



Southern Water's Water for Life: Hampshire

Technical Report 6: Habitats Regulations Assessment Consenting Risks: Ornithology and Airborne Noise Disturbance – Desalination and Water Recycling SROs

Report for Southern Water

FINAL

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1 Introduction

1.1 Background

Water companies in England and Wales are required to produce a Water Resources Management Plan (WRMP) every five years. The Plan sets out how the company intends to maintain the balance between supply and demand for water over the selected planning horizon (minimum 25 years) in order to ensure security of supply in each of the water resource zones making up its supply area.

Following submission of WRMPs in 2019, Ofwat through the Price Review 2019 (PR19) Final Determination, has identified the potential for companies to jointly deliver strategic regional water resources solutions to secure long-term resilience on behalf of customers while protecting the environment and benefiting wider society. As part of the assessment of companies' PR19 business plans, Ofwat introduced proposals to support the delivery of Strategic Regional Water Resource Options (SROs) over the next 5 to 15 years with solutions considered to be 'construction ready' for the 2025-2030 period. Ofwat's Final Determination in December 2019 set out a gated process for the co-ordination and development of a consistent set of SROs.

This gated process provides a mechanism for the industry, regulators, stakeholders and customers to input into the development and scheduling of these strategic solutions, through a combined set of statutory and regulatory processes. These include the National Framework, Drinking Water Safety Plans, Business Plans and WRMPs.

1.2 Southern Water's Strategic Challenge and Strategic Resource Options

The River Itchen, the River Test, and the Candover Stream are the three primary surface water resources utilised in Southern Water's Western Operating Area. In March 2019, the Environment Agency (EA) enacted sustainability reductions on all three sources, imposing new abstraction limitations to protect biodiversity in periods of drought. These reductions have fundamentally changed the water resources position in Hampshire and Isle of Wight (IOW) water resource zones (WRZs), and there is uncertainty regarding the potential for further changes in the future. The scale of the sustainability reductions is expected to generate sizeable supply-deficits during periods of severe drought.

Water supply modelling completed in development of Southern Water's WRMP, published in 2019, identified a 167 Ml/d supply-demand deficit across Southern Water's Western Operating Area during a 1-in-200-year drought scenario, accounting for the sustainability reductions referenced above. The WRMP19 preferred strategy included a 75Ml/d desalination plant in the Hampshire Southampton West (HSW) Water Resource Zone (WRZ). This was confirmed as the Base Case for the Gate 1 submission.

As part of the RAPID Gated process, Southern Water have been investigating a number of alternative Strategic Resource Options (SROs) to the Base Case including water recycling and water transfer from Portsmouth Water's Havant Thicket Reservoir.

One of these activities, was to further understand whether the construction noise would cause significant disturbance issues to the bird qualifying features of the numerous designated sites in the Solent and Langstone Harbour areas. The site selection work completed by [REDACTED] and conclusions of Stage 4 has informed the SRO configurations to be considered in this assessment. This is summarised alongside the SROs in **Table 1.1**.

Table 1.1 Water for Life-Hampshire strategic solution review

Solution	Configuration	Description	Comment
Desalination	Base Case	75Ml/d of drinking water produced by desalination plant in Fawley area supplying Hampshire Southampton West (HSW) Water Resources Zone with the interface between the new and existing distribution system located at Testwood WSW.	Part of this assessment, components at Lepe excluded during site selection work.

Section 2 Description of the Desalination and Water Recycling Solutions: high level description of the desalination and water recycling solutions and the components for each configuration.

Section 3 Construction Assumptions: generic methods for the construction of the components at the key locations discussed in Section 1.3. and indicative timescales. The information has been drawn from publicly available information (Environmental Statements, case study reviews) of similar schemes.

Section 4 Approach: overview of the approach taken to the noise modelling at the key locations identified.

Section 5 European Sites: summary of the designated sites being considered and the relevant qualifying bird features, with available baseline information summarised.

Section 6 Noise Disturbance Thresholds: review of relevant literature to identify suitable thresholds that could be used to understand the significance of disturbance for the different bird species that could be impacted.

Section 7 Noise Calculations: tabulated set of results for the noise generated from the construction activities at the known breeding and roosting locations for the European sites. Indicative contours mapped across priority habitats to determine likely impacts to foraging behaviours.

Section 8 Consideration of Noise Effects on Qualifying Features: interpretation of significance of the noise calculations and the likely effects to the bird qualifying features; breeding, roosting and foraging.

Section 9 Conclusions: concluding section.

2 Description of the Solutions

2.1 Desalination

The components of the desalination solution at Fawley are as follows:

- Sea water intake:
 - [REDACTED] **OR**
 - Offshore at Calshot
- Brine waste-stream and diffuser:
 - Offshore at Calshot utilising the disused Fawley outfall for some of the length **OR**
 - Offshore at Calshot but with completely new pipeline
- Pumping station to be located south of Fawley [REDACTED] (permanent land take c. 6,070m², additional temporary land take for construction compound c. 4,070m²)
- Pipeline to/from intake and outfall and desalination plant along western boundary of Fawley site.
- Desalination plant at [REDACTED] (including brine reception tank) (c 96,000m² for 75MI/d (permanent land take, 4,047m² temporary construction compound).
- Transfer pipeline to Testwood WSW (no water booster stations or break pressure tanks are required):
 - [REDACTED], SPA and Ramsar, then adjacent to it (west) to Testwood WSW **OR**
 - [REDACTED]
- Receiving tank at Testwood WSW.

The engineering information used within this assessment is based on the conceptual design produced for a 75MI/d solution for costing purposes only. The full 75MI/d will only be required to supply potable water in a 1 in 200 year drought event, and therefore the output at this level is periodic (one in every 20 years) a considered very much the worst-case scenario. However, the plant will need to be run with a sweetening flow of 15MI/d to main operational processes, ready for output to be increased when required. This would therefore be the likely, and more frequent, mode of operation.

For a 75MI/d Deployable Output desalination solution, 189MI/d of seawater is required which gives rise to 87m³/d solid waste and 114MI/d brine waste stream. When operating at a baseline level to provide 15MI/d, 38MI/d seawater is required resulting in 17m³/d solid waste and 23MI/d brine waste stream. The solid waste would need to be taken from site to landfill, requiring c. 1-2 movements per day when operating at 15MI/d and c.6-7 movements when operating at 75MI/d.

Two alternatives to the Base Case were worked up in additional detail by the WfLH Engineering team, as to a potential alternative to the Base Case. These considered an alternative site for the intake and outfall at Lepe, but with the desalination plant remaining at [REDACTED] and transferring water to Testwood WSW. The latter alternative (A.3) was to locate the desalination plant on Southampton Water, in an area close to Meon, with the transfer of water to Otterbourne WSW. These however were discounted as part of the early stages of the site selection work and are therefore not part of this assessment.

2.2 Water Recycling

Table 2.1 provides a summary of the components required for each configuration, following completion of the site selection work, and Sections 2.3.1 to 2.3.3 describe the configurations in more detail.

Table 2.1 Water recycling solution components

Component	B2 Water Recycling to Lake Otterbourne	B4 Water Recycling to Havant Thicket Reservoir	B5 Water Recycling () to Lake Otterbourne
Effluent transfer from	x	x	x
Effluent transfer from WRP site (WRP72)	x	x	x
Waste-stream to and out LSO	x	x	x
Transfer pipeline WRP to Lake Otterbourne environmental buffer (Routes 1 and 2)	x		x
Water booster stations (WBS) and break pressure tanks (BPT) (along pipeline routes)	x	x	x
Lake Otterbourne environmental buffer with emergency discharge pipeline to Otter Bourne watercourse <u>OR</u> to overland discharge area	x		x
Transfer pipeline WRP to Havant Thicket Reservoir (Routes 1 and 2)		x	
Havant Thicket Reservoir high lift pumping station (HTPS5)		x	
Transfer pipeline HTR to Otterbourne WTW (Routes 3 and 4)		x	
Pre-disinfection ceramic membrane plant at Otterbourne WSW	x	x	x

2.2.1 B2 - 61 MI/d Recycled Water from new Water Recycling Plant (fed from) to Otterbourne WSW via Lake Otterbourne environmental buffer

The components of the water recycling solution are as follows:

- Site for water recycling plant in proximity to (assumed to be WRP72 following site selection work) (permanent land take c. 45,000m², 4,047m² for temporary construction compound).
- Pipeline connection between and water recycling plant site (assumed tunnelled under watercourse)
- Transfer pipeline from water recycling plant to Lake Otterbourne environmental buffer
 - Route 1
 - Route 2
- Water booster stations and break pressure tanks along routes.
- Lake Otterbourne environmental buffer with emergency discharge pipeline to Otter Bourne watercourse² OR overland discharge area.
- Pre-disinfection ceramic membrane plant at Otterbourne WSW.

2.2.2 B4 - 15 MI/d Recycling Water from new Water Recycling Plant (fed from) to Otterbourne WSW via Havant Thicket Reservoir environmental buffer

The components of the water recycling solution are as follows:

- Site for water recycling plant in proximity to (assumed to be WRP72 following site selection work) (permanent land take c. 45,000m², 4,047m² for temporary construction compound).
- Pipeline connection between and water recycling plant site (assumed tunnelled under watercourse)
- Transfer pipeline from water recycling plant to Havant Thicket Reservoir
 - Route 1
 - Route 2
- Transfer pipeline from Havant Thicket Reservoir to Otterbourne WSW:
 - Route 3
 - Route 4

² A discharge structure will be required at the Otter Bourne watercourse, however this has currently not been sized (re: requirements to reduce scour etc) and therefore has not been included in the assessment.

- Initial high lift pumping station close to Havant Thicket Reservoir (permanent land take c. 6,070m², temporary construction compound c.4,050m²).
- Water booster stations and break pressure tanks along routes.
- Pre-disinfection ceramic membrane plant at Otterbourne WSW.

2.2.3 B5 - 75 Ml/d Recycling Water from new Water Recycling Plant (fed from [REDACTED] to Otterbourne WSW via Lake Otterbourne³ environmental buffer

The components of the water recycling solution are as follows:

- Site for water recycling plant in proximity to [REDACTED] (assumed to be WRP72 following site selection work) (permanent land take c. 45,000m², 4,047m² for temporary construction compound).
- Pipeline connection between [REDACTED] and water recycling plant site (assumed tunnelled under watercourse).
- Final effluent transfer from [REDACTED] to water recycling plant.
- The transfer from the water recycling plant will either utilise the Lake Otterbourne environmental buffer as described in B2b (Section 2.2.1).
- Pre-disinfection ceramic membrane plant at Otterbourne WSW.

³ There is currently no option being progressed where B5 would use Havant Thicket Reservoir as an environmental buffer instead of Lake Otterbourne. (*pers. Correspondence Southern Water 21.05.2021*).

3 Construction Assumptions

3.1 Desalination

3.1.1 Intake and Outfall

The expected duration of the various construction phases for the solution and proposed methodologies and details of the techniques are currently at outline design only.

At present, two options are being considered for the installation and construction of the marine infrastructure (i.e., the intake/outfall pipes):

- Open cut trenching along seabed and subsequent burial.
- Trenchless (tunnelled or pipe jacked⁴) beneath the seabed.

The worst-case scenario for installation and construction of all marine structures is to require open cut trenching. As specific details on extent of the intake/outfall pipelines are not confirmed, an accurate prediction of seabed footprint cannot be made, thus an assessment will be made on precautionary estimation.

3.1.1.1 Intake

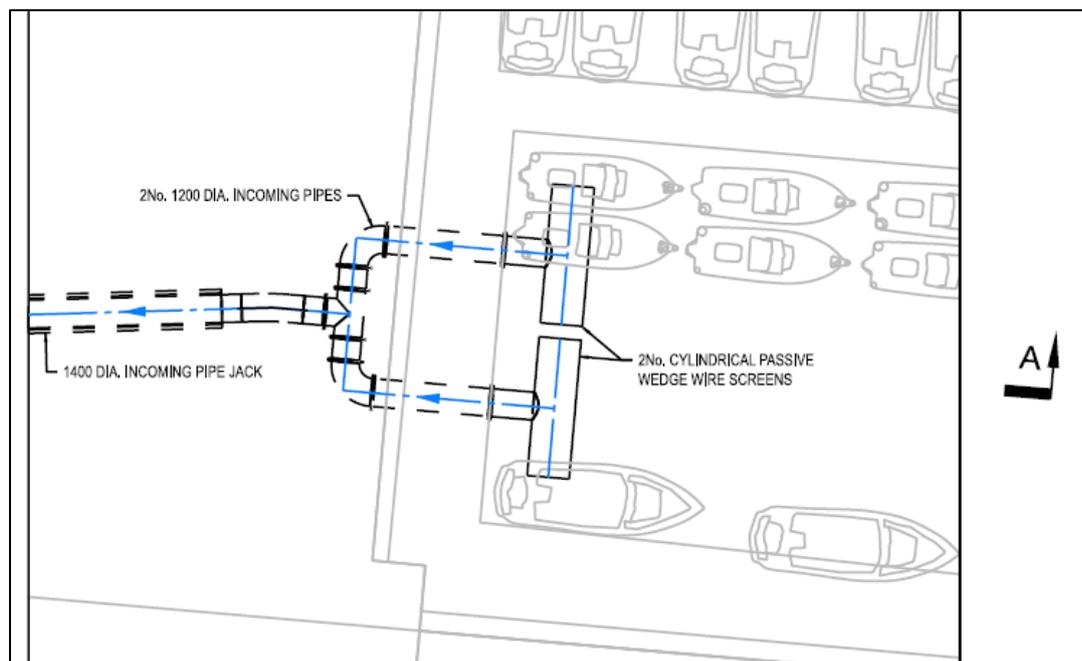
Water will be abstracted from Southampton Water via a submerged intake structure, fitted with an array of passive screens which prevent impingement of marine life and entrainment of debris, with the intake main extending along a tunnel to the on-shore pumping station structure. The intake is being designed to reduce impacts to fish populations through the screen sizing and low approach velocities. The intake will also need to be compliant with key legislation such as The Salmon and Freshwater Fisheries Act (1975) and The Eels Regulations (2009).

[REDACTED]

If the intake can be accommodated within the marina of the Fawley Waterside development, pending permission for [REDACTED], four passive wedge intake screens (e.g., no moving parts), 1.3m diameter, 4.7m length, with a fine mesh aperture of 1mm will be located within the marina. There is optionality around this configuration with potentially two, larger sized screens being located in the marina, as indicated in [Figure 3.1](#). The existing concrete walls of the marine would provide support to the screens, and from the dockside wall, the intake pipe will be pipe-jacked (trenchless) to the intake pumping station to be located on the opposite site of the Fawley Waterside access road.

⁴ Pipe-jacking is where pipes are pushed through the ground without disturbing the surface.

Figure 3.1 Indicative illustration of intake arrangement:



Solent intake (off Calshot) - tunnelled

To achieve this, the top of the existing outfall structure will be demolished (to remove the existing screens and to gain access to the shaft beneath). To enable this work to be carried out in a dry environment, a temporary sheet piled double wall cofferdam, c.16.5m diameter, will be constructed around the existing outfall location.

From this existing outfall shaft, a 1.8m internal diameter pipe jack c.350m long, c.4m below seabed level will terminate in a 6m internal diameter shaft at the new intake location. In order to construct the shaft in a dry environment using a caisson method, a temporary sheet piled double wall cofferdam, c.12.5m diameter, will be constructed around the shaft location. On completion of the shaft and intake screens, an area of c.8.5m diameter will be reinstated with scour protection rock and the cofferdam flooded and removed (there may be a number of steps to this removal based on commissioning of the desalination plant and ensuring the outfall is functioning effectively). Any screen components that can't be installed within the confines of the cofferdam will be installed by divers, post removal of the cofferdam.

To facilitate the construction of the cofferdam, shaft, pipework and removal of the pipe jacking equipment, it is anticipated that a jack up barge with a plan area of 1,000m² will be located adjacent to the cofferdam during the works.

As with the intake, the intake arrangement would consist of four passive wedge intake screens (e.g., no moving parts), 1.3m diameter, 4.7m length, with a fine mesh aperture of 1mm. Figure 3.2⁵ provides an indicative illustration of the intake arrangement for the Solent,

⁵ Based on 629451-SWS-DS-FL-DR-C-00002, 20 09 21

Figure 3.3 Typical trench detail

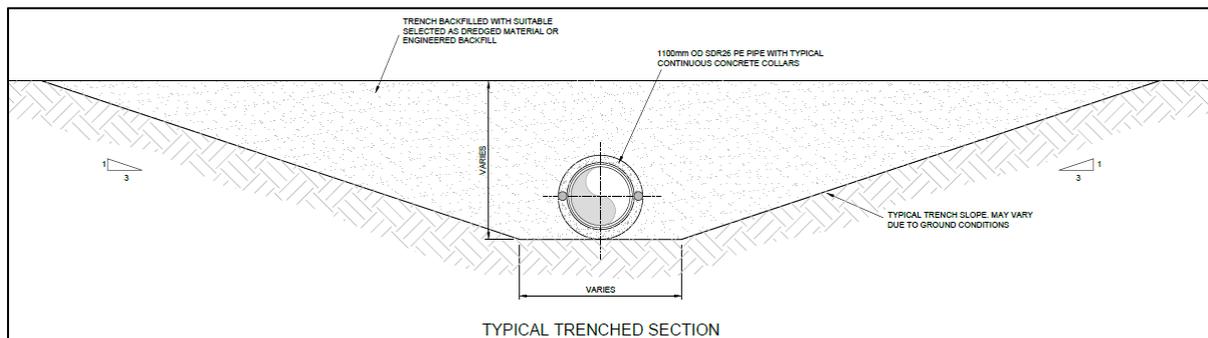
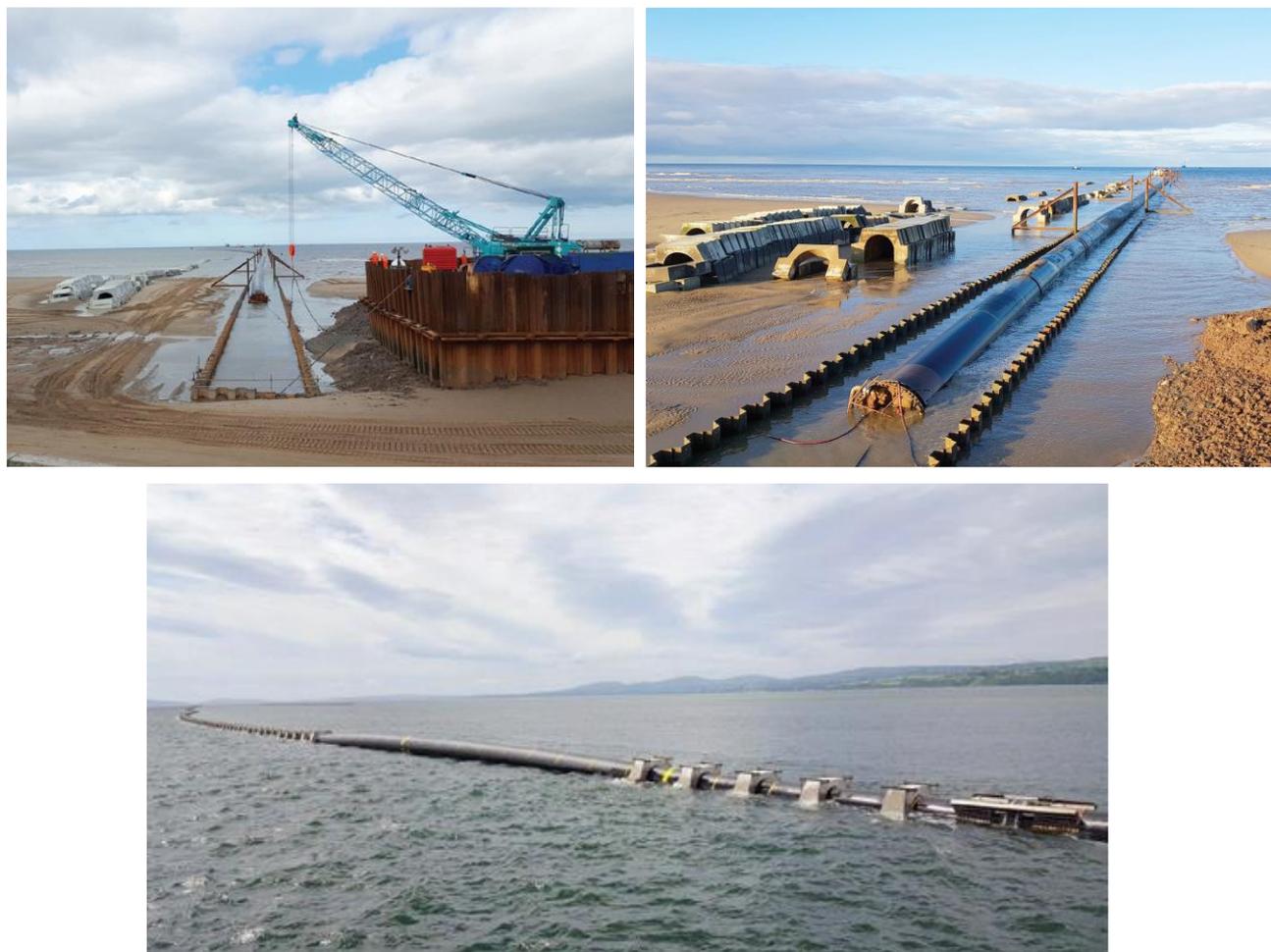


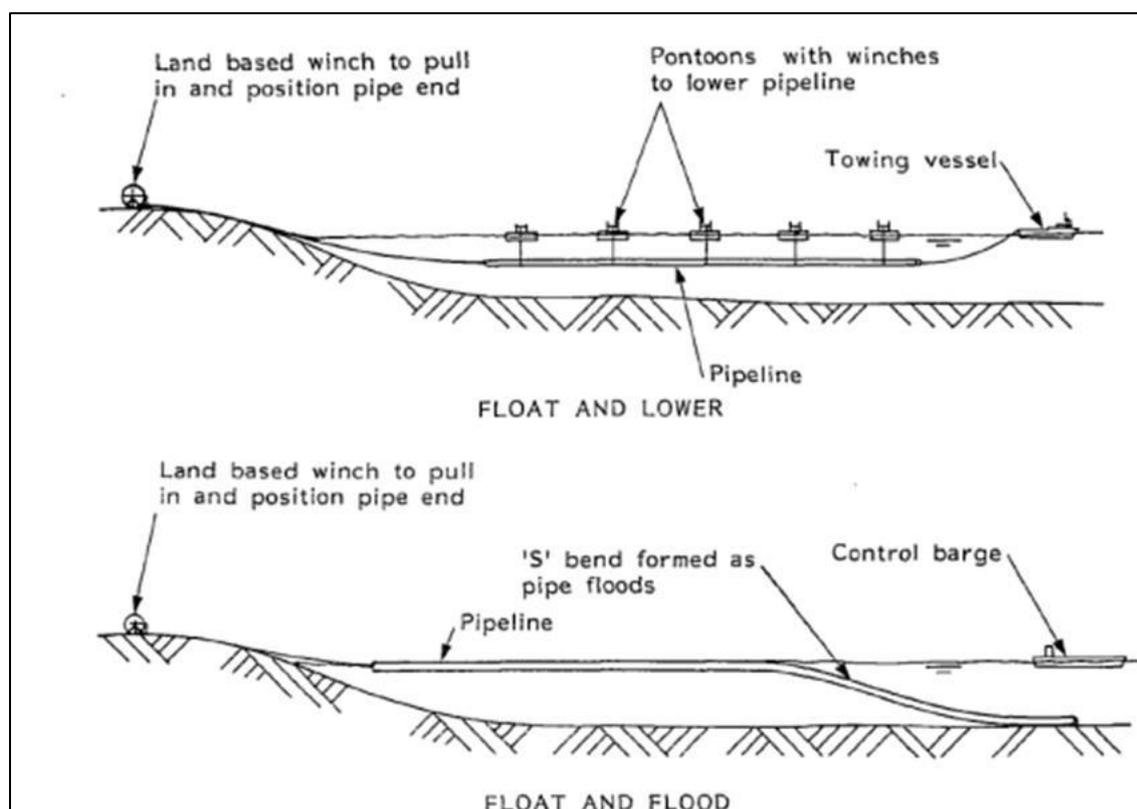
Figure 3.4 Indicative open cut trenching technique: United Utilities Anchorsholme Long Sea Outfall⁸



⁸ Thomson D. (2019) UK Water Projects 2019 - *Virtual Edition*. Anchorsholme Long Sea Outfall

The float and flood method as illustrated in **Figure 3.5** is the industry standard and proven method for installing long strings of polyethylene (PE) pipeline. This method minimises the risks during installation due to the reduced timescales for the installation operation (typically one tidal cycle).

Figure 3.5 Float and flood pipeline installation technique



A construction site is formed, and individual pipes are joined, in a local port or quay side (Southampton), to make one or more pipeline strings. The length of the strings will be dependent on the extent of the site, which need not necessarily be adjacent to or near to the location of the outfall. Careful weight and buoyancy control of the strings is essential as small variations can lead to difficulties during the floating and sinking operation. The completed strings are towed from the construction site and manoeuvred into position ready to be lowered in a controlled fashion. The lowering operation is achieved by flooding the string with water.

Upon completion of the pipe installation, the trench is backfilled with selected as dug material and scour protection at the discharge location (c.18m diameter). The diffuser arrangement will be fitted onto the outfall pipe and the marker post or buoy installed.

It should be noted that for the outfall alignment a straight line between the landfall and diffuser location or the use of long radius curves are preferred for this installation technique.

Tunnelled outfall

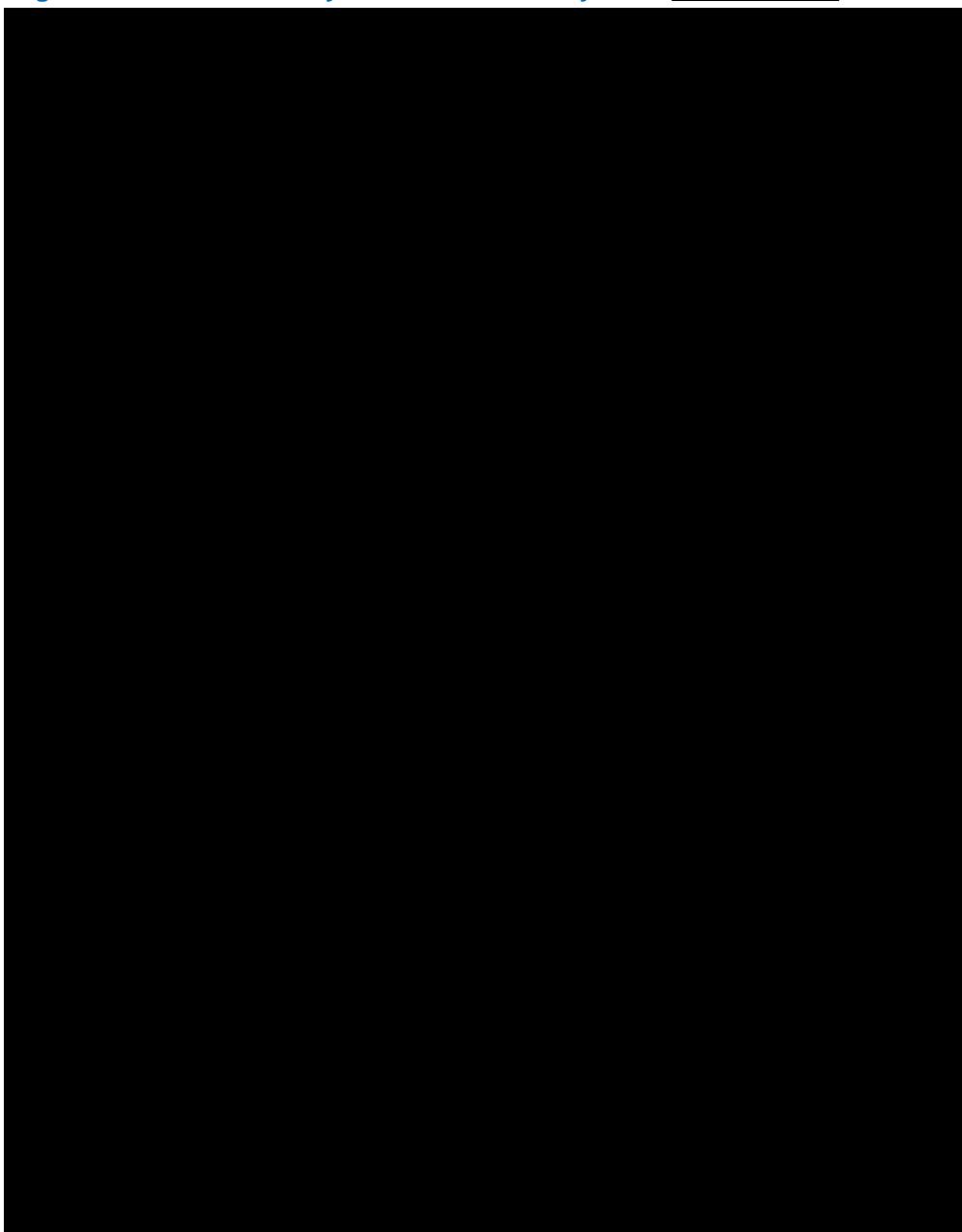
To ensure there is not an overlap of the brine with the intake, an additional pipeline c.720m long, 1.8m internal diameter, will be pipe jacked c.3m below seabed level and will terminate in a 6m internal diameter shaft at the outfall location. If both the intake and outfall can be accommodated, only one temporary cofferdam around the existing power station outfall will be required for the connections. However, another temporary sheet piled double wall cofferdam, ~12.5m diameter, will be constructed around the new outfall shaft location. On completion of the shaft and outfall diffusers, an area of ~8.5m diameter will be reinstated with scour protection rock and the cofferdam dam flooded and removed (there may be a number of steps to this removal based on commissioning of the desalination plant and ensuring the outfall is functioning effectively).

