



Nutrient Assessment and Budget

**Ropley
Botley Road
West End
Southampton
SO30 3HA**

Client: Mr Pitter

Date of Survey: 22 July 2024

Prepared by: BPS Design Consultants Ltd
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1.0 Introduction

Instructions were received from Mr Pitter to make an assessment of the nitrogen nutrient impact for the proposed development of 2 dwellings to the rear of Ropley, Botley Road, West End, SO30 3HA.

The report has been by Mr Robert Narramore IEng MICE.

2.0 Existing Site

The site is located at Ropley, Botley Road, West End, SO30 3HA, to the rear of the site. The site is currently 1 No House to the front of the plot with drive and rear garden.

The site is approximately 0.15 hectares.





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.

High levels of nitrogen and phosphorus nutrients exist in these waters/environments and evidence indicates these nutrients are causing eutrophication of the waters.

The total nutrient comes from a number of component parts believed to be:

- 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. Diffused urban rainfall runoff from urban surfaces and roads

Since the late 1980's and early 1990's the agricultural sector has reduced the nitrogen content in applied fertiliser by around 35%. The Chalk aquifers which underly the region and which are the dominant source of river flows into the Solent are believed to contain huge amounts 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.

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.

The following three agencies have recognised that improvements of the Total Nitrogen content (TN) 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 agencies 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 is 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 then 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.

Treatment works upgrades are difficult and complex to plan and deliver in the context of three of the main constraints:

- Limited Space at existing facilities.
- In use facilitates hampering potential upgrades. •
- The lack of investment/cashflow available.

Large coastal treatment works have been prioritised by Southern Water in AMPs4-6 from 2005-2019. AMP7 investment and construction programme for 2020-2025 is now underway.

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.

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.

As mentioned above there is a huge amount of largely agricultural legacy nitrogen in the Chalk aquifers 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 i.e. 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.

Natural England nitrogen assessment methodology NE-gen1 considers nitrogen for:

- Land use with regard to nitrogen contained in surface water run-off and infiltration.
- 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 and sanitation to establish a final figure and then adds a 20% buffer to this. 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.

4.0 Calculation of Sewage Load.

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

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

- Building Regulations maximum 125 LPD
- Building Regulations higher standard 110 LPD
- 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 regarding 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 LPD 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.

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.

The calculations attached to this report have been made on the basis of 110 LPD.

5.0 Wastewater Treatment Proposals

The existing dwelling is connected to the public foul water sewer network. So, it should be possible for a direct connection to this system to allow wastewater to be directed to treatment works.

The site is also large enough to allow the applicant to install individual Graf One2Clean treatment plants, one for each dwelling. The documented and confirmed performance for the Graf One2Clean system is TN of 9.1 mg/L. performance certificate included within the appendices.

The preferred option is to connect to the public sewer, so the nitrogen calculations are based on this method.

6.0 Existing Land Use

The site comprises 0.15 Ha of existing residential urban land. So there will be no change in the nitrogen from that land use as a result of the proposed development.

7.0 Nitrogen Calculation

The NE-gen 1 sewage loading, WwTW performance for TN and land use component are included in the calculations contained in appendices. The calculations also include the 2 mg/L allowance in water supply from NEv5 discussed above. 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 calculations indicate that inclusive of the 20% buffer there would be a net nitrogen increase of +6.13KgTN/yr from the proposed development.

8.0 Mitigation

The most common approach is land use offset whereby the increase in nitrogen at the site is offset by a corresponding reduction in nitrogen elsewhere in the sub-catchment eg by change of use from farmland to woodlands or community open space etc.

Some sites can achieve mitigation within their own site when farmland of relatively high existing nitrogen discharge is developed for housing such that the reduction in the nitrogen from the change in land use is greater than the increase from the new foul water loading.

