540	0	0					540	3.69
Jul	Dec	540	0	0	0				540	3.69
Aug	Jan	540	0	0	0	0			540	3.69
Sep	Feb	540	0	0	0	0	0		540	3.69
Oct	Mar		0	0	0	0	0	0	0	0
Nov	Apr			0	0	0	0	0	0	0
Dec	May				0	0	0	0	0	0
Jan	Jun					0	0	0	0	0
Feb	Jul						0	0	0	0
Mar	Aug							0	0	0

3 ASSESSMENT OF IMPACTS ON MUCKING FLATS SSSI AND SOUTH SHORE COMPONENTS OF SPA

3.1 Habitat loss

A summary of the mudflat area measurements is provided in Table 11, based on Table 5.1 from the HRAR (REP2-022). Differences to the HRAR analysis are shown in **red text**.

An estimate of the extent of the mudflat resource within the south shore component of the SPA was derived from the Natural England Priority Habitat 'Mudflat' GIS layer obtained from the NE online data resource. This is probably an underestimate of the total amount of mudflat present given that the analysis of the FLL demonstrated that not all of the mudflats in the vicinity of the causeway were classified as 'mudflat' in the NE habitat inventory.

Table 11. Mudflat areas in the vicinity of the TFGP

	NE 'Mudflat' Priority Habitat layer (ha)	Additional mudflat to MLW (ha)	Total mudflat
			(ha)
Causeway (habitat loss for duration of causeway life)			0.38
Barge pocket (habitat loss for c 2 years after use of causeway before dredged barge pocket recovers to mudflat)			1.42
Potential maximum area of mudflat loss to saltmarsh accretion			1.1
Works area excluding causeway, barge pocket and potential saltmarsh accretion area (no habitat loss)			2.4
0-500m east of works area (maximum potential disturbance impact zone) (no habitat loss)	3.26	0.92	4.18
0-500m west of works area (maximum potential disturbance impact zone) (no habitat loss)	2.1	0.11	2.21
North shore east of disturbance zone (outside SPA)	18.83	33.26	52.09
North shore west of disturbance zone (outside SPA)	6.07	0.3	6.37
South shore (outside SPA)	21.52	3.2	24.72
Total			94.87
Mudflat resource in Mucking Flats SSSI + south shore SPA within 7.3 km			353
Total mudflats Mucking Flats & South Shore SPA & FLL combined			447.87

Table 12 summarises the mudflat loss as a percentage of the total Mucking Flat and FLL mudflat resource for various combinations of short- and medium-term habitat loss scenarios.

Table 12. Summary of mudflat losses

Scenario	Habitat loss (ha)	Total mudflat	Percentage loss
Habitat loss from causeway and barge pocket as percentage of total mudflat resource (short-term)	1.80	444.87	0.40
Habitat loss from causeway and barge pocket as percentage of FLL mudflat resource (short-term)	1.80	94.87	1.90
Habitat loss from causeway as percentage of total mudflat resource (i.e. lifetime of causeway)	0.38	444.87	0.08
Habitat loss from causeway as percentage of FLL resource (medium-term i.e. lifetime of causeway)	0.38	94.87	0.40
Habitat loss from causeway and max estimate of saltmarsh accretion as percentage of total mudflat resource (medium-term i.e. lifetime of causeway)	1.48	444.87	0.33
Habitat loss from causeway and max estimate of saltmarsh accretion as percentage of FLL resource (medium-term i.e. lifetime of causeway)	1.48	94.87	1.56

Refer to Section 4.1 for comparison with the results from the SPA-wide HRAR.

3.2 Assessment of potential effects on ‘bird days’ from construction / use of the causeway

The sections and tables below provide the results of the analysis undertaken in the HRAR applied to the Mucking Flats SSSI and south shore component of the SPA. Refer to section 4.2 for a comparison with the results from the SPA-wide HRAR.

In some months, it is evident that the monthly mean counts of birds in the larger area (Mucking Flats SSSI plus south shore area within 7.3km) are lower than the monthly counts in the smaller area of the Mucking Flats SSSI alone. This is the result of the way in which WeBS data are reported for a consolidated site (a group of count sectors) when there are missing data from one or more of the count sectors that make up the consolidated site. This is clearly illustrated by the counts of Dunlin in Tables 5 and 15, where the monthly mean values for September, October, November, January and February are lower for the larger consolidated site (SSSI + south shore) than for the SSSI alone. In reality, the larger area will host more birds than the smaller area.