Alternatively, a 2,035m long tunnelled pipeline will be constructed for the outfall, with a land-based launch pit. A c.2.9m internal diameter tunnel, c.9m below sea bed level will terminate in a 8m internal diameter shaft at the discharge location. In order to construction the shaft in a dry environment using a caisson method, a temporary sheet piled double wall cofferdam, c.16.5m diameter, will be constructed around the shaft location. On completion of the shaft and intake screens, an area of c.12.5m diameter will be reinstated with scour protection rock and the cofferdam dam flooded and removed (there may be a number of steps to this removal based on commissioning of the desalination plant and ensuring the outfall is functioning effectively). To facilitate the construction of the cofferdam, shaft, pipework and removal of the tunnel boring machine, it is anticipated that a jack up barge with a plan area of 1,000m² will be located adjacent to the cofferdam during the works.

3.1.1.3 Desalination Plant Land Parcel Size

A preliminary site layout for the proposed desalination treatment works is provided in **Figure 3.6**, indicating that a site footprint of approximately 96,000m² permanent land take and 4,047m² for the temporary construction compound.

Figure 3.6 Preliminary desalination site layout at [REDACTED]



3.1.2 Pipelines

It is likely that there will be various work fronts progressing a particular aspect of the pipeline construction activities; topsoil stripping, trench excavation, pipeline installation and backfilling. Several work fronts may operate simultaneously.

Open cut trenching will be used for the majority of the pipeline route. The trench will be excavated, with temporary storage of subsoil within the construction corridor, separate to the topsoil. Either selected backfill or imported granular pipe bedding material would then be placed into the excavation and, following pipe installation, suitable surround materials would be placed as required. The trench would then be backfilled with the subsoil arising and compacted.

Where trench excavation is required in the road, this would commence with the breaking out of hard surfaces prior to excavation of the trench. Arisings generated by these activities would typically be tested and where suitable sent to a recycling facility. [REDACTED]

[REDACTED] There would be an allowance for 7 day working / extended hours 7am to 9pm Mon to Fri with traffic management under control from 7am to 7pm within the [REDACTED].

Trenchless techniques are proposed for main river crossings and larger roads, with either auger bore or Horizontal Directional Drill (HDD) likely to be employed subject to specific site conditions. Auger bore is suitable for relatively short distances, at shallow depths. Launch and reception pits would be required either side of the obstacle, potentially with support from sheet piles. The auger would bore horizontally to install a sleeve pipe. HDD would drive rods through the earth from a launch pit to a reception pit. The drill head is enlarged for each pass until the hole is a size greater than the pipe. The welded pipe is then fed through the hole. Dewatering is likely to be required for both methods at the reception and launch sites.

Smaller watercourses (<2m) would be crossed using an open-cut method. This could be undertaken by either installing a flume pipe (or pipes) into the bed of the watercourse, allowing flow of water during the works or by over-pumping the water. The watercourse is dammed using sheet piles at each end to form a dry area in between within which to work.

3.1.3 Indicative Plant and Programme Duration

The following tables provide an indication of the types of plant (**Table 3.1**) and likely duration of activities (**Table 3.2**) to inform this risk assessment, which aims to identify requirements for mitigation. There is no Early Contractor Involvement (ECI) at Gate 2, and therefore information has been derived from case studies of similar types of development. As such, the methods, plant and programme will be updated once ECI is available.

Table 3.1 Indicative list of plant required: desalination

Works	Plant
Intake and outfall (open cut)	Backhoe or cutter suction dredger, split hopper barges, barges, excavator, pile-driving equipment: vibratory hammer and impact hammer, crane Vehicles: dumper trucks, front loaders, bulldozers.
Intake and outfall (tunneled)	Tunnel boring machine and associated equipment, barges, pile-driving equipment – vibratory hammer and impact hammer, crawler crane, dewatering system. Vehicles: dumper trucks, front loaders, bulldozers.
Desalination plant	Excavator, dump trucks, telehandler, tower cranes, crawler cranes, pile-driving equipment (CFA), dewatering system
Pipeline	Excavator, trench box, dumper trucks for open-cut crossings, HDD/Auger and associated equipment for trenchless crossings.

Table 3.2 Indicative construction durations: desalination

Works	Activity	Indicative Duration
Intake and outfall (open cut)	Intertidal trench excavation	1 month
	Offshore trench dredging	2 months
	Pipe installation	1 week
	Diffuser and intake installation	1 week
	Scour (intake and outfall) and dome protection (outfall)	2 weeks
	Backfill trench	2 months
Intake and outfall (intertidal tunneled)	Construct beach access	2 weeks
	Construct cofferdam and receptor pit	5 weeks
	Construct launch pit	3 months
	Tunneling	2 months
	Remove TBM, cofferdam and backfill	3 weeks
Desalination plant	Site enabling/establishment	3 months
	Groundworks/levelling/site drainage	12 months
	Process unit construction	18 months
	Installation of MEICA	6 months
	Testing	4 months
Pipeline ⁹	450m/week in open areas 90m/week in urban areas HDD 100m crossing c. 5 weeks	Open areas: 3 weeks Urban areas: 206 weeks Trenchless crossings: 35 weeks

3.2 Water Recycling

The following description is taken from the Strategic Solution Gate 1 Submission: Annex 5 Water Recycling Technical Report 28 September 2020. Further refinement of the solution will occur as the project progresses from concept to detailed design if the solution is selected following completion of the Multi Criterion Decision Analysis (MCDA) at Gate 2.

3.2.1 Final Effluent (FE) feed water pumping station

A pumping station will be required at [REDACTED] (and [REDACTED] for configuration B5) to transfer water from the WTW to the water recycling plant. The construction will require the following components:

- Offtake structure from the existing gravity effluent outfall pipeline.
- Suction main to pumping station
- Wet well sump, pumps and associated equipment.
- Rising main to the proposed Water Recycling Plant site.

1 At this stage, the wet well construction is envisaged to entail typical open cut excavation with the wet well walls being formed from cast in-situ reinforced concrete. Groundwater control will be via standard sump pumping.

3.2.2 Water Recycling Plant

Following completion of the Stage 4 Site Selection work to inform the Gate 2 submission, the preferred location of the WRP is off [REDACTED] (WRP72), as shown in **Figure 3.7**. The indicative proposed layout of the WRP is shown in **Figure 3.8**.

⁹ Assuming Route 1 [REDACTED] desalination plant to Testwood WSW: 20,670m in length with 7 trenchless crossings, 23 road crossings, 18,550m in highways and 1,395m in fields.

Figure 3.7 Stage 4 Site Selection – WRP preferred site at WRP72

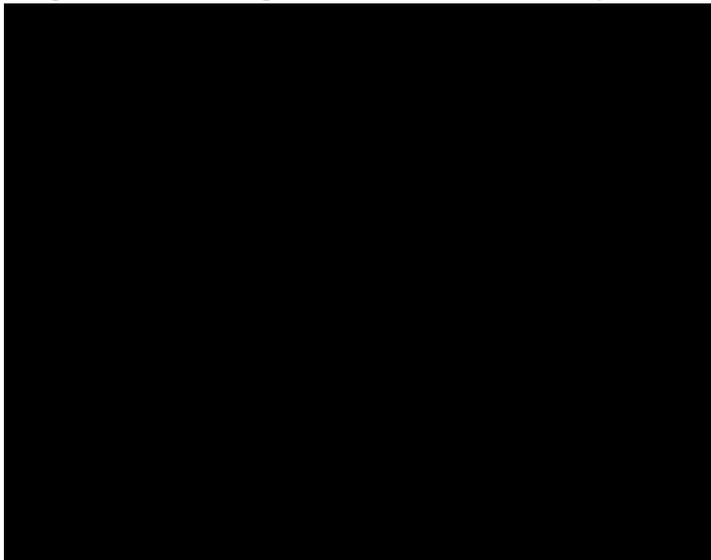
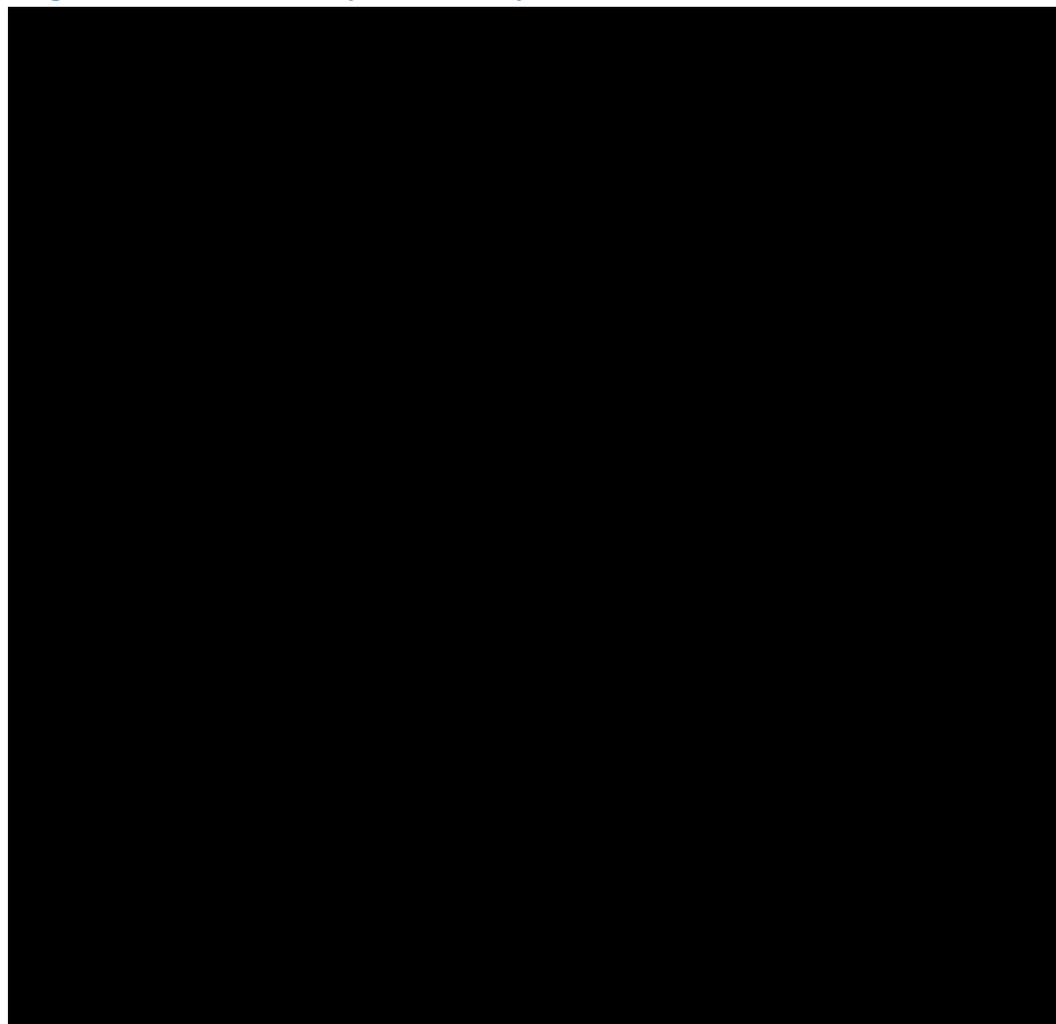


Figure 3.8 Preliminary WRP site layout



3.2.3 Pipelines

The descriptions as described for desalination (Section 3.1.2) are applicable to the water recycling configurations too.

3.2.4 Lake Otterbourne Environmental Buffer

The minimum land parcel required for the permanent works is c. 53,420m². The land topography and underlying geology will be key design parameters which would determine if the land parcel is suitable and the form of the final water storage facility.

At this preliminary stage, it is envisaged that the sides of the reservoir will be of earth embankment construction with a solid core (either clay or concrete) and include a cut off to limit seepage beneath the embankments. Preferably, the base of the reservoir will be founded on impermeable strata (clays) to limit infiltration however if this is not available, an artificial liner (polyethylene or geosynthetic clay) would be installed to create the impermeable barrier and mitigate water loss through the base. Side slopes have been estimated at grades of 1 in 4 internally to maximise volume whilst adhering to empirical good practice limits for slope stability, and externally at 1 in 6 to allow for grassing and maintenance thereof.

An emergency overflow will be required to ensure that any uncontrolled discharges (which may cause damage to the reservoir) are managed away from the structure and are safely routed downstream. Two options are currently being investigated, one to discharge the flow to the Otter Bourne (a tributary of the River Itchen SAC) and one to discharge across land between the reservoir and adjacent to the Otter Bourne (see **Figure 3.9**).

3.2.5 Indicative Plant and Programme Duration

The following tables provide an indication of the types of plant (**Table 3.3**) and likely duration of activities (**Table 3.4**) to inform this risk assessment, which aims to identify requirements for mitigation. There is no Early Contractor Involvement (ECI) at Gate 2, and therefore information has been derived from case studies of similar types of development. As such, the methods, plant and programme will be updated once ECI is available.

Table 3.3 Indicative list of plant required: water recycling

Works	Plant
Final effluent pumping station and LSO connections	Excavator, pile-driving equipment – vibratory hammer and impact hammer, crawler crane, dewatering system. Vehicles: dumper trucks, front loaders, bulldozers.
Water recycling plant	Excavator, dump trucks, telehandler, tower cranes, crawler cranes, pile-driving equipment (CFA), dewatering system
Pipeline	Excavator, trench box, dumper trucks for open-cut crossings, HDD/Auger and associated equipment for trenchless crossings.
Lake Otterbourne environmental buffer (reservoir)	Excavator, dump trucks, telehandler, tower cranes, crawler cranes, pile-driving equipment (CFA), dewatering system

Table 3.4 Indicative construction durations: water recycling

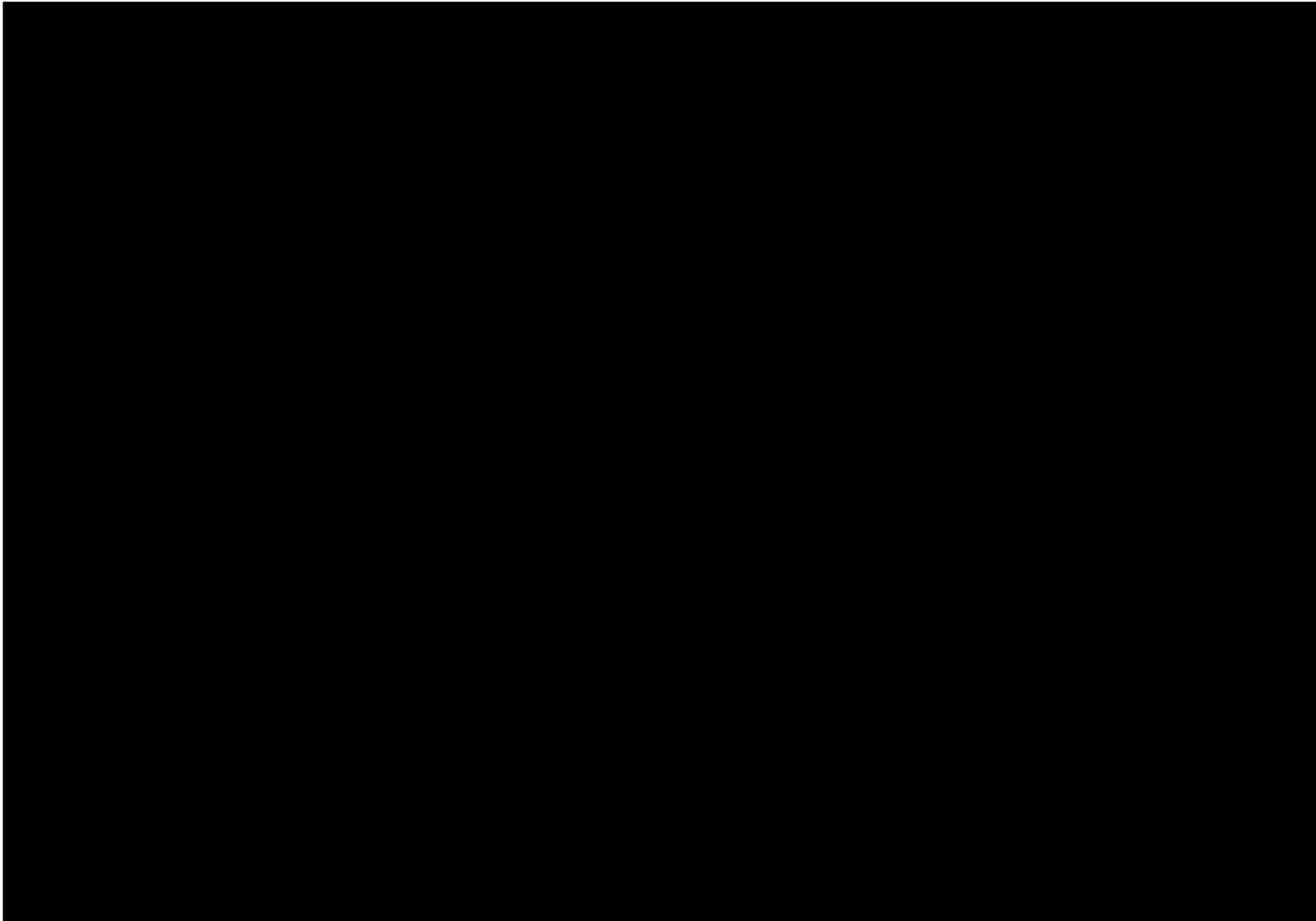
Works	Activity	Indicative Duration
FE pumping station and LSO connection	Wet well construction and connections	1 year
Water recycling plant	Site enabling/establishment	2 months
	Groundworks/levelling/site drainage	9 months
	Process unit construction	15 months
	Installation of MEICA	7 months
	Testing	4 months
██████████ to WRP pipeline (c.900m tunneled)	HDD 100m crossing c.5 weeks	4 months

Works	Activity	Indicative Duration
Pipeline from WRP to Havant Thicket Reservoir (HTR) ¹⁰	450m/week in open areas 90m/week in urban areas HDD 100m crossing c. 5 weeks	Open areas: 6 weeks Urban areas: 17 weeks Trenchless crossings: 13 weeks
Pipeline ¹¹	450m/week in open areas 90m/week in urban areas HDD 100m crossing c. 5 weeks	Open areas: 76 weeks Urban areas: 29 weeks Trenchless crossings: 120 weeks
Lake Otterbourne environmental buffer	Site enabling/establishment	4 weeks
	Solar panel removal & service diversions	8 weeks
	Reservoir construction	12 months
	Pumping station and pipelines	4 months
	Testing and commissioning	8 weeks
	Reinstatement and vegetation planting	4 weeks

¹⁰ Assuming Route 1 WRP to HTR: 4673m in length, with 4 trenchless crossings, 10 road crossings, 1,540m in highways and 2,783m in fields.

¹¹ Assuming Route 1 WRP to Otterbourne WSW: 39,230m in length with 21 trenchless crossings, 23 road crossings, 2,650m in highways and 33,965m in fields.

Figure 3.9 Preliminary design of Lake Otterbourne Environmental Buffer



4 Approach

4.1 Introduction

Given that a number of the SRO components are within or in close proximity to habitats likely to be used by the qualifying bird features of the Solent and Southampton Water SPA, Chichester and Langstone Harbours SPA, Solent and Dorset Coast SPA and New Forest SPA, noise calculations have been completed to estimate noise levels due to construction activities from development activities at a number of ornithological receptor sites.

The noise calculations were completed by [REDACTED] a Chartered Physicist and Member of the Institute of Acoustics who has over 30 years' experience as a noise and acoustics consultant.

The interpretation of these results, and an assessment of any subsequent significance of the noise levels indicated has been undertaken by Ricardo's ecologists.

4.2 Terminology

Sound levels are measured in decibels (dB). The decibel scale is logarithmic rather than linear. A noise level change of 3dB on a sound meter reading would be just perceptible by humans, and an increase of 10dB is perceived, subjectively, as a doubling of loudness. The human ear responds differently to sounds of different frequencies. The ear "hears" high frequency sound of a given level more loudly than low frequency sound of the same level. The A-weighted sound level, dB(A), takes this response into consideration and is commonly used for measurement of environmental noise in UK. It indicates the subjective human response to sound.

Environmental noise levels vary continuously from second to second. It is impractical to specify the sound level for each second and so time averaging is required. In practice human response to sound is related to various units which include allowance for the fluctuating nature of sound with time. For the purpose of this report these include:

- $L_{Aeq,T}$ the equivalent A-weighted continuous sound level over period T. This unit relates to the equivalent level of continuous sound for a specific time period T, for example 16 hr for daytime noise. It contains all the sound energy of the varying sound levels over the same time period and expresses it as a continuous sound level over that period. The unit is used for assessing traffic, transportation and industrial noise for planning purposes.
- L_{Amax} the maximum A-weighted sound level over a period of measurement. This unit is used for assessing the potential effect on sleep disturbance of individual events at night, such as aircraft, train movements or impulsive industrial activities.

4.3 Construction Noise Level Calculations at Sensitive Ornithological Receptor Sites

The construction noise calculations (see Section 4.2.3.3) were used to indicate noise levels at the selected receptor sites, within a radius of approximately 2.5km of the scheme components. Given the proximity of the SPA and SSSI designations, the sensitive receptor sites were selected based on the SPA, Core and Primary support areas identified in the Solent Wader and Brent Goose Strategy, known locations for breeding tern colonies, and areas with significant recordings in the within the New Forest SPA (surveys completed by The Verderers of the New Forest under the Higher Level Stewardship Agreement).

4.3.1 Baseline Noise Data

Baseline data collection has not been undertaken to inform the assessment, rather publicly available results presented in Environmental Statements for developments near the proposed construction sites have been used to determine likely noise levels.

4.3.1.1 Desalination

Baseline noise surveys have been undertaken for the [REDACTED], with three survey locations considered to provide an indication of baseline noise levels in the vicinity of key components of the desalination solution:

- MP1 – corresponding to the desalination plant at [REDACTED]
- [REDACTED]
- MP8 – corresponding to the Calshot intake/outfall works.

The locations are shown in **Figure 4.1** whilst the baseline noise survey results are presented in **Table 4.1**; all are taken from the Fawley Waterside Limited Environmental Statement April 2020.

Figure 4.1 [REDACTED] baseline noise monitoring locations

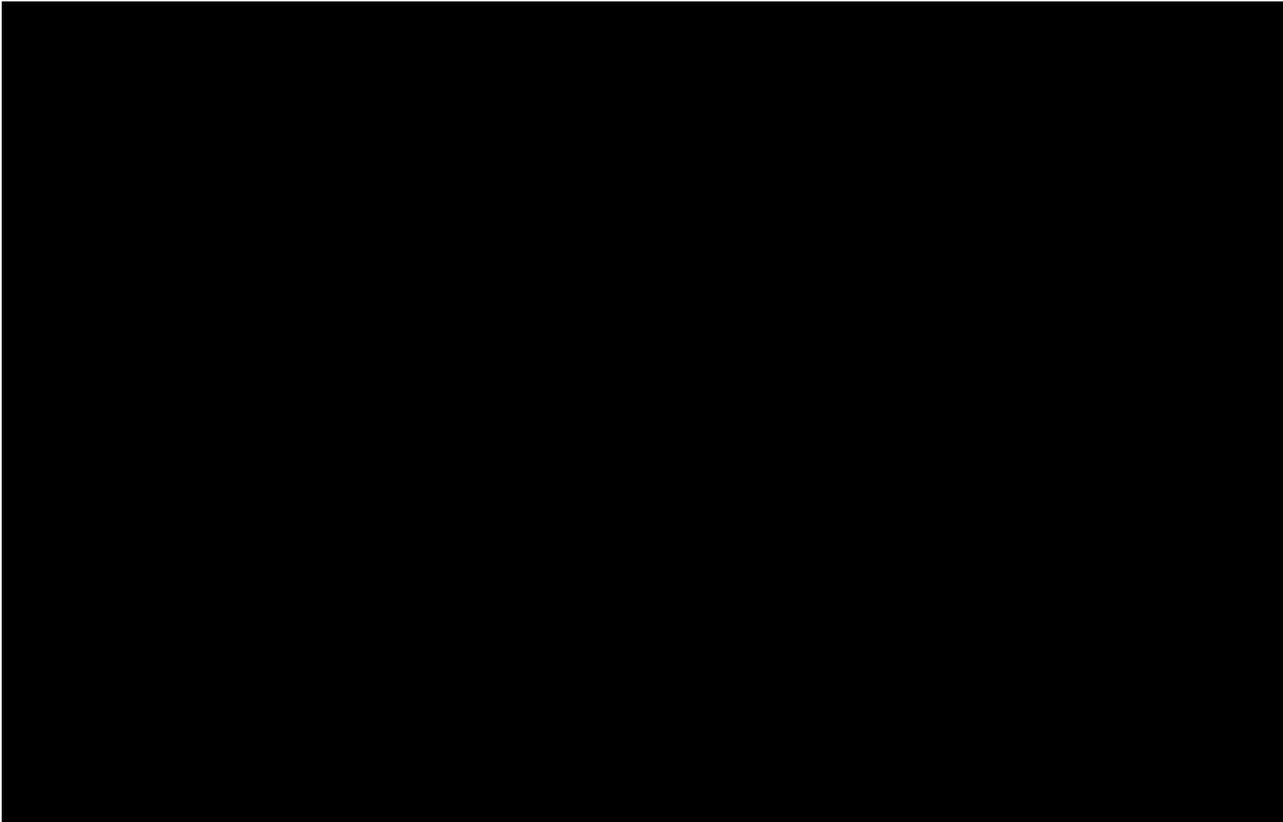


Table 4.1 Highest measured/derived noise levels at each measurement position¹²

Measurement Position (MP)	Daytime (L _{Aeq,16h})	Night-time (L _{Aeq,8hr})	Typical L _{AFMax} ¹³
1	45dB*	42dB	56dB
5	65dB	53dB	77dB
8	53dB*	-	-

*Incomplete measurement for time period.

