



Nitrate Neutrality Study – First Residential Parcel One Horton Heath

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Contents

Executive Summary	i
1. Introduction.....	1
1.1. Background	2
1.2. Purpose	3
1.3. Structure	3
1.4. Scope of the Assessment	3
1.5. Limitation and Copyright	3
1.6. Declaration of Competency	3
2. Approach	4
2.1. Background	4
2.2. European Designated Sites	4
2.3. Methodology	5
3. Results.....	6
4. Mitigation Measures	7
4.1. General Mitigation Measures	7
4.2. Provision of Sustainable Drainage Systems (SuDS)	8
5. Summary and Conclusion	10
References	12

Executive Summary

Hilson Moran has been appointed by the One Horton Heath Project Team (HHPT) at Eastleigh Borough Council (EBC) to provide a Nitrate Neutrality Study for the development of its One Horton Heath site in Hampshire, centred approximately on National Grid Reference SU 48815 17105.

To facilitate timely delivery, initially two planning applications will be submitted:

1. An Outline Planning Application (OPA) for the whole One Horton Heath project which will comprise:
“the comprehensive development of the site, delivering up to 2,500 No. residential dwellings, local employment, local retail, leisure, employment and community facilities, primary school, formal and informal publicly accessible open space, including formal sports facilities, landscaping, green infrastructure and sustainable drainage systems [SuDS]”; and
2. A full planning application for the first phase of the One Horton Heath project, located in the south east corner of the OPA site, which will comprise;
“Erection of 393 residential units with public open space, hard and soft landscape works, internal roads, footway/cycleways, associated parking spaces, substation, SuDS and associated infrastructure (This application is subject to Environmental Impact Assessment).”

The First Residential Parcel application (hereafter referred to as FRP) forms Phase 1 of the wider Outline Planning Application, providing 393 of the 2,500 dwellings for which outline consent is sought. The FRP has been submitted as a standalone planning application to enable the early delivery of homes within the One Horton Heath development. However, the FRP proposal is entirely consistent with the outline parameter plans, with detailed assessment of the OPA and FRP having been considered in tandem to ensure consistency throughout the design process. In part, the FRP is reliant on the mitigation and enhancements of the OPA.

A detailed Nitrate Neutrality Study for the wider OPA scheme has been prepared by Hilson Moran, namely report 25709-RP-SU-001, dated 04/12/20.

The OPA Nitrate Neutrality Study has demonstrated that

- 1) The total Nitrogen (N)-loss from agricultural uses from the whole pre-existing OPA site is **3,435.2 kg N/yr;**
- 2) N-losses from pre-existing foul sewage loadings have been calculated as **153.0 kg N/yr** from the whole site;
- 3) Consequently, total N-losses from the pre-existing site have been calculated as **3,588.2 kg N/yr;**
- 4) If the wastewater generated by the proposals is conveyed to Peel Common WwTW it will be treated and discharged at a TN concentration of 5.49 mg/L (assuming the facility discharges at an average of 90 % of the consent limit);
- 5) Consequently, the annual mass discharge of N into the Portsmouth Harbour SPA (assuming a 2 mg/L TN base concentration in the supplied potable water) from the wider OPA scheme would be **1,639.1 kg TN/yr;**
- 6) In terms of mitigation, assuming all N can be removed from the runoff from the proposed development, the OPA scheme would result in a net decrease in N discharged to the local environment of c. **1,949.2 kg TN/yr;**