Avocet

Table 13 (based on Table 6.4 of the HRAR) shows the peak count within the potential disturbance area for Avocet (works area + 500 m) for each month of the 2019-20 bird surveys and the number of bird days these peak counts represent. This gives a precautionary upper estimate of affected bird days in each month. The table also shows the 5-year monthly mean peak count for the Mucking Flats SSSI and south shore component of the SPA from the 2014/15-2018/19 period (obtained from WeBS data), and the number of bird days that this represents.

Table 13. Avocet use of potential impact area (counts and bird days) 2019-2020

	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Total bird days
Peak count in impact area	0	0	44	49	13	12	23	
Bird days	0	0	1320	1519	403	336	713	4291
5 year monthly mean count for Mucking Flats SSSI and south shore SPA (WeBS data)	2754	1486	467	475	575	657	788	
Bird-days	82620	46066	14010	14725	17825	18396	24428	218070

Table 14 (based on Table 6.5 of the HRAR) shows the number of potential bird days affected in each of the 12 potential construction scenarios, and expresses that as a percentage of the total number of bird days determined from the WeBS count data for the Mucking Flats SSSI and south shore component of the Thames Estuary and Marshes SPA. The percentages assume that all birds in the potential disturbance area for Avocet (works area + 500 m) are affected by disturbance.

Table 14. Avocet bird days potentially affected in different construction scenarios

Construction period		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total bird days	Total bird days as % of Mucking Flats SSSI & south shore total
Start	Finish									
Apr	Sep	0							0	0
May	Oct	0	0						0	0
Jun	Nov	0	0	1320					1320	0.61
Jul	Dec	0	0	1320	1519				2839	1.30
Aug	Jan	0	0	1320	1519	403			3242	1.49
Sep	Feb	0	0	1320	1519	403	336		3578	1.64
Oct	Mar		0	1320	1519	403	336	713	4291	1.97
Nov	Apr			1320	1519	403	336	713	4291	1.97
Dec	May				1519	403	336	713	2971	1.36
Jan	Jun					403	336	713	1452	0.67
Feb	Jul						336	713	1049	0.48
Mar	Aug							713	713	0.33

Dunlin

Table 15 (based on Table 6.4 of the HRAR) shows the peak count within the potential disturbance area for Dunlin (works area + 200 m) for each month of the 2019-20 bird surveys and the number of bird days these peak counts represent. This gives a precautionary upper estimate of affected bird days in each month. The table also shows the 5-year monthly mean peak count for the Mucking Flats SSSI and south shore component of the SPA from the 2014/15-2018/19 period (obtained from WeBS data), and the number of bird days that this represents.

Table 15. Dunlin use of potential impact area (counts and bird days) 2019-2020

	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Total bird days
Peak count in impact area	0	0	0	124	0	1	0	
Bird days	0	0	0	3844	0	28	0	3872
5 year monthly mean count for Mucking Flats SSSI and south shore SPA (WeBS data)	494	1718	7462	6648	8669	6463	4158	
Bird-days	14820	53258	223860	206088	268739	180964	128898	1076627

Table 16 (based on Table 6.5 of the HRAR) shows the number of potential bird days affected in each of the 12 potential construction scenarios, and expresses that as a percentage of the total number of bird days determined from the WeBS count data for the Mucking Flats SSSI and south shore component of the Thames Estuary and Marshes SPA. The percentages assume that all birds in the potential disturbance area for Dunlin (works area + 200 m) are affected by disturbance.

Table 16. Dunlin bird days potentially affected in different construction scenarios

Construction period		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total bird days	Total bird days as % of Mucking Flats SSSI & south shore total
Start	Finish									
Apr	Sep	0							0	0
May	Oct	0	0						0	0
Jun	Nov	0	0	0					0	0
Jul	Dec	0	0	0	3844				3844	0.36
Aug	Jan	0	0	0	3844	0			3844	0.36
Sep	Feb	0	0	0	3844	0	28		3872	0.36
Oct	Mar		0	0	3844	0	28	0	3872	0.36
Nov	Apr			0	3844	0	28	0	3872	0.36
Dec	May				3844	0	28	0	3872	0.36
Jan	Jun					0	28	0	28	0.003
Feb	Jul						28	0	28	0.003
Mar	Aug							0	0	0

Redshank

Table 17 (based on Table 6.4 of the HRAR) shows the peak count within the potential disturbance area for Redshank (works area + 200 m) for each month of the 2019-20 bird surveys and the number of bird days these peak counts represent. This gives a precautionary upper estimate of affected bird days in each month. The table also shows the 5-year monthly mean peak count for the Mucking Flats SSSI and south shore component of the SPA from the 2014/15-2018/19 period (obtained from WeBS data), and the number of bird days that this represents.

