

Nutrient Neutrality

**Six Bells Public House,
North Street, Havant, PO9 1PT**

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1 INTRODUCTION

1.1 Existing Site

The Six Bells public house is located in the town centre of Havant (Figure 1.1) and is a two-storey building (Figure 1.2) with a gable roof and with single-storey flat roof additions to the rear which house the WCs and storage areas. The business is located on the ground floor of the building (Figure 1.3) with two flats on the first floor above.

The public house has been on the market since 1st February 2019 but no offers of purchase have been received. The pub received a closure notice on the 17th February due to non-compliance of specified premises licence conditions and has been closed since 1st April.

1.2 Proposed Development

Due to the lack of any market interest as a Public House the proposals are for the conversion of the ground floor to provide 2 residential units as a one-bedroom and a two-bedroom flat (Figure 1.4). These proposals involve no additions or changes to the fabric or appearance to the front of the building facing North Street and the main changes will consist of internal walls to separate and provide the two ground floor flats with new windows to provide improved daylight and ventilation. All the proposed changes are internal and the building scale and structure will remain as existing. The roof drainage and the sewage connection will be retained as existing.

1.3 Requirement for a Nitrate Mitigation Study

The LPA has advised that Natural England's directive for any development with overnight stay accommodation in the Solent catchment area needs to prove that the proposals will provide a neutral or lower net nitrate emission to these waters, referred to as nutrient neutrality. Natural England's 'Advice for LPAs' (June 2019) sets out the planning and environmental context for the approach and methodology to calculate how nutrient neutrality can be achieved to assess whether any increase in wastewater from the proposed new development will have an adverse effect on the international sites in the Solent. Havant Borough Council has advised that they are not able to comment on the proposed development until these deliberations have been considered. This report is intended to fulfil these requirements.

1.3.1 Approach

To address the impact of new development on designated sites it should ideally achieve nutrient neutrality based on the net nitrogen budget for a new development. Natural England recommends that the proposals achieve nitrogen neutrality by securing the required mitigation in compliance with the Habitats Regulations.

The nutrient neutrality calculations include key inputs and assumptions based on the best-available scientific evidence and research but with a degree of uncertainty such as occupancy levels and water use for each household in perpetuity hence a precautionary approach should be used when addressing calculating nutrient budgets.

The required approach is to calculate the level of Nitrogen (N) from a development. However, N comes in different forms and the key measurement is the Total Nitrogen (TN), i.e. both the organic and inorganic forms of nitrogen because this is required and is what influences plant growth. TN is the sum of the inorganic forms - nitrate-nitrogen (NO₃-N), nitrite-nitrogen (NO₂-N), ammonia - and organically bonded nitrogen.

Total Nitrogen is measured at Wastewater Treatment Works (WwTW) where there is a permit with a TN limit consent. For WwTWs without permits the measurements could be inorganic nitrogen (nitrate + nitrite + ammoniacal N) or TN or a mix and most river quality monitoring by EA only records the inorganic N forms. Nitrate is normally the largest component of TN and quantities of organic N are significant whilst dissolved organic nitrogen has been found to comprise 7% of the potential biologically available nitrogen in local rivers and 13% of in the estuary. The land use change element of this methodology may therefore underestimate TN leaching hence Natural England require that a precautionary approach should be adopted.

1.3.2 Type of Development

Any type of development that would result in a net increase in population served by a wastewater system, including new homes, student accommodation, tourism attractions and tourist accommodation, will have wastewater implications. Commercial development not involving overnight accommodation are generally not be included but some uses can have a significant nitrogen loading.

1.3.3 Methodology

The procedure is as follows:

Stage 1 Calculate Total Nitrogen (TN) in kg/yr from the development that would exit the Wastewater Treatment Works (WwTW) after treatment

- Step 1 Calculate additional population
- Step 2 Confirm water use
- Step 3 Confirm local WwTW and permit level
- Step 4 Calculate Total Nitrogen (TN) that would exit the WwTW after treatment due to the proposed development.

Stage 2 Adjust Nitrogen load to offset existing nitrogen from current land use on the site.