- 7) Should a water usage rate of 110 l/person/day be achieved in the operational development, then the OPA scheme would result in a net reduction in N discharged to the local environment of **2,811.3 kg TN/yr**;
- 8) As such, the total mass of N discharged to sensitive European Designated Sites would be reduced as a result of the proposed OPA development discharging its sewage effluent to Peel Common WwTW. This would result in a net benefit to local biodiversity and the conservation status of the downstream European Designated Sites. Consequently, it has been assumed in this report that discharge to Peel Common WwTW will be progressed in preference to Chickenhall WwTW;
- 9) It is estimated that the proposed land uses within the new OPA development will result in a total loss of **1,529.4 kg TN/yr** in runoff from the site;
- 10) As part of the proposals, it is intended to construct a network of SuDS features across the OPA site comprising basins, swales, ponds and wetlands to sustainably manage runoff from the scheme. All proposed SuDS features will be planted and incorporate permanently wet areas around inlets, outlets and wetland areas within the base of the features;
- 11) Wetlands have been shown to remove N from runoff through processes such as denitrification and sedimentation. Assuming a mean removal rate of 181 g N/m²/yr can be achieved in the permanently wet areas of the proposed SuDS features, c. 49 % of the base of each SuDS feature will need to be provided as a permanently wetted area in order to treat all N in the runoff from the scheme. This percentage wetted area coverage will be achievable within the detailed design of the features;
- 12) Consequently, it is anticipated that the proposed SuDS network should be able to remove all of the additional N within the runoff resulting from the wider OPA scheme. This will ensure that the OPA scheme will confer a net reduction of at least **1,949.2 kg TN/yr** (with an aspiration to achieve a reduction of **2,811.3 kg TN/yr**) being discharged to the environment from the OPA site.

As the FRP forms part of the wider OPA scheme, it will serve to contribute to the above net reduction in N discharged to sensitive aquatic and marine habitats through:

- a. The elimination of N-losses from pre-existing agricultural uses by taking arable and pastoral farmland out of production;
- b. Minimising sewage-related N-loss, by conveying foul sewage to Peel Common WwTW, where it will be treated and discharged at a Total N (TN) concentration of 5.49 mg/l (assuming the facility discharges at an average of 90 % of the consent limit);
- c. Treating N in runoff from the development by means of a network of SuDS features, included as part of the FRP scheme.

Consequently, although the FRP may not achieve nitrate neutrality in isolation, it will contribute to the betterment attained by the OPA scheme as a whole, thereby resulting in a significant net benefit to local biodiversity and the conservation status of the downstream European Designated Sites.

1. Introduction

Hilson Moran has been appointed by HHPT at EBC to provide a Nitrate Neutrality Study for the development of its Horton Heath site in Hampshire, centred approximately on National Grid Reference SU 48815 17105 and identified in Figure 1.1.