Table 17. Redshank use of potential impact area (counts and bird days) 2019-2020

	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Total bird days
Peak count in impact area	0	0	0	2	0	0	0	
Bird days	0	0	0	62	0	0	0	62
5 year monthly mean count for Mucking Flats SSSI and south shore SPA (WeBS data)	232	175	154	63	85	146	162	
Bird-days	6960	5425	4620	1953	2635	4088	5022	30703

Table 18 (based on Table 6.5 of the HRAR) shows the number of potential bird days affected in each of the 12 potential construction scenarios, and expresses that as a percentage of the total number of bird days determined from the WeBS count data for the Mucking Flats SSSI and south shore component of the Thames Estuary and Marshes SPA. The percentages assume that all birds in in the potential disturbance area for Redshank (works area + 200 m) are affected by disturbance.

Table 18. Redshank bird days potentially affected in different construction scenarios

Construction period		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total bird days	Total bird days as % of Mucking Flats SSSI & south shore total
Start	Finish									
Apr	Sep	0							0	0
May	Oct	0	0						0	0
Jun	Nov	0	0	0					0	0
Jul	Dec	0	0	0	62				62	0.20
Aug	Jan	0	0	0	62	0			62	0.20
Sep	Feb	0	0	0	62	0	0		62	0.20
Oct	Mar		0	0	62	0	0	0	62	0.20
Nov	Apr			0	62	0	0	0	62	0.20
Dec	May				62	0	0	0	62	0.20
Jan	Jun					0	0	0	0	0
Feb	Jul						0	0	0	0
Mar	Aug							0	0	0

Ringed Plover

Table 19 (based on Table 6.4 of the HRAR) shows the peak count within the potential disturbance area for Ringed Plover (works area + 100 m) for each month of the 2019-20 bird surveys and the number of bird days these peak counts represent. This gives a precautionary upper estimate of affected bird days in each month. The table also shows the 5-year monthly mean peak count for the Mucking Flats SSSI and south shore component of the SPA from the 2014/15-2018/19 period (obtained from WeBS data), and the number of bird days that this represents.

Table 19. Ringed Plover use of potential impact area (counts and bird days) 2019-2020

	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Total bird days
Peak count in impact area	18	0	0	0	0	0	0	
Bird days	540	0	0	0	0	0	0	540
5 year monthly mean count for Mucking Flats SSSI and south shore SPA (WeBS data)	257	158	95	36	18	23	13	
Bird-days	7710	4898	2850	1116	558	644	403	18179

Table 20 (based on Table 6.5 of the HRAR) shows the number of potential bird days affected in each of the 12 potential construction scenarios, and expresses that as a percentage of the total number of bird days determined from the WeBS count data for the Mucking Flats SSSI and south shore component of the Thames Estuary and Marshes SPA. The percentages assume that all birds in the potential disturbance area for Redshank (works area + 100 m) are affected by disturbance.

Table 20. Ringed Plover bird days potentially affected in different construction scenarios

Construction period		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total bird days	Total bird days as % of Mucking Flats SSSI & south shore total
Start	Finish									
Apr	Sep	540							540	2.97
May	Oct	540	0						540	2.97
Jun	Nov	540	0	0					540	2.97
Jul	Dec	540	0	0	0				540	2.97
Aug	Jan	540	0	0	0	0			540	2.97
Sep	Feb	540	0	0	0	0	0		540	2.97
Oct	Mar		0	0	0	0	0	0	0	0
Nov	Apr			0	0	0	0	0	0	0
Dec	May				0	0	0	0	0	0
Jan	Jun					0	0	0	0	0
Feb	Jul						0	0	0	0
Mar	Aug							0	0	0

4 COMPARISON OF ANALYSES

4.1 Habitat loss assessment

Table 21 provides a comparison between the habitat losses expressed as percentages for:

