

Technical Note:

GFP II Limited – Harts Farm Way Ecological Appraisal (Emissions)

1. Introduction

1.1 Proposed power plant: Harts Farm Way

GFP II Limited propose to build a power plant in Havant that generates electricity to provide additional supply to the electrical grid during periods of high demand, or as required. The proposed installation consists of up to ten gas generators, each rated at 2,535kw.

The installation would be located off Harts Farm Way near Havant, at National Grid Reference (NGR) SU 70617 05826, within the Havant Borough Council (HBC) administrative area. The Site is between the A27 to the north, industrial units to the east and west and a Sewage Treatment Plant to the south.

There is an adjacent installation operated by Peak Gen Power Limited (Peak Gen), approximately 170m to the northwest of the GFP II Ltd site. This consists of ten diesel (compression-ignition) engines. The two installations will operate independently and may therefore operate simultaneously.

1.2 Air dispersion modelling

Emissions to air from the proposed installation have been subject to a separate modelling exercise (Wood 2020¹) to inform an assessment of the effects of the emissions on human and environmental receptors. The modelling exercise was based on all 10 engines operating simultaneously, with a total electrical export of 25 MW_e. However, GFP's export agreement is limited to 20 MW_e and therefore the modelling exercise is precautionary and over-estimates the output and the impacts of the installation.

The emissions of the Peak Gen installation have also been accounted for in modelling the impacts of the GFP II Ltd installation, with a total electrical export from that installation of 20 MW_e and assumed operation for a maximum of 500 hours per year (Wood 2018²).

1.3 This technical note

This technical note reviews the results of the air dispersion modelling exercise (Wood 2020) and summarises the initial Ecological Appraisal of any likely significant effects of emissions from the proposed installation on designated biodiversity sites.

¹ Wood (2020). Technical note: GFP II Limited – Harts Farm Way Air Dispersion Modelling.

² Wood (2018) Peak Gen Power Ltd Havant Power Plant Air Quality Impact Assessment.

2. Approach

2.1 Potential ecological receptors

In accordance with good practice guidance (Environmental Agency 2016³) the appraisal of air quality effects on ecological features focuses on biodiversity sites of international importance situated within 10km of the Site. These include Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar Sites. The appraisal also focuses on biodiversity sites of national and regional/local importance situated within 2km, including Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Local Nature Reserves (LNR), Ancient Woodland and Local Wildlife Sites (LWS).

Information on these receptors, including boundaries, citations and conservation objectives was collated using the MAGIC website⁴, JNCC website⁵ and Natural England website⁶. Details of Local Wildlife Sites, which are designated as Sites of Importance for Nature Conservation (SINC) in Hampshire, and Road Verges of Ecological Importance (RVEI), have not been obtained from Hampshire Biodiversity Information Centre (HBIC), for the reasons explained in **Section 4**.

The Air Pollution Information System (APIS⁷) website was used to determine the Critical Level (CLE) of air borne emissions associated with the habitats within the biodiversity sites. This information, in conjunction with the modelled emission data (Wood 2020), allows the impacts on biodiversity sites and associated species/habitats to be predicted.

2.2 Air Dispersion modelling

The dispersion modelling is detailed in a separate Technical Note (Wood 2020) and was undertaken at six locations (**Table 2.1**) to coincide with the nearest locations within designated biodiversity sites. The predicted ground level concentrations of emissions at each location have been compared against the relevant assessment criteria (Critical Level⁸). The modelling was based on all 10 engines operating simultaneously, with a total electrical export of 25 MWe. As GFP's export agreement is limited to 20 MWe, the modelling exercise is precautionary and over-estimates the output of the installation. The emissions of the nearby Peak Gen installation have been included in the modelling, with a total electrical export of 20 MWe and assumed operation for a maximum of 500 hours per year (Wood 2018).

Table 2.1 Air dispersion model locations

Location		X	Y	Receptor (biodiversity site)
E01	Ecological	469532	106992	Ancient Woodland (closest point on a block of four ancient woodlands)
E02	Ecological	468990	105431	Farlington Marshes LNR & Langstone Harbour SSSI
E03	Ecological	470389	105382	Chichester and Langstone Harbours SPA/Ramsar; Solent Maritime SAC; Langstone Harbour SSSI.

³ <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#screening-for-protected-conservation-areas>

⁴ <https://magic.defra.gov.uk/MagicMap.aspx>

⁵ <https://jncc.gov.uk/our-work/>

⁶ <http://publications.naturalengland.org.uk/category/6490068894089216>

⁷ <http://www.apis.ac.uk>

⁸ The concentration of an air pollutant above which adverse effects on ecosystems may occur based to present knowledge.

Location		X	Y	Receptor (biodiversity site)
E04	Ecological	471184	105177	Chichester and Langstone Harbours SPA/Ramsar; Solent Maritime SAC; Langstone Harbour SSSI.
E05	Ecological	472097	105106	Chichester and Langstone Harbours SPA/Ramsar; Solent Maritime SAC; Langstone Harbour SSSI.
E06	Ecological	465249	104568	Portsmouth Harbour Ramsar/SPA/SSSI

3. Results

3.1 Biodiversity sites

Designated biodiversity sites of international importance that are situated within 10km of the Site are summarised in **Table A.1 (Appendix A)**. Biodiversity sites of national and regional/local importance situated within 2km are summarised in **Table A.2 (Appendix A)**. As indicated above, the available information on SINC and RVEI have not been obtained for the reasons explained in **Section 4**.