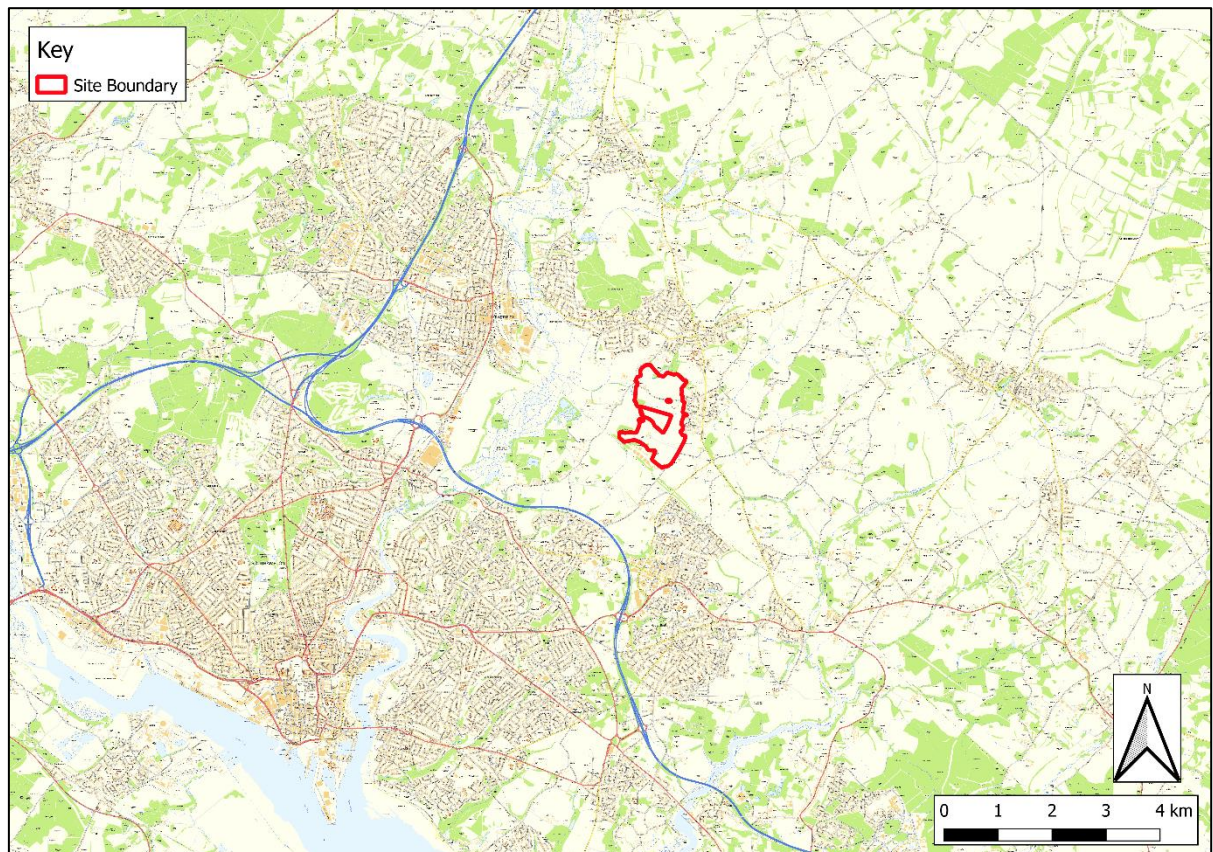


Figure 1.1 OPA Site location and boundary

The OPA for the whole One Horton Heath project which will comprise:

“the comprehensive development of the site, delivering up to 2,500 No. residential dwellings, local employment, local retail, leisure, employment and community facilities, primary school, formal and informal publicly accessible open space, including formal sports facilities, landscaping, green infrastructure and sustainable drainage systems [SuDS]”; and

The FRP is located in the south-east corner of the OPA site and constitutes the first phase of the One Horton Heath project. It will comprise:

“Erection of 393 residential units with public open space, hard and soft landscape works, internal roads, footway/cycleways, associated parking spaces, substation, SuDS and associated infrastructure (This application is subject to Environmental Impact Assessment).”

The FRP forms Phase 1 of the wider Outline Planning Application, providing 393 of the 2,500 dwellings for which outline consent is sought. The FRP has been submitted as a standalone planning application to enable the early delivery of homes within the One Horton Heath development. However, the FRP proposal is entirely consistent with the outline parameter plans, with detailed assessment of the OPA and FRP having been considered in tandem to ensure

consistency throughout the design process. In part, the FRP is reliant on the mitigation and enhancements of the OPA.

The layout of the FRP scheme is presented in Figure 1.2 below:

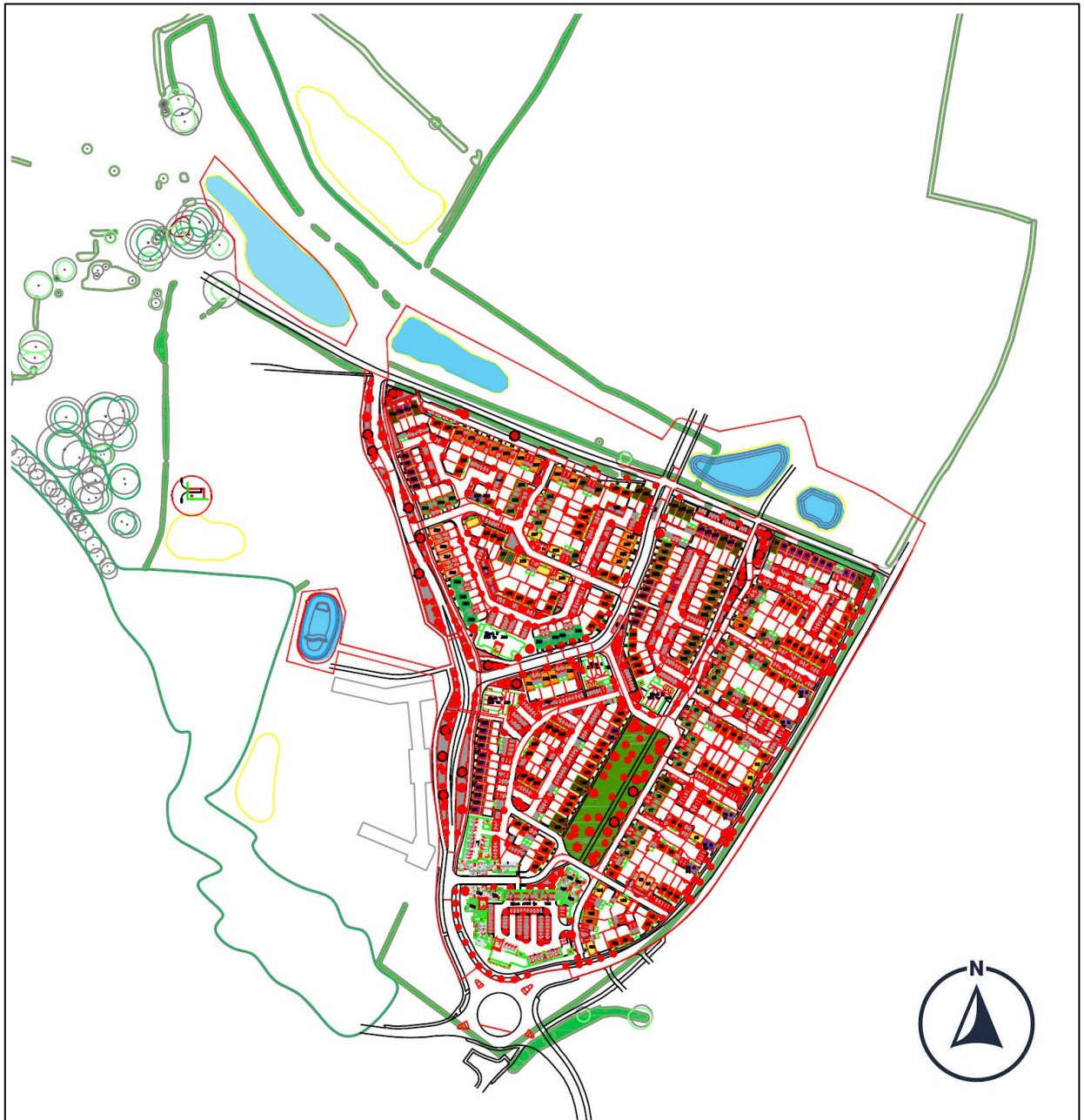


Figure 1.2 *Layout of FRP (not to scale)*

1.1. Background

Residential and tourism development applications within the Hampshire area have been being delayed or not permitted for more than a year due to the impacts associated with nitrate concentrations reaching the Solent and influencing the qualifying features of internationally designated sites associated with the Solent. These designated sites are the Solent Maritime Special

Area of Conservation (SAC), Portsmouth Harbour Special Protection Area (SPA), Chichester and Langstone Harbours SPA and Solent and Southampton Water SPA).

Additional nitrate loadings from new development, principally associated with increased wastewater generation, has been identified to be causing algal blooms within the Solent that influence dissolved oxygen levels within the marine waterbody as well as smothering food resources for birds and marine life.

Developments that can provide mitigation that delivers nitrogen neutrality are permissible, *i.e.* those that include mitigation to remove an equal volume of nitrate from the catchment as they contribute can proceed as they demonstrate no impact upon the qualifying features of the designated sites.

1.2. Purpose

This Nitrate Neutrality Study has been produced to accompany the full application for the FRP scheme and to provide sufficient evidence to both EBC and Natural England (NE) that nitrate neutrality can be achieved as part of the OPA scheme, in order to avoid any detrimental impacts on downstream European Designated Sites.

1.3. Structure

The following sections of the report provide an introduction to the study, followed by a summary of the OPA nitrate neutrality study.

References are included at the end of the report with document control information included at the front.

1.4. Scope of the Assessment

This document comprises the Nitrate Neutrality Study for the FRP, as part of the wider One Horton Heath scheme.

1.5. Limitation and Copyright

This report has been prepared on behalf of and for the exclusive use of EBC and is subject to and issued in connection with the provisions of the agreement set out by Hilson Moran. Hilson Moran accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

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1.6. Declaration of Competency

This assessment has been carried out by Dr Paul Bond PhD MSc BSc CEnv CSci MEnvSc MCIEEM. Paul possesses over 30 years' experience of environmental, civil engineering and industrial projects within commercial, public and academic sectors. He holds a doctorate in SuDS, possesses post-doctoral experience in bacterial nitrogen transformations and is also a competent Ecologist, possessing 20 years environmental consultancy experience. As such, Dr Paul Bond is suitably qualified and experienced to conduct and direct the Horton Heath Nitrate Neutrality Study.