¹² Adapted from Fawley Waterside Limited Volume 1: Updated Environmental Statement Chapter 9 - Noise and Vibration, Table 9.5 (April 2020).

¹³ The 'typical' LAFmax values have been derived by determining the 15th highest LAFmax event during the night-time period.

4.4 Construction Calculations

In accordance with the methodology presented in BS5228-1 (the code of practice for noise and vibration control on construction and open sites: noise), the potential noise levels generated during construction have been predicted by determining an appropriate source level for each item of construction plant and equipment (based on the sound pressure level at a distance of 10 m) and correcting it for:

- Distance effects on noise attenuation between source and receptor;
- Percentage operating time of the construction machinery;
- Barrier screening effects on noise attenuation (not always applicable);
- Ground absorption effects on noise attenuation; and
- Effects of embedded mitigation measures.

It is recognised that the procedure is an estimation process as the precise details of day-to-day plant usage, noise emission and working patterns are not known at this stage. However, historical data on noise from specific construction activities is available and the location of receptor sites relative to the construction works is also known.

Meteorological conditions can affect the propagation of sound, particularly over longer distances, thus the construction noise calculations take account of worst-case conditions whereby the receptor is assumed to be at a downwind location relative to the source.

The calculations were carried out using a BS5228-1 spreadsheet which follows the prescribed calculation methodology for the propagation path between each item of plant at the source activity location and each receptor site. Annex F of BS5228-1 provides equations for distance attenuation, soft ground absorption correction, percentage on-time correction, barrier effects, and the summation of noise from a number of plant items¹⁵.

4.4.1.1 Desalination

The calculations were based on plant assumptions which were derived from Section 3 and consultation with Southern Water engineers.

Desalination plant at [REDACTED]

Table 4.4 provides the assumed source noise levels at 10m for each construction activity for the desalination plant.

Table 4.4 Source noise levels of construction plant for Desalination Plant

Activity	Plant	Ref	Source
		BS5228	dB(A)@10m
Site Preparation	Excavator	2.2	77
	Crawler crane	2.39	74
	Dumpers	2.3	79
	Loader	2.28	76
	Dozer	2.11	79
	Bomag roller	2.39	74
	CFA Piling	12.43	77
Construction	Telehandler	4.55	70
	Tower crane	4.48	76
	Dumpers	2.3	79
	Loader	2.28	76

¹⁵ The construction plant values are derived from the BS5228 data which gives an L_{Aeq} at 10m for the plant running continuously during normal operations. The piling data for the assessment assumed piling continuously for 1 hour, i.e. a 100% on-time. This is feasible in practice as it can take up to 2 hours for a pile to be driven through 12m at 50 hits per minute.

Activity	Plant	Ref	Source
		BS5228	dB(A)@10m
	Welding	3.31	73
	Generators	4.85	66
	Dozer	2.11	79
	Crawler crane	4.52	75
	Dewatering	11.2	71

Based on the above plant data the worst-case cumulative noise level would be $L_{Aeq,1hr}$ 89dB at 10m during site preparation works that included CFA piling. This would be equivalent to a level of 44dB at 1,000m. The construction and fit out works would be less noisy, with a cumulative noise level of $L_{Aeq,1hr}$ 86dB at 10m, equivalent to a level of 41dB at 1,000m.

Calshot intake and outfall – open trench method

Plant for the construction of the Calshot intake and outfall by the trenching method is shown in **Table 4.5**.

Table 4.5 Source noise levels of construction plant for the Calshot intake and outfall by the trenching method

Activity	Plant	Ref	Source
		BS5228	dB(A)@10m
Trenching	Backhoe Excavator	4.66	69
	Suction Dredger	7.2	82
	Barges	4.71	71
	Excavator	2.2	77
	Vibro piling	3.8	88
	Crawler crane	4.52	75
	Dumpers	2.3	79
	Loader	2.28	76
	Dozer	2.11	79
	Impact piling	12.7	92

Based on the above data the worst-case cumulative noise level would be $L_{Aeq,1hr}$ 91dB at 10m during the trenching works that included impact piling. This would be equivalent to a level of 46dB at 1,000m.

Calshot intake and outfall – tunnelled method

Similarly, plant for the construction of the Calshot intake and outfall by the tunnelling method is shown in **Table 4.6**.

Table 4.6 Source noise levels of construction plant for the Calshot intake and outfall by the trenching method

Activity	Plant	Ref	Source
		BS5228	dB(A)@10m
Tunnelling	Barges	4.71	71
	Crawler crane	4.52	75
	Dumpers	2.3	79
	Loader	2.28	76
	Dozer	2.11	79
	Vibro piling	3.8	88

Activity	Plant	Ref	Source
	Dewatering	11.2	71
	Impact piling	12.7	92

Based on the above data the worst-case cumulative noise level would be $L_{Aeq,1hr}$ 87dB at 10m during the tunnelling works that included vibro piling. This would be equivalent to a level of 42dB at 1,000m.

Similarly, plant for the construction of the Calshot intake and outfall by the tunnelling method is shown in **Table 4.7**.

Table 4.7 Source noise levels of construction plant for the Pipeline construction

Activity	Plant	Ref	Source
		BS5228	dB(A)@10m
Construction	Dumpers	2.3	79
	Loader	2.28	76
	Excavator	2.2	77

Less plant would be required for the pipeline construction, resulting in a worst-case cumulative noise level $L_{Aeq,1hr}$ 84dB at 10m. This would be equivalent to a level of 39dB at 1,000m.

4.4.1.2 Water recycling

The calculations were based on plant assumptions which were derived from Section 3 and consultation with Southern Water engineers. **Table 4.8** provides the assumed source noise levels at 10 m for each construction activity.

Table 4.8 Source noise levels of construction plant: water recycling plant

Activity	Plant	Ref	Source
		BS5228	dB(A)@10m
Site Preparation	Excavator	2.2	77
	Crawler crane	2.39	74
	Dumpers	2.3	79
	Loader	2.28	76
	Dozer	2.11	79
	Bomag roller	2.39	74
	CFA Piling	12.43	77
	Vibro piling	3.8	88
	Impact piling	12.7	92
Construction	Telehandler	4.55	70
	Tower crane	4.48	76
	Dumpers	2.3	79
	Loader	2.28	76
	Welding	3.31	73
	Generators	4.85	66
	Dozer	2.11	79
	Crawler crane	4.52	75
Dewatering	11.2	71	

Based on the above plant data the worst-case cumulative noise level would be $L_{Aeq,1hr}$ 92dB at 10m during site preparation works that included impact piling. This would be equivalent to a level of 47dB at 1,000m. The construction and fit out works would be less noisy, with a cumulative noise level of $L_{Aeq,1hr}$ 86dB at 10m, equivalent to a level of 41dB at 1,000m.

4.5 Thresholds

There are no standards for the assessment of noise affecting water bird receptors (Solent and Langstone Harbour) or lowland birds and raptors (New Forest), therefore a literature review was completed to identify most suitable noise levels to use, and applicability to the different bird species (see Section 6).

Natural England have advised on other developments that a threshold of 70dB is no longer acceptable as a blanket threshold, and regard should also be had to the change in noise level as a result of the development.

To understand whether there could be a significant effect, the principles set out in the Natural England document 'A Review of the Effects of Noise on Birds' (2018) will be used as an initial screening tool. The document sets out the requirement to understand both background (LA_{90}) and maximum (LA_{max}/LA_{01}) noise levels which the birds are currently exposed to in assessing the impact of future noise sources.

Therefore, with regards to impulsive/sporadic events, the document states the following:

- In the case of sporadic noise, a greater than 3 dBA increase in peak noise might be a useful and sufficiently precautionary rule-of-thumb when considering the likelihood of a significant effect.
- With regards to continuous noise sources, the document states that as a rule of thumb, increases of 3dB or more against existing levels could be significant.

Values of $L_{Aeq,T}$ and L_{Amax} have been predicted and ambient $L_{Aeq,T}$ levels have been estimated, based on the results of recent noise measurements at residential receptor sites taken from publicly available information from neighbouring developments.

5 European Sites

5.1 Summary

There are a number of statutory designated SAC, SPA and Ramsar sites (referred to hereafter as European sites) present that overlap or are in the vicinity to the proposed construction areas. A large number make up the Solent European Marine Site.

The Gate 1 Stage 1 Screening identified LSEs with regards a number of European sites. [REDACTED]

[REDACTED] The designated sites to be considered are therefore:

- Solent and Dorset Coast SPA
- Chichester and Langstone Harbours SPA and Ramsar
- Solent and Southampton Water SPA and Ramsar
- New Forest SPA and Ramsar.

5.2 Qualifying Features

The following summarises the qualifying features of the sites.

Chichester and Langstone Harbours SPA

Article 4.1, During the breeding season:

- Little Tern *Sternula albifrons*, 100 pairs representing up to 4.2% of the breeding population in Great Britain (5 year mean, 1992-1996)
- Common tern *Sterna hirundo* 85 breeding pairs of common tern (five year mean 1982-1986)
- Sandwich Tern *Thalasseus sandvicensis*, 158 pairs representing up to 1.1% of the breeding population in Great Britain (1998)

Article 4.2, Over winter:

- Bar-tailed Godwit *Limosa lapponica*, 1,692 individuals representing up to 3.2% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)
- Curlew *Numenius arquata* 2,937 individuals five year peak mean 1982/83-1986/87), representing more than 1% of the British population during the wintering period
- Dark-bellied Brent Goose *Branta bernicla*, 17,119 individuals representing up to 5.7% of the wintering Western Siberia/Western Europe population (5 year peak mean 1991/2 - 1995/6)
- Dunlin *Calidris alpina alpina*, 44,294 individuals representing up to 3.2% of the wintering Northern Siberia/Europe/Western Africa population (5 year peak mean 1991/2 - 1995/6)
- Grey Plover *Pluvialis squatarola*, 3,825 individuals representing up to 2.5% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6)
- Pintail *Anas acuta* Average overwintering numbers have fluctuated from the pre-classification 323 individuals (five year peak mean 1982/83-1986/87)
- Red-breasted merganser *Mergus serrator* Average numbers of red-breasted merganser were at 206 individuals (five year peak mean 1982/83-1986/87)
- Redshank *Tringa totanus*, 1,788 individuals representing up to 1.2% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6)
- Ringed Plover *Charadrius hiaticula*, 846 individuals representing up to 1.7% of the wintering Europe/Northern Africa - wintering population (5 year peak mean 1991/2 - 1995/6)
- Sanderling *Calidris alba*, in the five years before classification, numbers of sanderling averaged at 407 overwintering birds (five year peak mean 1982/83-1986/87)
- Shelduck *Tadorna tadorna*, five year peak mean of 4,287 overwintering birds (1982/83 - 1986/87), 4% of the West European population
- Shoveler, *Spatula clypeata*, 2,803 individuals, five year peak mean (1982/83-1986/87)
- Teal *Anas crecca*, five year peak mean of 2,553 overwintering birds (1982/83 - 1986/87)

- Turnstone *Arenaria interpres*, 564 individuals, five year peak mean (1982/83-1986/87)
- Wigeon *Mareca penelope*, 2,803 individuals, five year peak mean (1982/83-1986/87)

Over winter, the area regularly supports 93,142 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: Wigeon *Anas penelope*, Bar-tailed Godwit *Limosa lapponica*, Dark-bellied Brent Goose *Branta bernicla bernicla*, Ringed Plover *Charadrius hiaticula*, Grey Plover *Pluvialis squatarola*, Dunlin *Calidris alpina alpina*, Black-tailed Godwit *Limosa limosa islandica*, Redshank *Tringa totanus*, Little Grebe *Tachybaptus ruficollis*, Little Egret *Egretta garzetta*, Shelduck *Tadorna tadorna*, Curlew *Numenius arquata*, Teal *Anas crecca*, Pintail *Anas acuta*, Shoveler *Anas clypeata*, Red-breasted Merganser *Mergus serrator*, Oystercatcher *Haematopus ostralegus*, Lapwing *Vanellus vanellus*, Knot *Calidris canutus*, Sanderling *Calidris alba*, Cormorant *Phalacrocorax carbo*, Whimbrel *Numenius phaeopus*.

Solent and Southampton Water SPA

Article 4.1, During the breeding season:

- Common Tern *Sterna hirundo*, 267 pairs representing at least 2.2% of the breeding population in GB
- Little Tern *Sternula albifrons*, 49 pairs representing at least 2.0% of the breeding population in GB
- Mediterranean Gull *Ichthyophaga melanocephalus*, 2 pairs representing at least 20.0% of the breeding population in GB
- Roseate Tern *Sterna dougallii*, 2 pairs representing at least 3.3% of the breeding population in GB
- Sandwich Tern *Thalasseus sandvicensis*, 231 pairs representing at least 1.7% of the breeding population in GB.

Article 4.2, Over winter:

- Black-tailed Godwit *Limosa limosa islandica*, 1,125 individuals representing at least 1.6% of the wintering Iceland - breeding population
- Dark-bellied Brent Goose *Branta bernicla bernicla*, 7,506 individuals representing at least 2.5% of the wintering Western Siberia/Western Europe population
- Ringed plover *Charadrius hiaticula*, 552 individuals representing at least 1.1% of the wintering Europe/Northern Africa - wintering population
- Teal *Anas crecca*, 4,400 individuals representing at least 1.1% of the wintering Northwestern Europe population.

Assemblage qualification: A wetland of international importance:

Over winter, the area regularly supports 53,948 individual waterfowl including: Gadwall *Anas strepera*, Teal *Anas crecca*, Ringed plover *Charadrius hiaticula*, Black-tailed Godwit *Limosa islandica*, Little Grebe *Tachybaptus ruficollis*, Great Crested Grebe *Podiceps cristatus*, Cormorant *Phalacrocorax carbo*, Dark-bellied Brent Goose *Branta bernicla*, Wigeon *Anas penelope*, Redshank *Tringa tetanus*, Pintail *Anas acuta*, Shoveler *Anas clypeata*, Red-breasted Merganser *mergus serrator*, Grey Plover *Pluvialis squatarola*, Lapwing *Vanellus vanellus*, Dunlin *Calidris alpina alpina*, Curlew *Numenius arquata*, Shelduck *Tadorna tadorna*.

Solent and Dorset Coast SPA

Article 4.1, During the breeding season:

- Common Tern *Sterna hirundo*, 492 pairs (984 breeding adults) (2009 - 2014), 4.77% of the breeding population in GB
- Little Tern *Sternula albifrons*, 63 pairs (126 breeding adults) (2009 - 2014), 3.31% of the breeding population in GB
- Sandwich Tern *Thalasseus sandvicensis*, 441 pairs (882 breeding adults) (2008 - 2014), 4.01% of the breeding population in GB

The New Forest SPA

Article 4.1, During the breeding season:

During the breeding season the area regularly supports: European nightjar *Caprimulgus europaeus* 8.8% of the GB breeding population; woodlark *Lullula arborea* 29.5% of the GB breeding population; European honey buzzard *Pernis apivorus* 12.5% of the GB breeding population; Dartford warbler *Sylvia undata* 33.6% of the GB breeding population

Over winter the area regularly supports: Hen harrier *Circus cyaneus*, 2% of the GB population.

Article 4.2: During the breeding season the area regularly supports: Hobby *Falco subbuteo* 5% of the population in GB; wood warbler *Phylloscopus sibilatrix* at least 2% of the population in GB.

Chichester and Langstone Harbours Ramsar

Ramsar criterion 1: Two large estuarine basins linked by the channel which divides Hayling Island from the main Hampshire coastline. The site includes intertidal mudflats, saltmarsh, sand and shingle spits and sand dunes.

Ramsar criterion 5: Assemblages of international importance: Species with peak counts in winter: 76480 waterfowl (5 year peak mean 1998/99-2002/2003).

Ramsar criterion 6 Assemblages of international importance:

Qualifying Species/populations (as identified at designation): Species with peak counts in spring/autumn:

- Ringed plover, *Charadrius hiaticula* Europe/Northwest Africa 853 individuals, representing an average of 1.1% of the population (5 year peak mean 1998/9-2002/3)
- Black-tailed godwit, *Limosa limosa islandica*, Iceland/W Europe 906 individuals, representing an average of 2.5% of the population (5 year peak mean 1998/9-2002/3)
- Common redshank, *Tringa totanus totanus*, 2577 individuals, representing an average of 1% of the population (5 year peak mean 1998/9-2002/3)

Species with peak counts in winter:

- Dark-bellied brent goose, *Branta bernicla bernicla*, 12987 individuals, representing an average of 6% of the population (5 year peak mean 1998/9-2002/3)
- Common shelduck *Tadorna tadorna*, NW Europe 1468 individuals, representing an average of 1.8% of the GB population (5 year peak mean 1998/9-2002/3)
- Grey plover *Pluvialis squatarola*, E Atlantic/W Africa -wintering 3043 individuals, representing an average of 1.2% of the population (5 year peak mean 1998/9-2002/3)
- Dunlin *Calidris alpina alpina* W Siberia/W Europe 33436 individuals, representing an average of 2.5% of the population (5 year peak mean 1998/9-2002/3)

Species/populations identified after designation for possible future consideration under criterion 6.

Species regularly supported during the breeding season: Little tern, *Sternula albifrons*, W Europe 130 apparently occupied nests, representing an average of 1.1% of the breeding population (Seabird 2000 Census).

Solent and Southampton Water Ramsar

Ramsar criterion 1:

The site is one of the few major sheltered channels between a substantial island and mainland in European waters, exhibiting an unusual strong double tidal flow and has long periods of slack water at high and low tide. It includes many wetland habitats characteristic of the biogeographic region:

- saline lagoons
- saltmarshes
- estuaries
- intertidal flats
- shallow coastal waters
- grazing marshes
- reedbeds
- coastal woodland
- rocky boulder reefs.

Ramsar criterion 2: Important assemblage of rare plants and invertebrates. At least 33 British Red Data Book (BRDB) invertebrates and at least eight BRDB Book plants are represented on site.

Ramsar criterion 5: Assemblages of international importance: Species with peak counts in winter: 51343 waterfowl. In addition to those species listed as part of the SPA designation, and in criterion 6, the following are considered as part of the waterfowl assemblage: Black headed gull *Larus ridibundus*, Slavonian grebe

Podiceps auritus, black necked grebe *Podiceps nigricollis nigricollis*. Little egret *Egretta garzetta*, spotted redshank *Tringa erythropus*, common redshank *Tringa nebularia* and water rail *Rallus aquaticus*.

Ramsar criterion 6:

Qualifying Species/populations (as identified at designation):

Species with peak counts in spring/autumn: Ringed plover, *Charadrius hiaticula*, Europe/Northwest Africa 397 individuals, representing an average of 1.2% of the GB population

Species with peak counts in winter: Dark-bellied brent goose, *Branta bernicla bernicla*, 6456 individuals, representing an average of 3% of the population, Eurasian teal, *Anas crecca*, NW Europe 5514 individuals, representing an average of 1.3% of the population, Black-tailed godwit, *Limosa limosa islandica*, Iceland/W Europe 1240 individuals, representing an average of 3.5% of the population

The New Forest Ramsar

Ramsar criterion 1: Valley mires and wet heaths are found throughout the site and are of outstanding scientific interest. The mires and heaths are within catchments whose uncultivated and undeveloped state buffer the mires against adverse ecological change. This is the largest concentration of intact valley mires of their type in Britain.

Ramsar criterion 2: The site supports a diverse assemblage of wetland plants and animals including several nationally rare species. Seven species of nationally rare plant are found on the site, as are at least 65 British Red Data Book species of invertebrate. See notes 21/22 of the Ramsar Information Sheet for all invertebrate species.

Plants of note: *Pulicaria vulgaris*, *Eriophorum gracile*, *Mentha pulegium*, *Ludwigia palustris*, *Pilularia globulifera*, *Elatine hexandra*, *Eleocharis acicularis*, *Gentiana pneumonanthe*, *Illecebrum verticillatum*, *Lycopodium inundatum*, *Carex montana*, *Cicendia filiformis*, *Deschampsia setacea*, *Thelypteris palustris*, *Hammarbya paludosa*, *Eleocharis parvula*, *Galium debile*, *Gentiana pneumonanthe*, *Impatiens noli-tangere*, *Myosurus minimus*, *Oenanthe pimpinelloides*, *Parentucellia viscosa*, *Polypogon monspeliensis*, *Polygonum minus*, *Ranunculus tripartitus*, *Rhynchospora fusca*, *Thelypteris palustris*, *Utricularia intermedia*.

Species of note: Dartford warbler *Sylvia undata*, hen harrier *Circus cyaneus*, Southern damselfly *Coenagrion mercuriale*, stag beetle *Lucanus cervus*, great crested newt *Triturus cristatus*, brook lamprey *Lampetra planeri*, bullhead *Cottus gobio*

Ramsar criterion 3: The mire habitats are of high ecological quality and diversity and have undisturbed transition zones. The invertebrate fauna of the site is important due to the concentration of rare and scarce wetland species. The whole site complex, with its examples of semi-natural habitats is essential to the genetic and ecological diversity of southern England.

5.3 Baseline Overview

5.3.1 Chichester and Langstone Harbours Special Protection Area and Ramsar

The Estuarine Waterbirds Low Tide counts completed in 1992-93 and 1998-99¹⁶ observed tidal movements for a number of bird species (grey plover, knot, dunlin, black-tailed godwit, and curlews) with feeding occurring in Portsmouth Harbour, and roosting in Langstone Harbour.

Latest information regarding habitat/location preferences for roosting and feeding is presented in **Table 5.1**, summarised from the Supplementary Advice for Conservation Objectives available on Natural England's

¹⁶ British Trust for Ornithology (undated) Estuarine Waterbirds at Low Tide. Edited by: Andy Musgrove, Rowena Langston, Helen Baker and Robin Ward. Accessed at <https://www.bto.org/our-science/projects/wetland-bird-survey/publications/other-webs-publications>

designated views webpage¹⁷. Latest population figures have also been obtained from the WeBS Annual Online Report¹⁸.

The additional Ramsar bird qualifying feature not covered by the SPA designation is black-tailed godwit. Baseline information for this species has been included in **Table 5.1**.

¹⁷ Accessed at:

<https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UK9011011&SiteName=Chichester%20and%20Langstone%20Harbour&SiteNameDisplay=Chichester%20and%20Langstone%20Harbours%20SPA&countyCode=&responsiblePerson=&SeaArea=&IFCAAarea=&NumMarineSeasonality=18&HasCA=1>. Last accessed 03.07.2020.

¹⁸ Frost, T.M., Calbrade, N.A., Birtles, G.A., Mellan, H.J., Hall, C., Robinson, A.E., Wotton, S.R., Balmer, D.E. and Austin, G.E. 2020. Waterbirds in the UK 2018/19: The Wetland Bird Survey. BTO/RSPB/JNCC. Thetford.

Table 5.1 Summary of feeding and roosting preferences, and population counts for qualifying features: Chichester and Langstone Harbours

Qualifying Feature	Feeding Preferences/Locations	Roosting Preferences/Locations	Five year average ¹⁹ (peak (year)) Langstone Harbour	Five year average ²⁰ (peak (year)) Chichester Harbour	Importance	Presence on site	WeBS Alerts
Bar-tailed godwit (<i>Limosa lapponica</i>), Non-breeding	Feed on intertidal sediments but show a preference for sandier substrates. Important feeding area around Sword Sands (Langstone Harbour).	Roost on saltmarsh, freshwater and coastal grazing marsh and shingle RSPB Islands, Farlington Marshes, the Langstone Oysterbeds, Sword Sands and Kench Spit in Langstone Harbour	244 (416 (17/18))	576 (760 (15/16))	At the time of classification in 1987, bar-tailed godwits were present at numbers of national importance, and remain at an abundance, which represents more than 1% of the UK population.	Sep-Apr	High (SB) Medium (LT)
Common tern (<i>Sterna hirundo</i>), Breeding	Feed on small fish and crustaceans, terrestrial insects and occasionally squid. Forage throughout the harbours, in the harbour mouths and into the Solent. They are generalist and opportunist feeders, using more varied habitats, a wider range of feeding techniques and taking a wider variety of prey than other tern species, with a mean maximum foraging range of 12.6 ±10.6 km. They take food from near the surface of the water by plunge-diving to a depth of 1-2 m, often after hovering. Prey might also be gathered by 'contact dipping'.	Nest in simple shallow 'scrapes' on sand, shingle or within low vegetation ²¹ . Oysterbeds islets, the RSPB Islands and on floating manmade rafts	6 (29 (17/18))	40 (62 (18/19))	When classified in 1987, the Chichester and Langstone Harbours SPA supported 85 breeding pairs of common tern (five year mean 1982-1986).	Apr-Sep	
Curlew (<i>Numenius arquata</i>), Non-breeding	Feed on marine worms, shellfish and shrimps found in the intertidal sediments within the sheltered harbours. South of Farlington Marshes and south of Bedhampton Wharf.	Farlington Marshes, the Oysterbeds, the RSPB islands and Kench Spit provide important roost habitat for curlew overwintering in the SPA, including shingle banks, marshland and manmade structures	1,077 (1,418 (15/16))	1,273 (1,595 (17/18))	When classified in 1987, the Chichester and Langstone Harbours SPA supported nationally important numbers of curlew (2,937 individuals five year peak mean 1982/83-1986/87). more than 1% of the British population during the wintering period.	Jun-Apr	Medium (MT,SB)
Dark-bellied brent goose (<i>Branta bernicla bernicla</i>), Non-breeding	Main food sources are the green algae (<i>Ulva</i> species) and seagrass beds growing on the intertidal sediments. Green algae is found throughout the harbours, whilst seagrass beds are located in more limited areas such as Sinah Lake and Mallard Sands in Langstone Harbour.	Roost on the water overnight.	5,154 (5,563 (15/16))	12,795 (14,260 (15/16))	When classified in 1987, Chichester and Langstone Harbours supported internationally important numbers of dark-bellied Brent geese, accounting for 12% of the West European population.	Oct-Mar	
Dunlin (<i>Calidris alpina alpina</i>), Non-breeding	Feed in groups on the intertidal sediments throughout the harbours. Feed in particular to the south of Thorney Island and in the Emsworth Channel (Chichester Harbour).	Dunlin roost on sediment islands and spits, saltmarsh and coastal and freshwater grazing marsh. Farlington Marshes, the Oysterbeds, Kench Spit and Railway Bank and at Eastney Lake Spit.	12,611 (15,220 (16/17))	11,386 (14,252 (18/19))	At time of classification in 1987, 2.6% of the West European population overwintered in Chichester and Langstone Harbours SPA.	Sep-Apr	Medium (LT,SB)
Grey plover (<i>Pluvialis squatarola</i>), Non-breeding	Turnstone forage on intertidal sediment and rocky substrates. The prey on a wide variety of foods including crustaceans, barnacles and bivalves often found by turning over stones and seaweed. However, they will also feed upon bird eggs, corpses and even chips.	Turnstone roost on both natural (shingle and marshland) and artificial (pontoons and boats) habitat. In Chichester Harbour they roost in small numbers, quite widely spread. Some small concentrations are at Chidham Point, on the pontoons at Itchenor and on the boats at East Head and Bosham. In Langstone Harbour they roost on the RSPB Islands and Farlington Marshes, as well as at the Kench Spit and Railway Bank, the west side of the Kench and Mullberry Harbour.	697 (865 (14/15))	1,299 (1,667 (15/16))	When the SPA was classified in 1987, there were internationally important numbers (3.9% of the Western European population) of grey plover overwintering in Chichester and Langstone Harbours.	Aug-Mar	Medium (LT,SB)
Little tern (<i>Sternula albifrons</i>), Breeding	Forage alone in shallow water often within 1km of their breeding colony for small fish, crustaceans, and insects. Forage throughout the harbours, in the harbour mouths and into the Solent.	Nest in simple shallow 'scrapes' on bare sand and shingle. Nest on Bakers Island, Pilsley Island, the north Stakes Islands, and the Oysterbeds islets.	0 (0)	30 (57 (19/20))	When classified in 1987, the Chichester and Langstone Harbours SPA supported 109 breeding pairs of little tern (five year mean 1982-1986).	Apr-Aug	

