BPS Design Consultants Ltd
Architectural Services and Structural Engineers

Nutrient Assessment and Budget Rev B

Proposed New Build
Swinley
Pylands Lane
Bursledon
SO31 1BH

Client:	**C Hoodless and V Hoodless**
Date of Survey:	**8th January 2025**
Prepared by:	**BPS Design Consultants Ltd** **Seafields** **Dodwell Lane** **Bursledon** **Southampton** **SO31 1DJ**

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1.0 Introduction

Instructions were received from C Hoodless and V Hoodless to make an assessment of the nitrogen nutrient impact for the proposed development of 1 No dwelling to the rear of Swinley, Pylands Lane, Bursledon, SO31 1BH

The report has been by Mr Robert Narramore IEng MICE.

2.0 Existing Site

The site is located at Swinley, Pylands Lane, Bursledon, SO31 1BH, 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 0.11 hectares.

3.0 Nitrate Assessment.

References as follows: -

- Natural England Advice note version 5 of June 2020 -Achieving Nutrient Neutrality for New Development in The Solent Region (NEv5). This document NEv5 should be referred to for further understanding.

- Natural England- Nutrient Neutrality Generic Methodology dated 1 February 2022 (NE-gen1). NE-gen1 provides an update on the calculation procedure, however 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 the current procedure.

- Natural England Nutrient Calculator version V-03-01-3 is the current procedure.

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 20005-2019. 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 LPDto 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.

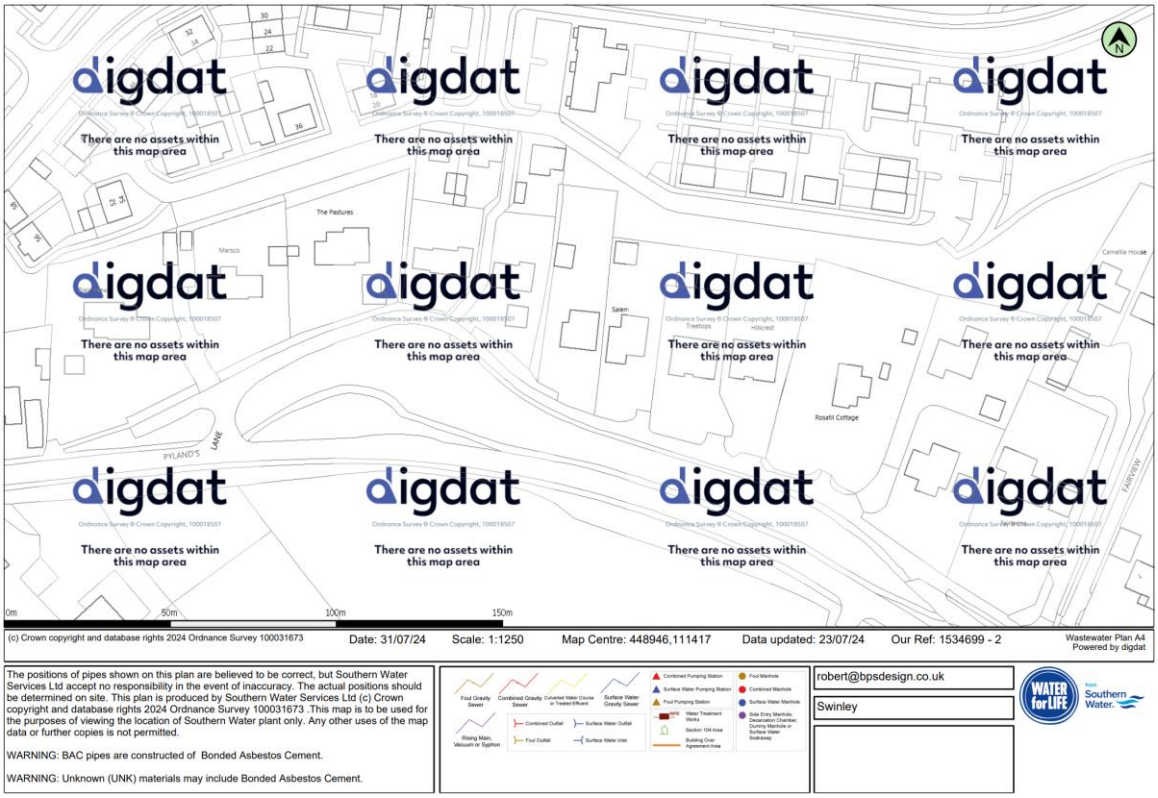
There is a further fundamental error in that sewage load is less than not equal to water use. Water efficiency calculations include a 5 LPD for external use that is not returned to the sewer so does not form part of the sewage load. In water metered properties sewage bills are calculated at 95% of the water supply volume in recognition of this.