2. Approach

2.1. Background

There is currently uncertainty surrounding whether the condition of designated ecological areas located within the Solent Region will be detrimentally impacted by increases in discharges of treated sewage effluent from future housing growth in the area. This issue has been subject to ongoing detailed work commissioned by local planning authorities in association with NE, the EA and water companies. Until this work is complete, NE maintains the stance that the uncertainty remains and the potential for future housing developments across the Solent Region to exacerbate these impacts creates a risk to the potential future conservation status of designated sites. Consequently, NE has stated that one way to address this uncertainty is for new development to achieve nutrient neutrality by securing the required mitigation in compliance with the Habitats Regulations.

NE has developed a recommended methodology to determine the potential impact of new developments on local designated sites. Hilson Moran has been appointed by HHPT to provide a detailed Nitrate Neutrality Study for the development of its Horton Heath site in Hampshire. The aim of the study is to refine the NE approach, in order to provide a robust assessment of the impact of the development on downstream European Designated Sites and to inform the selection of appropriate mitigation measures for the scheme.

2.2. European Designated Sites

The Habitats Directive and Conservation of Habitats and Species Regulations 2017 (as amended) make reference to the consideration of likely significant effects of a project or plan on one or more European Sites, including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs).

However, national planning policy provided by the National Planning Policy Framework (NPPF)¹, also expects those sites under consideration for designation, *i.e.* potential SPAs (pSPAs) and candidate SACs (cSACs), Ramsar sites and areas identified to provide compensatory sites, to be considered through the Habitats Regulations Assessment (HRA) process. The legislation/agreement governing the designation of the sites are described further below:

- SPAs – classified under the European Council Directive 79/49/EEC ‘on the conservation of wild birds’ (also known as the ‘Birds Directive’) for the protection of wild birds and their habitats, including particularly rare and vulnerable species listed in Annex I of the Directive and migratory species;
- SACs – designated under European Council Directive 92/43/EEC ‘on the conservation of natural habitats and of wild fauna and flora’ (also known as the ‘Habitats Directive’), targeting particular habitats (listed on Annex I) and/or species (listed on Annex II) that are identified as being of European importance;
- Ramsar – listed under the Convention on Wetlands of International Importance (Ramsar Convention, 1971) as sites that support important wetland habitats and species, especially waterfowl habitat; and,
- Compensatory Sites – sites that have been identified to provide compensatory habitat for that impacted by plans or projects permitted through the ‘imperative reasons for overriding public interest’ (IROPI) assessment.

For ease of reference, these designations are collectively referred to within this Nitrate Neutrality Study report as 'European Designated Sites', despite Ramsar designations being made at the international level. SPAs and SACs are also referred to in guidance documents as 'Natura 2000' sites.

2.3. Methodology

The Nitrate Neutrality Study methodology is based on the NE approach (included as **Appendix 1** to the Hilson Moran Nitrate Neutrality Study for the wider OPA scheme, namely report 25709-RP-SU-001, dated 04/12/20) with additional detail designed to increase the accuracy of the methodology and confidence in the results.