Stage 3 Adjust nitrogen load to account for land uses within the proposed development.

Stage 4 Calculate the net change in the Total Nitrogen load that would result from the development

Consider Mitigation Measures.

These are described in the following section.

2 METHODOLOGY

2.1 Stage 1 - Total Nitrogen (TN) from Proposed Development

The first step is to calculate the Total Nitrogen (TN) in kg/year from the development that would enter and exit the local Wastewater Treatment Works (WwTW) after treatment

2.1.1 Step 1 Calculate Additional Population

All types of new housing (market and affordable) and overnight accommodation will increase the housing stock within the catchment, and which will result in an associated increase in population levels, leading to inevitable wastewater implications. The additional population that would use the proposed development, a 1 bed and a 2 bed flat, is assumed to be 2 and 3 persons respectively, a total of 5 persons. This is the same as Natural England's recommended occupancy rate of 2.4 per unit based on the Office for National Statistics latest figures. The number of occupants is restricted by the number of bedrooms and 5 persons is therefore a precautionary estimate as required by the guidance.

2.1.2 Step 2 Confirm Water Use

The water use / efficiency standard for the proposed development is then defined and the nitrogen load is calculated from the scale of water use. The water use is based on adherence to the limit under G2 of the Building Regulations 2010 to provide a maximum water use of 110 l/p/day which is the estimated amount of wastewater that will be generated by the development and will flow to the wastewater treatment works. This includes WCs, personal washing, clothes and utensils washing and all general domestic uses. Natural England consider 110 l/p/d is a precautionary figure and that this should be adopted in the calculations.

2.1.3 Step 3 Confirm WwTW and Permit Level

The next step is (i) to identify the Wastewater treatment works (WwTW) that the development will use, and (ii) to identify the permit concentration limit for Total Nitrogen at this WwTW.

Wastewater from homes across Portsmouth, Havant, Hayling Island, Cosham, Paulsgrove, Waterlooville, Horndean and Hambledon is treated at Budds Farm Wastewater Treatment Works to the south of Havant. This serves around 410,000 people and during normal weather conditions treats 109 Mld (million litres per day) of wastewater and during storm conditions up to 200 Mld and disposes treated wastewater to Langstone Harbour.

Where the receiving waters are defined as sensitive under the Urban Wastewater Treatment Directive (UWWTD) with respect to particular nutrients, the final effluent discharge needs to achieve an annual average of 15mg/l TN for works serving a population of between 10,000 and 100,000 and an annual average of 10mg/l TN for works of over 100,000 population. The Budds Farm serves a population in excess of 400,000 and as the Solent has been designated as a sensitive area in regard to eutrophication the effluent is required to achieve a 10mg/l TN standard. Southern Water undertook £1.8billion of capital schemes between 2005 and 2010 to

facilitate nitrogen removal at several of their WWTs, including Budd's Farm, which includes a Sludge Treatment Centre and the 10mg/l TN standard was achieved by the end of March 2008.

The load calculations then use a worst case scenario that the WwTW operates at 90% of its permitted limit which is taken as the closest the water company can reasonably operate works without breaching the consent limit.

2.1.4 Step 4 Calculate Total Nitrogen (TN) in Kg/yr

Step 4 is to then calculate the Total Nitrogen (TN) in Kg/year that would exit the WwTW after treatment as derived from the proposed development. This is calculated by multiplying the water use of the proposed development by the appropriate concentration of Total Nitrogen after treatment at the WwTW. The Total Nitrogen load of the proposed development of 2 dwellings with 5 occupants is therefore based on a water use of 110 l/p/d, 90% of the WwTW consent limit for TN of 10 mg/l. This gives a Wastewater total nitrogen load for the proposed development of 1.81 kg/TN/yr (Table 2.1).

