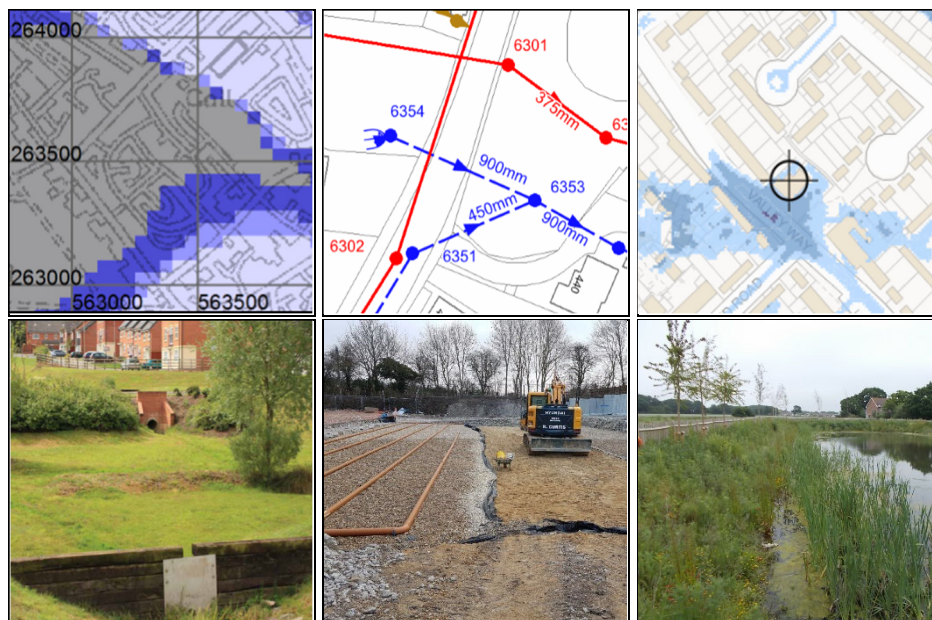




Nutrient Assessment & Budget

**Old Oak Farm, Winchester Road
Fair Oak, Hants**

Reference: 23073

Issue: **Date:**

1

19/9/2023

*To NE 16/03/2022 methodology with
replacement NE calculator June 2022*

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1. Introduction

- 1.1 Instructions were received from Wessex Planning to undertake an assessment of the nutrient impact for the proposed replacement of 2 dwellings at Old Oak Farm, Winchester Road, Fair Oak, Hants.
- 1.2 This assessment has been undertaken by A P Traves BSc CEng MIStructE MCIHT.
- 1.3 The client's attention is drawn to the conditions and limitations contained in Appendix D.

2. Development Description & Location

- 2.1 The site comprises a 0.20 Ha existing residential urban fabric parcel in the south east corner of the land holding and 0.17 Ha parcel of the paddock area towards the south west corner of the land holding at Old Oak Farm, Winchester Road, Fair Oak, Hants.
- 2.2 It is proposed to replace and relocate the two existing dwellings from the 0.20 Ha south east parcel into the 0.17 ha south west paddock parcel and for the south east parcel to become open urban fabric. The proposed layout is indicated Jon Dale Architects plan 128-SL01 contained in appendix A of this report.