3. Results

The OPA Nitrate Neutrality Study demonstrated that

- 1) The total Nitrogen (N)-loss from agricultural uses from the whole pre-existing OPA site is **3,435.2 kg N/yr**;
- 2) N-losses from pre-existing foul sewage loadings have been calculated as **153.0 kg N/yr** from the whole site;
- 3) Consequently, total N-losses from the pre-existing site have been calculated as **3,588.2 kg N/yr**;
- 4) If the wastewater generated by the proposals is conveyed to Peel Common WwTW it will be treated and discharged at a TN concentration of 5.49 mg/L (assuming the facility discharges at an average of 90 % of the consent limit);
- 5) Consequently, the annual mass discharge of N into the Portsmouth Harbour SPA (assuming a 2 mg/L TN base concentration in the supplied potable water) from the wider OPA scheme would be **1,639.1 kg TN/yr**;
- 6) In terms of mitigation, assuming all N can be removed from the runoff from the proposed development, the OPA scheme would result in a net decrease in N discharged to the local environment of c. **1,949.2 kg TN/yr**;
- 7) Should a water usage rate of 110 l/person/day be achieved in the operational development, then the OPA scheme would result in a net reduction in N discharged to the local environment of **2,811.3 kg TN/yr**;
- 8) As such, the total mass of N discharged to sensitive European Designated Sites would be reduced as a result of the proposed OPA development discharging its sewage effluent to Peel Common WwTW. This would result in a net benefit to local biodiversity and the conservation status of the downstream European Designated Sites. Consequently, it has been assumed in this report that discharge to Peel Common WwTW will be progressed in preference to Chickenhall WwTW;
- 9) It is estimated that the proposed land uses within the new OPA development will result in a total loss of **1,529.4 kg TN/yr** in runoff from the site;

4. Mitigation Measures

4.1. General Mitigation Measures

As part of the Hilson Moran OPA Nitrate Neutrality Study, a high-level assessment of mitigation measures suitable for the proposed scheme was conducted early on in order to inform the design process and final mitigation measures, if required. The results of this assessment are presented as **Appendix 15** of the report.

The report identified 4 main mitigation options that could have potential for the scheme. These comprised:

- 1) Addressing agricultural inputs within the catchment through the application of best practise measures, incorporating technology and providing intercepting wetlands. Although the success of these measures would be dependent upon identifying appropriate farmsteads within the River Itchen Fluvial Catchment and willing individuals to engage with the process, it was identified within the report that the provision of wetlands could be a valuable measure provided within the boundary of the post-development scheme, providing multifunctional water quality, flood prevention, biodiversity and amenity features;
- 2) The introduction of a suitable Reverse Auction Scheme for nitrogen reduction, in collaboration with Southern Water, which would offer funding to farmers in exchange for commitments that provide a reduction in the input of nitrogen in to the catchment. Whilst this mitigation option has significant and proven potential to reduce nitrogen inputs at a catchment level for the benefit of sensitive habitats downstream, it is currently unclear whether it is a realistic option for Horton Heath within the timeframe associated with the increase in residential occupancy resulting from the scheme;
- 3) On-site wastewater denitrification, either by providing a number of appropriate package treatment works across the proposed development or alternatively providing a single centralised on-site wastewater treatment plant. The report identified that this approach could wholly deliver the nitrate neutrality required and even result in a nitrate deficit, compared to the pre-existing agricultural uses of the site. However, as discussed in the NE Nitrate Neutrality Methodology, the EA has a presumption against private sewage treatment works in sewered areas and will always seek connection to the mains sewer where possible and practicable. A principle concern relates to the failure rates of package treatment plants (PTPs) and the lack of review and periodic upgrades via regulatory systems that apply to mains;
- 4) Offsetting, with the removal of low-grade agricultural land within the same catchment and returning it to unproductive green infrastructure with biodiversity and amenity value.

The calculations in Section 3 of the Hilson Moran OPA Nitrate Neutrality Study demonstrate that if all foul sewage from the proposed OPA scheme is conveyed to Peel Common WwTW for treatment and that the N in runoff from the proposals can be managed appropriately, the scheme would result in a net reduction in N discharged to the local environment of at least **1,949.2 kg TN/yr** with the potential to achieve a net reduction of **2,811.3 kg TN/yr** if a water usage of 110 l/person/day can be accomplished in the operational development.

Consequently, assuming treatment at Peel Common WwTW will be feasible, the majority of the above mitigation measures will not be necessary, with only the provision of wetlands identified as a necessary measure to remove nitrate in runoff from within the site, whilst providing multifunctional water quality, flood prevention, biodiversity and amenity features.

4.2. Provision of Sustainable Drainage Systems (SuDS)

As part of the OPA proposals, it is intended to construct a network of SuDS features across the site comprising basins, swales, ponds and wetlands to sustainably manage runoff from the scheme as illustrated in **Appendix 15** of the Hilson Moran OPA Nitrate Neutrality Study.