¹⁹ Contains Wetland Bird Survey (WeBS) data from Waterbirds in the UK 2018/19 © copyright and database right 2020. WeBS is a partnership jointly funded by the BTO, RSPB and JNCC, in association with WWT, with fieldwork conducted by volunteers. Accessed at: <https://app.bto.org/webs-reporting/>

²⁰ Contains Wetland Bird Survey (WeBS) data from Waterbirds in the UK 2018/19 © copyright and database right 2020. WeBS is a partnership jointly funded by the BTO, RSPB and JNCC, in association with WWT, with fieldwork conducted by volunteers. Accessed at: <https://app.bto.org/webs-reporting/>

²¹ English Nature. 2001. Solent European Marine Site: English Nature's advice Regulation 33(2) Conservation Advice Package: English Nature
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Qualifying Feature	Feeding Preferences/Locations	Roosting Preferences/Locations	Five year average ¹⁹ (peak year) Langstone Harbour	Five year average ²⁰ (peak year) Chichester Harbour	Importance	Presence on site	WeBS Alerts
	Little tern forage for small fish, crustaceans, and insects in shallow water often within 1km of their breeding colony to a maximum of 5km ²² . They hover and then plunge dive near the surface of the water or by 'contact dipping' where only the bill enters the water and the bird remains in flight.						
Pintail (<i>Anas acuta</i>), Non-breeding	Feed at the surface of the water by dabbling (submerging the head) for vegetation. Feed throughout the harbours but particularly favour the Nutbourne Bay area and north of the Thorney Channel in Chichester Harbour	Roost on the open water. They favour areas such as the Thorney Deeps and Nutbourne Bay in Chichester Harbour. In Langstone Harbour, they also roost on the RSPB Islands, Farlington Marshes, the Oysterbeds and Southmore Spit	211 (277 (16/17))	143 (246 (17/18))	Pintail numbers have remained stable since the Chichester and Langstone Harbours SPA was classified in 1987. Average overwintering numbers have fluctuated from the pre-classification 323 individuals (five year peak mean 1982/83-1986/87) but currently average at 338 individuals (five year peak mean 2009/10-2013/14).	Sep-Mar	
Red-breasted merganser (<i>Mergus serrator</i>), Non-breeding	Dive and swim to forage on fish and aquatic invertebrates in the water column. In Langstone Harbour, they favour the deeper waters to the east of Farlington Marshes and towards Langstone Bridg	Feed and roost on the water in both Chichester and Langstone harbours.	143 (205 (16/17))	105 (136 (18/19))	There were nationally important numbers of red-breasted merganser in Chichester and Langstone Harbours SPA when it was classified in 1987. Average numbers of red-breasted merganser were at 206 individuals (five year peak mean 1982/83-1986/87).	Oct-Mar	Medium (ST)
Redshank (<i>Tringa totanus</i>), Non-breeding	Feed on invertebrates, both inland and in estuaries. Prey includes earthworms and crane fly larvae as well as crustaceans, molluscs and marine worms. Feed throughout the harbours including The Kench.	Roost on the RSPB Islands, Farlington Marshes, Oysterbeds, Kench Spit, Kench Railway Bank, Eastney Lake Spit and on the beach on the north side of Kendalls Wharf in Langstone Harbour.	845 (921 (17/18))	1,654 (1728 (17/18))	At the time of classification in 1987, 1.4% of the West European population of redshank overwintered in the Chichester and Langstone Harbours SPA. Redshank overwintered in numbers of national importance and the total within the SPA accounted for more than 1% of the British population.	Jul-Apr	
Ringed plover (<i>Charadrius hiaticula</i>), Non-breeding	Feed on invertebrates found on sand and shingle shores, mudflats, saltmarshes, short grassland and flooded fields. Important areas for such habitat are Pilsay Sands, East Head, north of Black Point, Hayling Beach and Sword Sands.	Roosts are on the RSPB islands, Farlington Marshes, the Oysterbeds, the Kench Spit and Railway Bank and the Eastern Road bridge.	251 (349 (19/20))	209 (271 (17/18))	Chichester and Langstone Harbours SPA supports nationally important numbers (more than 1% of the population) of overwintering ringed plover.	Aug-May	High (LT,SB) Medium (MT)
Sanderling (<i>Calidris alba</i>), Non-breeding	Feed in small groups at the edge of the tide, chasing the waves as they go out to collect crustaceans, worms, fish and jellyfish. Key area within Langstone Harbour is Sword Sands.	Roost on shingle, saltmarsh and sand. Roost in the main bird areas such as the RSPB Islands, Farlington Marshes, the Oysterbeds, the Kench and Sword Sands (Langstone Harbour)	28 (52 (18/19))	181 (217 (19/20))	Historically, in Chichester and Langstone Harbours SPA sanderling numbers accounted for 3.1% of the West European population.	Aug-May	High (SB)
Sandwich tern (<i>Thalasseus sandvicensis</i>), Breeding	Feed on sandeels, herring and sprats, as well as crustaceans and small squid. Forage alone or in small flocks taking prey from near the surface of the water by plunge-diving to a depth of 2m. There is stronger tendency to feed at the harbour mouths. At high tide in Langstone Harbour, they form groups to forage south of South Binness island.	They nest colonially in high densities on the ground, on shingle spits, ridges and islets. In Chichester and Langstone Harbours SPA, they breed on the South Stakes islands, the Oysterbeds islets and the RSPB Islands.	0 (0)	26 (54 (18/19))	Sandwich tern numbers have risen in Chichester and Langstone Harbours SPA since classification. There was an average of 37 pairs breeding in the SPA in the five years before classification in 1987. Now, there is an average of 93 breeding pairs (five year mean 2011-2015).	Apr-Aug	
Shelduck (<i>Tadorna tadorna</i>), Non-breeding	Feed on marine snails, invertebrates and small shellfish found within intertidal sediments. Forage throughout the site but particularly prefer the Fishbourne, Thorney and Bosham Channels as well as the Warblington Coast in Chichester Harbour	Roost on saltmarsh and the open water. Favoured areas in Chichester Harbour include the saltmarsh in front of Old Park Wood, Fowley Island and Thorney Deeps. They also roost on the RSPB islands in Langstone Harbour as well as at Farlington Marshes.	463 (849 (15/16))	481 (656 (17/18))	There were Internationally important numbers (4% of the West European population) of shelduck in Chichester and Langstone Harbours SPA at time of classification in 1987.	Nov-Jun	High (LT,SB)

²² Woodward I D, Frost T M, Hammond M J, and Austin G E, 2019. Wetland Bird Survey Alerts 2016/2017: Changes in numbers of wintering waterbirds in the Constituent Countries of the United Kingdom, Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSIs) and Areas of Special Scientific interest (ASSIs). BTO Research Report 721. BTO, Thetford.

Qualifying Feature	Feeding Preferences/Locations	Roosting Preferences/Locations	Five year average ¹⁹ (peak year) Langstone Harbour	Five year average ²⁰ (peak year) Chichester Harbour	Importance	Presence on site	WeBS Alerts
Shoveler (<i>Spatula clypeata</i>), Non-breeding	<p>Feed on grazing marsh, seagrass (<i>Zostera</i> species) and other aquatic plants and roots, often at night.</p> <p>Favoured areas in the harbours include the Emsworth and Thorney Channels, the northern tips of the Bosham and Chichester Channels, Eames Farm, Thorney Deeps, Tournerbury Farm, School Rithe and Farlington Marshes.</p>	<p>Roost mostly on the open water at Thorney Deeps, in the Thorney, Fishbourne and Bosham channels, off Gutner Point and at Nutbourne Bay in Chichester Harbour.</p> <p>In Langstone Harbour, the main concentrations are seen to the west of Langstone Bridge and east of Farlington Marshes.</p>	87 (122 (16/17))	481 (656 (17/18))	At the time of classification in 1987, shoveler were present in the Chichester and Langstone Harbours SPA at nationally important numbers.	Sep-Mar	Medium (MT,LT,SB)
Teal (<i>Anas crecca</i>), Non-breeding	<p>Feed on small invertebrates and seeds.</p> <p>In Chichester Harbour, they forage in the Thorney Channel, at Snowhill Creek and at Mill Rythe / Yacht Haven. They favour Farlington Marshes in Langstone Harbour.</p>	<p>Roost on the open water, in areas such as the Thorney Deeps, at the edges of intertidal creeks, in ponds and on grazing marsh.</p> <p>In Langstone Harbour, they roost across Farlington Marshes and the intertidal creeks.</p>	439 (600 (16/17))	1,070 (1,325 (16/17))	The North-western European population overwinters in the UK (5808). At the time of classification in 1987, 1% of the Western European population of teal overwintered in Chichester and Langstone Harbours SPA.	Sep-Mar	Medium (SB)
Turnstone (<i>Arenaria interpres</i>), Non-breeding	<p>Forage on intertidal sediment and rocky substrates.</p> <p>Feed on a wide variety of foods including crustaceans, barnacles and bivalves often found by turning over stones and seaweed.</p>	<p>Roost on both natural (shingle and marshland) and artificial (pontoons and boats) habitat.</p> <p>In Chichester Harbour they roost in small numbers, quite widely spread. Some small concentrations are at Chidham Point, on the pontoons at Itchenor and on the boats at East Head and Bosham.</p> <p>In Langstone Harbour they roost on the RSPB Islands and Farlington Marshes, as well as at the Kench Spit and Railway Bank, the west side of the Kench and Mullberry Harbour.</p>	297 (486 (15/16))	247 (324 (16/17))	At the time of classification in 1987 there were nationally important numbers (representing more than 1% of the British population) of turnstone overwintering in Chichester and Langstone Harbours SPA (564 individuals, five year peak mean 1982/83-1986/87).	Aug-Apr	
Wigeon (<i>Mareca penelope</i>), Non-breeding	<p>Feed on grazing marsh, seagrass (<i>Zostera</i> species) and other aquatic plants and roots.</p> <p>Their favoured areas in the harbours include the Emsworth and Thorney Channels, the northern tips of the Bosham and Chichester Channels, Eames Farm, Thorney Deeps, Tournerbury Farm, School Rithe and Farlington Marshes.</p>	<p>Roost mostly on the open water at Thorney Deeps, in the Thorney, Fishbourne and Bosham channels, off Gutner Point and at Nutbourne Bay in Chichester Harbour.</p> <p>In Langstone Harbour, the main concentrations are seen to the west of Langstone Bridge and east of Farlington Marshes.</p>	948 (1,128 (17/18))	2,699 (3,387 (16/17))	At the time of classification in 1987, nationally important numbers of wigeon (2,803 individuals, five year peak mean 1982/83-1986/87) were present in Chichester and Langstone Harbours SPA during the wintering period.	Mar-Sep	
Black tailed godwit (<i>Limosa limosa</i>) Passage (Ramsar feature only)	<p>Feed on invertebrates such as worms, small shellfish and crabs in intertidal mudflats and sandflats mainly at the heads of the channels.</p>	<p>Roost in Thorney Deeps, at the head of the Fishbourne Channel and it is thought they roost at the top of the Bosham Channel. They can be found on the eastern side of Chidham where they feed around Cobnor Point and in fields to the north of it. On the west side of Chidham they feed in fields to the north of the channel and roost on the east side of the channel.</p>	517 (652 (16/17))	702 (850 (19/20))	906 individuals within the Ramsar site, representing an average of 2.5% of the population (5-year peak mean 1998/99–2002/03) ²³ .	Aug - Apr	

²³ https://chichester.gov.uk/media/31702/Final-Selsey-NP-SEA-Scoping-Report-April-2019/pdf/Final_Selsey_NP_SEA_Scoping_Report_April_2019.pdf
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5.3.2 The New Forest Special Protection Area

A302 Dartford Warbler (*Sylvia undata*)

The Dartford warbler is a small passerine bird reaching a length of 13cm. The species is found across maritime western Europe with the northern-most populations existing within the United Kingdom predominantly along the south coast. The range of the species is limited in the UK due in part to vulnerability to extended low temperatures during winter months. Habitat for the species consists predominantly of lowland heaths of which the new forest contains large scale examples. Historically, habitat loss and fragmentation alongside periods of consecutive severe winters have reduced population sizes across the UK.

The Dartford warbler has been subject to four national surveys, occurring in 1974, 84, 94 and 2006, as well as numerous localised monitoring programs²⁴. The results of national surveys in 1984, 1996 and 2006 show consecutive increases in numbers and range of the species across the UK. Results of the 2006 survey show that the species has extended its range and now inhabits a broader area with territories observed in Wales and as far north as Staffordshire. Despite a national increase in Dartford warbler territories, the 2006 survey recorded 420 territories within the New Forest SPA a 21% decline from 535 territories recorded in 1994. Since the 2006 national survey, several local surveys have been completed within the New forest SAC with the most recent being undertaken by the Hampshire Ornithological society in 2018²⁵. In this survey a substantial decline in breeding birds at the site since 2006 was recorded, from 420 territories in 2006 to 143 in 2018. [REDACTED]

The dramatic decline in the species during this period has been attributed to two episodes of unusually cold late winter in 2018 causing significant mortalities.

²⁴ Wotton, Simon & Conway, Greg & Eaton, Mark & Henderson, Ian & Grice, Phil. (2009). The status of the Dartford warbler in the UK and the channel Islands in 2006. *British Birds*. 102. 230-246.

²⁵ Hampshire Ornithological Society, 2019. New Forest Dartford Warbler Survey Report 2018. Higher Level Stewardship Agreement The Verderers of the New Forest AG00300016.

Figure 5.1 Dartford Warbler territories in proximity to proposed pipeline route along [REDACTED]²⁶



A072 Honey Buzzard (*Pernis apivorus*)

The honey buzzard is a species of day-flying migratory bird of prey, which uniquely, feeds nestlings a diet primarily of wasp larvae²⁷. The species migrates from sub-Saharan Africa to breeding grounds across northern Europe, typically entering UK territory between May and early June. During migration, the species exploits wind patterns to cover long distances efficiently, following strategic routes crossing the Mediterranean at a narrow point such as the straits of Gibraltar. European populations of the species are secure although regional breeding populations are declining in some areas of Europe²⁸.

Data regarding UK breeding populations for the species is sparse having been poorly studied due in part to low population numbers and the secretive habits of the species. Additionally, data for the species is kept private due to the threat from egg collectors. A study publishing data collected within the new forest area by enthusiasts between 1954 and 2011 was published in 2012²⁹. The study is characterised by the author as “amateur” in its scientific rigour but represents one of the most sustained data sets for the species within the UK. The study reports that 214 breeding attempts were successful during the study period and from those a total of 356 young were reared. The study reports that the peak recorded population during the study reached 20 individuals in 2002 with the 8 breeding pairs and 2 non-breeding pairs. Further data available on the NBN Atlas shows three recorded sightings within the New forest

²⁶ Hampshire Ornithological Society, 2019. New Forest Dartford Warbler Survey Report 2018. Higher Level Stewardship Agreement The Verderers of the New Forest AG00300016.

²⁷ Ziesemer, Fridtjof & Meyburg, Bernd-Ulrich. (2015). Home range, habitat use and diet of Honey-buzzards during the breeding season. *British Birds*. 108. 467– 481.

²⁸EEA 2013. *Pernis apivorus* Report under Article 12 of the Birds Directive.

²⁹ Wiseman, E.J. 2012. Honey-buzzards in southern England. *British Birds*. 105(1):23-28.

SPA occurring in 2004, 2008 and 2014 recorded by The British Trust for Ornithology, although the spatial resolution for these data points is low.

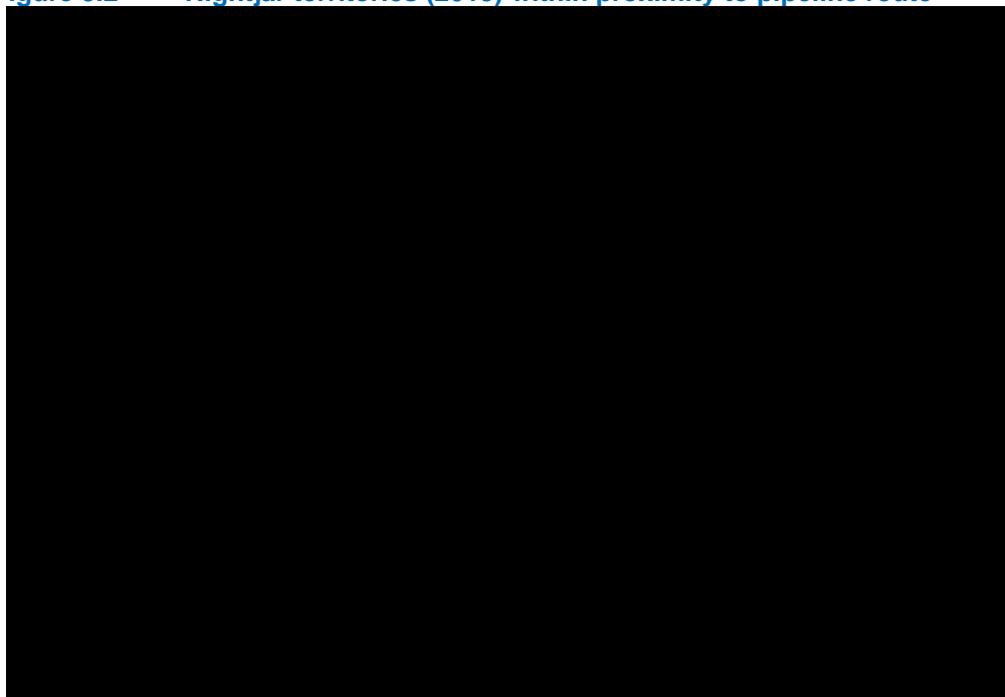
A224 Nightjar (*Caprimulgus europaeus*)

The nightjar is a crepuscular and nocturnal insectivorous bird which breeds across Europe and northwest China. The species migrates from over-wintering grounds in sub-Saharan Africa, arriving in the UK between late-April and mid-May. During the twilight hours and at night the species feeds upon insects, capturing its prey mid-flight. The species is associated with areas of Heathland, moorland and woodland edges requiring areas of bare ground in which to nest. Eggs are laid directly on the ground in clutches of one or two, the adults cryptic grey-brown patterned plumage providing excellent camouflage during breeding and when disturbed adult birds distract predators from the nest by feigning injury.

The national population of nightjars has faced historic pressure attributed to habitat fragmentation and loss as well as increased use of pesticides which have led to a decline in prey species. National surveys in 1981, 1992 and 2004³⁰ have shown a steady increase in population across the UK, rising from an estimated 2,100 calling males in 1981 to 4,606 calling males in 2004. Data collected during the 2004 national survey as well as additional surveys in 2005 recorded 713 territorial males within the new forest. Two more recent studies were completed in 2013³¹ and 2018³² on behalf of the Verderers of the New Forest, these studies concluded that nightjar populations in the new forest despite increasing in the range are falling with the total number of territories dropping to 554 in 2013 and again to 435 in 2018.

Within these 1km squares, numerous nightjar territories were recorded within both the 2013 and 2018 survey suggesting nightjars occur within proximity to the pipeline route during the breeding season.

Figure 5.2 Nightjar territories (2013) within proximity to pipeline route³³



³⁰ British Trust for Ornithology (2017). Nightjar national breeding surveys in Britain. Occurrence dataset <https://doi.org/10.15468/yjrm3w> accessed via GBIF.org on 2020-05-22.

³¹ Neil Gates & Alan Bull, New Forest Nightjar Report. Higher Level Stewardship Agreement The Verderers of the New Forest AG00300016.

³² Sarah Jackson, 2018. Survey & Assessment of Nightjar *Caprimulgus europaeus* status in the New Forest Report. Higher Level Stewardship Agreement The Verderers of the New Forest AG00300016.

³³ RPS Nightjar presentation: Survey results 2013.

A246 Woodlark (*Lullula arborea*)

The woodlark is a small species of passerine bird growing to 15cm in length, feeding on seeds during the winter months and switching to insects during the breeding months. In the UK the breeding population is largely confined to southern areas and is associated with lowland heathland, young coniferous plantation forest and marginal farmland. Nesting occurs within short vegetation from early March through to July.

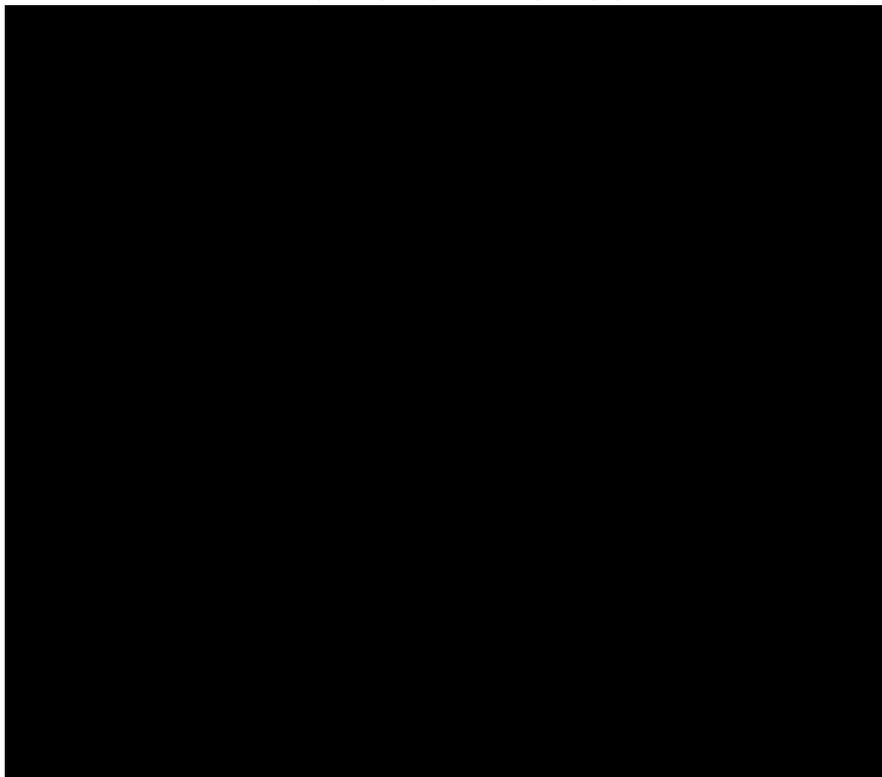
The national population of woodlark have faced historic pressure due to habitat fragmentation and loss as well as changes in forestry and heathland management. National surveys of woodlark breeding populations have been completed in 1986, 1997 and 2006³⁴ and show a continued increase in Woodlark populations. The breeding population were estimated to number 250 territories in 1987, this number increased to between 1,436 to 1,552 in 1997 and again to 3064 territories in 2006. The geographic range of the species was also recorded to have increased during these surveys, increasing by 46% between 1997 and 2006. The results of the three national surveys have been attributed to conservation-restoration projects and clear-felling forest management practices. Despite the national population of woodlark increasing consistently, New Forest populations have shown fluctuations between surveys. In 1997 the national survey reported a total of 183 pairs within the New Forest, this number fell to 143 pairs in 2006. Similarly, local surveys carried out for the New Forest Higher Level Stewardship Scheme showed a continued decline to 134 territories in 2014³⁵. Most recently, however, surveys completed in 2019³⁶ showed a slight increase in local populations to 169 territories. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Figure 5.3 Woodlark territories (2019) in proximity to pipeline route within [REDACTED]³⁷



³⁴ Conway, Greg & Wotton, Simon & Henderson, Ian & Eaton, Mark & Drewitt, Allan & Spencer, Jonathan. (2009). The status of breeding Woodlarks *Lullula arborea* in Britain in 2006. *Bird Study*. 56. 310-325. 10.1080/00063650902792163.

³⁵ Gates.N.2014. New Forest Woodlark 2014 Survey Report. Higher Level Stewardship Agreement The Verderers of the New Forest AG00300016.

³⁶ Hampshire Ornithological Society.2019. New Forest Woodlark 2019 Survey Report. Higher Level Stewardship Agreement The Verderers of the New Forest AG00300016.

³⁷ RPS Nightjar presentation: Survey results 2013.

A082 Hen Harrier (*Circus cyaneus*)

The Hen Harrier is a ground-nesting bird of prey species found in open moorland; the species exhibits sexual dimorphism with males being smaller with grey/silver plumage whereas females display dark brown mottled plumage. The species preys upon small rodents and birds, whilst nesting the male provides food for the female and young, passing prey items to the female in mid-air to avoid revealing the nest location to predators. The species faces historical pressure from loss of habitat as well as illegal killing due to their association with grouse moorland. The species was driven to near extinction during the 19th century and are today one of the most threatened birds of prey in the UK.

National surveys have been conducted to understand hen harrier populations across the UK taking place between 1988 and 2016. These surveys have recorded a marked decline in hen harrier population across the UK, Scotland has remained a major stronghold for the species with England representing a very small proportion of breeding pairs. The most recent national survey revealed that in 2016³⁸ only four breeding or territorial pairs were observed across England, representing 1-2% of the UK population. This is despite suitable habitat in England being potentially able to support up to 232 pairs of hen harriers³⁹. Furthermore, the RSBP reported two hen harrier deaths in 2016-2017 with both corpses being of satellite-tracked birds containing shotgun pellets⁴⁰. Despite low numbers of recorded breeding pairs nationally, the NBN atlas database contains 378 recorded occurrences of the species between 1981 and 2015 within the New Forest SPA, however spatial resolution for this data is very low due to the sensitive nature of the species. Approximately 87% of occurrences recorded on the NBN Atlas occur within the winter months between November and February as the species inhabits the New Forest during the winter, with more favourable hunting conditions and warmer climate compared to northern latitudes. As such the conservation aims relating to the hen harrier within the New Forest SPA⁴¹ are to conserve the supporting non-breeding habitat for the species.

A099 Hobby (*Falco subbuteo*)

The hobby is a small falcon, which feed on dragonflies and small birds, such as house martins and swifts, catching their prey in mid-air. Hobby arrive in the UK from March, with spring migration peaking between mid-April and mid-May. Autumn migration largely takes place between mid-August and mid-September with the very latest birds still being recorded towards the end of October. Hobby has undergone a large-scale expansion, consolidating their range in the south and expanding into the north, east and west, and undergoing a 16% population increase between 1995-2010. Hobbies breed in open lowland areas with mature trees, either in groves, in clumps, in lines or at woodland edges and use nests built by other species. A JNCC SPA species account is not available. The NBN Atlas contains 12 records of the species within the New Forest SPA, recorded in April or May, the latest record being from 2013.

A314 Wood warbler (*Phylloscopus sibilatrix*)

The wood warbler is a Red Listed species in the UK (UK Birds of Conservation Concern Status) with the BTO Breeding Bird Survey monitoring declines and a rapid and significant decline since 1994, with a reduction in distribution across large areas of lowland England. The British population size is estimated at 6,500 males in 2016. The species is widespread and numerous in deciduous forest in Europe and has its highest densities in the UK in the western oak woods of Wales. The species is present in the UK during the summer, between April and September, and breeds in woodland habitats and it rarely breeds among scattered trees of hedges, riversides or moorland margins. A JNCC SPA

³⁸ Simon R. Wotton, Stephen Bladwell, Wendy Mattingley, Neil G. Morris, David Raw, Marc Ruddock, Andrew Stevenson & Mark A. Eaton (2018) Status of the Hen Harrier *Circus cyaneus* in the UK and Isle of Man in 2016, *Bird Study*, 65:2, 145-160, DOI: 10.1080/00063657.2018.1476462

³⁹ Potts, G.R. 1998. Global dispersion of nesting Hen Harriers *Circus cyaneus*; implications for grouse moors in the UK. *Ibis* 140: 76–88.