3. Background to Nitrogen Nutrient Assessment

- 3.1 The background to the issue is set out in current Natural England Advice note version 5 of June 2020 -Achieving Nutrient Neutrality for New Development in The Solent Region (NEv5). Reference should be made to NEv5 for a more in depth understanding which is summarised in the following paragraphs. Reference should also be made to Natural England- Nutrient Neutrality Generic Methodology dated 1 February 2022 (NE-gen1). Whilst NE-gen1 provides update on the calculation approach NEv5 is still current as this contains the catchment specific guidance on mitigation location. NE- gen1 was issued to LPAs on 16 March 2022 inclusive of a defective NE calculator (16/3/2022). This calculator was replaced (20/4/2022) and again in June 2022 which is current.
- 3.2 The Solent water environment is internationally important and is protected under the Water Environment Regulations and the Conservation of Habitats and Species Regulations, as well as national protections. There are high levels of nitrogen and phosphorus nutrients in these waters and the evidence indicates these nutrients are causing eutrophication of the waters (excess mats of dense green algae which deplete oxygen as these subsequently decay)
- 3.3 The total nutrient content comes from a number of component parts:
 - i. Agricultural use of fertilisers, particularly in the latter half of the 20th century
 - ii. General coastal background content
 - iii. Nitrate within final discharge from sewage treatment works
 - iv. Diffuse urban rainfall runoff from urban surfaces
- 3.4 Since the late 1980's and early 1990's the agricultural sector has reduced the nitrogen content in applied fertiliser by around 35%. However, the Chalk aquifers which underly the region and which are the dominant source of river flows into The Solent contain a massive amount of legacy nitrogen mainly in the form of soluble nitrate, from decades of previous agricultural practice. It is anticipated that it will take decades from now for the nitrogen content in groundwater to gradually reduce.
- 3.5 Nitrate in treated sewage is the natural product of the breakdown of ammonia contained in human waste. Historic practice was that the permitted concentration of ammoniacal nitrogen in the treated discharge was limited so that the ammonia to nitrate conversion occurred at the treatment works and took up oxygen within the works and did not subsequently take up oxygen from out of the waters into which discharge was made to

protect the receiving waters from deoxygenation ,ie that the discharge made would have a low Biological Oxygen Demand (BOD).

- 3.6 It has been recognised by the Environment Agency, water companies and OFWAT for some time that improvement of the Total Nitrogen (TN) content of discharge needs to be addressed. The water industry works in 5 year spending cycles/programmes referred to as Asset Management Plans (AMPs) and these three parties agree between them how much investment (which comes from increases in sewage bills) can be made in any AMP and what will be delivered in terms of improvement for the investment permitted (affordable). Since the beginning of AMP4 in 2005 Southern Water have begun to systematically upgrade existing treatment works to provide 'nitrogen stripping'. This process has to be artificially 'forced' by careful and continuous control of the treatment process to create a low oxygen environment which 'debonds' the oxygen from the nitrate and stimulates the emission of gaseous nitrogen into the atmosphere (which is 78% nitrogen). This nitrogen release is thus stripped from the effluent that discharges into the receiving waters. It is not practicable to strip 100% of the nitrogen from the sewage, and the upgraded treatment works typically operate to a new TN permit level of around 10 mg/L compared to typical value of around 27 mg/L for traditional works without TN permit limits.
- 3.7 Treatment works upgrades are difficult and complex to plan and deliver in the context of three of the main constraints:
- There is little space at most works for the finished new infrastructure
 - The existing works has to continue to operate during the upgrade and there is little room for this and the working space needed to construct the new infrastructure.
 - The investment cashflow is regulated by OFWAT against bill increases and notwithstanding this there are a finite number of specialists to plan and deliver this so there can only be a limited rate at which the upgrades are delivered.
- The economies of scale and immediate proximity to The Solent has dictated that it is the large coastal treatment works which have been prioritised by Southern Water in AMPs4-6 from 20005-2019. AMP7 investment and construction programme for 2020-2025 is now underway.
- 3.8 Wastewater Treatment Works (WwTW) upgrade programme is ongoing but in short it is not realistic to simply add a TN limit to existing permits as there will be no immediate change in performance of existing WwTWs. The upgrade programme will take decades to eventually deliver across the board improved TN performance.
- 3.9 The NE-gen1 methodology is aimed at planning permissions for proposed developments and does not address agricultural practice or the water industry AMP process. The NE-gen1 methodology is built off a single fundamental premise. This assumes that persons at work or using non-residential offices and commercial/retail premises must also live in the catchment. In the round this is a reasonable basis on which to look at the total sewage volume. However in zero rating commercial development from nitrogen loading it inherently means that residential developers fund the nitrogen nutrient mitigation of all non-residential commercial development in the region.
- 3.10 As set out in paragraph 3.4 there is a massive amount of largely agricultural legacy nitrogen in the Chalk aquifer below the region which forms the base flow to the rivers flowing into The Solent. The drinking water supplies in southern Hampshire are drawn from this groundwater and these rivers, and this typically contains 7-8 mg/L of nitrogen that does not stem from the proposed developments. The previous NEv2 methodology did not recognise that this represents around 85% of the nitrogen returned to the water environment from upgraded WwTWs and around 30% from traditional WwTWs. NEv5 gives a 2 mg/L allowance ie about 20% on upgraded WwTW effluent and 7% on traditional WwTW discharges. Whilst this is only partial recognition it is better than the previous NEv2 that made no recognition at all. In effect residential developers will therefore also be funding the mitigation of the unrecognised legacy nitrogen predominantly from historic agricultural

practices. The 2 mg/L value is still contained within the NE-gen1 assessment spreadsheet but is no longer as transparent as it was previously.