For all other developments the mitigation land and development land are at different locations. There are three potential approaches to securing the necessary mitigation land:

- i. The applicant already controls a suitable area of private land.
- ii. Some LPAs already control such land and buy into their scheme can be made.
- iii. Buy in to a third-party scheme

It is a requirement that the change in use at the mitigation site is legally secured in perpetuity and that necessary maintenance to ensure the new low nitrogen usage is also secured. Whilst hypothetically a suitably sized piece of land could be privately procured at a suitable location and taken out of farming use to provide an offset reduction in nitrogen on that land in perpetuity, the urban south Hampshire location of the site, means this may be difficult to find as much nearby local land is similarly earmarked for potential future development.

In March 2020 Eastleigh Borough Council cabinet agreed an initial charging policy for nitrogen credits offered by an EBC scheme. EBC have since acquired 78.5 Ha of land to generate these credits and on 29 March 2021 EBC cabinet sanctioned a credit charging policy of £3,000 +VAT per Kg for the credits.

Eastleigh Borough is located in the Itchen catchment, which NEv5 paragraph 5.28 states is interchangeable with the Test catchment in which the site discharge would be made.

The EBC 29/3/2021 nitrogen credit charging policy paragraphs 9 and 15 confirm that developers outside the Borough may purchase credits “as long as it can be demonstrated that the relevant LPA [WCC for this site] has received

a valid planning application and ultimately that mitigation is secure in an appropriate planning agreement.”

The anticipated costs for mitigation from EBC would be of the order £18390.00+VAT on this basis. The PfSH website indicates the point of contact for the EBC scheme to be nutrientoffset@eastleigh.gov.uk

NEv5 subdivides the overall Solent catchment into 6 sub catchments, see appendices. The site lies in the East Hampshire Solent catchment area. However NEv5 paragraph 5.32 directs that for River Hamble catchment acceptable mitigation catchment locations are River Hamble catchment. 8.3 Section 5 of NEv5 sets out various types of hypothetical mitigation. However, most of these are impractical for modest numbers of dwellings in an urban context, where served by the public sewer.

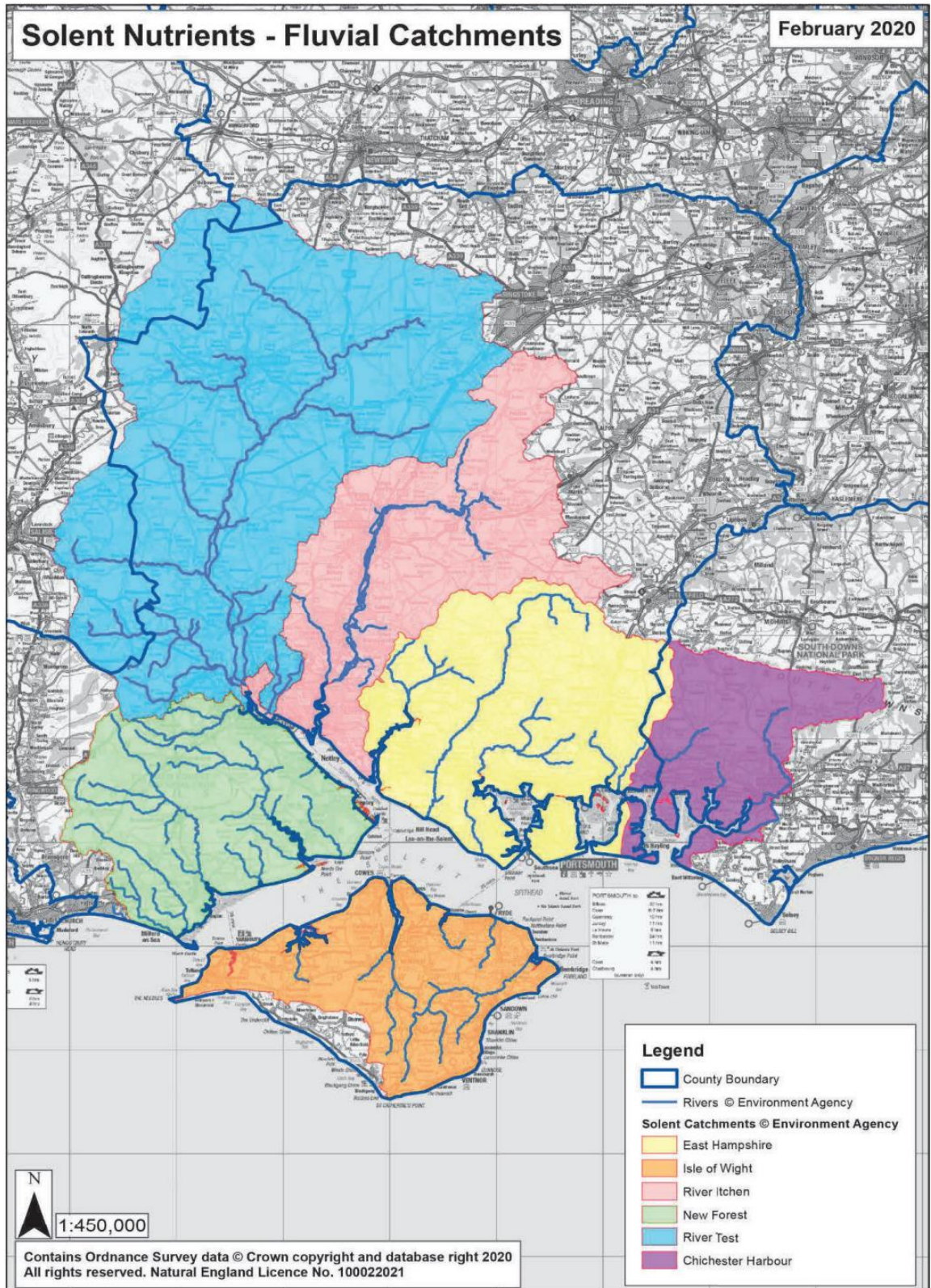
So, for this development the EBC mitigation scheme will be implemented, and connections made into the existing foul system.