Within the FRP a number of SuDS features are included in the peripheral soft landscaped areas which will intercept, attenuate and treat runoff from the developed areas, as illustrated in Figure 1.2 above.

It is intended that all the proposed SuDS features will be planted and incorporate permanently wet areas around inlets (sediment forebays), outlets (secondary sedimentation areas) and wetland areas within the base of the features, as illustrated in Figure 4.1 below.

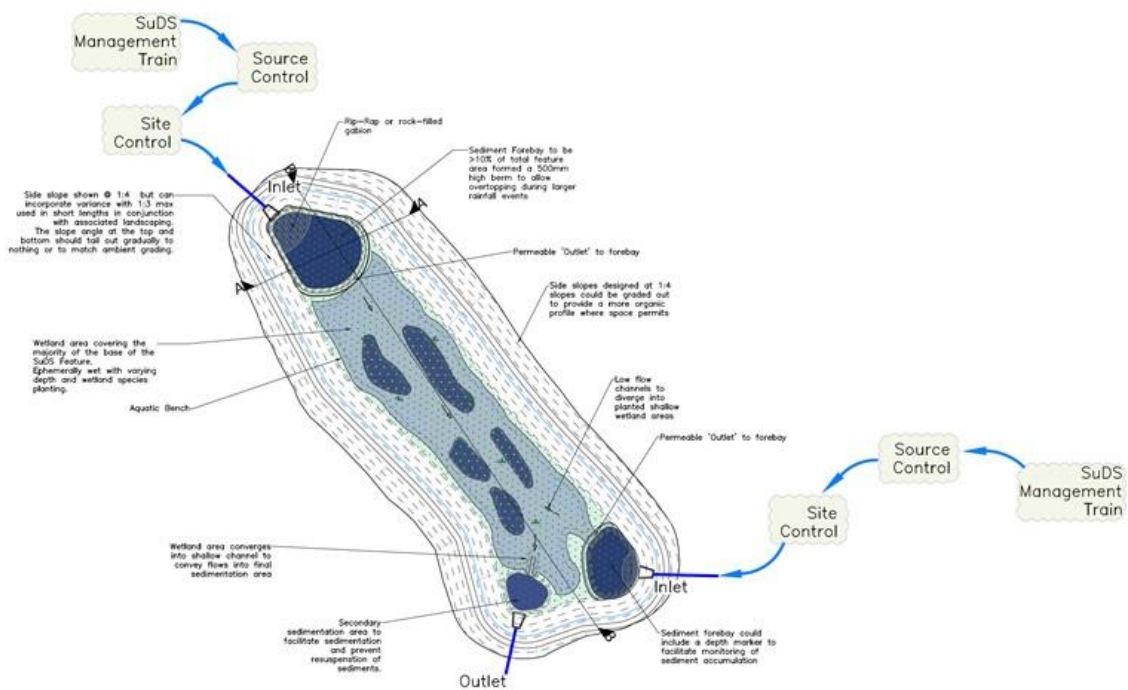


Figure 4.1 Schematic of Typical Proposed SuDS Feature

With reference to the NE Nitrate Neutrality Methodology, the ability of wetlands to remove nitrogen from runoff through processes such as denitrification and sedimentation has been demonstrated in numerous studies. In particular, a recent systematic review of the effectiveness of wetlands for N (and P) removal conducted by Land *et al*, 2016² used data from 203 wetlands worldwide. The average N removal rate for wetlands that were included in this review was 181 g N/m²/yr.

Assuming this removal rate can be achieved in the permanently wet areas of the proposed SuDS features, a minimum of 49 % of the base of each SuDS feature will need to be provided as a permanently wetted area. With reference to Figure 4.1 above, this percentage wetted area coverage is achievable and will be targeted within the detailed design of the features.

Consequently, it is anticipated that the proposed SuDS network should be able to remove all of the additional N within the runoff resulting from the scheme.

The above measures will ensure that the FRP proposals contribute to the overall OPA scheme net reduction of at least **1,949.2 kg TN/yr** (with an aspiration to increase this to **2,811.3 kg TN/yr** if a water usage rate of 110 l/person/day is achieved) being discharged to the environment from the OPA site, which would result in a significant net benefit to local biodiversity and the conservation status of the downstream European Designated Sites.