- 3.11 Natural England nitrogen assessment methodology NE-gen1 considers nitrogen for:
- 1) Land use with regard to nitrogen contained in surface water run-off and infiltration.
 - 2) Sanitation with regard to nitrogen content in the final treated discharge from the WwTW serving the development.

The assessment compares pre and post development quantities on nitrogen for the land use (1) and sanitation (2) to establish a final figure and then adds a 20% buffer to this.

- 3.11 Natural England advise the NE-gen1 methodology is advised for all types of development that would result in a net increase in population served by a wastewater system, including new houses, student accommodation, tourism attractions and tourist accommodation.

- 3.12 The site lies within the Itchen catchment. In March 2022 Natural England added a phosphorus neutrality requirement to development affecting the freshwater fluvial Itchen catchment. Similarly to nitrogen nutrients, impact comprises (1) a land use/surface water runoff component and (2) a sanitation component. Increased phosphorus nutrient levels in these waters has potential to generate algal blooms which can reduce oxygen levels in the water and cause death of aquatic organisms. Similarly to nitrogen nutrients the two principal sources are agricultural fertilisers including a large agricultural legacy effect on the massive volumes of groundwater stored in the local Chalk aquifers which feed the local rivers; and human habitation discharges from WwTWs and PTPs.

4. Derivation of Sewage Load

- 4.1 The NEv5 methodology used a blunt 2.4 average household occupancy and 110 litres per person per day (LPD) for housing.

- 4.2 NE-gen1 now recognises that water consumption on sites varies:

- Building Regulations maximum 125 LHD
- Building Regulations higher standard 110 LHD
- Higher standard by water efficiency calculation

NE-gen1 directs that the level of proposed water usage is increased by 10 LPD *“to account for changes to less water efficient fittings through the lifetime of the development”*. This direction is contrary to the industry direction of travel, Southern Water’s own water supply policies which NE recognise in their February 2022 advice note regrading water neutrality within the Sussex North Water Supply Zone and associated Frequently Asked Questions document (December 2021) in which this demonstrates explicit awareness of Southern Water’s Target 100 *“to reduce water consumption in Southern Water’s whole water supply area in the long term (not just Sussex North), as set out in their Water Resources Management Plan.”* The evidence therefore points to a long term reduction in use NOT a long term increase.

- 4.3 There is a further fundamental error in that sewage load is less than not equal to water use. Water efficiency calculations include a 5 LPD for external use that is not returned to the sewer so does not form part of the sewage load. In water metered properties sewage bills are calculated at 95% of the water supply volume in recognition of this.
- 4.4 The calculations attached to this report have been undertaken on the basis of 110 LPD unless a water efficiency calculation has been provided to us and is attached. A +10 LPD has been added as directed by Natural England. The liability and accountability for the impact of this direction rest with Natural England as current evidence set out in 4.2 and 4.3 above indicates their current approach is unsound.

5. Wastewater Treatment Works

- 5.1 The site is remote from the public foul water sewer network.

- 5.2 The existing dwellings are served by an historic septic tank without a certified TN and TP performance. ie a default septic tank.
- 5.3 It is proposed to install a Graf One2Clean package treatment plant(PTP) which has a certified performance of 9.1 mg/L TN and 0.4 mg/L TP. The associated performance certification is contained in Appendix B

6. Land Use Component

- 6.1 The site comprises 0.20 Ha of residential urban fabric and 0.17 ha of paddock. There will be a small change in nutrient from the land use component as a result of the proposed development.