3.2 Air dispersion modelling

The main air pollutants affecting vegetation and ecosystems are nitrogen oxides (NO_x), sulphur dioxide (SO₂) and ammonia (NH₃), which is a primary source of Nitrogen and Acid deposition. Ozone (O₃) as a regional pollutant, rather than being assessed at project level. These pollutants have direct effects on habitats through exposure to the gas and indirect effects, through deposition of gas to soil and freshwater (dry deposition) or with precipitation (wet deposition).

The results of the air dispersion modelling are detailed in the separate Technical Note (Wood 2020) and are based on the operation of the installation for 1,500, 2,000 and 2,500 days per year. The modelling concluded that there is negligible risk of any of these operational regimes causing exceedance of the relevant Acid deposition or Nitrogen deposition air quality assessment criteria. Sulphur emissions can have detrimental effects on habitats and species, however as the proposed installation will use natural gas, emissions of sulphur will be negligible. The ecological impacts of NO_x (annual and daily mean) on biodiversity sites, including those located on Chichester and Langstone Harbours, which are nearest to the Site, are considered further in **Section 4**.

4. Appraisal of Effects

4.1 Potential effects of NO_x

NO_x can be deposited via wet or dry mechanisms and can have two resulting effects on habitats/species: acidification and eutrophication. Acidification increases the acidity of soils, which can directly affect some organisms, also promoting leaching of important base chemicals (e.g. calcium) and mobilisation and uptake by plants of toxins (especially metals such as aluminium). Air pollution concentrations of NO_x contribute to eutrophication within ecosystems by increasing the amounts of available nitrogen (N)⁹. This is a particular problem in low-nutrient habitats, where available nitrogen is often a limiting factor on plant growth, resulting

⁹ Nitrogen in a form that can be absorbed and used by plants.

in slow-growing, low-nutrient specialists being out-competed by faster growing species that take advantage of the increase in available N.

In the UK there has been a significant decline in NO_x emissions in recent years and a consequent decrease in acid deposition. In England, NO_x has declined by 65% since 1990 (NAEI, 2014). Emissions are expected to decline further, and the effect of NO_x decreases on ecosystems has been marked, particularly in respect of acidification. The key contributor to acidification is thought to be deposited nitrogen, the major source being ammonia emissions, which has not decreased significantly. Although it was estimated that the proportion of UK semi-natural ecosystems that exceed the Critical Loads¹⁰ for eutrophication would decline from 40% to 32% by 2010 (NEGTA, 2001)¹¹, eutrophication from N-deposition (primarily from ammonia, typically from agriculture) is now considered the most significant air quality issue for many habitats. N deposition affects a wide area, including within designated sites (Holman et al, 2019)¹².

4.2 Assessment criteria

The Environment Agency's risk assessment guidance (Environment Agency 2016) includes a series of criteria to define when the impacts of emissions on ecological receptors can be screened-out of the assessment. For European Sites (SAC and SPA) and RAMSAR sites and nationally designated sites (SSSI and NNR), the guidance advises that to screen-out the need for further assessment, the Process Contribution (PC) for any substance emitted from an industrial source must meet both of the following criteria at the assessment location:

- Short-term PC is less than 10% of the short-term environmental standard; and
- Long-term PC is less than 1% of the long-term environmental standard.

For non-statutory sites, including local wildlife sites and ancient woodlands, the Environment Agency uses less stringent criteria in its permitting decisions. Environment Agency policy for its permitting process is that if either the short-term or long-term PC is less than 100% of the Critical Level or Critical Load, they do not require further assessment.

The APIS website identifies the Critical Level of NO_x as 75µg m⁻³ (daily mean) and 30µg m⁻³ (annual mean). These levels are set for all receptors types as "*values are not habitat specific, as in Critical Loads, but have been set to cover broad vegetation types*" (APIS, 2020¹³). These are the relevant long-term and short-term environmental standards for NO_x, however a higher (200 µg m⁻³) daily mean is an appropriate standard in circumstances where SO₂ and Ozone levels are predicted to be well below their respective Critical Levels and has been applied in this appraisal (Wood 2020).

4.3 Zone of Influence

Biodiversity sites of regional and local importance

The air dispersion modelling (Wood 2020) predicts that NO_x concentrations (PC) will not reach Critical Levels (75 µg m⁻³ or 200 µg m⁻³ daily mean, nor 30µg m⁻³ annual mean) at any of the modelled locations, or at any

¹⁰ Deposition flux of an air pollutant below which significant harmful effects on sensitive ecosystems do not occur, according to present knowledge. Usually measured in units of kilograms per hectare per year (kg/ha/yr).