- 1) Mucking Flats SSSI only
- 2) Mucking Flats SSSI + south shore SPA within 7.3 km
- 3) Whole SPA (as set out in the HRAR, REP2-022)

Table 21. Comparison between assessments of mudflat loss expressed as percentage of total mudflat resource

Mudflat loss from:	Mucking Flats SSSI and FLL (355 ha mudflat)	Mucking Flats SSSI + south shore SPA and FLL (448 ha mudflat)	Whole SPA + FLL (2605 ha mudflat)
Causeway only	0.11%	0.08%	0.015%
Causeway and barge pocket	0.51%	0.40%	0.07%
Causeway and maximum potential mudflat loss to saltmarsh accretion	0.42%	0.33%	0.06%

Table 21 shows that habitat losses do not exceed 1% of the total mudflat resource for either of the alternative scales of assessment. When assessed against the mudflat resource for Mucking Flats SSSI + south shore SPA, the causeway represents a 0.08% loss of mudflat. When assessed against the resource for Mucking Flats SSSI only, the causeway represents a 0.11% loss of mudflat. Although this is higher than the loss of mudflat resource as a percentage of the whole SPA, it is not considered that this is sufficiently high to trigger any concerns regarding the medium-long term loss of mudflat from the causeway to the populations of birds associated with Mucking Flats SSSI and the parts of the SPA within 7.3 km of the causeway.

Similarly when assessing the shorter-term impact of the causeway plus mudflat loss due to the dredging of the barge pocket, the mudflat loss remains below 1% at 0.51% for Mucking Flats SSSI and 0.4% for Mucking Flats SSSI + south shore.

When assessing the potential maximum longer-term loss of mudflat from saltmarsh accretion over the maximum lifespan of the causeway (35 years), the mudflat losses are below 0.5% of the mudflat resource (compared with 0.06% of the whole SPA resource).

Because the habitat losses from dredging the barge pocket would revert to mudflat approximately 2 years after barge movements are completed, there is no year during the lifetime of the causeway where habitat losses from the causeway, the barge pocket and the maximum amount of saltmarsh accretion (which would only be reached at the very end of the causeway's lifetime) would occur simultaneously. However, even if the habitat losses for all three factors are combined (2.9 ha), this figure still does not exceed 1% of the mudflat resource for the Mucking Flats SSSI and FLL (355 ha, of which 2.9 ha is 0.82%).

Losses of mudflat from the causeway and sediment accretion would be reversed after the causeway is decommissioned.

It is therefore concluded that the assessment presented in the HRAR (REP2-022) for habitat loss is not altered by examining the habitat loss as a percentage of a smaller subset of the SPA as requested by Natural England. As the loss of mudflat is outside of the SPA and represents less than 1% of the available habitat resource, it is not considered that this represents a significant loss of habitat for qualifying features of the SPA, and it is concluded that the effects of direct habitat loss on qualifying features of any nearby designated sites can be screened out as not comprising a Likely Significant Effect.

This additional analysis therefore supports the existing conclusions of the HRAR as being correct.

4.2 Assessment of effects on ‘bird days’ from construction and use of the causeway

Avocet

Table 22 presents a comparison of the total number of Avocet bird days affected in each of the 12 construction scenarios (i.e. a construction period of 6 months, each of the 12 scenarios commencing in a different month) for:

- 1) Mucking Flats SSSI only
- 2) Mucking Flats SSSI + south shore SPA within 7.3 km
- 3) Whole SPA (as set out in the HRAR)

Table 22. Comparison between assessments of effects on Avocet bird days

Construction period		Total bird days affected	Total bird days as percentage of Mucking Flats SSSI bird days	Total bird days as percentage of Mucking Flats SSSI + south shore bird days	Total bird days as percentage of whole SPA bird days
Start	Finish				
Apr	Sep	0	0	0	0
May	Oct	0	0	0	0
Jun	Nov	1320	0.79	0.61	0.57
Jul	Dec	2839	1.71	1.30	1.24
Aug	Jan	3242	1.95	1.49	1.41
Sep	Feb	3578	2.15	1.64	1.56
Oct	Mar	4291	2.58	1.97	1.87
Nov	Apr	4291	2.58	1.97	1.87
Dec	May	2971	1.79	1.36	1.29
Jan	Jun	1452	0.87	0.67	0.63
Feb	Jul	1049	0.63	0.48	0.46
Mar	Aug	713	0.43	0.33	0.31

The two scenarios with the highest effect are construction commencing in October or November, as these overlap with the two months when highest counts were recorded.