5. Summary and Conclusion

This report provides a summary of the evidence gathered to support the Nitrate Neutrality Study for the Horton Heath OPA scheme, of which the FRP constitutes the first phase.

The Nitrate Neutrality Study has demonstrated that:

- 1) The total Nitrogen (N)-loss from agricultural uses from the whole pre-existing OPA site is **3,435.2 kg N/yr**;
- 2) N-losses from pre-existing foul sewage loadings have been calculated as **153.0 kg N/yr** from the whole site;
- 3) Consequently, total N-losses from the pre-existing site have been calculated as **3,588.2 kg N/yr**;
- 4) If the wastewater generated by the proposals is conveyed to Peel Common WwTW it will be treated and discharged at a TN concentration of 5.49 mg/L (assuming the facility discharges at an average of 90 % of the consent limit);
- 5) Consequently, the annual mass discharge of N into the Portsmouth Harbour SPA (assuming a 2 mg/L TN base concentration in the supplied potable water) from the wider OPA scheme would be **1,639.1 kg TN/yr**;
- 6) In terms of mitigation, assuming all N can be removed from the runoff from the proposed development, the OPA scheme would result in a net decrease in N discharged to the local environment of c. **1,949.2 kg TN/yr**;
- 7) Should a water usage rate of 110 l/person/day be achieved in the operational development, then the OPA scheme would result in a net reduction in N discharged to the local environment of **2,811.3 kg TN/yr**;
- 8) As such, the total mass of N discharged to sensitive European Designated Sites would be reduced as a result of the proposed OPA development discharging its sewage effluent to Peel Common WwTW. This would result in a net benefit to local biodiversity and the conservation status of the downstream European Designated Sites. Consequently, it has been assumed in this report that discharge to Peel Common WwTW will be progressed in preference to Chickenhall WwTW;
- 9) It is estimated that the proposed land uses within the new OPA development will result in a total loss of **1,529.4 kg TN/yr** in runoff from the site;
- 10) As part of the proposals, it is intended to construct a network of SuDS features across the OPA site comprising basins, swales, ponds and wetlands to sustainably manage runoff from the scheme. All proposed SuDS features will be planted and incorporate permanently wet areas around inlets, outlets and wetland areas within the base of the features;
- 11) Wetlands have been shown to remove N from runoff through processes such as denitrification and sedimentation. Assuming a mean removal rate of 181 g N/m²/yr can be achieved in the permanently wet areas of the proposed SuDS features, c. 49 % of the base of each SuDS feature will need to be provided as a permanently wetted area in order to treat all N in the runoff from the scheme. This percentage wetted area coverage will be achievable within the detailed design of the features;
- 12) Consequently, it is anticipated that the proposed SuDS network should be able to remove all of the additional N within the runoff resulting from the wider OPA scheme. This will ensure that the OPA scheme will confer a net reduction of at least

1,949.2 kg TN/yr (with an aspiration to achieve a reduction of **2,811.3 kg TN/yr**) being discharged to the environment from the OPA site.

As the FRP forms part of the wider OPA scheme, it will serve to contribute to the above net reduction in N discharged to sensitive aquatic and marine habitats through:

- d. The elimination of N-losses from pre-existing agricultural uses by taking arable and pastoral farmland out of production;
- e. Minimising sewage-related N-loss, by conveying foul sewage to Peel Common WwTW, where it will be treated and discharged at a Total N (TN) concentration of 5.49 mg/l (assuming the facility discharges at an average of 90 % of the consent limit);
- f. Treating N in runoff from the development by means of a network of SuDS features, included as part of the FRP scheme.

Consequently, although the FRP may not achieve nitrate neutrality in isolation, it will contribute to the betterment attained by the OPA scheme as a whole, thereby resulting in a significant net benefit to local biodiversity and the conservation status of the downstream European Designated Sites.

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- ¹ Ministry of Housing, Communities and Local Government (2019). National Planning Policy Framework. February 2019.
- ² Land M, Graneli W, Grimvall A, Hoffmann CC, Mitsch WJ, Tonderski KS, Verhoeven JTA (2016). *How effective are created or restored freshwater wetlands for nitrogen and phosphorus removal?* A systematic review. Environmental Evidence 5:9