¹¹ NEGTA (2001). Transboundary Air Pollution: Acidification, Eutrophication and Ground-level Ozone in the UK. Report of the National Expert Group on Transboundary Air Pollution (D Fowler Chair). UK Department of the Environment, Food and Rural Affairs.

¹² Holman et al (2019). A guide to the assessment of air quality impacts on designated nature conservation sites – version 1.0, Institute of Air Quality Management, London. www.iaqm.co.uk/text/guidance/airquality-impacts-on-nature-sites-2019.pdf.

¹³ APIS (2016). http://www.apis.ac.uk/critical-loads-and-critical-levels-guide-data-provided-apis#_Toc279788054. Accessed: 22nd May 2020.

location within 2km of the Site. Therefore, effects on locally/regionally designated sites, including Ancient Woodland, LWS, SINC, RVEI are screened-out, along with LNR.

Biodiversity sites of international and national importance

Daily mean Nitrogen Oxide (NO_x)

On a precautionary basis, the predicted/modelled daily mean NO_x concentrations at each location (**Table 4.1**) are based on the engines (GFP II Ltd and Peak Gen sites) operating for 16 hours a day, 365 days a year, which is in excess of the anticipated operational regime. The GFPII site is based on operation of the 10 engines at full output whereas they export agreement only allows 80% output of the engines. Under this scenario, daily mean NO_x concentrations (PC) are predicted to exceed the 10% threshold (above the Critical Level) slightly (12%) at one of the locations (E03). This is at the northern edge of Chichester and Langstone Harbours SPA and Ramsar, Chichester Harbour SSSI and Solent Maritime SAC and is the location on all four designations that is closest to the proposed installation. Daily mean NO_x levels are predicted to be below the 10% threshold throughout the majority of the area covered by these biodiversity sites, for example at E02 and E05 (**Table 4.1**), which are also close to the northern edge of these designations. Daily mean NO_x concentrations (PC) are also predicted to be below the 10% threshold at all receptors in circumstances where the installation is operated at up to 13 hours per day.

Table 4.1 Predicted daily mean NO_x

Receptor	AQAL ¹⁴ (µg m ⁻³)	PC (µg m ⁻³)	PEC ¹⁵ (µg m ⁻³)	PC (% of AQAL)	PEC (% of AQAL)
E01	200	4.17	70.59	2.1%	35.3%
E02	200	6.11	84.71	3.1%	42.4%
E03	200	24.46	139.80	12.2%	69.9%
E04	200	13.21	97.21	6.6%	48.6%
E05	200	7.54	68.08	3.8%	34.0%
E06	200	1.23	67.03	0.6%	33.5%

Annual mean Nitrogen Oxide (NO_x)

Annual mean NO_x concentrations (PC) are predicted to exceed the 1% threshold (2.9% or less) at one of the locations (E03) under all operational scenarios (**Table 4.2 – 4.4**) and marginally (1.1%) at another (E04) under the highest operational scenario (**Table 4.4**). As above these locations are at the northern edge of Chichester and Langstone Harbours SPA and Ramsar, Chichester Harbour SSSI and Solent Maritime SAC and reflect the point on all four designations that is closest to the proposed installation. Therefore, annual mean NO_x concentrations (PC) are predicted to be below the 1% threshold throughout the majority of the area covered by these biodiversity sites, for example at E02 and E05 (**Table 4.2 – 4.4**), which are also close to the northern edge of these designations. Annual mean NO_x concentrations (PC) are predicted to be below the 1% threshold at all receptors in circumstances where the installation operates for up to 1280 hours per year.

¹⁴ Air Quality Assessment Level – in this instance the Critical Level (daily mean NO_x) is applied.

¹⁵ Predicted Environmental Concentration (process contribution plus baseline).

Table 4.2 Annual mean NO_x impacts - 1500 hours operation

Receptor	AQAL ($\mu\text{g m}^{-3}$)	PC ($\mu\text{g m}^{-3}$)	PEC ($\mu\text{g m}^{-3}$)	PC (% of AQAL)	PEC (% of AQAL)
E01	30	0.05	28.20	0.2%	94.0%
E02	30	0.09	31.57	0.3%	105.2%
E03	30	0.52	32.21	1.7%	107.4%
E04	30	0.20	29.22	0.7%	97.4%
E05	30	0.13	22.63	0.4%	75.4%
E06	30	0.02	31.43	0.1%	104.8%

Table 4.3 Annual mean NO_x impacts - 2000 hours operation

Receptor	AQAL ($\mu\text{g m}^{-3}$)	PC ($\mu\text{g m}^{-3}$)	PEC ($\mu\text{g m}^{-3}$)	PC (% of AQAL)	PEC (% of AQAL)
E01	30	0.07	28.22	0.2%	94.1%
E02	30	0.12	31.60	0.4%	105.3%
E03	30	0.70	32.38	2.3%	107.9%
E04	30	0.27	29.29	0.9%	97.6%
E05	30	0.17	22.67	0.6%	75.6%
E06	30	0.02	31.43	0.1%	104.8%