These highest-impact scenarios involve a potential impact on 1.87% of the total bird days available in the SPA, as stated in the HRAR. When only the population of Avocets from Mucking Flats SSSI is assessed, the scenarios involve a potential impact on 2.58% of the available bird days in Mucking Flats SSSI. When the population of Avocets from Mucking Flats SSSI + the south shore SPA within 7.3 km is assessed, the scenarios involve a potential impact on 1.97% of the available bird days in this subsection of the SPA.

It is not considered that this increase of 0.71 of a percentage point (Mucking Flats SSSI) or 0.10 of a percentage point (Mucking Flats SSSI plus south shore) is sufficiently high to trigger a conclusion of AEOL compared to the conclusion of no AEOL presented in the HRAR.

It is therefore concluded that the assessment presented in the HRAR for Avocet is not altered by examining the population as a percentage of a smaller subset of the SPA, and the analysis of the effects of the causeway on the Conservation Objectives for Avocet as presented in the HRAR is not significantly changed.

It can therefore reasonably be concluded that there will be no AEOL of the Thames Estuary and Marshes SPA from potential changes to the population of Avocet as a result of the construction and use of the causeway.

Dunlin

Table 23 presents a comparison of the total number of Dunlin bird days affected in each of the 12 construction scenarios (i.e. a construction period of 6 months, each of the 12 scenarios commencing in a different month) for:

- 1) Mucking Flats SSSI only
- 2) Mucking Flats SSSI + south shore SPA within 7.3 km
- 3) Whole SPA (as set out in the HRAR)

Table 23. Comparison between assessments of effects on Dunlin bird days

Construction period		Total bird days affected	Total bird days as percentage of Mucking Flats SSSI bird days	Total bird days as percentage of Mucking Flats SSSI + south shore bird days	Total bird days as percentage of whole SPA bird days
Start	Finish				
Apr	Sep	0	0	0	0
May	Oct	0	0	0	0
Jun	Nov	0	0	0	0
Jul	Dec	3844	0.36	0.36	0.28
Aug	Jan	3844	0.36	0.36	0.28
Sep	Feb	3872	0.36	0.36	0.29
Oct	Mar	3872	0.36	0.36	0.29
Nov	Apr	3872	0.36	0.36	0.29
Dec	May	3872	0.36	0.36	0.29
Jan	Jun	28	0.003	0.003	0.002
Feb	Jul	28	0.003	0.003	0.002
Mar	Aug	0	0	0	0

The four scenarios with the highest effect are construction commencing between September to December inclusive, as these overlap with the two months when highest counts were recorded.

These highest-impact scenarios involve a potential impact on 0.29% of the total bird days available in the SPA. When only the population of Dunlin from Mucking Flats SSSI is assessed, the scenarios involve a potential impact on 0.36% of the available bird days in Mucking Flats SSSI. When the population of Dunlin from Mucking Flats SSSI + the south shore SPA within 7.3 km is assessed, the scenarios also involve a potential impact on 0.36% of the available bird days in this subsection of the SPA.

It is not considered that this increase of 0.07 of a percentage point (Mucking Flats SSSI) or 0.10% (Mucking Flats SSSI plus south shore) is sufficiently high to trigger a conclusion of AEOL compared to the conclusion of no AEOL presented in the HRAR, especially when it is considered that Dunlin were only sporadically recorded in the potential causeway impact area.

It is therefore concluded that the assessment presented in the HRAR for Dunlin is not altered by examining the population as a percentage of a smaller subset of the SPA, and the analysis of the effects of the causeway on the Conservation Objectives for Dunlin as presented in the HRAR is not significantly changed.

It can therefore reasonably be concluded that there will be no AEOL of the Thames Estuary and Marshes SPA from potential changes to the population of Dunlin as a result of the construction and use of the causeway.