7. Nutrient Assessment

NITROGEN

- 7.1 The NE-gen 1 sewage loading, PTP performance for TN and land use component are included in the calculations contained in Appendix C.
- 7.2 The calculations can also include the 2 mg/L allowance in water supply from NEv5 discussed in paragraph 4.41. For the awareness of the LPA the actual nitrogen content removed from the environment in the water supply from the environment but not recognised in NEv5/NE-gen1 in most cases in the Solent area is very significantly greater than the NE methodology acknowledges. The water supply at this location is however made from outside the Solent catchment so no deduction has been included.
- 7.3 The calculations demonstrate an existing nitrogen discharge of 19.84 KgTN/yr (unbuffered) from the existing dwellings on the default septic tank, and a post development discharge of 1.60 KgTN/yr (unbuffered) for the proposed dwellings served by the proposed Graf One2Clean PTP. The proposed development would therefore yield a net **nitrogen reduction of 18.24 KgTN/yr (unbuffered)**. Application of the 20% buffer to nutrient reductions is not applicable.

PHOSPHORUS

- 7.4 The NE-gen 1 sewage loading, PTP performance for TP and land use component are included in the calculations contained in Appendix C.
- 7.5 There is no deductible allowance for TP in the water supply to the site.
- 7.6 The calculations demonstrate an existing phosphorus discharge of 2.44 KgTP/yr (unbuffered) from the existing dwellings on the current default septic tank, and a post development discharge of 0.11 KgTP/yr (unbuffered) for the proposed dwellings served by the proposed Graf One2Clean PTP. The proposed development would therefore yield a net **phosphorus reduction of 2.33 KgTP/yr (unbuffered)**. Application of the 20% buffer to nutrient reductions is not applicable.

8. Mitigation

NITROGEN

- 8.1 NEv5 Figure 1 subdivides the overall Solent catchment into 6 sub catchments. A copy of this Figure is contained in Appendix C.
- 8.2 The site lies in the Itchen subcatchment. However NEv5 paragraph 5.42 states that for discharges to the ground mitigation land should be within the same catchment at the outfall location of the PTP. The development site and proposed PTP are in the same catchment and inherently meet mitigation location requirements.

- 8.3 **The proposed development will yield a net nitrogen nutrient reduction of 18.24 KgTN/yr and the proposed development therefore exceeds the balance point to achieve neutrality and no mitigation is required.**

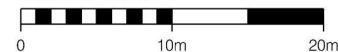
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- 8.4 Whereas the Itchen and Test catchments are interchangeable with respect to nitrogen nutrient mitigation as both discharge to the Southampton Water section of the Solent as the impacted receptor, for phosphorus the receptor is the Itchen SAC which would limit a phosphorus mitigation site to the freshwater fluvial catchment of the Itchen.
- 8.5 The site lies in the Itchen subcatchment. However NEv5 paragraph 5.42 states that for discharges to the ground mitigation land should be within the same catchment at the outfall location of the PTP. The development site and proposed PTP are in the same catchment and inherently meet mitigation location requirements.
- 8.6 **The proposed development will yield a net phosphorus nutrient reduction of 2.33 KgTP/yr and the proposed development therefore exceeds the balance point to achieve neutrality and no mitigation is required.**

Appendix A



scale 1:500



JON DALE ARCHITECT LTD.

Jon Dale RIBA 12 Crestwood View, Eastleigh, Hampshire, SO50 4NF Tel: 07787 575126 E-mail: jondalearchitect@gmail.com

Project

Old Oak Farm

Fair Oak

-

Title

Site Plan

-

Scale
1:500

Date
July 23

Drawn
RP

Checked
JD

Job No.
128

Drawing. No.
SLO1

Revision
-

Appendix B

PERFORMANCE RESULTS

Otto Graf GmbH

Carl-Zeiss-Str. 2 - 6, 79331 Teningen, Germany

EN 12566-3, Annex B

Small wastewater treatment systems for up to 50 PT

Small wastewater treatment system one2clean

Sequencing Batch Reactor (SBR) process

Test report PIA2015-208B15.e

Nominal organic daily load	0.24 kg BOD ₅ /d	
Nominal hydraulic daily load	0.75 m ³ /d	
Material	polypropylene	
Treatment efficiency (nominal sequences)	Efficiency	Effluent
	COD	94.7 % 36 mg/l
	BOD ₅	98.1 % 6 mg/l
	N _{tot} *	86.8 % 9.1 mg/l
	NH ₄ -N	88.7 % 4.6 mg/l
	P _{tot}	95.1 % 0.4 mg/l
	SS	95.7 % 14 mg/l
Electrical consumption	0.64 kWh/d	

**determined for temperatures $\geq 12^{\circ}\text{C}$ in the bioreactor*

Performance tested by:

PIA – Prüfinstitut für Abwassertechnik GmbH

(PIA GmbH)

Hergenrather Weg 30

52074 Aachen, Germany

This document replaces neither the declaration
of performance nor the CE marking.