Table 4.4 Annual mean NO_x impacts - 2500 hours operation

Receptor	AQAL ($\mu\text{g m}^{-3}$)	PC ($\mu\text{g m}^{-3}$)	PEC ($\mu\text{g m}^{-3}$)	PC (% of AQAL)	PEC (% of AQAL)
E01	30	0.08	28.23	0.3%	94.1%
E02	30	0.15	31.63	0.5%	105.4%
E03	30	0.87	32.56	2.9%	108.5%
E04	30	0.34	29.35	1.1%	97.8%
E05	30	0.21	22.71	0.7%	75.7%
E06	30	0.03	31.44	0.1%	104.8%

The modelled/predicted $0.45 \mu\text{g m}^{-3}$ contour of NO_x (PC) associated with the operation of the installation for 2,500 hours per year is marked on **Figure 4.1**, operation, corresponding to the PC of 1% (above Critical Level) assessment criterion/threshold (before rounding). This is overlaid on the boundary of Chichester and Langstone Harbours Ramsar and SPA, Solent Maritime SAC and Langstone Harbour SSSI, all of which share the same boundary and are ~455m south-west of the proposed installation at the closest point. **Table 4.5** summarises these biodiversity sites, with further details included in **Appendix A**. Based on aerial imagery there appears to be a sewage farm, concrete plant and electrical substation, along with an area of grassland and woodland/scrub, between the proposed installation and these designated sites.

Figure 4.1: PC plume dispersion (NO_x) contour (1% of Critical Level) and Ramsar/SPA (inc. SAC/SSSI) boundary.