Table 2.1 Total Nitrogen (TN) Load From Development Wastewater

Step	Measurement	Value	Unit	Explanation
Development proposal	Development that would increase the population served by a wastewater system	2	No of apartments	Residential dwellings
Step 1	Additional population	5	Persons	A 1-bed and a 2-bed dwelling with 2 and 3 occupants
Step 2	Water use	110	l/p/day	110 litres/day.
Step 2	Wastewater from the development	550	litres/day	5 persons x 110 litres/day.
Step 3	Receiving WwTW environmental permit limit for TN	10.0	mg/l TN	Consented limit
Step 3	Required Standard	9.0	mg/l TN	90% of consented limit of 10 mg/l TN
Step 4	TN discharged after WwTW treatment	4950	mg/TN/day	550 l/d x 9.0 mg/l
TN in kg/TN/day		0.00495	Kg/TN/day	Divide by 1,000,000
TN in kg/TN/yr		1.807	Kg/TN/yr	Over 365 days
Wastewater total nitrogen load		1.81 kg/TN/yr		

2.2 Stage 2 - Nitrogen Load from Current Land Use

This next stage is to calculate the existing nitrogen losses from the current land use which is subtracted from the proposed development land use wastewater Total Nitrogen load. In this case the existing building is a public house and this clearly does supply a nutrient loading to the WWTW but at a lower rate than standard domestic use of 110 l/p/day. A public house would use water for toilets, flushing WCs, but also glasses cleaning and some laundry activities, general washing and cleaning and a use of 10 l/p/d is assumed. The Pub is assumed to have an average

of 10 clients per hour over a 12 hour working day. This gives a Wastewater total nitrogen load for the existing development of 3.94 kg/TN/yr (Table 2.2).

Table 2.2 Total Nitrogen (TN) Load From Existing Site Wastewater

Step	Measurement	Value	Unit	Explanation
Development proposal	Development types that would use the wastewater system	1	PH	Public House
Step 1	Population	120	Persons/day	Assume 10 persons per hour over a 12 hour day
Step 2	Water use	10	l/p/day	10 litres/per/day.
Step 2	Wastewater from the development	1200	litres/day	120 persons @ 10 l/p/d
Step 3	Receiving WwTW environmental permit limit for TN	10.0	mg/l TN	Consented limit
Step 3	Required Standard	9.0	mg/l TN	90% of consented limit of 10 mg/l TN
Step 4	TN discharged after WwTW treatment	10800	mg/TN/day	1200 x 9.0 mg/l
TN in kg/TN/day		0.0108	Kg/TN/day	Divide by 1,000,000
TN in kg/TN/yr		3.942	Kg/TN/yr	X 365 days
Wastewater total nitrogen load		3.94 kg/TN/yr		

2.3 Stage 3 - Nitrogen Load from Other Land Uses with the Proposed Development

The last stage is to add the nitrogen load that will result from the new development but that is not received by a WWTW. This includes the nitrogen load from the new urban developments and open spaces including any Suitable Alternative Natural Greenspace (SANG), Nature Reserves or Bird Refuge Areas. The calculation only includes the areas of the site where there will be a change in land use, for example from agricultural land to new urban development or agricultural land to Suitable Alternative Natural Greenspace (SANG) / open space. Where there are no proposed changes to the land use this land should be excluded from the nitrogen budget as there will be no change to the nitrogen load from this area.

2.3.1 Urban Development

The nitrogen load from the new urban development results from sewer overflows and from drainage that picks up nitrogen sources on the urban land. Urban development includes the built form, gardens, road verges and small areas of open space within the urban fabric. These nitrogen sources include atmospheric deposition, pet waste, fertilisation of lawns and gardens and inputs to surface water sewers. The nitrogen leaching from urban land equates to 14.3 kg/ha/yr. However, no such areas are proposed.

2.3.2 Open Space and Green Infrastructure

Nitrogen loss draining from new designated open space or Suitable Alternative Natural Greenspace (SANG) should also be included. The nitrogen leaching from this land is likely to equate to 5 kg/ha/yr. This figure can also be used where new nature reserves or bird refuge areas are created. Small areas of open space within the urban fabric, such as road verges, gardens, children's play areas and other small amenity areas should not be included within this category. The urban development figure is appropriate for these land uses. No such areas are proposed.

2.3.3 Community Food Growing Provision

For any areas of the site that are proposed for community food growing provision it is recommended that the average farm rate is used (26.9 kg/ha/yr). No such areas are proposed.