Notified Body
No.: 1739



Certified according to
ISO 9001:2008



Prüfinstitut für Abwassertechnik GmbH
geprüft - tested - testé

Elmar Lancé

November 2016

Appendix C

Development site details

Date (dd/mm/yyyy):

19/09/2023

Site Name:

Old oak Farm (existing septic tank)

Planning Application number:

to be assigned

Site Address:

Winchester Road, Fair Oak

Stage 1

User Inputs

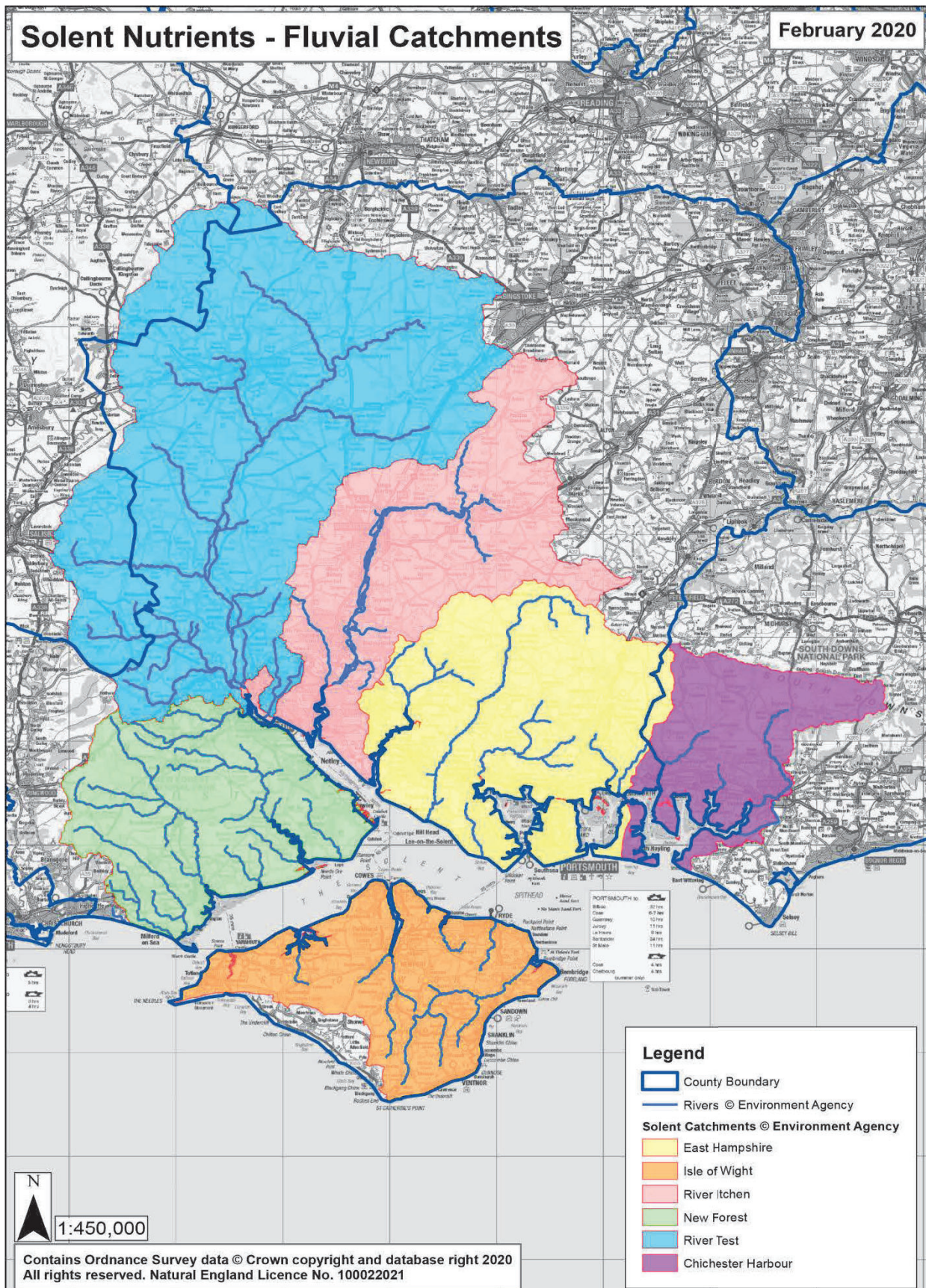
Date of first occupancy:	02/01/2022
Average occupancy rate:	2.40
Water usage (litres/person/day):	120
Development Proposal (dwellings/units):	2
Include deductible acceptable loading?	Yes
Wastewater treatment works:	Septic Tank default
Wastewater treatment works P permit (mg TP/litre):	11.6
Wastewater treatment works N permit (mg TN/litre):	94.3