⁴⁰ <https://community.rspb.org.uk/ourwork/skydancer/b/skydancer/posts/hen-harrier-breeding-numbers-in-england-2017>

⁴¹ Natural England. 2019. European Site Conservation Objectives: Supplementary advice on conserving and restoring site features New Forest Special Protection Area (SPA) Site code: UK9011031.

species account is not available. The NBN Atlas contains 967 records for the species between 1969 and 2015, with the majority of recordings in May.

5.3.3 Solent and Southampton Water Special Protection Area and Ramsar

Latest information regarding habitat/location preferences for roosting and feeding is presented in **Table 5.2**, summarised from the Supplementary Advice for Conservation Objectives available on Natural England's designated views webpage . Latest population figures have also been obtained from the WeBS Annual Online Report.

Table 5.2 Summary of feeding and roosting preferences, and population counts for qualifying features: Solent and Southampton Water

Qualifying Feature	Feeding Preferences/Locations	Roosting Preferences/Locations	Five year average ⁴² (peak count (year))	Importance	Presence on site	WeBS Alerts
Common tern (<i>Sterna hirundo</i>), Breeding	Forage alone or in small flocks for small fish and crustaceans, terrestrial insects and occasionally squid. They take food from near the surface of the water by plunge-diving to a depth of 1-2 m, often following hovering. Prey might also be gathered by 'contact dipping': where only the bill enters the water and the bird remains in flight throughout.	Breed, and nest in simple shallow 'scrapes' on sand, shingle or within low vegetation. Important breeding areas within the site include Hurst Point to Pitts Deep, and the North Solent. Common terns may also breed in areas including Lymington – Pylewell, Beaulieu Estuary, and Newtown Harbour although less frequently.	28 (94, (17/18))	The Seabird 2000 census identified 2.2% of the global population nest in England. The Solent and Dorset Coast SPA supports 4.92% of the UK's common tern breeding population.	Apr– mid-Sep	
Little tern (<i>Sternula albifrons</i>) Breeding	Forage alone in shallow water often within 1km of their breeding colony for small fish, crustaceans, and insects. They take food from near the surface of the water by plunge-diving, often following hovering, or by 'contact dipping'. Important foraging areas in the site include Hurst Point – Pitts Deep, and the Medina estuary during later/early season.	Nest in simple shallow 'scrapes' on bare sand and shingle. Important breeding areas within the site include Hurst Point – Pitts Deep, with less frequently used sites including North Solent, Lymington to Pylewell, and Newtown Harbour.	1 (4, (25/16))	The Seabird 2000 census identified 2.2% of the global population nest in the UK. The Solent and Dorset Coast SPA support 3.31% of the UK's little tern breeding population	Apr-Aug	
Sandwich tern (<i>Thalasseus sandvicensis</i>) Breeding	Feed in shallow coastal waters, mainly on small fish and crustacea, as well as worms and molluscs in shallow waters overlying the sediment.	Prefer to nest on small shingle islands among or below vegetation. Tend to nest colonially with other species of tern, usually common. Important breeding areas within the site include the shingle banks and islands within Brownsea lagoon, Hurst Point to Pitts Deep, and the South Lakes islands, the oyster beds islets and the RSPB islands within Langstone Harbour, and Tern Island within Pagham Harbour. Other areas include Lymington to Pylewell, Newtown Harbour, Hawkers Island, Cockleshell and Pylewell Marsh	12 (24, (17/18))	The Seabird 2000 census identified 9.6% of the global population nest in the UK. The Solent and Dorset Coast SPA supports 4.01% of the UK's sandwich tern breeding population.	Early Mar/Apr - Sep	
Mediterranean gull (<i>Ichthyaetus melanocephalus</i>) Breeding	Forage in shallow coastal waters, particularly close to their breeding sites, where they can catch invertebrates and small fish. Feed in arable fields, and intertidal areas along the coastline. Also feed on black-headed gull eggs and chicks and have more recently been predated intensively on common tern eggs, and opportunistically on sandwich tern eggs.	Nest colonially in short to medium swards of vegetation, and sometimes on vegetated shingle islands, particularly with black-headed gulls. Important breeding areas within the site include Newtown Harbour, Hurst – Lymington, and the North Solent.	119 (165, (16/17))	When classified in 1998, the site supported 2 pairs (five year peak mean 1994 - 1998), representing at least 20% of the breeding population in Great Britain	May - Aug	
Roseate tern (<i>Sterna dougallii</i>) Breeding	Forage over substrates that are sandy making use of shallow water where there are schools of smaller fish. Have a large foraging distance form colonies up to 30KM Feed alone or in small flocks.	Prefer to next on small islands where the nest in a hollow or under thick vegetation, rock of debris. Rely on Common terns in the colony to defend them.	None breeding since 2006	When classified in 1998, the site supported 2 pairs (five year peak mean 1993 - 1997), representing at least 3.1% of the breeding population in Great Britain	May - Aug	
Black-tailed Godwit (<i>Limosa limosa islandica</i>) Non-breeding	Feed mostly on worms in the mudflats whilst the tide is out, but also on insects, snails, some plants, beetles, grasshoppers and other small insects during the breeding season. Particularly important feeding areas for black-tailed godwit include Beaulieu Estuary, Newtown Harbour, and North-West Solent.	Roost in areas with extensive stretches of bare ground or short vegetation with unrestricted views. Within the site, important roosting areas include Southampton Water and the North-West Solent.	588 (750, (17/18))	When classified in 1998, the site supported 1,125 individuals (five year peak mean 1992/3 - 1996/7), representing at least 1.6% of the wintering Iceland-breeding population	Jul -Apr	Medium (ST,SB)
Dark-bellied brent goose (<i>Branta bernicla bernicla</i>), Non-breeding	Feed mainly on green algae (<i>Ulva spp.</i>) and seagrass beds growing on the intertidal sediments. Important feeding sites include Southampton Water, Newton Harbour, and the North-West Solent,	Roost on the water overnight. During the day they exhibit sub-population preferences and will roost close to preferred feeding areas.	2223 (3355, (14/15))	When classified in 1998, the site supported 7,506 individuals of dark-bellied Brent goose (five year peak mean 1992/3 - 1996/7), representing	Oct – Mar	Medium (MT)

⁴² Contains Wetland Bird Survey (WeBS) data from Waterbirds in the UK 2018/19 © copyright and database right 2020. WeBS is a partnership jointly funded by the BTO, RSPB and JNCC, in association with WWT, with fieldwork conducted by volunteers. Accessed at: <https://app.bto.org/webs-reporting/>

Qualifying Feature	Feeding Preferences/Locations	Roosting Preferences/Locations	Five year average ⁴² (peak count (year))	Importance	Presence on site	WeBS Alerts
		Important roosting sites within the site include Southampton Water, Beaulieu Estuary, Newtown Estuary, and North-West Solent.		2.5% of the wintering Western European population		
Ringed plover (<i>Charadrius hiaticula</i>), Non-breeding	Forage for food on beaches, tidal flats and fields, usually by sight. They eat insects, crustaceans and worms.	Roost on sandbanks, bare arable fields or in low vegetation. Main roosting areas for ringed plover in the site are Southampton Water and the North-West Solent, whilst other roosting sites include Beaulieu Estuary and Newtown Harbour.	142 (205, (16/17))	When classified in 1998, the site supported 552 individuals (five year peak mean 1992/3 - 1996/7), representing 1.1% of the wintering Europe/Northern Africa wintering population.	Present most of the year May-Aug	High (LT,SB)
Teal (<i>Anas crecca</i>), Non-breeding	Mudflats, creeks, and saltmarsh provide suitable feeding grounds, where teal feed on small invertebrates and seeds. Important feeding grounds include Southampton Water and Newtown Harbour.	Roost on the open water, with important sites including Southampton Water, Beaulieu Estuary, Newtown Harbour, and North-West Solent.	1247 (1352, (14/15))	When classified in 1998, the site supported 4,400 individuals (five year peak mean 1992/3 - 1996/7), representing at least 1.1% of the wintering North-western Europe population.	Sep – Mar	

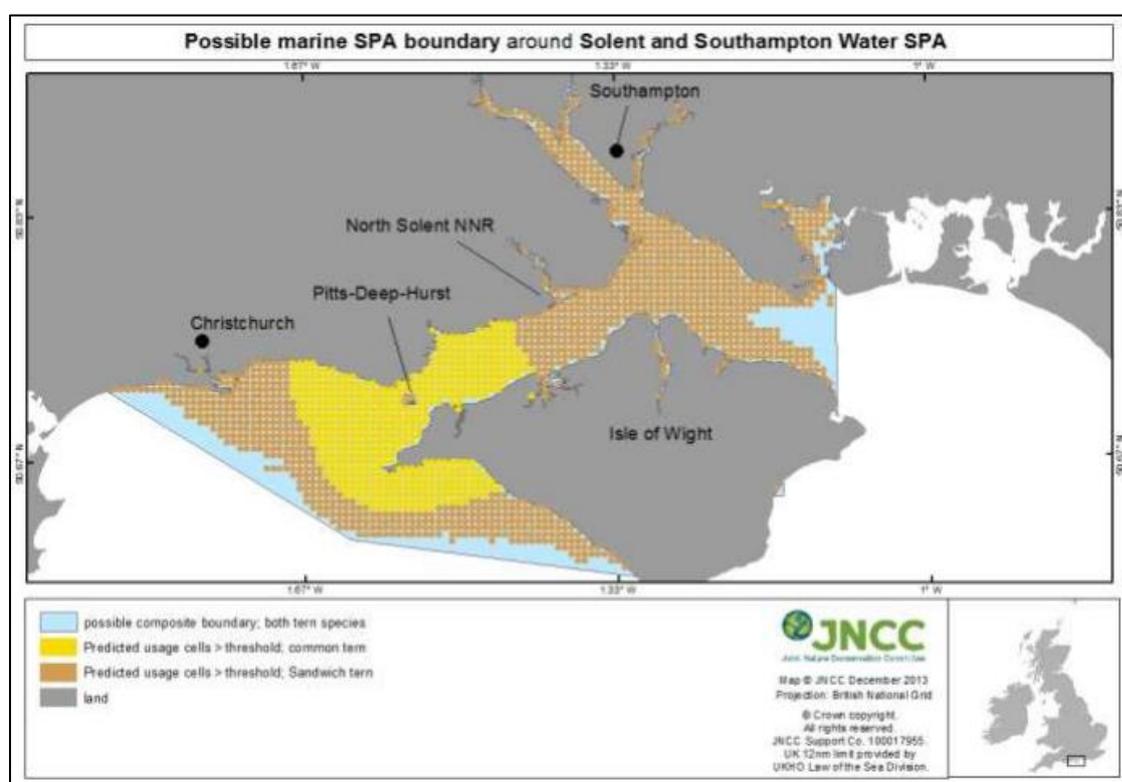
5.3.4 Solent and Dorset Coast Special Protection Area

Solent and Dorset Coast SPA was classified in January 2020 to protect important foraging areas at sea, used by qualifying interest features from colonies within adjacent, already classified SPAs. The site is 889.81 km². The qualifying interest features are three species of tern^{43, 44}:

- Sandwich tern *Thalasseus sandvicensis* (Breeding) (A191);
- Common tern *Sterna hirundo* (Breeding) (A193);
- Little tern *Sternula albifrons* (Breeding) (A195).

From west to east, the adjacent SPAs with the tern species as qualifying interest features (in parentheses) are: Poole Harbour SPA (common tern); Solent and Southampton Water SPA (common, Sandwich and little tern); and Chichester and Langstone Harbours SPA (common, Sandwich and little tern). **Figure 5.4** and **Figure 5.5** show the predicted foraging areas of the larger tern species, around the North Solent SSSI and Pitts-Deep-Hurst colonies (western Solent) and in Langstone and Chichester Harbours. The foraging areas of little tern are smaller, with predicted areas shown in **Figure 5.6**.

Figure 5.4 Map showing the predicted usage of common and Sandwich terns in the Solent and Dorset Coast Special Protection Area⁴⁵



⁴³ NE (Natural England), 2017. European Site Conservation Objectives for Solent & Dorset Coast SPA (UK9011061). Available online at: <http://publications.naturalengland.org.uk/publication/6567218288525312> [Accessed May 2021.]

⁴⁴ NE (Natural England), 2021. Designated Sites View. Solent and Dorset Coast SPA. Advice on Operations. Available online at: <https://designatedsites.naturalengland.org.uk/Marine/FAPMatrix.aspx?SiteCode=UK9020330&SiteName=solent&SiteNameDisplay=Solent+and+Dorset+Coast+SPA&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeas=3> [Accessed May 2021].

⁴⁵ Win I, Wilson LJ, and Kuepfer A, 2013. Identification of possible marine SPA boundaries for the larger tern species around the United Kingdom. JNCC report.

Figure 5.5 Map showing the predicted usage of common and sandwich terns in the Chichester and Langstone Harbours Special Protection Area⁴⁶

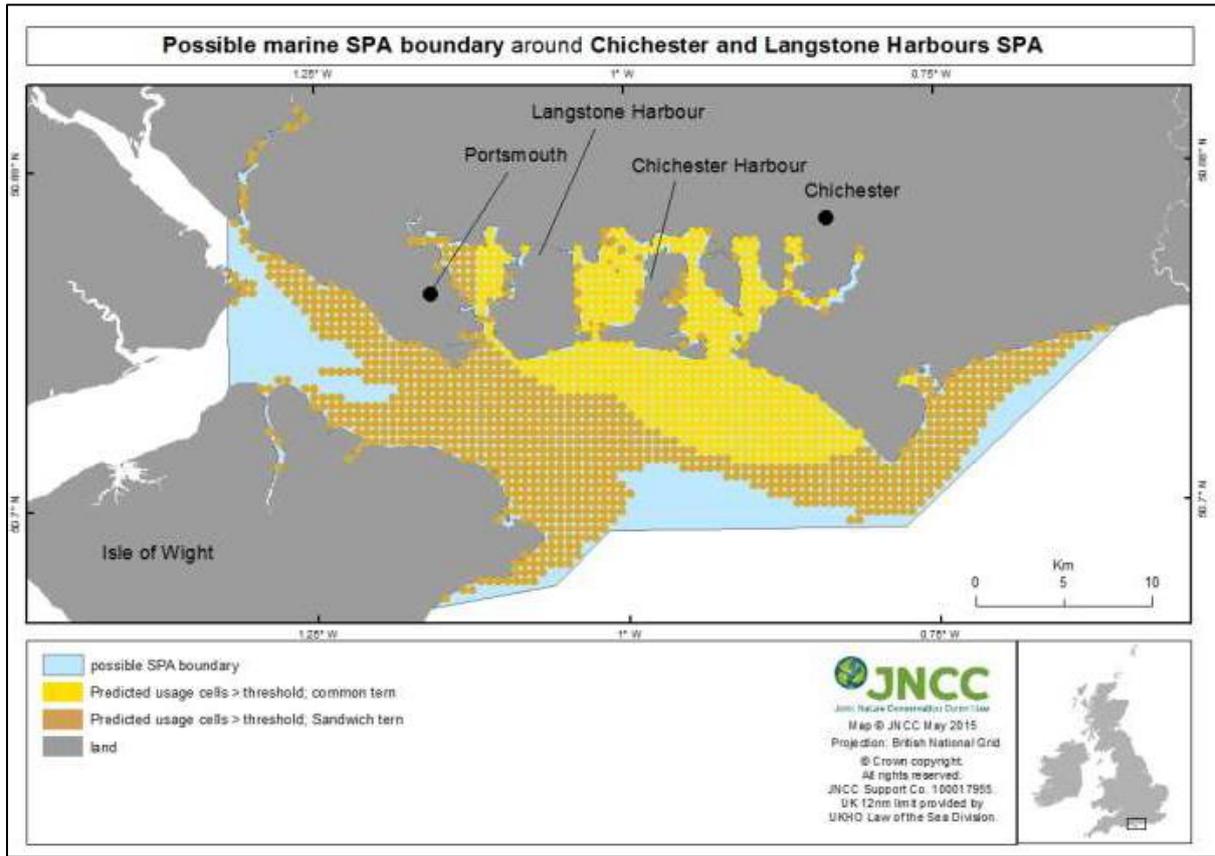
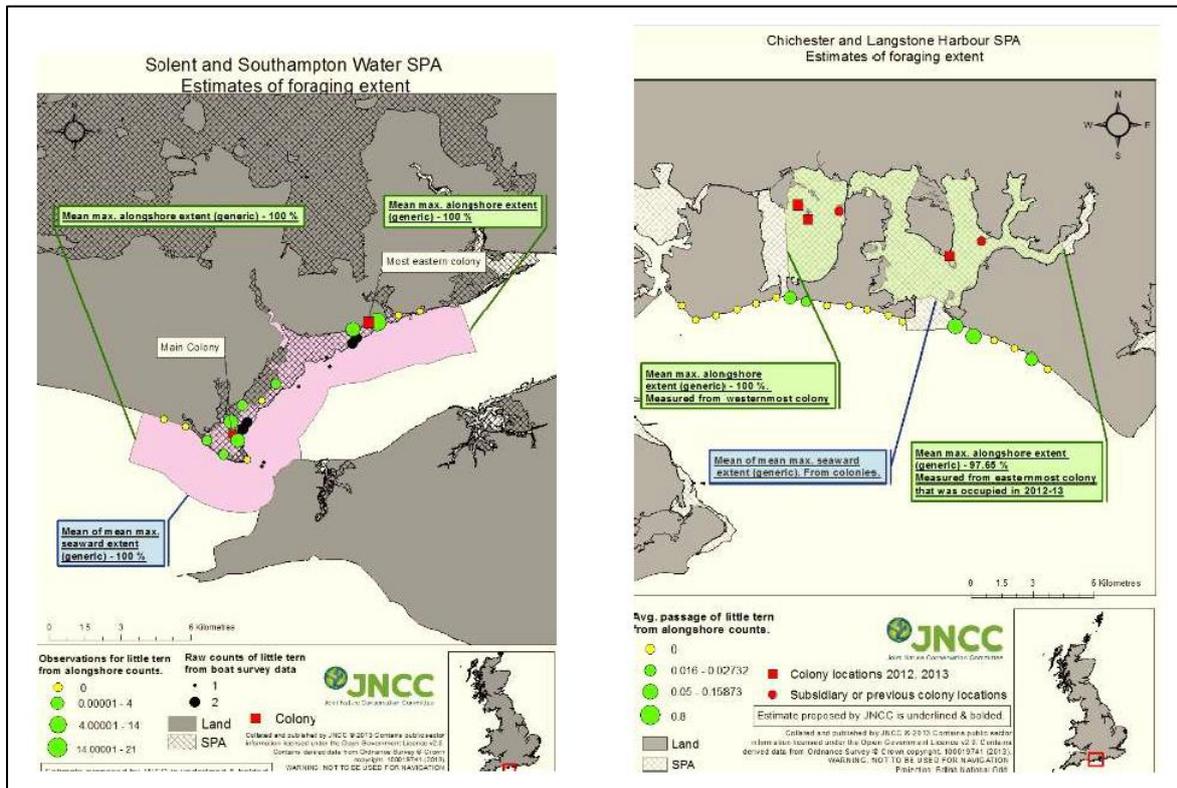


Figure 5.6 Map showing predicted foraging areas for little tern in the Solent and Southampton Water SPA and Chichester and Langstone Harbours SPA



6 Noise Disturbance Thresholds: Literature Review

6.1 Introduction

The solutions have the potential to generate significant noise during both site preparation and construction stages, notably as a result of ground clearance and excavations, piling, the installation and construction of the intake/outfall pipes (desalination plant only), vehicle movements and other construction related activities. Very loud and percussive noises have the potential to disturb birds. A disturbance event may cause birds to take flight (either returning to the same area or departing), to cease feeding or roosting and to temporarily abandon eggs or chicks, leaving them susceptible to chilling and predation.

The Supplementary Advice on Conservation Objectives makes reference to the definition of disturbance from the Agreement on the Conservation of African-Eurasian Migratory Waterbirds Action Plan⁴⁷, which is as follows:

“Any human-induced activity that constitutes a stimulus (equivalent to a predation threat) sufficient to disrupt normal activities and/or distribution of waterbirds relative to the situation in the absence of that activity.”

and

“Where the intensity of disturbance results in an under-exploitation of resources otherwise available to waterbirds under undisturbed conditions, such a process can be seen to equate to net (albeit potentially only temporarily) habitat loss.”

The factors that influence a species response to a disturbance are numerous, but the three key factors are species sensitivity, proximity of disturbance sources and timing/duration of the potentially disturbing activity. The most disturbing activities are likely to be those that involve irregular, infrequent, percussive, unpredictable loud noise events, movement or vibration over a long duration. Birds are least likely to be disturbed by activities that involve regular, frequent, predictable, quiet patterns of sound or movement or minimal vibration. The further any activity is from the birds, the less likely it is to result in disturbance.

Bird assemblage is key to understanding the potential for disruption within the relative SPA's. The proposed sites of the desalination plant and the WRP are located adjacent to intertidal / marine habitats and in proximity to the Solent and Southampton Water SPA and the Chichester and Langstone Harbours SPA and Ramsar sites respectively. The bird assemblages within these relevant SPA's are generally characterised by over wintering waterbirds, along with breeding common tern, little tern and Sandwich tern (see Table 5.2).

The proposed pipeline from the Fawley desalination plant to Testwood WSW will run adjacent to the New Forest SPA and Ramsar and directly through the New Forest National Park. The bird assemblage within this SPA generally comprises birds of prey and passerines. The intakes and outfall locations for the desalination plant are located within the Solent and Dorset Coast SPA, and in proximity to the Solent and Southampton Water SPA and Ramsar. With regards the water recycling plant, the infrastructure for the plant is located adjacent to the Chichester and Langstone Harbours SPA and Ramsar.

6.2 Waterbirds

As detailed above, the bird assemblages within the relevant intertidal and marine SPA's are generally characterised by over wintering waterbirds, along with breeding Common Tern, Little Tern and Sandwich Tern. The literature on the impacts of construction noise on waterbirds is now fairly extensive.

⁴⁶ Win I, Wilson LJ, and Kuepfer A, 2013. Identification of possible marine SPA boundaries for the larger tern species around the United Kingdom. JNCC report.

⁴⁷ Agreement on the Conservation of African Eurasian Migratory Waterbirds 6th Session of the Meeting of the Parties 9-14 November 2015, Bonn, Germany. Resolution 6.7 Adoption of Guidance in the Context of Implementation of the AWEA Action Plan. Definition originally from Fox, A.D. & Madsen, J. 1997. Behavioural and distributional effects of hunting disturbance on waterbirds in Europe: implications for refuge design. Journal of Applied Ecology 34: 1-13.

A 2009 IECS report⁴⁸ gives an illustrative overview of the effects of disturbance to non-breeding waterbirds based on observations made during the construction of the South Humber Power Station. Five effect levels and subsequent descriptive disturbance impacts were defined based on the findings from the study, summarised as **Table 6.1** below.

Table 6.1 IECS noise impact criteria

Level	Impact	Effect Level	dBA ⁴⁹	Type of Noise
1	No Impact	Low	Below 50	Regular Construction Noise
2	Behavioural changes (alarm calls, heads up, change in feeding / roosting activity)	Moderate	Equal to or below 70	Piling Noise
3	Movement Within zone	Moderate to High	Above 70	Piling Noise
4	Movement out of zone but remaining on site	High	Above 85	Piling Noise
5	Movement off site	High	Not Defined	Piling Noise

The general outcome from the research was that ambient construction noise levels should be restricted to be below 70 dBA at the bird, as that birds will habituate to regular noise below this level, and sudden noise below 55 dBA is unlikely to have any impact on waterbirds. These assertions are also supported by similar studies undertaken in the intertidal and marine environment⁵⁰.

6.2.1 Waterbird Mitigation Toolkit

The IECS have since produced a 'Waterbird Disturbance Mitigation Toolkit' in 2013 to further assist developers in relation to disturbance impacts on non-breeding waterbirds arising from construction works within or adjacent to European sites (e.g., Special Protection Areas and Ramsar Sites)⁵¹. The toolkit recognises and provides a simple screening criteria for developments. Disturbance stimuli 'at the bird' were separated into three effect levels:

- **High Level Disturbance Stimuli:** Sudden single noise of over 60 dBA (at the bird) / - Continuous/repetitive noise over 72 dBA (at the bird) in an environment not previously disturbed;
- **Moderate Level Disturbance Stimuli:** Sudden noises of 55-60 dBA (at the bird) / Continuous/repetitive noises 60-72 dBA (at the bird); and
- **Low Level Disturbance Stimuli:** Noise of less than 55dB (at the bird) / Noise of 55-72 dBA (at the bird) in a highly disturbed environment e.g., with background ambient noise levels of >60 dBA.

The toolkit also provides a criteria to assess the effects of noise decay, where construction activities will be taking place at a distance away from the potentially affected bird colonies (see **Figure 6.1**).

- Acceptable 'dose' levels are shaded green, with dark green unlikely to have any affect, and pale green occasionally inducing a low level behavioural response such as a heads-up reaction;
- Yellow to orange shading is where a response is likely, but mitigation may be effective in reducing the disturbance risk;

⁴⁸ Cutts, N., Phelps, A. and Burdon, D. (2009) Construction and waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA, Institute of Estuarine and Coastal Studies, University of Hull.

⁴⁹ The table itself does not prescribe the noise unit assessed, however reference within the report is made to LAmax.

⁵⁰ Cutts N & Allan J. 1999. Avifaunal Disturbance Assessment. Flood Defence Works: Saltend. Report to Environment Agency [accessed 27/06/2021].

⁵¹ https://www.tide-toolbox.eu/tidetools/waterbird_disturbance_mitigation_toolkit/

- Pale red is where mitigation is necessary and might be of value, but with a remaining risk of effect; and
- Dark red is where a flight response is almost certain to occur and would be increasingly difficult to mitigate through screening and may require the cessation of works during high sensitivity periods.

Figure 6.1 IECS threshold matrix

Metres from Source	dB(A)										
	0.67	120	110	100	95	90	85	80	75	70	65
1.33	114	104	94	89	84	79	74	69	64	59	54
2.67	108	98	88	83	78	73	68	63	58	53	48
5.33	102	92	82	77	72	67	62	57	52	47	42
10.67	96	86	76	71	66	61	56	51	46	41	36
20.67	90	80	70	65	60	55	50	45	40	35	30
42.67	84	74	64	59	54	49	44	39	34	29	24
85.33	78	68	58	53	48	43	38	33	28	23	
170.67	72	62	52	47	42	37	32	27	22		
341.33	66	56	46	41	36	31	26	21			
682.66	60	50	40	35	30	25	20				
1365.32	54	44	34	29	24						

The outcomes from the IECS toolkit, which can be applied to this scheme, can largely be defined as the following:

- A high level of noise disturbance constitutes a sudden noise event of over 60 dBA at the bird or prolonged noise of over 72 dBA at the bird. Construction noise should be mitigated when levels exceed these values at the bird (based on a measured L_{Aeq}).

6.2.2 Conflicting Research

It must be noted that several studies suggest the threshold levels highlighted within the IECS reports are over-precautionary.

A study undertaken by Xodus Group⁵² of noise levels and impact on water birds at the Pyewipe mudflats during construction for the new Grimsby River Terminal, identified that construction noise caused only about 1% of the total disturbances observed. Disturbances to large number of birds at any one time were more commonly caused by raptors (mainly peregrine), aircraft and helicopters.

Based on the findings of the study, it was concluded that a threshold level of 70 dB L_{Amax} for significant waterbird disturbance is likely to be very precautionary. The study concluded that a threshold of 80 dB L_{Amax} is likely to more appropriate for water birds.