Redshank

Table 24 presents a comparison of the total number of Redshank bird days affected in each of the 12 construction scenarios (i.e. a construction period of 6 months, each of the 12 scenarios commencing in a different month) for:

- 1) Mucking Flats SSSI only
- 2) Mucking Flats SSSI + south shore SPA within 7.3 km
- 3) Whole SPA (as set out in the HRAR)

Table 24. Comparison between assessments of effects on Redshank bird days

Construction period		Total bird days affected	Total bird days as percentage of Mucking Flats SSSI bird days	Total bird days as percentage of Mucking Flats SSSI + south shore bird days	Total bird days as percentage of whole SPA bird days
Start	Finish				
Apr	Sep	0	0	0	0
May	Oct	0	0	0	0
Jun	Nov	0	0	0	0
Jul	Dec	62	1.03	0.20	0.11
Aug	Jan	62	1.03	0.20	0.11
Sep	Feb	62	1.03	0.20	0.11
Oct	Mar	62	1.03	0.20	0.11
Nov	Apr	62	1.03	0.20	0.11
Dec	May	62	1.03	0.20	0.11
Jan	Jun	0	0	0	0
Feb	Jul	0	0	0	0
Mar	Aug	0	0	0	0

The six scenarios with the highest effect are construction commencing in July to December inclusive, as these overlap with the two months when highest counts were recorded.

These highest-impact scenarios involve a potential impact on 0.11% of the total bird days available in the SPA. When only the population of Redshanks from Mucking Flats SSSI is assessed, the scenarios involve a potential impact on 1.03% of the available bird days in Mucking Flats SSSI. When the population of Redshanks from Mucking Flats SSSI + the south shore SPA within 7.3 km is assessed, the scenarios involve a potential impact on 0.20% of the available bird days in this subsection of the SPA.

It is not considered that this increase of 0.92 of a percentage point (Mucking Flats SSSI) or 0.09% (Mucking Flats SSSI plus south shore) is sufficiently high to trigger a conclusion of AEIOI compared to the conclusion of no AEIOI presented in the HRAR, especially when it is considered that very small numbers of Redshank were recorded in the potential causeway impact area.

It is therefore concluded that the assessment presented in the HRAR for Redshank is not altered by examining the population as a percentage of a smaller subset of the SPA, and the analysis of the effects of the causeway on the Conservation Objectives for Redshank as presented in the HRAR is not significantly changed.

It can therefore reasonably be concluded that there will be no AEOI of the Thames Estuary and Marshes SPA from changes to the population of Redshank as a result of the construction and use of the causeway.

Ringed Plover

Table 25 presents a comparison of the total number of Ringed Plover bird days affected in each of the 12 construction scenarios (i.e. a construction period of 6 months, each of the 12 scenarios commencing in a different month) for:

- 1) Mucking Flats SSSI only
- 2) Mucking Flats SSSI + south shore SPA within 7.3 km
- 3) Whole SPA (as set out in the HRAR)

Table 25. Comparison between assessments of effects on Ringed Plover bird days

Construction period		Total bird days affected	Total bird days as percentage of Mucking Flats SSSI bird days	Total bird days as percentage of Mucking Flats SSSI + south shore bird days	Total bird days as percentage of whole SPA bird days
Start	Finish				
Apr	Sep	540	3.69	2.97	2.13
May	Oct	540	3.69	2.97	2.13
Jun	Nov	540	3.69	2.97	2.13
Jul	Dec	540	3.69	2.97	2.13
Aug	Jan	540	3.69	2.97	2.13
Sep	Feb	540	3.69	2.97	2.13
Oct	Mar	0	0	0	0
Nov	Apr	0	0	0	0
Dec	May	0	0	0	0
Jan	Jun	0	0	0	0
Feb	Jul	0	0	0	0
Mar	Aug	0	0	0	0

The six scenarios with the highest effect are construction commencing in April to September inclusive, as these overlap with the two months when highest counts were recorded.

These highest-impact scenarios involve a potential impact on 2.13% of the total bird days available in the SPA. When only the population of Ringed Plover from Mucking Flats SSSI is assessed, the scenarios

involve a potential impact on 3.69% of the available bird days in Mucking Flats SSSI. When the population of Ringed Plovers from Mucking Flats SSSI + the south shore SPA within 7.3 km is assessed, the scenarios involve a potential impact on 2.97% of the available bird days in this subsection of the SPA.

It is not considered that this increase of 1.56 percentage points (Mucking Flats SSSI) or 0.84 of a percentage point (Mucking Flats SSSI plus south shore) is sufficiently high to trigger a conclusion of AEOI compared to the conclusion of no AEOI presented in the HRAR, especially when it is considered that low numbers of Ringed Plover were recorded in the potential causeway impact area.