2.4 Stage 4 - Net Change in the Total Nitrogen Load Due to the Development

Stage 4 calculates the net change in the Total Nitrogen load that would result from the development. This is the difference between the Total Nitrogen load for the proposed development (wastewater, urban area, open space etc) and the existing land use and gives a net Wastewater total nitrogen load of -2.135 kg/TN/yr (Table 2.3).

Natural England recommend that a 20% precautionary buffer is built into the calculations. There may be cases where the local authority consider an alternative precautionary buffer should be used on a site-specific basis but 20% is adopted. This gives a revised wastewater total nitrogen load of -1.708 kg/TN/yr (Table 2.3) and this negative figure indicates TN loading will decrease.

Table 2.3 Net Change In Nitrogen Load From The Development

Step	Measurement	Value	Unit	Explanation
1	Wastewater Nitrogen load from proposed development (stage 1)	1.807	Kg/N/yr	Table 2.1
2	Existing land uses Nitrogen load (stage 2)	3.942	Kg/N/yr	Table 2.2
3	Nitrogen from land use changes	0.0	Kg/N/yr	Section 2.3
4	Net change. Difference between future and existing Nitrogen loading.	-2.135	Kg/N/yr	Negative indicates the proposals will generate less TN
	Nitrogen Budget without buffer	-2.135	Kg/N /yr	
	Nitrogen Buffer with 20% buffer	-1.708	Kg/N /yr	Stage 4 figure + 20%
Nitrogen Budget with 20% buffer		-1.71 Kg/N /yr		

2.5 Need for Mitigation

If there is a Nitrogen surplus (a positive figure), then mitigation is required to achieve nitrogen neutrality. If the calculations identify a deficit (a negative figure) as in this case then no mitigation is required. These calculations show the existing Public House would generate a higher amount of wastewater than 2 flats and hence that the proposed development will reduce the nitrate loading from the WWTW to the Solent estuary.

3 CONCLUSIONS

- The Six Bells public house in Havant is a two-storey gable roof building with single-storey flat roof additions to the rear which house the WCs and storage areas. The business is located on the ground floor with two flats on the first floor above.
- Due to the lack of market interest as a Public House the proposals are for the conversion of the ground floor to provide 2 residential units as a one-bedroom and a two-bedroom flat. There will involve no additions or changes to the external fabric or appearance of the building and its scale and structure will remain as existing. The roof drainage and the sewage connections will also be retained as existing.
- The LPA has advised that Natural England's directive for any development with overnight stay accommodation on the Solent catchment area needs to prove that the proposals will provide a neutral or lower net nitrate emission to these waters. Natural England's 'Advice for LPAs' (June 2019) sets out the approach and methodology to calculate how nutrient neutrality can be achieved and how to assess whether any increase in wastewater from the proposed new development to the Solent. Havant Borough Council has advised that they are not able to comment on the proposed development until these deliberations have been considered. This report is intended to fulfil these requirements.
- A new development should ideally achieve nutrient neutrality or a reduction based on the net nitrogen budget to ensure there is no impact on designated sites in the Solent. The required approach is to calculate the net level of Total Nitrogen (TN) that would exit the Wastewater Treatment Works (WwTW) after treatment due to the proposed development.
- Under the Urban Wastewater Treatment Directive (UWWTD) the final effluent discharge at Budds Farm WwTW needs to achieve an annual average of 10mg/l TN as it serves a population of more than 100,000. The load calculations assume the WwTW operates at 90% of its permitted limit which is taken as the closest the water company can reasonably operate works without breaching the consent limit. The Total Nitrogen (TN) that would exit the WwTW after treatment due to the proposed development is based on 5 occupants of the two dwelling with a water use of 110l/p/d and is 1.81 kg/TN/yr.
- The is adjusted by considering the Nitrogen load from the existing site. The public house clearly does supply a nutrient loading to the WWTW but at a lower rate than the standard domestic use of 110 l/p/day and 10 l/p/d is assumed. Assuming the Pub has an average of 10 clients per hour over a 12 hour working day the wastewater total nitrogen load for the existing development is 3.94 kg/TN/yr.
- The nitrogen load is further adjusted to account for land uses within the proposed development which is not received by a WWTW such as open spaces, SANGs, Nature Reserves or Bird Refuge Areas but there no proposed changes to the land use hence these areas are not included in the nitrogen budget.