Authorised for BPS Design Consultants Ltd, 22nd July 2024



Robert Narramore IEng MICE
Managing Director

9.0 **Appendix A**



10.0

Appendix B

Development site details

Date (dd/mm/yyyy):	24/07/2024
Site Name:	Ropley, Botley Road, West End
Planning Application number:	Not Yet Issued
Site Address:	Ropley, Botley Road, West End

Stage 1

User Inputs

Date of first occupancy:	25/12/2024
Average occupancy rate:	2.40
Water usage (litres/person/day):	120
Development Proposal (dwellings/units):	2
Include deductible acceptable loading?	No
Wastewater treatment works:	Chickenhall Eastleigh WwTW
Wastewater treatment works P permit (mg TP/litre):	1
Wastewater treatment works N permit (mg TN/litre):	27

A nutrient permit is changing for the selected WwTW as of 01/01/2025. Therefore, two nutrient budgets will be calculated for the loading before and after the 2025 WwTW permit upgrade.

Post 2025 WwTW P permit: 0.6 mg TP/litre

Stage 1 Calculated Loading

Post-2025 Stage 1 Nutrient Loading		
Additional population	4.8	people
Wastewater by development	576	litres/day
Annual wastewater TP load	0.11	kg TP/yr
Annual wastewater TN load	5.11	kg TN/yr

Pre-2025 Stage 1 Nutrient Loading		
Annual wastewater TP load:	0.19	kg TP/yr
Annual wastewater TN load:	5.11	kg TN/yr

Stage 2

User Inputs

Catchment:	Itchen		
Soil drainage type:	Freely draining		
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)	Annual nitrogen nutrient export (kg TN)
Residential urban land	0.15	0.25	2.31
Total:	0.15	0.25	2.31

Stage 3

User Inputs

New land use type(s)	Area (ha)	Annual phosphorus nutrient export (kg TP)	Annual nitrogen nutrient export (kg TN)
Residential urban land	0.15	0.25	2.31
Total:	0.15	0.25	2.31

Stage 4

Calculated Outputs

Post-2025 Annual Nutrient Budget

The total annual phosphorus load to mitigate is:

0.14 kg TP/year

The total annual nitrogen load to mitigate is:

6.13 kg TN/year

Pre-2025 Annual Nutrient Budget

The pre-2025 annual phosphorus load to mitigate is:

0.23 kg TP/year

The pre-2025 annual nitrogen load to mitigate is:

6.13 kg TN/year