Further international studies include:

⁵² Postlethwaite, Bernard, and Stephenson, Simon. 2012. "Grimsby River Terminal Construction - Pile Noise Monitoring and Bird Behaviour Observations." L-30062-S02-REPT-001. Xodus Group

- Breeding crested terns showed the maximum responses (preparing to fly or flying off) to noise events that were greater than 85 dBA (Brown, 1990)⁵³; and
- Black duck, American wigeon, gadwall and green-winged teal were not adversely affected by aircraft disturbance (using a time activity budget approach) at below 85 dBA (Conomy *et al.* 1998)⁵⁴.

Quantifying the effects of anthropogenic noise on wildlife is challenging. Sensitivity to noise varies widely across taxa and may also vary depending upon context, sex, and life history. Responses to noise are rarely isolated from other forms of environmental disturbance, such as habitat alteration and visual disturbance, confounding interpretation of biological responses to noisy environments⁵⁵. Therefore, taking a conservative approach to the assessment is key to help ensure the effects of a broad range of auditory scenarios associated with the schemes, on a broad range of predicted species over the relevant SPA's, are appropriately considered when assessing the requirement for mitigation.

6.2.3 Summary

It is recommended to apply the IECS toolkit criteria when assessing the impacts of the proposed schemes on waterbird disturbance in the Solent and Southampton Water SPA and the Chichester and Langstone Harbours SPA. Construction noise should be mitigated when activities result in a sudden noise event of over 60 dBA at the bird or prolonged noise of over 72 dBA at the bird (based on a measured L_{Aeq}).

6.3 Birds of Prey and Passerines

When considering the potential impacts on the birds within the New Forest SPA, the criteria set by the IECS and informed by studies conducted on waterbirds may not be a suitable tool for this purpose. As detailed above, the qualifying species within the New Forest SPA generally comprise birds of prey and passerines. There is a dearth of literature assessing threshold tolerances to noise in relation to passerines, however it appears persistent noise such as busy roads may result in a greater level of disturbance than temporary or sporadic noise (e.g., railways, airlines and construction). Persistent noise within a bird's frequency range can result in song frequency shifts, and a study has indicated that reproductive success in great tits is affected by shifts in song frequency⁵⁶. The masking of birdsong may interfere with the quality of male mating rituals, and subsequently the female's assessment of the quality of her mating partner may be impaired⁵⁷. Noise may also mask acoustic communication between offspring and parents, interrupting parental feeding regimes⁵⁸. Whilst the above studies focus on persistent noisy environments, the nature of the pipeline construction work is temporary. Loud noises caused by construction activities (e.g., piling) are sporadic and not necessarily comparable to road noise.

Work assessing the impacts of sporadic noise on birds is often centred around railway noise. A study assessing the abundance and richness of birds (largely comprising passerines) at relative distances to an active railway line in a woodland environment in eastern Poland demonstrated that the noise from trains does not adversely affect the density of woodland birds⁵⁹. Quite the reverse, the numbers of birds and their species richness in the immediate vicinity of the tracks were higher than in the depths of the woodland. It was concluded that this was likely to be due to the edge effect, and that the relatively

⁵³ Brown, A.L. (1990) Measuring the effect of aircraft noise on sea birds. *Environment International* 16, 587- 592

⁵⁴ Conomy, J.T., Dubousky, J.A., Collazo, J.A. and Fleming, W.J. (1998) Do Black Ducks and Wood Ducks habituate to aircraft disturbance? *The Journal of Wildlife Management* 62, 1135-1142

⁵⁵ A synthesis of two decades of research documenting the effects of noise on wildlife (wildliferesearch.co.uk)

⁵⁶ Halfwerk W, Bot S, Buikx J, van der Velde M, Komdeur J, ten Cate C, Slabbekoorn H. Low-frequency songs lose their potency in noisy urban conditions. *Proc Natl Acad Sci U S A*. 2011 Aug 30;108(35):14549-54. doi: 10.1073/pnas.1109091108. Epub 2011 Aug 29. PMID: 21876157; PMCID: PMC3167545.

⁵⁷ Bottalico, P., Spoglianti, D., Bertetti, C. A., & Falossi, M. (2015). Effect of noise generated by construction sites on birds. Paper presented at 44th International Congress and Exposition on Noise Control Engineering, INTER-NOISE 2015, San Francisco, United States.

⁵⁸ Schroeder J, Nakagawa S, Cleasby IR, Burke T (2012) Passerine Birds Breeding under Chronic Noise Experience Reduced Fitness. *PLoS ONE* 7(7): e39200. <https://doi.org/10.1371/journal.pone.0039200>

⁵⁹ Wiącek, J., Polak, M., Filipiuk, M. et al. Does railway noise affect forest birds during the winter?. *Eur J Forest Res* 138, 907–915 (2019). <https://doi.org/10.1007/s10342-019-01212-3>

infrequent noise generated from the passing trains did not impede vocal communication. Similar results were found along railway lines in Tibet⁶⁰.

The designated bird of prey assemblage within the New Forest SPA comprises Hen Harrier, Honey Buzzard and Hobby. As with the passerines, there is a dearth of literature assessing threshold tolerances (such as that completed for waterbirds). Generally, studies and guidance suggest that construction disturbance during breeding season may occur up to around 500 m from source for a number of raptor species including hen harrier⁶¹, however this figure considers all potential effects arising from construction as opposed to noise in isolation.

Studies undertaken on military training grounds have identified extreme tolerance to bombings by harriers⁶². A harrier continued hunting during target practice, suspected to be capturing small birds flushed from cover by the bombings. This indicates that temporary, very loud and percussive noise in and of itself may not have a significant impact on harriers where food is in abundance and other pressures minimal, however these results cannot necessarily be applied to the other qualifying species within the New Forest SPA (Hobby and Honey Buzzard).

6.3.1 Summary

Work on the construction of the pipeline adjacent to the New Forest SPA is likely to take place along the verges of the [REDACTED] a busy road linking the Solent residential areas with the M27 and Southampton. Construction traffic is unlikely to cause a significant shift away from the baseline noise conditions in this area and thus a persistent increase in ambient noise is unlikely to be generated. Significant temporary and sporadic increases in noise associated with specific construction activities such as piling may cause temporary disturbance however, the literature as detailed above indicates that impacts from such noise may only cause temporary disturbance, and in some cases no disturbance.

During raptor breeding season, studies and guidance suggest that construction disturbance may occur up to around 500 m from source. It should be noted this does not relate to noise in isolation. With this in mind, should breeding birds be identified during breeding season, appropriate exclusion zones should be established immediately to prevent disturbance to breeding attempts.

⁶⁰ Li Z, Ge Ch, Li J, Li Y, Xu A, Zhou K, Xue D (2010) Ground-dwelling birds near the Qinghai-Tibet highway and railway. *Trans Res D* 15:525–528

⁶¹ Ruddock, M. & Whitfield, D. P. (2007). A Review of Disturbance Distances in Selected Bird Species, A report from Natural Research (Projects) Ltd to Scottish Natural Heritage.

⁶² Jackson, J.A., Schardien, B.J. & McDaniel, T.H. (1977). Opportunistic hunting of a marsh hawk on a bombing range. *Raptor Research*, 11, 86

7 Noise Calculations

Tables 7.1 to 7.5 show the distances of the various ornithological receptor sites from the scheme components, and estimated noise levels as follows:

- **Table 7.1** Water recycling plant
- **Table 7.2** Desalination plant
- **Table 7.3** Calshot intake and outfall (open cut)
- **Table 7.4** Calshot intake and outfall (tunnelled)
- **Table 7.5** Pipeline installation in [REDACTED]

Distances were measured from boundary of the identified land parcel to the boundary of the SW&BGS compartment (Core and Primary Support Areas only), or data point. This is likely to be precautionary as the construction site itself will be set back from the boundary to allow for landscape planting and screening. Distance measurements were made to the closest point of each of the ornithological receptor sites, which represents a worst case for noise estimations for each receptor site.

The estimated baseline LAeq levels and corresponding construction noise LAeq and LAm_{ax} values are provided for each receptor site. Locations were indicated in red where the LAeq or LAm_{ax} were likely to exceed the baseline level by at least 3 dB. Natural England have indicated on other developments that the exceedance of a baseline level by 3dB is likely to require assessment as Stage 2 Appropriate Assessment, for the purpose of Habitats Regulations Assessment.

Based on the predicted construction noise levels, indicative noise contours were plotted showing ornithological receptor sites (where known and GIS data publicly available) for LAeq and for LAm_{ax} levels (**Figures 7.1 to 7.10**). The contours are indicative only.

Table 7.1 Estimated noise levels at ornithological receptors throughout the construction programme (LAeq,T and LMax dB): Water recycling plant

Data Source	Site	OSGB 1936		Closest	Estimated Baseline	Highest Predicted Construction Noise (during continuous Piling)	
		X	Y	Distance (m)		LAeq,1hr [dB]	LMax [dB]
				(within 2.5km of WRP72)	LAeq,day		
Solent and Dorset Coast SPA (known breeding colony sites)	Southmoor Nature Reserve	471266	104843	1005	50	47	55
	North Binness Island	469564	104522	1025	52	47	54
	Long Island	470161	104148	1217	50	45	53
	Baker's Island	469479	103559	1869	48	42	49
	Round Nipp Island	470297	103472	2069	48	41	48
	South Binness Island	469882	103090	2090	48	41	48
	Hayling Island Nature Reserve	471404	103584	2294	50	40	47
Solent Waders and Brent Goose Strategy (Core and Primary sites only)	Core Area H07A	469752	105513	37	58	76	83
	Core Area P08C	468304	105009	1443	58	44	51
	Core Area P08A	467803	104761	2129	58	41	48
	Primary Area H90	470797	105212	510	52	53	60
	Primary Area H02A	469282	106716	1132	58	46	54
	Primary Area H25B	472352	105578	1763	54	42	50
	Primary Area H25C	472315	105369	1790	50	42	50
	Primary Area H24A	472634	105541	2088	56	41	48
	Primary Area H24D	472558	105341	2192	50	40	48
Primary Area H24E	472707	105293	2308	50	40	47	

Figure 7.1 Indicative worst case LAeq contours during piling operations with estimated LAeq baseline levels: Water recycling plant



Figure 7.2 Indicative worst case LAmax contours during piling operations with estimated LAeq baseline levels: Water recycling plant



Table 7.2 Estimated noise levels at ornithological receptors throughout the construction programme (LAeq,T and LAmax dB): Desalination plant at [REDACTED]

Data Source	Site	OSGB 1936		Closest	Estimated Baseline	Highest Predicted Construction Noise (during continuous Piling)	
		X	Y	Distance (m)		LAeq,day	LAeq,1hr [dB]
				(within 2.5km)			
Solent and Dorset Coast SPA (closest known breeding colony site)	North Solent National Nature Reserve	442570	98625	5000	45	30	38
Solent and Southampton Water SPA (using SW&BGS compartment references)	SPA compartment NF61	447150	103215	166	45	55	63
	SPA compartment NF97	446990	103425	370	45	51	59
	SPA compartment NF85	446787	103869	722	45	46	54
	SPA compartment NF84	446834	103992	900	45	45	52
	SPA compartment NF98	446780	104115	968	45	44	51
	SPA compartment NF91	445585	104968	2198	48	37	44
	SPA compartment NF59	447808	102276	989	50	44	51
	SPA compartment NF201	448134	102370	1346	45	41	49
	SPA compartment NF60	448151	102566	1335	45	41	49
	SPA compartment NF58	448619	101849	1940	45	38	45
Solent Waders and Brent Goose Strategy (Core and Primary sites only)	Core Area NF156B	448261	101568	1773	45	39	46
	Primary Area NF100	445909	104570	1718	49	39	46
	Primary Area NF156A	447763	102293	953	50	44	52

Figure 7.3 Indicative worst case LAeq contours during piling operations with estimated LAeq baseline levels: Desalination Plant at [REDACTED]

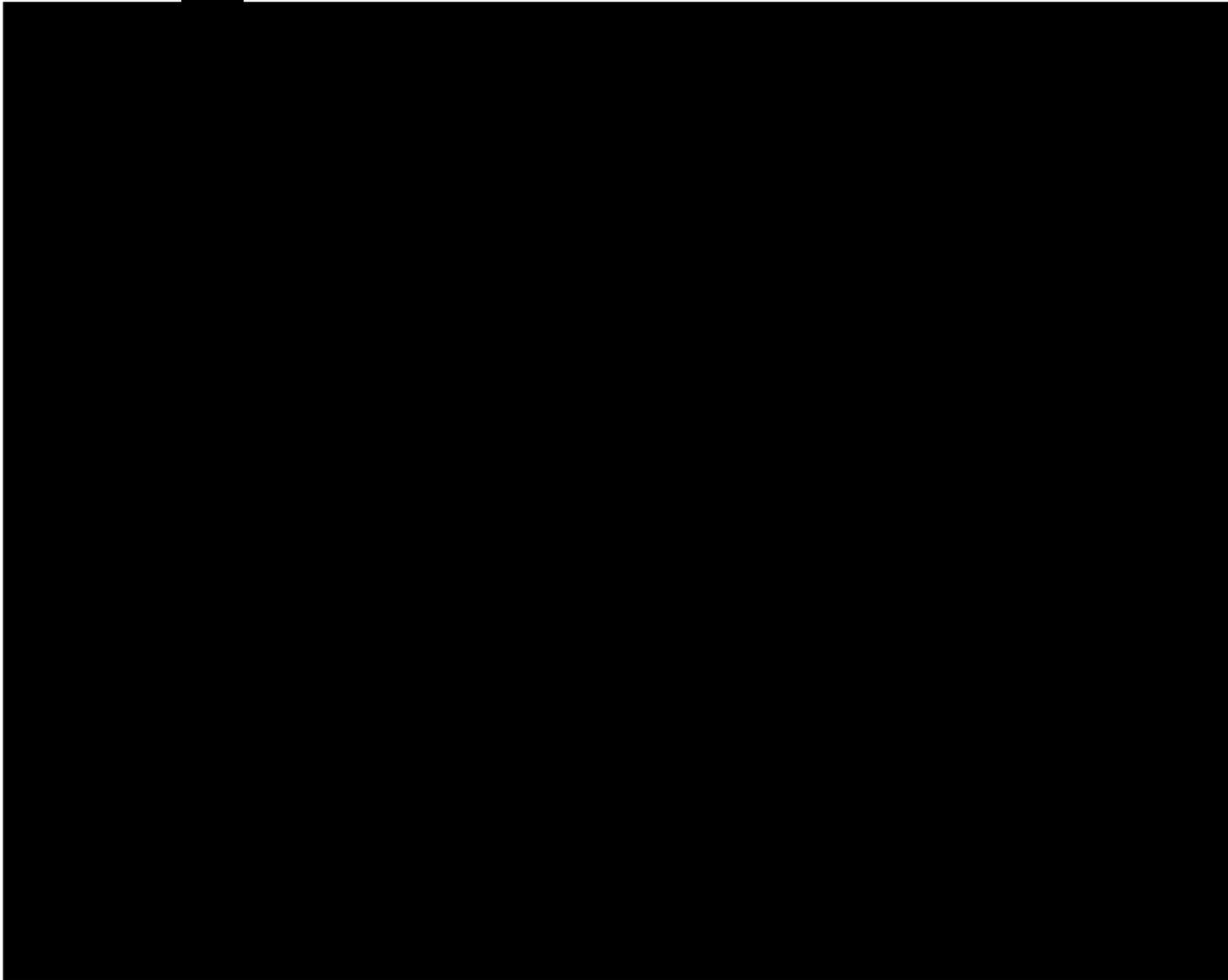


Figure 7.4 Indicative worst case LAmax contours during piling operations with estimated LAeq baseline levels: Desalination Plant at [REDACTED]

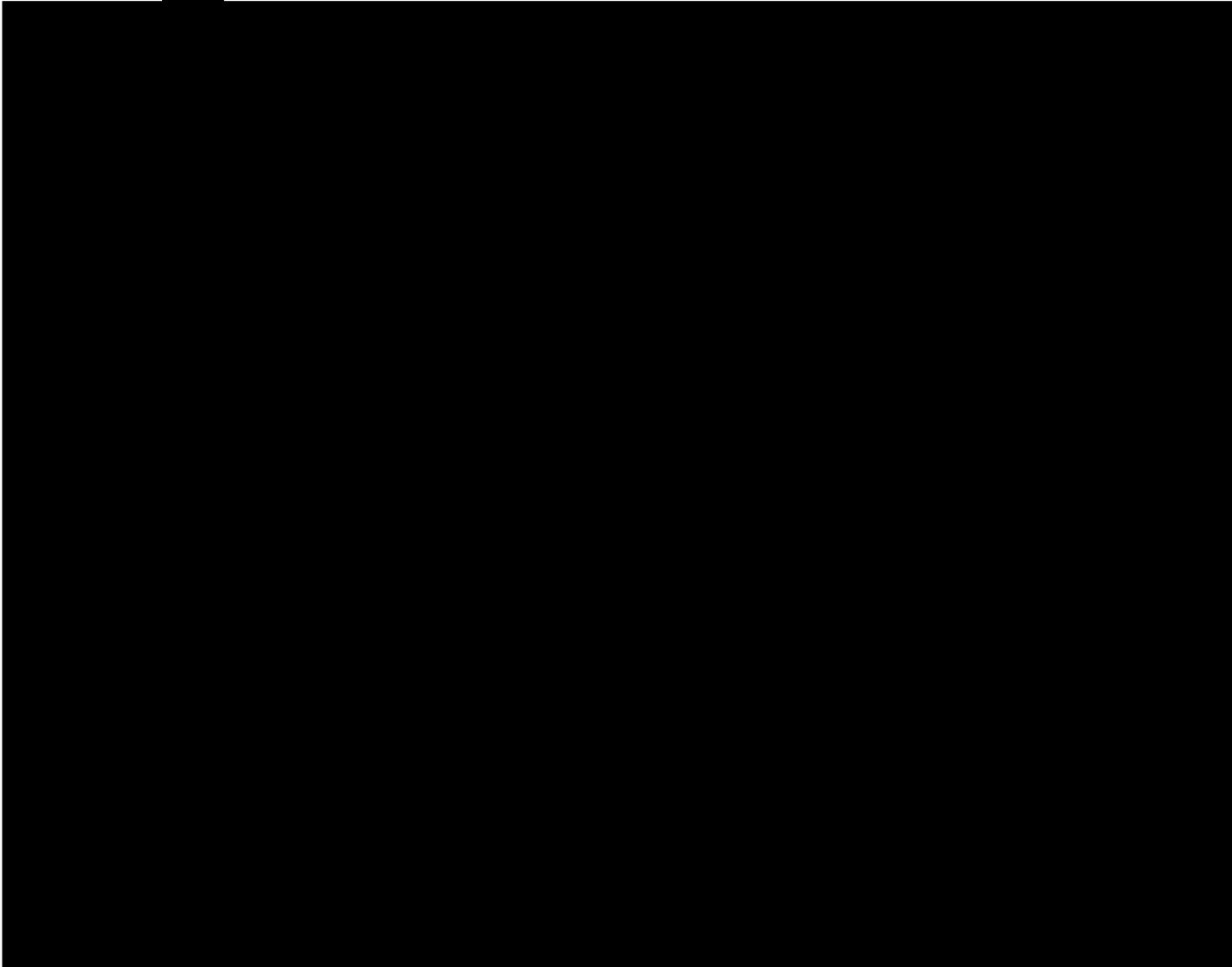


Table 7.3 Estimated noise levels at ornithological receptors throughout the construction programme (LAeq,T and LAmax dB): Calshot outfall – open cut construction⁶³

Data Source	Site	OSGB 1936		Closest	Estimated Baseline	Highest Predicted Construction Noise (during continuous Piling)	
		X	Y	Distance (m)		LAeq,day	LAeq,1hr [dB]
				(within 2.5km)			
Solent and Dorset Coast SPA (known breeding colony sites)	North Solent National Nature Reserve	442570	98625	5000	45	32	40
Solent and Southampton Water SPA (using SW&BGS compartment references)	SPA compartment NF61	447712	102363	1011	50	46	54
	SPA compartment NF97	447018	103396	2297	45	39	46
	SPA compartment NF59	448486	101855	645	45	50	57
	SPA compartment NF201	448469	102021	722	45	49	56
	SPA compartment NF60	448277	102664	1069	45	46	53
	SPA compartment NF58	448560	101790	647	45	50	57
Solent Waders and Brent Goose Strategy (Core and Primary sites only)	Core Area NF156B	448261	101568	Within	48	>65 (small area)	>90 (small area)
	Primary Area NF100	445909	104570	3790	45	35	42
	Primary Area NF156A	448078	101379	300	48	57	64

⁶³ For starting point only, not for the whole length of the trench into the intertidal section.

Figure 7.5 Indicative worst case LAeq contours during piling operations with estimated LAeq baseline levels: Calshot outfall – open cut construction



Figure 7.6 Predicted worst case LAmax contours during piling operations with estimated LAeq baseline levels: Calshot outfall – open cut construction

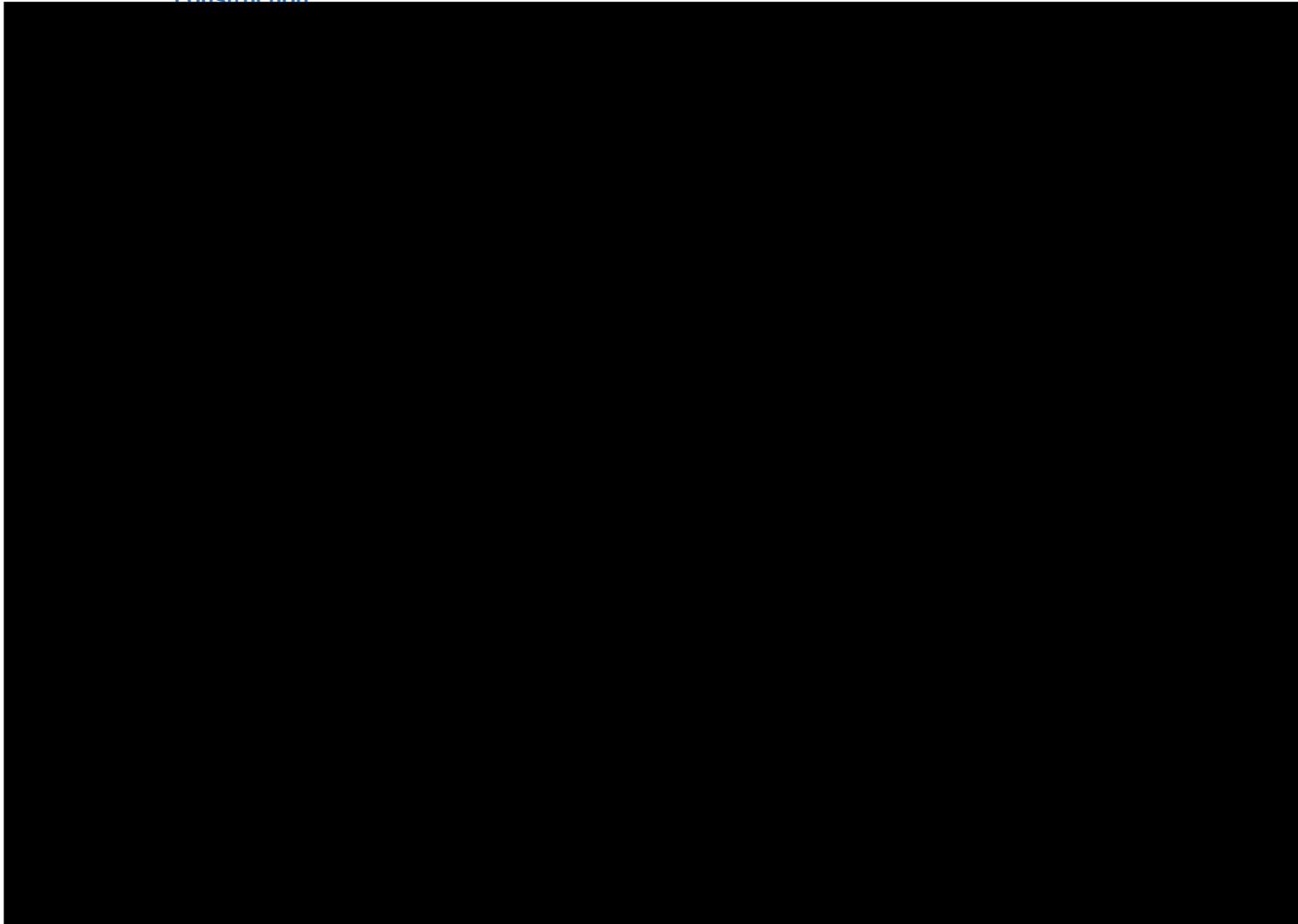


Table 7.4 Estimated noise levels at ornithological receptors throughout the construction programme (LAeq,T and LAmax dB): Calshot intake and outfall (tunnelled construction – assumed launch pit [REDACTED])

Data Source	Site	OSGB 1936		Closest	Estimated Baseline	Highest Predicted Construction Noise (during continuous Piling)	
		X	Y	Distance (m)		LAeq,day	LAeq,1hr [dB]
				(within 2.5km)			
Solent and Dorset Coast SPA (known breeding colony sites)	North Solent National Nature Reserve	442570	98625	5000	45	32	40
	SPA compartment NF61	447712	102363	1011	50	42	49
Solent and Southampton Water SPA (using SW&BGS compartment references)	SPA compartment NF97	447018	103396	2297	45	35	42
	SPA compartment NF59	448486	101855	645	45	46	53
	SPA compartment NF201	448469	102021	722	45	45	52
	SPA compartment NF60	448277	102664	1069	45	41	49
	SPA compartment NF58	448560	101790	647	45	46	53
	Solent Waders and Brent Goose Strategy (Core and Primary sites only)	Core Area NF156B	448261	101568	Within	48	>65 (small area)
	Primary Area NF100	445909	104570	3790	45	30	38
	Primary Area NF156A	448078	101379	300	48	52	60

Figure 7.7 Indicative worst case LAeq contours during piling operations with estimated LAeq baseline levels: Calshot intake and outfall – tunnelled construction (assumed launch pit location)