It is therefore concluded that the assessment presented in the HRAR for Ringed Plover is not altered by examining the population as a percentage of a smaller subset of the SPA, and the analysis of the effects of the causeway on the Conservation Objectives for Ringed Plover as presented in the HRAR is not significantly changed.

It can therefore reasonably be concluded that there will be no AEOI of the Thames Estuary and Marshes SPA from changes to the population of Ringed Plover as a result of construction and use of the causeway.

4.3 Assessment of potential effects on ‘bird days’ from presence of the causeway

The causeway may remain in place for up to the 35 year design lifetime of the flexible generation plant, although decommissioning and removal of it will take place sooner if alternative access for AILs becomes possible, as per DCO requirement 18.

The presence of the causeway will therefore have a continued effect until it is removed. Studies examining the passive effect of structures on the foraging behaviour of birds are limited. The Waterbird Disturbance Mitigation Toolkit (WDMT)² states that Ringed Plover, Dunlin and Redshank will forage extremely close to plant (<50m) during construction works. The disturbance effect of the causeway when it is physically present but not being built or in active use would certainly not be any greater than the effect from its construction or use, and would very likely be smaller. Given this and the low numbers and frequency of occurrence of birds recorded using the area in the vicinity of the causeway, it is concluded that no AEOI would result from the presence of the causeway itself for these species.

Avocets are not included in the WDMT, but again it is considered that the passive effect of the causeway would not be any greater than the effect from construction or use of the causeway and is likely to be smaller. The passive effect of the causeway would, therefore, be similar or smaller to the effect predicted for construction / operation, just over a longer time period. Therefore, for the same reasons presented in the HRAR (REP-022 sections 6.4.16-6.4.30), the SPA population will be maintained above 283 individuals in the medium-long term even if there is some displacement of birds from the vicinity of the causeway, and again no AEOI for Avocets is expected.

² Cutts, N., Hemingway, K. & Spencer, J. (2013). Waterbird disturbance mitigation toolkit. Institute of Estuarine and Coastal Studies, University of Hull.

5 SUMMARY

5.1 Approach to supplemental assessment

At Natural England's request, additional detail has been provided to supplement the assessment in the HRAR (REP2-022) of impacts from the construction, use and retention of the causeway on the Thames Estuary & Marshes SPA.

Natural England considers that the impacts of the causeway should be assessed against a subset of the SPA bird population, i.e. birds associated with Mucking Flats SSSI only, in addition to the analysis carried out for the SPA-wide population in the HRAR.

The Applicant maintains its position that the appropriate level at which impacts should be assessed for HRA is the SPA-wide populations of birds which are Qualifying Features (which Natural England has agreed is a technically correct approach), as was presented in the HRAR. Nevertheless, in the interests of seeking to reach agreement about the significance of any impact, and without prejudice to the Applicant's position that the approach in the HRAR is correct, the further analysis presented in this document has been undertaken.

The Applicant's view is that in this supplemental assessment, it is correct to consider bird populations on both the south and north sides of the Thames, since there is no reason to believe that sea birds do not cross the river. Hence, bird populations in Mucking Flats SSSI as NE requests (at up to 7.3 km distance from the causeway on the north bank) and bird populations within the SPA at up to that distance on the south bank should be included.

Nevertheless, an analysis of impacts considering the bird populations strictly limited to Mucking Flats SSSI has also been undertaken.

The supplemental assessment has considered the potential impacts from mudflat loss and from loss of bird days during the construction, use and existence of the causeway over its lifetime.

5.2 Conclusions

In all scenarios considered, mudflat losses would be <1% of the applicable area of habitat.

Bird-day impacts would range from 0.36% to 3.69% for the four species considered. For Avocet, Dunlin and Redshank the difference between the effect on the SPA population as a whole (HRAR approach) and the subset SSSI population (supplemental analysis) would be less than one percentage point. For Ringed Plover, the difference is 1.56 percentage points. Low numbers of Ringed Plover were recorded in the potential causeway impact area. It is also highlighted that these percentages are framed in the context of the number of potentially affected bird-days, which do not translate into percentage losses to the population. The potential losses in the populations of each species are predicted to be negligible.

In summary, whichever subset of mudflat habitat and SPA bird population is used, the assessment shows that the impacts of habitat loss or loss of bird days is not materially different to the assessment of the whole SPA effect and does not change the conclusion as presented in the HRAR that there would be no adverse effect on the integrity of the Thames Estuary and Marshes SPA.