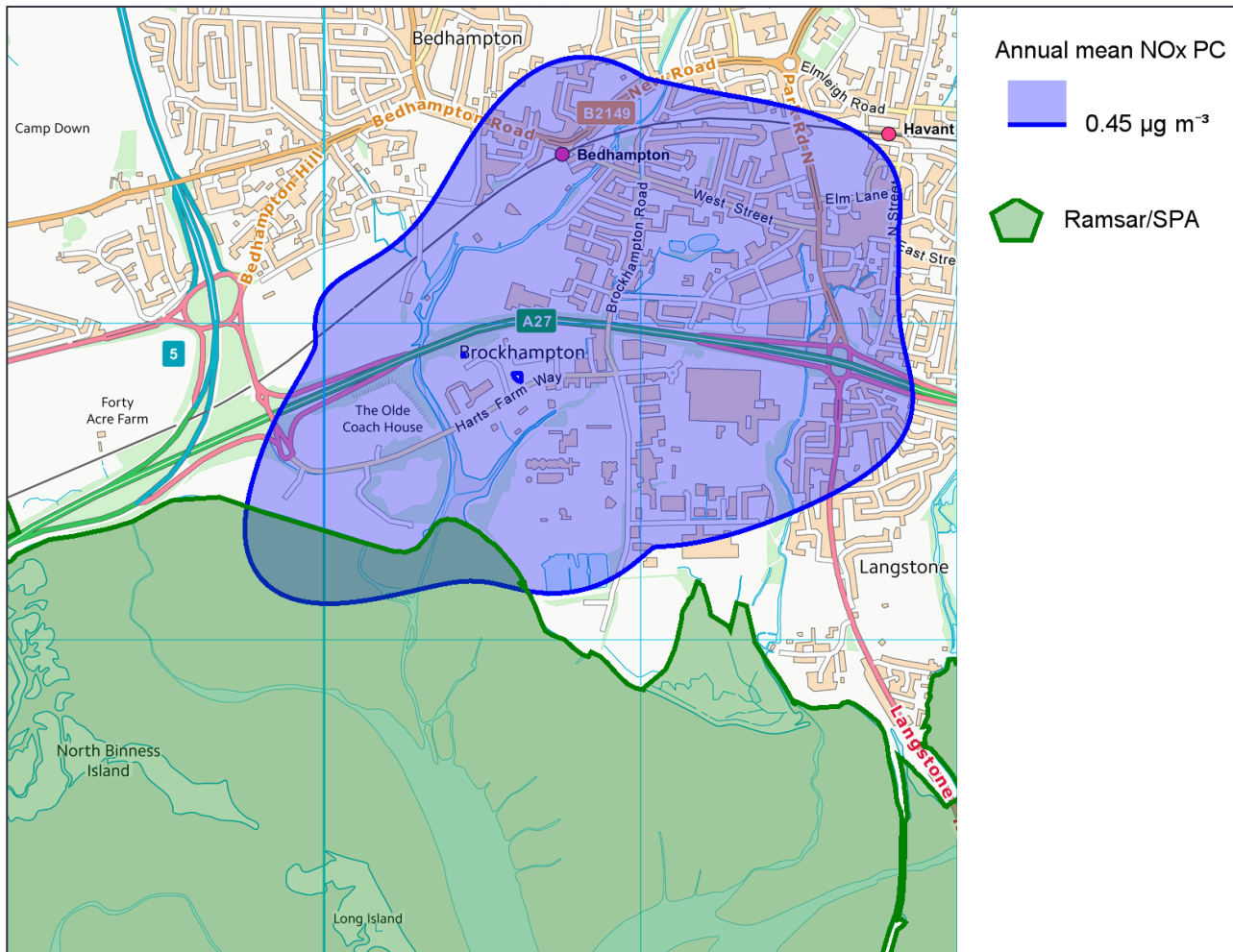


Table 4.5 Biodiversity sites within the Zone of Influence

Designation (area)	Reasons for designation (summary)
Chichester and Langstone Harbour SPA (5810.65ha)	Qualifying features include <i>waterbird assemblages</i> along with 18 bird species (bar-tailed godwit, common tern, curlew, dark-bellied brent goose, dunlin, grey plover, little tern, pintail, red-breasted merganser, redshank, ringed plover, sanderling, sandwich tern, shelduck, shoveler, teal, turnstone and wigeon), all of which apart from common tern, little tern and sandwich tern are non-breeding ¹⁶ . Conservation objectives for the site are to maintain or restore: extent and distribution of habitats of the qualifying features; structure and function of the habitats of the qualifying features; supporting processes on which the habitats of the qualifying features rely; populations of each of the qualifying features; and distribution of qualifying features. Natural England (2020 ¹⁷) provides information on site targets for each qualifying feature. All 19 qualifying features are given the target attribute of 'supporting habitat: air quality' with the target to 'maintain concentrations and deposition of air pollutants at below the site-relevant Critical Load or Level values'. This has been included to maintain the vegetation structure and composition of the habitats that support the qualifying species.

¹⁶ Natural England (2019). European Site Conservation Objectives for Chichester and Langstone Harbours Special Protection Area Site Code: UK9011011. Version 3 – 21st February 2019.

¹⁷ Natural England (2020). Designated Sites View:

<https://designatedsites.naturalengland.org.uk/Marine/SupAdvice.aspx?SiteCode=UK9011011&SiteName=&SiteNameDisplay=Chichester+and+Langstone+Harbours+SPA&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality=18>. Accessed 21st May 2020.

Designation (area)	Reasons for designation (summary)
Chichester and Langstone Harbour Ramsar (5749ha)	Two large estuarine basins which include extensive intertidal mudflats, saltmarsh, sand and shingle spits and sand dunes supporting beds of <i>Zostera</i> and <i>Enteromorpha</i>, with a more varied community at higher levels. Peak counts of wintering water birds regularly exceed 20,000, including internationally important numbers. Assemblages of international importance with peak counts in winter of 76480 waterfowl (5 year peak mean 1998/99-2002/2003) and also species/populations occurring at levels of international importance (black-tailed godwit, common redshank, dark-bellied brent goose, common shelduck, grey plover and dunlin¹⁸) Conservation objectives for the site include maintaining the internationally important wetlands characteristic of the Atlantic biogeographical region in favourable condition, as well as maintaining the status of the wetland in regularly supporting 20,000 waterfowl. Intertidal mudflats and sandflats are habitats particularly relevant to these objectives¹⁹. Air quality is not specifically listed as a threat, although contamination is noted, including nutrient enrichment: <i>nutrient enrichment can adversely affect the feeding habitats of wintering waterfowl and assemblage populations and because of this, the high levels of nutrients in Langstone Harbour and the extensive use of its intertidal areas and shallow coastal waters for feeding give cause for concern</i>. Airborne NO_x could potentially be considered one such source of nutrient enrichment which may have the potential to affect the feeding habitats of wintering waterfowl through alteration to botanical composition or structure or through effects of airborne NO_x on prey species of the bird species listed.
Solent Maritime SAC (11243.12)	Habitats that are a primary reason for site selection: - Estuaries; - Spartina swards (<i>Spartinion maritimae</i>); and - Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>). Qualifying features (habitats), not a primary reason for site selection: - Sandbanks which are slightly covered by sea water all the time; - Mudflats and sandflats not covered by seawater at low tide; - Coastal lagoons (Priority feature); - Annual vegetation of drift lines; - Perennial vegetation of stony banks; - Salicornia and other annuals colonizing mud and sand; and - Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes") Qualifying feature (species), not a primary reason for site selection: - Desmoulin's whorl snail (<i>Vertigo moulinsiana</i>) Air borne pollutants are not listed as one of the most important impacts on this site. The Conservation Objectives are maintain or restore: extent and distribution of qualifying natural habitats and habitats of qualifying species; structure and function (including typical species) of qualifying natural habitats; structure and function of the habitats of qualifying species; supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; populations of qualifying species; and distribution of qualifying species.
Langstone Harbour SSSI (2,069.4 ha)	Extensive mudflats; saltmarsh and cord-grass marsh. Internationally important, supporting high densities of intertidal invertebrates and large populations of migrant and overwintering waders and wildfowl, dependent on them and on extensive eelgrass (<i>Zostera angustifolia</i> and <i>Z. noltii</i>) beds. An important intertidal summer and autumn assembly ground for waders during the moult and as a post-moult wintering ground. Includes Farlington Marshes - grassland and marsh on reclaimed tidal silt protected by a sea wall; and a similar smaller area at Southmoor in the north-east of the harbour. Brackish, marsh, fresh marsh, lagoon with reed beds, <i>Agrostis stolonifera</i> grassland and scrub. Vital high water wader roost and feeding ground for Brent geese.