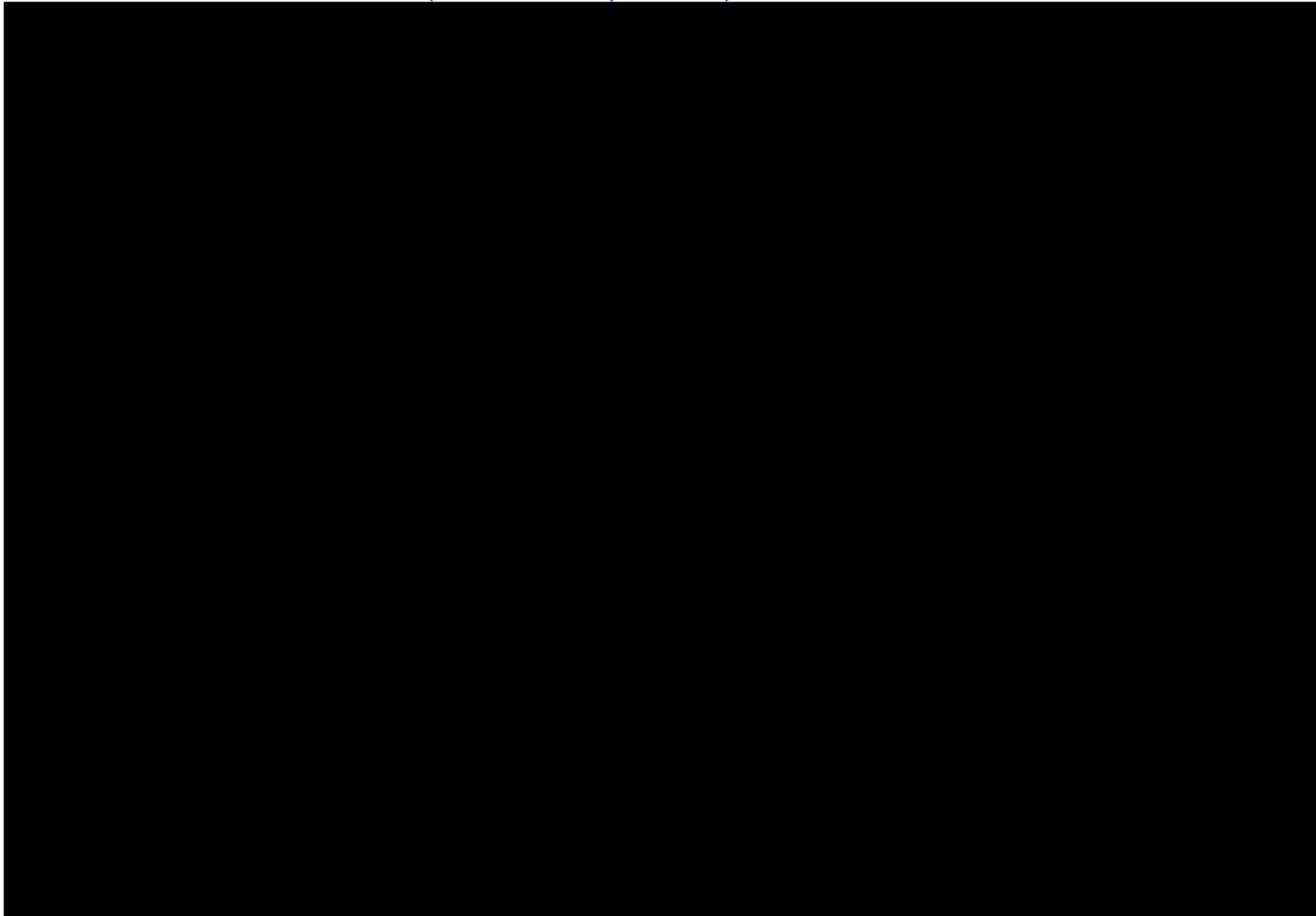


Figure 7.8 Indicative worst case LAmax contours during piling operations with estimated LAeq baseline levels: Calshot intake and outfall – tunnelled construction (assumed launch pit location)

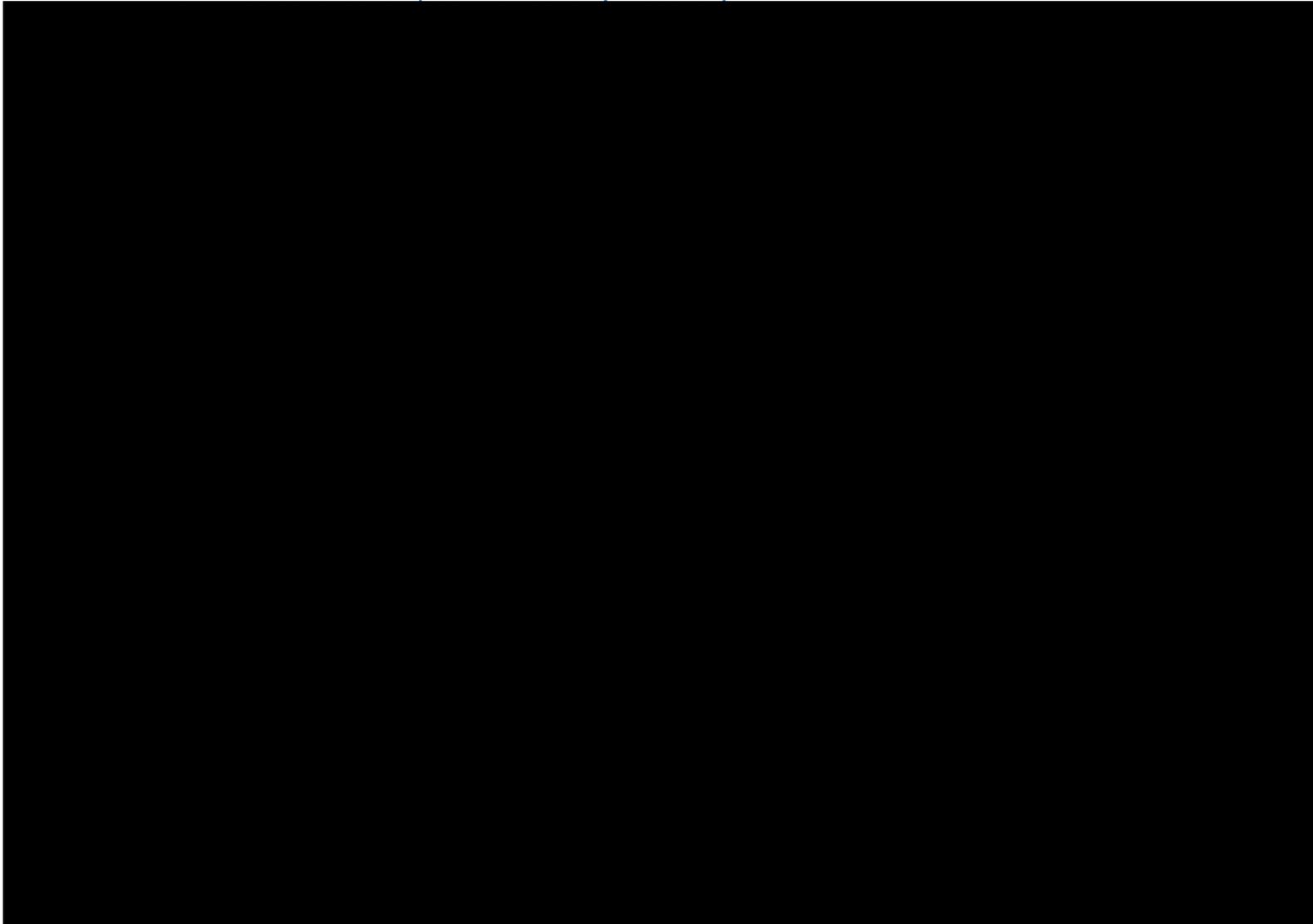


Table 7.5

Data Source	Site	OSGB 1936		Closest	Estimated Baseline	Highest Predicted Construction Noise	
		X	Y	Distance (m)		LAeq,1hr [dB]	LAmax [dB]
				(within 2.5km)			
New Forest SPA	Dartford warbler territory ⁶⁴						
	Dartford warbler territory						
	Dartford warbler territory						
	Dartford warbler territory						
	Woodlark territory ⁶⁵						
	Woodlark territory						
	Woodlark territory						
	Woodlark territory						
	Woodlark territory						
	Woodlark territory						
	Woodlark territory						
	Woodlark territory						
	Woodlark territory						
	Woodlark territory						
	Woodlark territory						
	Woodlark territory						
	Nightjar territory ⁶⁶						
	Nightjar territory						
	Nightjar territory						
Nightjar territories within 2.1km of route (x17)							

⁶⁴ Hampshire Ornithological Society (2019) New Forest Dartford Warbler Survey Report 2018. Higher Level Stewardship Agreement The Verderers of the New Forest AG00300016.

⁶⁵ Hampshire Ornithological Society (2019) New Forest Woodlark Survey Report 2019. Higher Level Stewardship Agreement The Verderers of the New Forest AG00300016

⁶⁶ Jackson S (2018) Survey and Assessment of Nightjar *Caprimulgus europaeus* status in the New Forest. Higher Level Stewardship Agreement, The Verders of the New Forest AG00300016. Arcadian Ecology & Consulting Ltd. Curdridge.

Figure 7.9 Indicative worst case LAeq contours during pipeline construction with estimated LAeq baseline levels

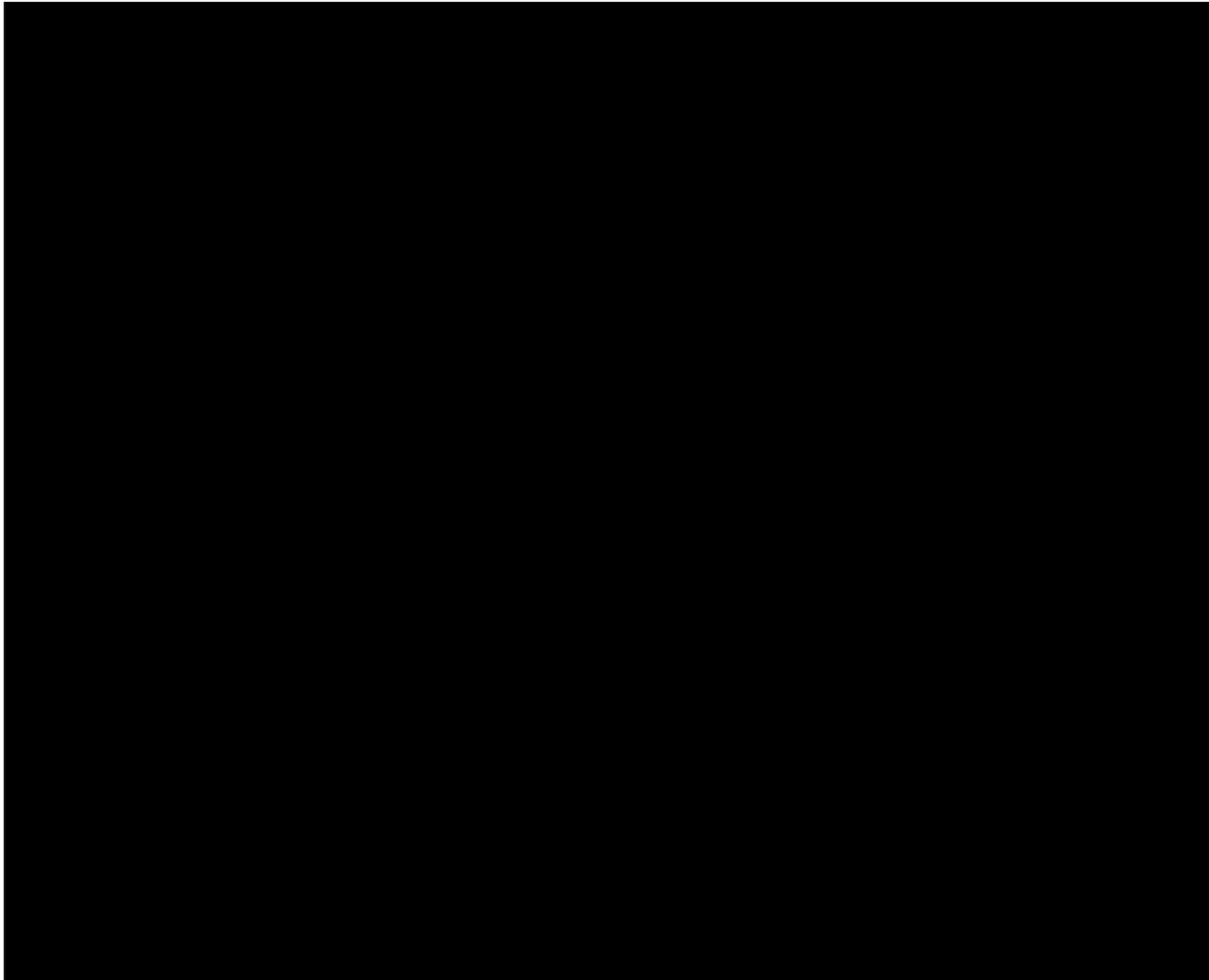


Figure 7.10 Indicative worst case LAmax contours during pipeline construction with estimated LAeq baseline levels



8 Consideration of Noise Effects on Qualifying Features

Baselined surveys have not been completed for the water recycling plant, desalination plant and Calshot intake and outfall; therefore, the distribution and bird species present is informed by publicly available data only. Survey work is proposed to commence in late summer 2021.

The assessment considers the key sites identified in the tables within Section 7. However, the cumulative impact to numerous sites within the noise contours, for example SW&BGS low and secondary support sites, will need to be undertaken once data has been collated (either desk-based or survey) to understand the usage of the sites.

8.1 Water Recycling Plant Site

8.1.1 Waterbirds

The Estuarine Waterbirds at Low Tide presents distribution maps of species within Langstone Harbour (1998-99). The highest concentrations of bird species were found at Chalkdock Lake, Farlington Marshes, the west shore and the Kench. In relation to the proposed site of the water recycling plant off Hart Farm Way, species commonly occurring in the north east of the harbour are; dark-bellied brent goose, wigeon, Eurasian teal, pintail, oystercatcher, ringed plover, grey plover, lapwing, knot, dunlin, black-tailed godwit, bar-tailed godwit, curlew and common redshank. The distribution reflects the feeding preferences of these species across the mudflats found in this part of the harbour. Dunlin are noted to particularly favour the area adjacent to Budds Wall⁶⁷. The islands within the harbour are used during the overwintering period by the majority of the Chichester and Langstone Harbour SPA qualifying species. Closer roosting locations include Southmoor Spit to the south east of the WRP site used by pintail and northern shoveler, whilst Eurasian teal are stated as roosting in the intertidal creeks which could include those in proximity to the WRP site⁶⁸.

Functionally linked habitat is mapped as part of the Solent Wader and Brent Goose Strategy. The proposed site for the WRP is not classified itself; it was H07D however, removed due to limited use. The site is adjacent to two low use sites (H08 and H07C) and in close proximity to a Core Area (H07A) and Secondary Support Area (H07B). Survey work completed for the planning application for the industrial warehouse unit in the western part of the site between January and March 2021, suggested that the H08 low use site was not in use⁶⁹. The survey work also did not record species within the adjacent H07A, H07B and H07C, although this conclusion is based on one season's worth of work (January - March 2021) and therefore, other factors could have reduced use in that particular year. However, high levels of recreational disturbance were noted which could be a limiting factor, as well as suboptimal habitats.

The piling activity will mainly impact peak noise levels (LAmax) given the relatively short term duration of the work. Therefore, if the 70dB LAmax threshold is used, only one of the measured location exceeds this; Core Area H07A. However, based on proximity and the contour mapping, the adjacent low use sites are also likely to experience similar noise levels. When using a change of 3dB to determine the potential for a likely significant effect, this extends to areas including Southmoor Nature Reserve and Primary Area H90 to the south east of the WRP site, and Long Island. However, it should be noted that the noise calculations completed are indicative only at this stage based on construction assumptions and extrapolating data to estimate baseline noise levels at sensitive receptors. As such, the baseline

⁶⁷ Musgrove, A J, Langston, R H W, Baker, H and Ward, R M (eds). 2003. Estuarine Waterbirds at Low Tide: the WeBS Low Tide Counts 1992/93 to 1998/99. WSG/BTO/WWT/RSPB/JNCC, Thetford – Section 4.30 Langstone Harbour. Accessed at <https://www.bto.org/our-science/projects/wetland-bird-survey/publications/estuarine-waterbirds-low-tide>.

⁶⁸ Natural England Conservation Advice for Marine Protected Areas Chichester and Langstone Harbours SPA (March 2018) Site Information. Accessed at [Marine site detail \(naturalengland.org.uk\)](https://www.naturalengland.org.uk)

⁶⁹ Harts Farm Way, Havant Habitats Regulations Assessment – APP/21/00189 Produced for Clowes Developments (UK) Ltd By Applied Ecology Ltd (April 2021). Accessed at [APP/21/00189 | Outline application for the development of new employment units to provide up to 29,000 sq m \(gross internal area\) for flexible use across use classes E \(light industrial\), B2 and B8 with ancillary offices, car parking, service yards, drainage works, landscaping and associated works to prepare the site for development. All matters are reserved except the means of access to the site. | Brockhampton West, Harts Farm Way, Havant](https://www.app.gov.uk/APP/21/00189)

noise levels at the sensitive receptors, and therefore the exceedance of the +3dB threshold, is uncertain.

Assuming a flight response could occur above 55dB, during piling works at LAmx, an area of approximately 85.5ha within the north east of Langstone Harbour would be within this contour. The northern part of Langstone Harbour is characterised by mudflat habitat and therefore, disturbance at low tide would affect those species with mudflats as a habitat preference.

Therefore, the work completed to date demonstrates that mitigation will likely be required to avoid an adverse effect. Areas of the SW&BGS used by the overwintering species to roost within immediate proximity of the WRP site, and those to the south east at Southmoor Nature Reserve could experience disturbance effects.

Measures to minimise noise include:

- Use of acoustic screens and hoarding to reduce dissipation of noise;
- Siting stationary plant away from the southern and western boundaries of the site;
- Using modern quiet equipment and ensuring such equipment is properly maintained and operated by trained staff; and
- Applying silencers/enclosures to particularly noisy equipment where possible.

Further noise assessment will be required once the SRO is selected and this should include baseline noise monitoring at sensitive receptors (where access allows, and assuming the survey itself would not result in disturbance issues) and comparison of noise levels with and without mitigation.

If after application of best practice mitigation measures such as those indicated above, and exceedance of 70dB is still expected at the closest sensitive receptor, the use of percussive piling or use of heavy machinery that cause such an exceedance should be timed to avoid sensitive periods and additional conditions imposed.

During consultation with Natural England⁷⁰, advice was provided on the types of conditions that have been used on cable and pipeline projects to either avoid or reduce disturbance of overwintering species. Although not directly applicable to the water recycling plant, with the exact conditions needing to be refined once the construction programme is known, areas to explore further are as follows:

- Use of vibrational piling rather than percussive piling. If percussive piling is required soft-start procedures must be employed over a period of at least 20 minutes. If piling ceases for greater than 10 minutes, the soft-start procedure must be repeated.
- Restrict works to certain states of tide to reduce impacts to overwintering birds feeding on the intertidal habitats at low tide.
- If works are to be undertaken during the overwintering period, or close to nesting birds, a suitably qualified ecological should be appointed as an Ecological Clerk of Works (ECoW) to supervise.
- Where temperatures at 0°C or lower for 7 consecutive days (but allowing short periods of thaw of one or two days) piling must not be undertaken until the temperature increases above 0°C for 5 consecutive days.

As part of the ECoW, monitoring of bird flight responses could be undertaken as part of a watching brief to ensure works cease if a flight response is recorded. The level of flight response that constitutes the ceasing of a particular activity would need to be agreed as part of the Construction Environmental Management Plan.

8.1.2 Terns and Mediterranean gull

Common tern, little tern and sandwich tern breed on the RSPB islands within the harbour, the closest to the WRP site being North Binness and Long Island. Further south are Baker's Island, South Binness Island and Round Nap Island. Mediterranean gull are also thought to breed on these islands (not a

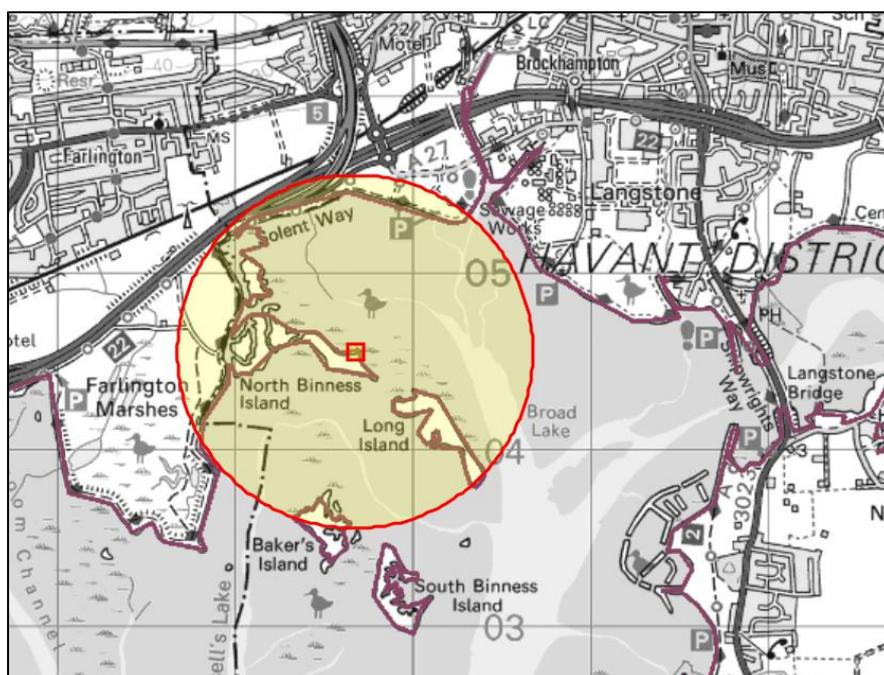
⁷⁰ Natural England (August 2021) Discretionary Advice Service (Charged Advice) DAS UDS 4533 Development Proposal and Location: Gate 2 RAPID pre-submission document review.

qualifying feature of the Chichester and Langstone Harbours SPA but a qualifying feature of the Solent and Southampton Water SPA).

A survey of the feeding activity of the tern species within Langstone Harbour has not been completed, therefore, use of the northern part is unknown. However, on the basis that little tern have the smallest foraging range of the species and are known to feed in shallow water, it is likely that at low tide they would use the deeper channels and any areas of standing water.

Again, assuming breeding colonies on North Binness Island, using a 1km foraging area for tern⁷¹, a key area of foraging would be within the 55dB contour (during piling works at L_{Amax}), as demonstrated in **Figure 8.1**. The indicative noise calculations suggest there could be a +3dB change over baseline noise levels.

Figure 8.1 Indication of 1km foraging area for Little tern from North Binness Island



There is therefore the potential that the tern breeding colony locations on the northern RSPB islands (North Binness Island and Long Island) could experience a +3dB increase over baseline noise levels.

The mitigation measures detailed for waterbirds in Section 8.1.1. are not always suitable for avoiding disturbance to nesting terns. Natural England have advised that Sandwich tern no longer nest in Chichester Harbour, therefore the breeding colonies within Langstone Harbour are of higher importance in maintaining populations. Numbers of common and Sandwich tern have increased in the harbours since designation, although the national trend is of decreasing population size⁷². However little tern numbers have decreased both nationally and within the harbours. There is uncertainty as to whether construction works at the WRP site would result in disturbance of tern species using the RSPB islands in particular, and potential disturbance of foraging, particularly for little tern who have the smallest foraging range.

There is currently no evidence available to understand existing levels of habituation by the tern species, given the proximity of areas of industrial development, or evidence from construction work within similar proximity and flight responses during noisy activities. A review of Natural England's consultation responses to date for the Harts Farm Way warehouse development would suggest disturbance to the wader and brent geese is the key issue to be addressed. Construction technologies and timescales

⁷¹ Rowell H (2020) Definition of Favourable Conservation Status for Little Tern *Sternula albifrons* Defining Favourable Conservation Status Project

⁷² JNCC (2019) Eleventh Article 12 UK Birds Directive Report (2019): Annex B – Species' status and trends'

may however differ, giving rise to different levels and types of noise generation, and as such the two types of development may not necessarily be comparable.

Mitigation for the tern species will need to focus on timing of the noisiest activities, to avoid key sensitive periods to reduce nest abandonment, and reduce disturbance when adults are feeding young chicks and foraging ranges are further reduced. Works may also need to be timed to avoid key foraging periods, for example early morning and evening, or during particular stages of the tidal cycle⁷³. Further understanding of the use of the area immediately fronting the WRP site will be required, as will updated noise calculations. A review of mitigation packages put in place to reduce disturbance at other SPAs with terns as a qualifying feature would be useful e.g., the Wylfa Newydd Nuclear Power Station - Development Consent Order which impacted the Anglesey Terns / Morwenoliaid Ynys Môn SPA, and considered measures such as observing an establishment period for nests, and a noise limit of 55dB (although the DCO application has been withdrawn (February 2021))^{74, 75}.

8.2 Desalination Plant

8.2.1 Waterbirds

The Estuarine Waterbirds at Low Tide presents distribution maps of species within Southampton Water (1998-99). The highest concentrations of bird species were found at Cadland Creek, Hythe/ Dibden, Bury/ Eling and the Hamble River⁷⁶. In relation to the proposed location of the desalination plant off the northern access road, compartments NF61 and NF97 under the worst-case scenario (continuous piling) will be exposed to the highest noise levels during construction. At both locations the noise levels are estimated to increase by at least 3dB above ambient noise level (LAeq 1hr) and LAmax dB. These compartments consist of a mosaic of intertidal mudflats and saltmarsh priority habitat, plus littoral coarse sediment and are classified as SPA sites. The compartments are also located in Unit 5 of the Hythe to Calshot Marshes SSSI, which is in unfavourable – recovering condition⁷⁷. In the upper shore, the saltmarsh is dominated by sea purslane and in the mid shore by common cordgrass. The saltmarshes are generally poor nesting habitat for qualifying species due to regular tidal inundation and a high level of disturbance in the upper shore. However, the broad habitat does support in excess of 10,000 overwintering birds, with suitable foraging grounds and roosting sites present⁷⁸.

Bird species commonly recorded in compartment NF61 and NF97 are: dark-bellied brent goose, shelduck, wigeon, teal, dunlin, curlew, redshank and black-tailed godwit (latter to a lesser extent)⁷⁶. For example, during wintering surveys undertaken in 2015 along the front of the former power station (covering the saltmarsh, shingle and intertidal mudflat habitat) high water peak counts of dark-bellied brent goose were 751, shelduck 52.5, oystercatcher 676, wigeon 208 and teal 207⁷⁹. Sandwich tern and common tern have also been recorded⁸⁰. No records of little tern, roseate tern or Mediterranean gull have been logged on NBN Atlas.

The density of bird populations south of Fawley oil refinery has previously been lower (9.2 birds/per hectare) in comparison to bird populations north of Fawley oil refinery (43.5 birds/per hectare)⁸¹. Factors known to impact on the distribution of waterfowl include food availability, temperature, water

⁷³ Davies S (1979) Development and behaviour of Little Tern chicks - Gibraltar Point Nature Reserve, Skegness, Lincolnshire. Pages 291-298.

⁷⁴ Horizon Nuclear Power (June 2018) Wylfa Newydd Project 5.2 Shadow Habitats Regulations Assessment Report (Parts 1 and 2). Accessed at [EN010007-001360-5.2 Shadow Habitats Regulations Assessment Report \(Part 1 of 2\) \(Rev 1.0\).pdf](https://planninginspectorate.gov.uk/EN010007-001360-5.2 Shadow Habitats Regulations Assessment Report (Part 1 of 2) (Rev 1.0).pdf)

⁷⁵ Hughes T (December 2018 – for Deadline 2) Wylfa Newydd Nuclear Power Station -Development Consent Order (EN010007) Written Representation Biodiversity – Cemlyn Nature Reserve.

⁷⁶ Musgrove, A J, Langston, R H W, Baker, H and Ward, R M (eds). 2003. Estuarine Waterbirds at Low Tide: the WeBS Low Tide Counts 1992/93 to 1998/99. WSG/BTO/WWT/RSPB/JNCC, Thetford – Section 4.32 Southampton Water.

⁷⁷ Natural England (2018). Condition of SSSI Units for Site Hythe to Calshot Marshes SSSI. Accessed from: <https://designatedsites.naturalengland.org.uk/ReportUnitCondition.aspx?SiteCode=S1001035&ReportTitle=Hythe to Calshot Marshes SSSI>

⁷⁸ Natural England (1993) Hythe to Calshot Marshes SSSI, Citation. 1 – 2.

⁷⁹ WSP (2020) Fawley Waterside Ltd, Volume 1: Updated Environmental Statement, Chapter 10 – Conservation, Terrestrial and Marine Biodiversity. 1 – 152.

⁸⁰ British Trust of Ornithology (2020). BTO and partners 2006 – 2019. Accessed from NBN Atlas: [Birds \(BTO+partners\) 2016 - 2019 | NBN Atlas](https://nbnatlas.org/Birds/BTO+partners/2016-2019)

⁸¹ BTO (2007). WeBS Counts. Published in Environmental Statement for Port of Southampton, ABPmer, pg 203.

depth and availability of suitable roosting habitat that is sheltered and safe from predators. The broad distribution of bird species within Southampton Water will be influenced by food availability (density of benthic invertebrates) and the feeding ecology of each species, plus species sensitivities to anthropogenic disturbance, which would impact on the suitability of roosting habitat. The latter is deemed likely due to the heavily developed nature of the estuary with the presence of the docks, oil refinery and power station along the banks of the estuary.