Stage 1 Calculated Loading

Stage 1 Nutrient Loading

Additional population	4.8	people
Wastewater by development	576	litres/day
Annual wastewater TP load	2.44	kg TP/yr
Annual wastewater TN load	19.84	kg TN/yr

Figure 1 Solent Catchment Area Contains public sector information licensed under the Open Government Licence v3.0



Development site details

Date (dd/mm/yyyy):

19/09/2023

Site Name:

Old Oak Farm (proposed PTP)

Planning Application number:

to be assigned

Site Address:

Winchester Road, Fair Oak

Stage 1

User Inputs

Date of first occupancy:	02/01/2022	
Average occupancy rate:	2.40	
Water usage (litres/person/day):	120	
Development Proposal (dwellings/units):	2	
Include deductible acceptable loading?	Yes	
Wastewater treatment works:	Package Treatment Plant user defined	
Wastewater treatment works P permit (mg TP/litre):	Please enter value in cell to the right:	0.4
Wastewater treatment works N permit (mg TN/litre):	Please enter value in cell to the right:	9.1

Stage 1 Calculated Loading

Additional population	4.8	people
Wastewater by development	576	litres/day
Annual wastewater TP load	0.08	kg TP/yr
Annual wastewater TN load	1.49	kg TN/yr

Stage 2

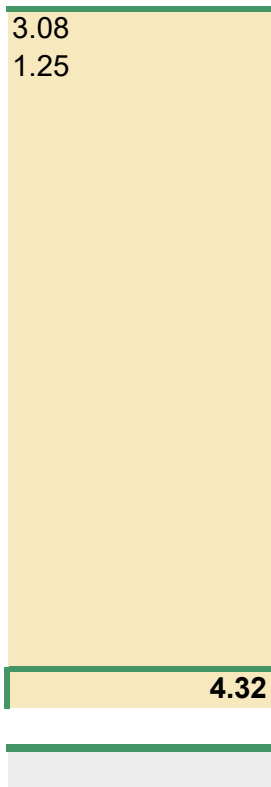
User Inputs

Catchment:	Itchen
Soil drainage type:	Impeded drainage
Annual average rainfall (mm):	800.1 - 850
Within Nitrate Vulnerable Zone (NVZ):	Yes

Existing land use type(s)	Area (ha)	Annual phosphorus nutrient export (kg TP)
Residential urban land	0.20	0.33
Lowland	0.17	0.10
Total:	0.37	0.43



**Annual nitrogen
nutrient export
(kg TN)**



Stage 3

User Inputs		
New land use type(s)	Area (ha)	Annual phosphorus nutrient export (kg TP)
Residential urban land	0.17	0.28
Open urban land	0.20	0.18
Total:	0.37	0.46

New land use type(s)	Area (ha)	Annual phosphorus nutrient export (kg TP)
Residential urban land	0.17	0.28
Open urban land	0.20	0.18
Total:	0.37	0.46

**Annual nitrogen
nutrient export**
(kg TN)

2.61
1.81

4.43

Appendix D

CONDITIONS AND LIMITATIONS OF NITROGEN NUTRIENT ASSESSMENT

May 2020

Aqua Callidus Consulting Ltd is constituted as a limited liability company in accordance with the Companies Act 1989 (with registered number 11390910 and with its registered office at Kintyre House, 70 High Street, Fareham, Hants, PO16 7BB).



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6. Unless stated otherwise the nitrogen assessment is based on site specific information provided by the client and manufacturers and wastewater companies public information on the performance of wastewater treatment plants and works. No liability is accepted for the accuracy of such third party information.
7. Unless stated otherwise the nitrogen assessment is undertaken as a desktop assessment and no site visit has been made.