4.4 Magnitude of effects

The annual mean PC (NO_x) emissions from the proposed Installation, operated at 2,500 hours per year, is predicted to reach 2.9% above the Critical Level (30 µg m⁻³), exceeding the 1% assessment criteria, at the northern edge of Chichester and Langstone Harbours Ramsar and SPA, Langston Harbour SSSI and Solent

¹⁸ Information Sheet on Ramsar Wetlands (RIS). Ramsar Information Sheet: UK11013.

¹⁹ English Nature (2001). English Nature's advice for the Solent European marine site given under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994.

Maritime SAC. This is at the point (E03) on all four designations that is closest to the proposed installation and the PC is likely to remain below the 1% criterion throughout the majority of the area covered by these biodiversity sites, including as modelled at E02 and E05 (**Table 4.2 – 4.4**). Notably, the PEC at location E03 exceeds the CLE in the absence of the predicted PC, albeit the PC is predicted to add a further 2.7% ($0.87 \mu\text{g m}^{-3}$) to a background PEC of $31.69 \mu\text{g m}^{-3}$.

The area of these designated sites over which the PC is predicted to exceed the 1% assessment criterion is approximately 16 hectares, representing a very small proportion of these designated sites: ~0.28% (SPA and Ramsar), ~0.14% (SAC) and ~0.77% (SSSI). Based on the MAGIC website and aerial imagery, the habitats within this area are substantially intertidal mud and intertidal mixed sediments, with small isolated fragments of saltmarsh. These habitats are supporting features of the SPA and Ramsar Site, providing foraging habitats for the associated bird species/assemblages. These habitats are also one of the qualifying features of the SAC and a reason for the notification of the SSSI. The area of these habitats over which the exceedance is predicted to occur is a tiny proportion of the available mudflat habitat within the SPA/Ramsar/SAC/SSSI and a smaller proportion of the mudflat habitat within the wider Chichester and Langstone Harbour and Portsmouth Harbour area.

4.5 Conclusions

The modelling exercise was based on all 10 engines at the GFPII site operating simultaneously, with a total electrical export of 25 MW_e. However, GFPII's export agreement is limited to 20 MW_e and therefore the modelling exercise is precautionary and over-estimates the output and the impacts of the installation. The emissions of the adjacent Peak Gen Limited installation have also been accounted for in modelling the impacts of the GFP II Ltd installation, assuming operation with a total electrical export of 20 MW_e and a maximum of 500 hours per year coinciding with operation of the GFPII plant. This presents an over prediction of the likely impacts from the GFPII installation.

The annual mean PC (NO_x) emissions from the proposed Installation, operated at 2,500 hours per year, is predicted to reach 2.9% above the CLE, exceeding the 1% (above CLE) assessment criteria at the closest point on Chichester and Langstone Harbours Ramsar and SPA, Langston Harbour SSSI and Solent Maritime SAC. This effect is predicted to be limited to the northern edge of these biodiversity sites and the PC is likely to remain below the 1% criterion throughout the majority of these sites. The PC is predicted to add 2.7% to a background PEC ($31.69 \mu\text{g m}^{-3}$) that currently exceeds the CLE ($30 \mu\text{g m}^{-3}$) at this location. Although intertidal mudflat habitats are supporting features of the SPA and Ramsar Site, one of the qualifying features of the SAC and a reason for the notification of the SSSI, a small increase in NO_x is predicted to affect a small proportion of the area covered by these biodiversity sites: ~0.28% (SPA and Ramsar), ~0.14% (SAC) and ~0.77% (SSSI), and a small proportion of the available mudflat habitat within these sites and surrounding areas. Therefore no likely significant effects on these biodiversity sites are predicted, also recognising that mudflats are subject to frequent tidal inundation and are likely to be more resilient to the influence of small changes in aerial NO_x emissions compared to other habitat types to which the same Critical Level ($30 \mu\text{g m}^{-3}$) applies.