Other compartments whereby noise exposure exceeds the baseline by at least 3dB include the following five compartments, classified as SPA sites: NF84, NF85, NF60, NF98 and NF201. However, as the predicted noise level is below 55dB (LA_{max}) no impact during construction is anticipated at these components in relation to waterbirds. A secondary support area and candidate site are also located within the zone of influence where noise from construction is predicted to not exceed the 3dB threshold. Calshot Marshes Local Nature Reserve is a primary support area and is located outside the zone of influence.

Although a 3dB increase above baseline noise levels is anticipated at a number of compartments, overall, the increase in noise levels during continuous piling is anticipated to be <55dB and therefore, is considered low level disturbance with limited impact⁸². Predicted noise levels at compartments NF61 and NF97 exceed 55dB and could lead to a flight response if birds are present in the upper shore. However, predicted noise levels remain sufficiently below the 70dB threshold LA_{max} threshold for waterbirds⁸³. The piling activity will mainly impact peak noise levels (LA_{max}) given the relatively short-term duration of the work. Therefore, if the 70dB LA_{max} threshold is used, no significant effects on the compartments within the zone of influence are anticipated for waterbirds. In addition, there is an approximate 260m buffer between the proposed construction works and European site, plus deciduous woodland priority habitat which may provide a visual buffer (subject to final design and whether any would require removal to accommodate the desalination plant). Although there is limited information regarding noise thresholds and levels of disturbance for tern species, the breeding colonies themselves are considered to be at sufficient distance (c. 6km) such that there will not be any noise impacts. Localised disturbance of foraging in Southampton Water may occur. Therefore, the following mitigation measures are recommended, as are those detailed in Section 8.1.3 for wintering birds:

- Adopt a phased approach to construction whereby a 'soft-start' is used during activities that produce a high level of noise (i.e piling). This involves increasing noise levels over a 30 minute period;
- Acoustic screens around the perimeter of the construction site;
- Locate temporary work compounds to the west of the construction site, furthest away from Southampton Water;
- Using modern quiet equipment and ensuring such equipment is properly maintained and operated by trained staff; and
- Applying silencers/enclosures to particularly noisy equipment where possible.

8.2.2 Terns and Mediterranean gull

No suitable breeding habitat for common tern, sandwich tern, roseate tern, little tern or Mediterranean gull has been identified within the potentially impacted area (desk based assessment and initial walkovers (July 2021) only). Breeding colonies are located at Hurst Point, Pitts Deep, North Solent National Nature Reserve and to a lesser extent Titchfield Haven National Nature Reserve (common tern and Mediterranean gull), with the closest sites located approximately 6.5km south-east of the proposed works (across Southampton Water) or at the North Solent NNR at Beaulieu River. Disturbance to breeding colonies is therefore considered unlikely given the distance to the known locations.

A small area to the east of [REDACTED] will be within the 55dB contour (during piling at LA_{max}) consisting of mudflat and saltmarsh habitat. The mapping of foraging ranges from breeding colonies used to identify the boundaries of the Solent and Dorset Coast SPA identified that foraging in

⁸² https://www.tide-toolbox.eu/tidetools/waterbird_disturbance_mitigation_toolkit/

⁸³ Cutts, N., Phelps, A. and Burdon, D. (2009) Construction and waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA, Institute of Estuarine and Coastal Studies, University of Hull.

Southampton Water would be limited to Sandwich tern, which has a large foraging range c.49km⁸⁴. Survey work completed for the [REDACTED], which included the intertidal area between [REDACTED] and Calshot Spit did not record any tern species⁸⁵. Disturbance during foraging is therefore also considered unlikely.

8.3 Calshot Intake and Outfall

8.3.1 Waterbirds

The Estuarine Waterbirds at Low Tide presents distribution maps of species within Southampton Water (1998-99). The highest concentrations of bird species were found at Cadland Creek, Hythe/ Dibden, Bury/ Eling and the Hamble River⁸⁶. In relation to the proposed location of the Calshot intake and outfall close to the B3053, considering both open trenched and tunnelled construction methods, compartments NF156A and NF156B under the worst-case scenario (continuous piling) will be exposed to the highest noise levels. The noise levels are estimated to increase by at least 3dB above ambient noise level (LAeq 1hr) and LMax dB. NF156A is classified as a primary area in the Solent and Waders Brent Goose Strategy, covering the majority of the Calshot Marshes. Bird surveys conducted at Calshot Marshes from 1996/97 – 2000/01 recorded 15.7 birds/ per hectare with a mean count of 596 individuals⁸⁷. NF156B is a core area, that runs along the north-western edge of Calshot Spit and consists of coastal and floodplain grazing marsh priority habitat. Noise disturbance is also predicted along the south-eastern side of Calshot spit which forms part of the Solent and Southampton Water SPA. This shingle and mixed sediment present in the upper shore forms an important high tide roost site for dunlin, ringed plover and turnstone, although is subject to high anthropogenic disturbance⁸⁸. Bird surveys conducted at Calshot beach from 1996/97 – 2000/01 recorded 1.2 birds/per hectare with a mean count of 108⁸⁷.

Bird species previously recorded within close proximity of compartment NF156A and NF156B are dark-bellied brent goose, shelduck, wigeon, teal, ringed plover, grey plover, dunlin, black-tailed godwit, curlew and redshank⁸⁶. For example, during wintering surveys undertaken in 2015 along the priority saltmarsh and intertidal mudflat habitat, high water peak counts for dark-bellied brent goose were 751, 52.5 for shelduck, 676 for oystercatcher, 208 for wigeon 208 and 207 for teal⁸⁸. However, the broader coastal habitat associated with Southampton Water supports in excess of 10,000 overwintering birds, with suitable foraging grounds and roosting sites present⁸⁹.

The general distribution of bird species within Southampton Water will be influenced by food availability (density of benthic invertebrates) and the feeding ecology of each species, plus species sensitivities to anthropogenic disturbance, which would impact on the suitability of foraging and roosting habitat. The latter is deemed likely due to the heavily developed nature of the estuary with the presence of the docks, oil refinery and power station along the banks of the estuary. During a study on the sensitivities of waterbirds to recreational disturbance, dunlin, redshank, curlew and wigeon were recorded reacting via major flight or short walk/swim more frequently (higher %) than dark-bellied brent goose, shelduck, teal and grey plover. Black-tailed godwit and ringed plover were not included in the study⁹⁰. The study highlighted that distance from the source of disturbance was a key factor in the level of response and water-based activities caused greater disturbance than activities in the terrestrial habitat.

If tunnelled construction methods are proposed, there are four other compartments classified as SPA sites whereby exposure exceeds ambient levels by at least 3dB. These include: NF59, NF201, NF60 and NF58. Predicted noise levels if the pipeline is installed using tunnelled construction methods are

⁸⁴ Natural England Technical Information Note TIN135 First edition 28 November 2012 www.naturalengland.org.uk
Sandwich tern: species information for marine Special Protection Area consultations. Accessed at [TIN135 edition 1.pdf](#)

⁸⁵ WSP (2020) Fawley Waterside Ltd, Volume 1: Updated Environmental Statement, Chapter 10 – Conservation, Terrestrial and Marine Biodiversity. 1 – 152.

⁸⁶ Musgrove, A J, Langston, R H W, Baker, H and Ward, R M (eds). 2003. Estuarine Waterbirds at Low Tide: the WeBS Low Tide Counts 1992/93 to 1998/99. WSG/BTO/WWT/RSPB/JNCC, Thetford – Section 4.32 Southampton Water.

⁸⁷ BTO (2007). WeBS Counts. Published in Environmental Statement for Port of Southampton, ABPmer, pg 203.

⁸⁸ WSP (2020) Fawley Waterside Ltd, Volume 1: Updated Environmental Statement, Chapter 10 – Conservation, Terrestrial and Marine Biodiversity. 1 – 152.

⁸⁹ Natural England (1993) Hythe to Calshot Marshes SSSI, Citation. 1 – 2.

⁹⁰ Stillman, L. D & Fearnley, H. (2011). The Solent Disturbance and Mitigation Project Phase II, Results of bird disturbance fieldwork 2009/10. Footprint Ecology, pg 36.

all <55dB (LAmax) for all SPA site compartments and therefore, no impact during construction is anticipated at these compartments in relation to waterbirds. However, NF156A and NF156B could potentially be exposed to >65dB (LAmax) in the south western corner of Calshot Marshes. Based on previous surveys, dark-bellied brent goose and dunlin have been observed in high abundance within this region⁹¹. On the basis that dark-bellied brent goose may not be as sensitive to noise disturbance, the potential increase in noise above ambient conditions is particularly concerning for dunlin.

If open trenching is proposed, there are five other compartments classified as SPA sites whereby noise exposure exceeds ambient levels by at least 3dB and a moderate level of disturbance is predicted. These include: NF61, NF59, NF201, NF60 and NF58 and consist of saltmarsh and intertidal mudflat habitat, plus littoral coarse sediments. Both site NF156A and NF156B are predicted to be exposed to a high level of disturbance, with noise levels predicted to reach 65 – 70dB LAeq 1hr and over 70dB LAmax. Therefore, there is potential for likely significant effects on qualifying wintering bird populations, particularly present at Calshot marshes. Due to the low density of birds recorded at Calshot beach in comparison to habitats north of Calshot spit, disturbance impacts from proposed construction works are considered to be less likely at this stage.

The following mitigation measures, in addition to suggested types of condition provided by Natural England (see Section 8.1.3) are recommended for further consideration:

- Avoid night-time construction works (from 1 hour before dusk to dawn) during the post-breeding/ passage period for terns which is between 15th August – 31st October inclusive;
- Adopt a phased approach to construction whereby a 'soft-start' is used during activities that produce a high level of noise. This involves increasing noise levels over a 30 minute period;
- Visual/ acoustic screens around the perimeter of the construction site;
- Locate temporary work compounds to the north of the construction site, furthest away from Solent and Southampton Water;
- Using modern quiet equipment and ensuring such equipment is properly maintained and operated by trained staff; and
- Applying silencers/enclosures to particularly noisy equipment where possible.

Further noise assessment will be required once the SRO is selected and this should include baseline noise monitoring at sensitive receptors (where access allows, and assuming the survey itself would not result in disturbance issues) and comparison of noise levels with and without mitigation.

If after application of best practice mitigation measures such as those indicated above, and exceedance of 70dB is still expected at the closest sensitive receptor, the use of percussive piling or use of heavy machinery that cause such an exceedance should be timed to avoid sensitive periods. In this case, the closest sensitive receptors are those high roosting sites and foraging areas used by the brent geese and waders, and as such, the overwintering period should be avoided (i.e., October to March inclusive).

8.3.2 Terns and Mediterranean gull

Sandwich tern and common tern have been recorded in the area on the NBN Atlas⁹². No records of little tern, roseate tern or Mediterranean gull have been logged on NBN Atlas within the potentially impacted area. Tern species were not recorded as part of the surveys completed for the [REDACTED] which included Calshot Spit⁹³.

No suitable habitat for qualifying breeding populations has been identified within the potentially impacted area (desk based assessment and initial walkovers (July 2021) only). Key breeding colonies of tern species and Mediterranean gulls are located at Hurst Point, Pitts Deep, North Solent NNR to a lesser extent Titchfield Haven National Nature Reserve (common tern and Mediterranean gull), with the closest site located approximately 5.1km north-east of the proposed works (across Southampton

⁹¹ Musgrove, A J, Langston, R H W, Baker, H and Ward, R M (eds). 2003. Estuarine Waterbirds at Low Tide: the WeBS Low Tide Counts 1992/93 to 1998/99. WSG/BTO/WWT/RSPB/JNCC, Thetford – Section 4.32 Southampton Water.

⁹² British Trust of Ornithology (2020). BTO and partners 2006 – 2019. Accessed from NBN Atlas: [Birds \(BTO+partners\) 2016 - 2019 | NBN Atlas](#)

⁹³ WSP (2020) Fawley Waterside Ltd, Volume 1: Updated Environmental Statement, Chapter 10 – Conservation, Terrestrial and Marine Biodiversity. 1 – 152.

Water). No breeding sites have been identified in compartment NF156A and NF156B. Disturbance to breeding colonies is therefore considered unlikely given the distance to the known locations.

The mapping of foraging ranges from breeding colonies used to identify the boundaries of the Solent and Dorset Coast SPA identified that foraging in the Solent off Calshot Spit would be limited to Sandwich tern, which has a large foraging range c.49km⁹⁴. An offshore area will be within the 55dB contour, therefore the utilisation of the shallow waters by the tern and Mediterranean gull species will be required to confirm the need for mitigation e.g., restriction of noisiest activities at particular stages of the tide, periods in the day to minimise disruption to foraging.

Tom Tiddlers Ground, to the north of Calshot Spit, is part of the Fawley Waterside Development Nature Park Management Plan. As part of the habitat improvements, the following is proposed:

- *Single islands providing nesting habitat for Annex I birds, in particular Little tern, Common tern and Mediterranean gull.*

The usage of these habitats by the SPA qualifying features will need to be confirmed through survey work, depending on the progress of the Nature Park.

8.3.3 Passerines

During the baseline data collection and survey work completed for the [REDACTED] Tom Tiddlers Ground, to the north of Calshot Spit was assessed. The Conservation, Terrestrial and Marine Biodiversity ES chapter states;

“The survey of the area undertaken by [REDACTED] for Hampshire County Council in 2014 refers to a “quite excellent assemblage of breeding birds including Reed Warbler, Reed Bunting, Cuckoo, Cetti’s Warbler, Nightingale and Dartford Warbler”.

Breeding bird surveys undertaken by Cox and Combridge (2015 and 2016) confirmed the presence of this assemblage of breeding birds including both Nightingale and Dartford warbler, although the habitat of both species was noted as being in poor condition.”

Surveys in 2018 did not record nightingale and Dartford warbler due to habitat deterioration. Tom Tiddlers Ground is part of the Fawley Waterside Development Nature Park Management Plan, and as such the following habitat improvements are proposed:

- *Introduction of livestock grazing to restore rank and species poor saltmarsh to species rich Atlantic saltmeadow saltmarsh, an Annex I habitat type for which the Solent Maritime SAC has been designated.*
- *Construction of the saline lagoon to create an additional Annex I priority habitat type for which the Solent Maritime SAC has been designated including habitat for rare and specialist invertebrates in particular Insensible shrimp *Gammarus insensibilis*, Starlet anemone *Nematostella vectensis* and Lagoon cockle *Cerastoderma glauca*.*
- *Single islands providing nesting habitat for Annex I birds, in particular Little tern, Common tern and Mediterranean gull.*
- *Undisturbed feeding and roosting habitat within the lagoon and associated coastal grazing marsh for wintering wildfowl and waders, in particular dark-bellied brent geese, wigeon, teal, redshank, oystercatcher, dunlin and ringed plover. New un-disturbed high water roosts such as these have been identified through both the Solent Recreation Mitigation Partnership and the Wader and Brent Goose Strategy in offsetting the effects of disturbance on wintering birds.*
- *A new intertidal creek with fringing saltmarsh and intertidal mud providing additional Annex I habitat offsetting impacts of sea level rise and saltmarsh erosion⁹⁵.*

⁹⁴ Natural England Technical Information Note TIN135 First edition 28 November 2012 www.naturalengland.org.uk
Sandwich tern: species information for marine Special Protection Area consultations. Accessed at [TIN135 edition 1.pdf](#)

⁹⁵ WSP (2020) Fawley Waterside Ltd, Volume 1: Updated Environmental Statement, Chapter 10 – Conservation, Terrestrial and Marine Biodiversity. 1 – 152.

The proposed habitats are therefore less likely to be suitable for nightingale and Dartford warbler, although survey work should be undertaken to confirm this, depending on the progress of the Nature Park.

8.4

Anecdotal information from bird watching sites suggest that honey buzzard is found predominantly in the Acres Down area of the New Forest, which is c. 7km from the pipeline route, and therefore disturbance of breeding sites is considered unlikely. Similarly, hen harrier is unlikely to be disturbed during the overwintering period with the SACO stating that the main roosting sites are in the north west and south of the New Forest. Based on wood warblers' habitat preferences for nesting sites "*Wood Warblers are associated with well-wooded landscapes and favour sub-mature and mature, usually oak dominated, woodlands. They prefer relatively closed-canopy woodlands with varied sub-canopy structure, relatively sparse understorey and some field layer vegetation*", and habitat mapping publicly available for the corridor adjacent to the pipeline route, it is considered unlikely that this species will be disturbed during construction. There is uncertainty as to whether hobby would be impacted, with no records for the species along the corridor detailed on the NBN Atlas.

One woodlark territory is within 500m, and three nightjar territories. Using the threshold of an increase of 3dB over baseline for peak noise, an additional woodlark and nightjar territory would be impacted.

A total of 169 woodlark territories were recorded in the New Forest in 2019, whilst a total of 435 nightjar territories were recorded in the New Forest in 2018. This would equate to a potential direct disturbance to 0.012% of the woodlark territories and 0.009% of the nightjar territories, assuming construction works were affecting all sites in the same year. Disturbance of these pairs may disturb others through territory encroachment.

Consideration should be given to the following measures to reduce potential disturbance:

- Use of acoustic screens and hoarding to reduce dissipation of noise;
- Siting stationary plant away from the southern and western boundaries of the site;
- Using modern quiet equipment and ensuring such equipment is properly maintained and operated by trained staff; and
- Applying silencers/enclosures to particularly noisy equipment where possible.

9 Conclusions

The construction noise calculations have been based on extrapolating existing baseline noise data available from two publicly available Environmental Statements for developments at similar locations; [REDACTED] and [REDACTED]. Similarly, baseline information on the distribution of the SPA and Ramsar qualifying bird species has been derived from the designated site Supplementary Advice on Conservation Objectives, publicly available WeBS data and an initial survey visit to the desalination sites. Construction assumptions have been made using the high level conceptual design information, with no formal construction plant list or construction programme available. The BS5228 reference data for measurements of noise from typical construction activities. As such, the assessment work completed is a crude indication of potential noise disturbance issues to aid discussion with the stakeholders and provide a basis on which to complete further assessment as part of the planning process.

The work has allowed early dialogue with the stakeholders on the appropriateness of the methodology that could be adopted for future assessments, and suitable disturbance thresholds.

The work completed to date demonstrates that mitigation will likely be required to avoid an adverse effect from noise disturbance at all the construction sites, as follows:

- Water recycling plant – will need to consider mitigation for both breeding (terns and Mediterranean gulls) and wintering bird species. The mudflats in the north east of Langstone Harbour are likely to be used by a range of wintering species, and the RSPB islands in the middle of the harbour are used by the tern species and Mediterranean gulls for breeding.
- Desalination plant – will need to consider mitigation for wintering bird species. Uncertainty as to the use of the site as functionally linked habitat for the New Forest SPA and Ramsar species. Breeding tern and Mediterranean gull disturbance considered unlikely.
- Calshot intake and outfall – will need to consider mitigation for wintering bird species. Breeding tern and Mediterranean gull disturbance considered unlikely, although foraging in the shallow waters off Calshot Spit will need to be determined through survey work. Area is unlikely to be used as functional habitat for the species of the New Forest SPA and Ramsar given habitat decline in Tom Tiddlers Ground, and the proposed habitats being created as part of the Fawley Waterside Development Nature Park. Again, this will need to be verified.
- [REDACTED]

However, baseline noise surveys should be undertaken in proximity to the sensitive ecological receptors (assuming the activity itself would not cause disturbance) to collect data on ambient conditions. Ornithological data collection and baseline surveys, where necessary, will aid the understanding of existing levels of habituation and distribution of species across the sites, including the following:

- WeBS data will need to be requested from the following sectors; Fawley, Calshot, Lepe, West Hayling Island, Langstone RSPB Reserve and Farlington Marshes⁹⁶.
- Wintering bird surveys at Calshot marshes (focused on coastal grazing marsh and grassland) and Calshot beach to gain up to date information on bird species presence, abundance and behaviour (using the site for foraging or roosting) in order to determine potential impacts on qualifying species due to the proposed intake and outfall pipeline on Calshot beach.
- Further assessment of the suitability of the habitat for breeding/ nesting sandwich tern, common tern, little tern, roseate tern and Mediterranean gull.
- Wintering bird surveys are also recommended south of Fawley oil refinery to gain up to date information on bird species presence, abundance and behaviour (using the site for foraging or roosting) in order to determine potential impacts on qualifying species due to the proposed desalination plant. Surveys would focus on species present in the saltmarsh and mudflats.

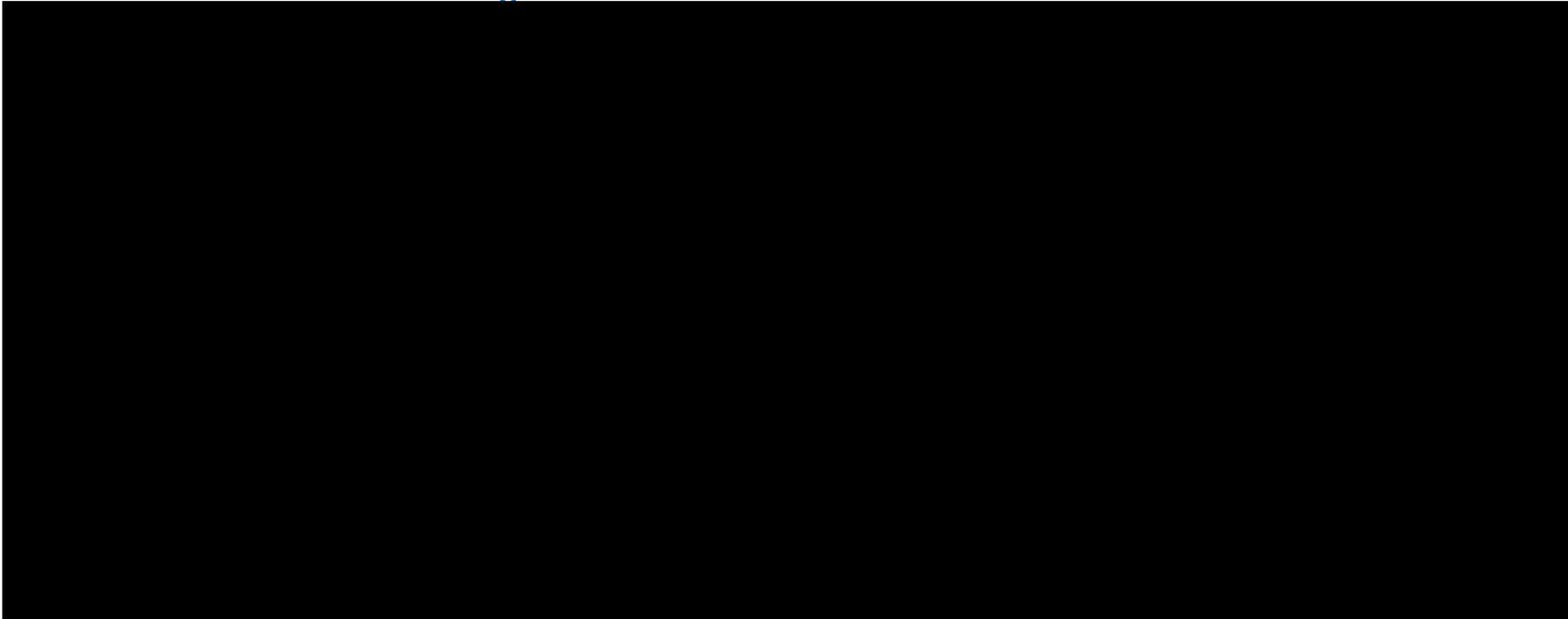
⁹⁶ Other sectors may be required to understand other impacts.

- Limited data and evidence on the potential thresholds of tern species and passerines to construction noise. Regulatory guidance required on this to further develop the assessment and agree a suitable set of parameters within which construction works can be undertaken.

Appendices

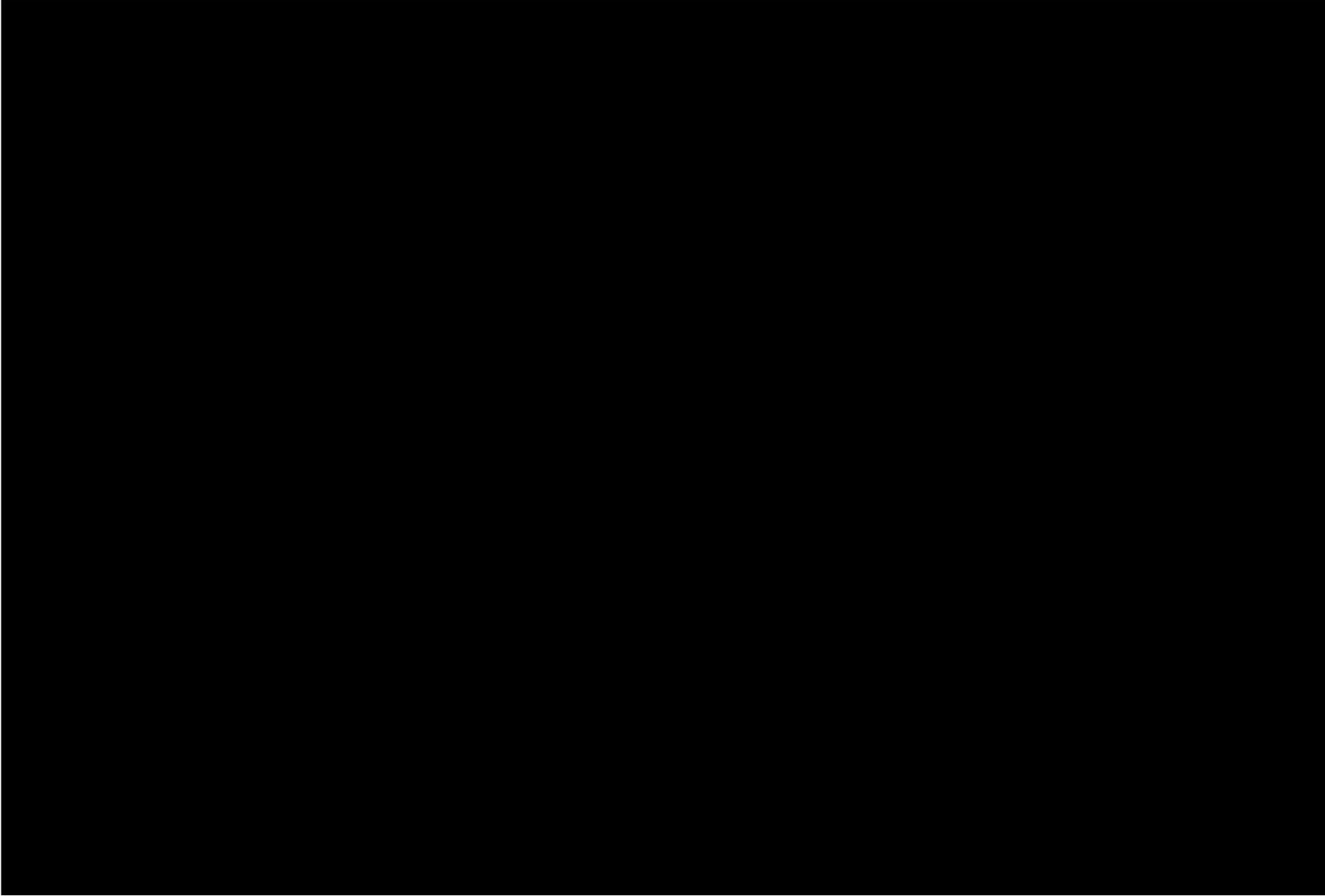
Appendix A Stakeholder Comment Log

Stakeholder Comment Log⁹⁷



⁹⁷ Natural England (9 August 2021) Discretionary Advice Service (Charged Advice) DAS UDS 4533 Development proposal and location: Gate two RAPID pre-submission document review.









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