- The net change in the Total Nitrogen load that would result from the development is the difference between the Total Nitrogen load for the proposed development and for the existing land use and this gives a net loss of -2.13 kg/TN/yr. A 20% precautionary buffer is used in the calculations gives -1.71 kg/TN/yr. This negative figure means TN loading will be reduced.
- If there is a Nitrogen surplus (a positive figure) then mitigation is required to achieve nitrogen neutrality. As the calculations show a deficit (a negative figure) then for this site no mitigation is required. The calculations show the existing public house would generate a higher amount of wastewater than 2 flats and hence that the proposed development will reduce the nitrate loading to the estuary.

Figures

Figure 1.1 Site Location Plan

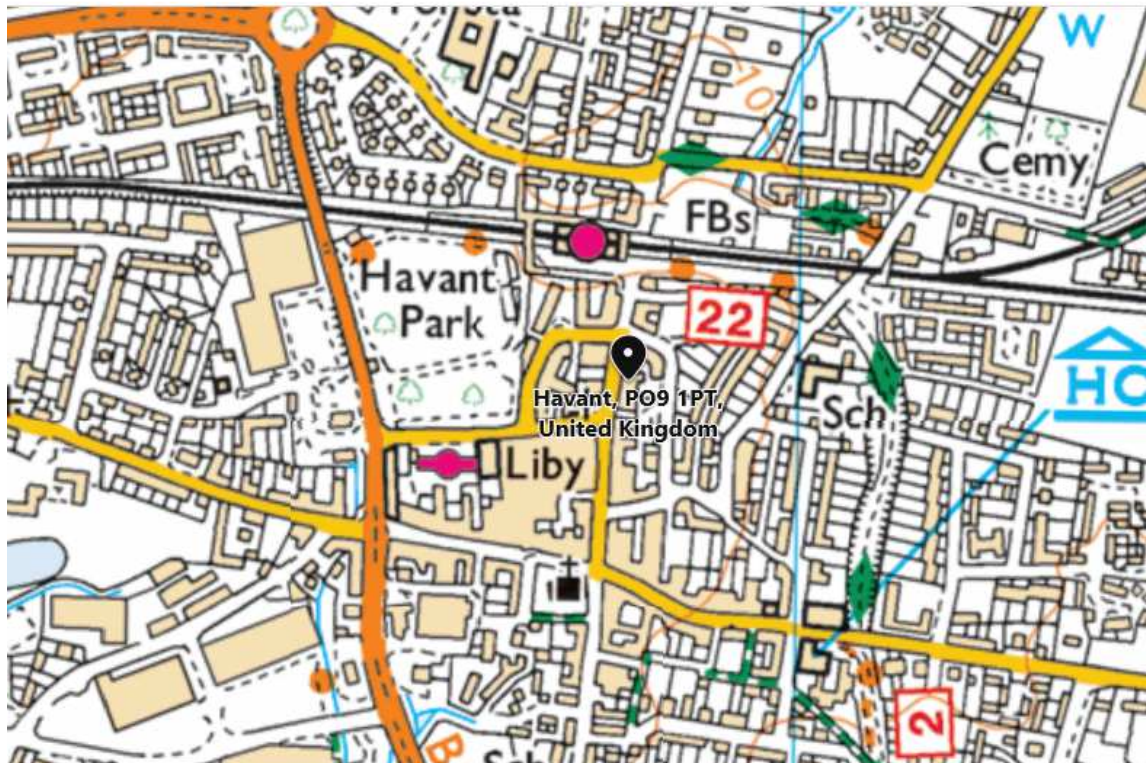


Figure 1.2 Site Photograph



Figure 1.3 Existing Ground Floor Plan



Figure 1.4 Proposed Ground Floor Plan