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Appendix A

Details of biodiversity sites

Table A.1 Biodiversity Sites of International Importance

Designation	Proximity to the Site (approx.) an	Reasons for designation
Chichester and Langstone Harbour SPA	455m (south-west)	ARTICLE 4.1 QUALIFICATION (79/409/EEC) During the breeding season the area regularly supports: • <i>Sterna albifrons</i> (Eastern Atlantic - breeding) 4.2% of the GB breeding population (5 year mean, 1992-1996); • <i>Sterna hirundo</i> (Northern/Eastern Europe - breeding) 0.3% of the GB breeding population (5 year mean, 1992-1996); and • <i>Sterna sandvicensis</i> (Western Europe/Western Africa) 0.2% of the GB breeding population (5 year mean, 1993-1997). Over winter the area regularly supports: • <i>Limosa lapponica</i> (Western Palearctic - wintering) 3.2% of the GB population (5 year peak mean 1991/92-1995/96). ARTICLE 4.2 QUALIFICATION (79/409/EEC) Over winter the area regularly supports: • <i>Anas acuta</i> (North-western Europe) 1.2% of the population in Great Britain (5 year peak mean 1991/92-1995/96); • <i>Anas clypeata</i> (North-western/Central Europe) 1% of the population in Great Britain (5 year peak mean 1991/92-1995/96); • <i>Anas crecca</i> (North-western Europe) 0.5% of the population (5 year peak mean 1991/92-1995/96); • <i>Anas penelope</i> (Western Siberia/North-western/North-eastern Europe) 0.7% of the population in Great Britain (5 year peak mean 1991/92-1995/96); • <i>Arenaria interpres</i> (Western Palearctic - wintering) 0.7% of the population in Great Britain (5 year peak mean 1991/92-1995/96); • <i>Branta bernicla</i> (Western Siberia/Western Europe) 5.7% of the population (5 year peak mean 1991/92-1995/96); • <i>Calidris alba</i> (Eastern Atlantic/Western & Southern Africa - wintering) 0.2% of the population (5 year peak mean 1991/92-1995/96); • <i>Calidris alpina</i> (Northern Siberia/Europe/Western Africa) 3.2% of the population (5 year peak mean 1991/92-1995/96); • <i>Charadrius hiaticula</i> (Europe/Northern Africa - wintering) 3% of the population in Great Britain (5 year peak mean 1991/92-1995/96); • <i>Mergus serrator</i> (North-western/Central Europe) 3% of the population in Great Britain (5 year peak mean 1991/92-1995/96); • <i>Numenius arquata</i> (Europe - breeding) 1.6% of the population in Great Britain (5 year peak mean 1991/92-1995/96); • <i>Pluvialis squatarola</i> (Eastern Atlantic - wintering) 2.3% of the population (5 year peak mean 1991/92-1995/96); • <i>Tadorna tadorna</i> (North-western Europe) 3.3% of the population in Great Britain (5 year peak mean 1991/92-1995/96); and • <i>Tringa totanus</i> (Eastern Atlantic - wintering) 1% of the population (5 year peak mean 1991/92-1995/96). ARTICLE 4.2 QUALIFICATION (79/409/EEC): AN INTERNATIONALLY IMPORTANT ASSEMBLAGE OF BIRDS Over winter the area regularly supports: 93230 waterfowl (5 year peak mean 1991/92-1995/96), Including: <i>Branta bernicla bernicla</i> , <i>Tadorna tadorna</i> , <i>Anas penelope</i> , <i>Anas crecca</i> , <i>Anas acuta</i> , <i>Anas clypeata</i> , <i>Mergus serrator</i> , <i>Charadrius hiaticula</i> , <i>Pluvialis squatarola</i> , <i>Calidris alba</i> , <i>Calidris alpina alpina</i> , <i>Limosa lapponica</i> , <i>Numenius arquata</i> , <i>Tringa totanus</i> , <i>Arenaria interpres</i>.

Designation	Proximity to the Site (approx.) an	Reasons for designation
Chichester and Langstone Harbour Ramsar	455m (south-west)	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 (species occurring at levels of international importance). Qualifying Species/populations (as identified at designation): Species with peak counts in spring/autumn: • Ringed plover, <i>Charadrius hiaticula</i>, 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, <i>Limosa limosa islandica</i>, Iceland/W Europe, 906 individuals, representing an average of 2.5% of the population (5 year peak mean 1998/9-2002/3); and • Common redshank, <i>Tringa totanus totanus</i>, 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, <i>Branta bernicla bernicla</i>, 12987 individuals, representing An average of 6% of the population (5 year peak mean 1998/9-2002/3); • Common shelduck, <i>Tadorna tadorna</i>, NW Europe, 1468 individuals, representing an average of 1.8% of the GB population (5 year peak mean 1998/9-2002/3); • Grey plover, <i>Pluvialis squatarola</i>, E Atlantic/W Africa -wintering, 3043 individuals, representing an average of 1.2% of the population (5 year peak mean 1998/9-2002/3); and • Dunlin, <i>Calidris alpina alpina</i>, 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 subsequent to designation for possible future consideration under criterion 6 - Species regularly supported during the breeding season: • Little tern, <i>Sterna albifrons albifrons</i>, W Europe. 130 apparently occupied nests, representing an average of 1.1% of the breeding population (Seabird 2000 Census).
Portsmouth Harbour SPA	5.5 km (west)	ARTICLE 4.2 QUALIFICATION (79/409/EEC) Over winter the area regularly supports: • <i>Branta bernicla bernicla</i> (Western Siberia/Western Europe) 0.9% of the population (5 year peak mean 1991/92-1995/96); • <i>Calidris alpina alpina</i> (Northern Siberia/Europe/Western Africa) 1% of the population in Great Britain (5 year peak mean 1991/92-1995/96); • <i>Limosa limosa islandica</i> (Iceland - breeding) 0.4% of the population in Great Britain (5 year peak mean 1991/92-1995/96); and • <i>Mergus serrator</i> (North-western/Central Europe) 0.9% of the population in Great Britain (5 year peak mean 1991/92-1995/96).

Designation	Proximity to the Site (approx.) an	Reasons for designation
Portsmouth Harbour Ramsar	5.5 km (west)	RAMSAR CRITERION 3 Intertidal mudflat areas possess extensive beds of eelgrass <i>Zostera angustifolia</i> and <i>Zostera noltei</i> which support the grazing dark-bellied brent geese populations. The mud-snail <i>Hydrobia ulvae</i> is found at extremely high densities, which helps to support the wading bird interest of the site. Common cord-grass <i>Spartina anglica</i> dominates large areas of the saltmarsh and there are also extensive areas of green algae <i>Enteromorpha</i> spp. and sea lettuce <i>Ulva lactuca</i>. More locally the saltmarsh is dominated by sea purslane <i>Halimione portulacoides</i> which gradates to more varied communities at the higher shore levels. The site also includes a number of saline lagoons hosting nationally important species. RAMSAR CRITERION 6 (species occurring at levels of international importance). Qualifying Species/populations (as identified at designation): Species with peak counts in winter: Dark-bellied brent goose, <i>Branta bernicla bernicla</i>, 2105 individuals, representing an average of 2.1% of the GB population (5 year peak mean 1998/9-2002/3).
Solent and Isle of White Lagoons SAC	3 km (west)	Habitats that are a primary reason for site selection: Coastal lagoons (priority feature).
Solent Maritime SAC	455m (south-west)	Habitats that are a primary reason for site selection: - Estuaries; <i>Spartina</i> swards (<i>Spartinion maritimae</i>); and - Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>). Qualifying features (habitats), not a primary reason for site selection: - Sandbanks which are slightly covered by sea water all the time; - Mudflats and sandflats not covered by seawater at low tide; - Coastal lagoons (Priority feature); - Annual vegetation of drift lines; - Perennial vegetation of stony banks; <i>Salicornia</i> and other annuals colonizing mud and sand; and - Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes") Qualifying feature (species), not a primary reason for site selection: - Desmoulin's whorl snail (<i>Vertigo moulinsiana</i>).
Solent and Dorset Coast pSPA	4 km (west)	Article 4 Qualification (2009/147/EC): The site regularly supports more than 1% of the Great Britain breeding populations of Sandwich tern (<i>Sterna sandvicensis</i>), Common tern (<i>Sterna hirundo</i>) and Little tern (<i>Sternula albifrons</i>).

Table A.2 Biodiversity sites of national, regional and local importance

Designation	Proximity to Site	Reasons for designation
Langstone Harbour SSSI	455m south-west	Extensive mudflats; saltmarsh and cord-grass marsh. Internationally important, supporting high densities of intertidal invertebrates and large populations of migrant and overwintering waders and wildfowl, dependent on them and on extensive eelgrass (<i>Zostera angustifolia</i> and <i>Z. noltii</i>) beds. An important intertidal summer and autumn assembly ground for waders during the moult and as a post-moult wintering ground. Includes Farlington Marshes - grassland and marsh on reclaimed tidal silt protected by a sea wall; and a similar smaller area at Southmoor in the north-east of the harbour. Brackish, marsh, fresh marsh, lagoon with reed beds, <i>Agrostis stolonifera</i> grassland and scrub. Vital high water wader roost and feeding ground for Brent geese.
Chichester Harbour SSSI	1.5km south east	Intertidal mudflats are feeding grounds for internationally important numbers of ringed plover, grey plover, redshank, black-tailed godwit, dunlin, sanderling, curlew and greenshank (the latter two in autumn particularly) with bar-tailed godwit numbers of European importance. Further features of the SSSI include <i>wintering wildfowl and waders and breeding birds both within the Harbour and in the surrounding permanent pasture fields and woodlands. There is a wide range of habitats which have important plant communities</i> ²⁰ . Along with the intertidal mudflats noted to be important bird foraging habitat, it includes the unimproved permanent pasture 'behind the sea wall' which are floristically rich as well as areas of saltmarsh, reedbeds and shingle. Within each of these habitats botanical species are listed within the citation including sea purslane, sea lavender and cord grass on the saltmarsh fringing the mudflats.
Farlington Marshes LNR	1.6 km (south-west)	LNRs support wildlife or geological features that are of special interest locally, providing opportunities to enjoy or study nature.
West Hayling LNR	1.9 km (south-east)	
Hayling Billy LNR	1.9 km (south-east)	
Ancient woodland (ID 1489282)	1.5 km (north-west)	Ancient replanted woodland at Littlepark Wood
Ancient woodland (ID 1488333)	1.8 km (north-west)	Ancient and semi-natural woodland near (north/north-west_ Littlepark Wood
Ancient woodland (ID 1489389)	1.7 km (north-west)	Ancient and semi-natural woodland near (north) Littlepark Wood

²⁰ Natural England (2020). Designated Sites View: <https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1003245>. Accessed 21st May 2020.

Designation	Proximity to Site	Reasons for designation
Ancient woodland (ID 1487521)	1.9 km (north-west)	Ancient and semi-natural woodland near (south) Gundymoor Wood