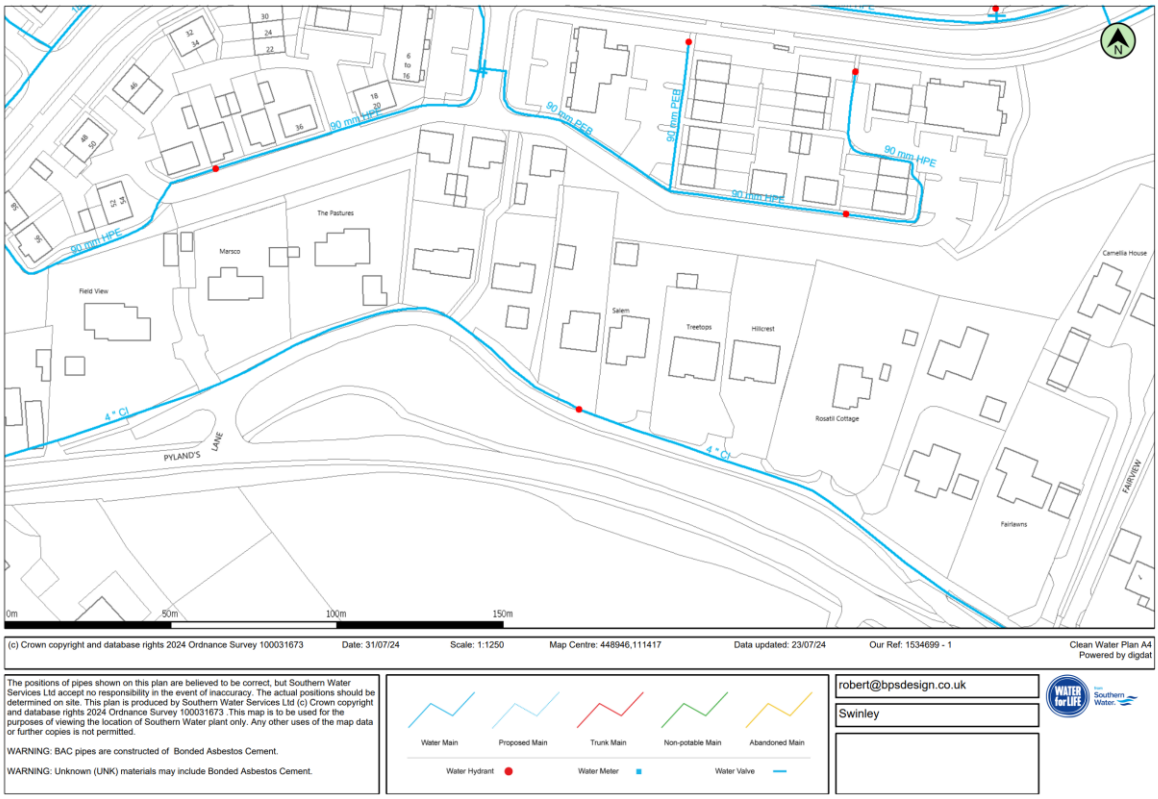
The calculations attached to this report have been made on the basis of 110 LPD.

5.0 Wastewater Treatment Proposals

The existing dwelling is connected to a cess pit this will be replaced with new system, this does not form part of the calculations.

The site is remote from the public foul water sewer network, it may be possible to connect into the Bellway Estate but at this time no online records exist, this is not to say they don't exist, just not available online or they may not be adopted. So in the interest of doubt the applicant proposes to install a Graf One2Clean treatment plant (PTP) which has a confirmed performance for TN of 9.1 mg/l, 1 No for each dwelling. The subsequent nitrogen assessment calculations are based on use of a Graf One2Clean The associated performance certification is contained in Appendices.





6.0 Existing Land Use

The site comprises 0.10 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 £2700.00+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 new treatment plants provided.

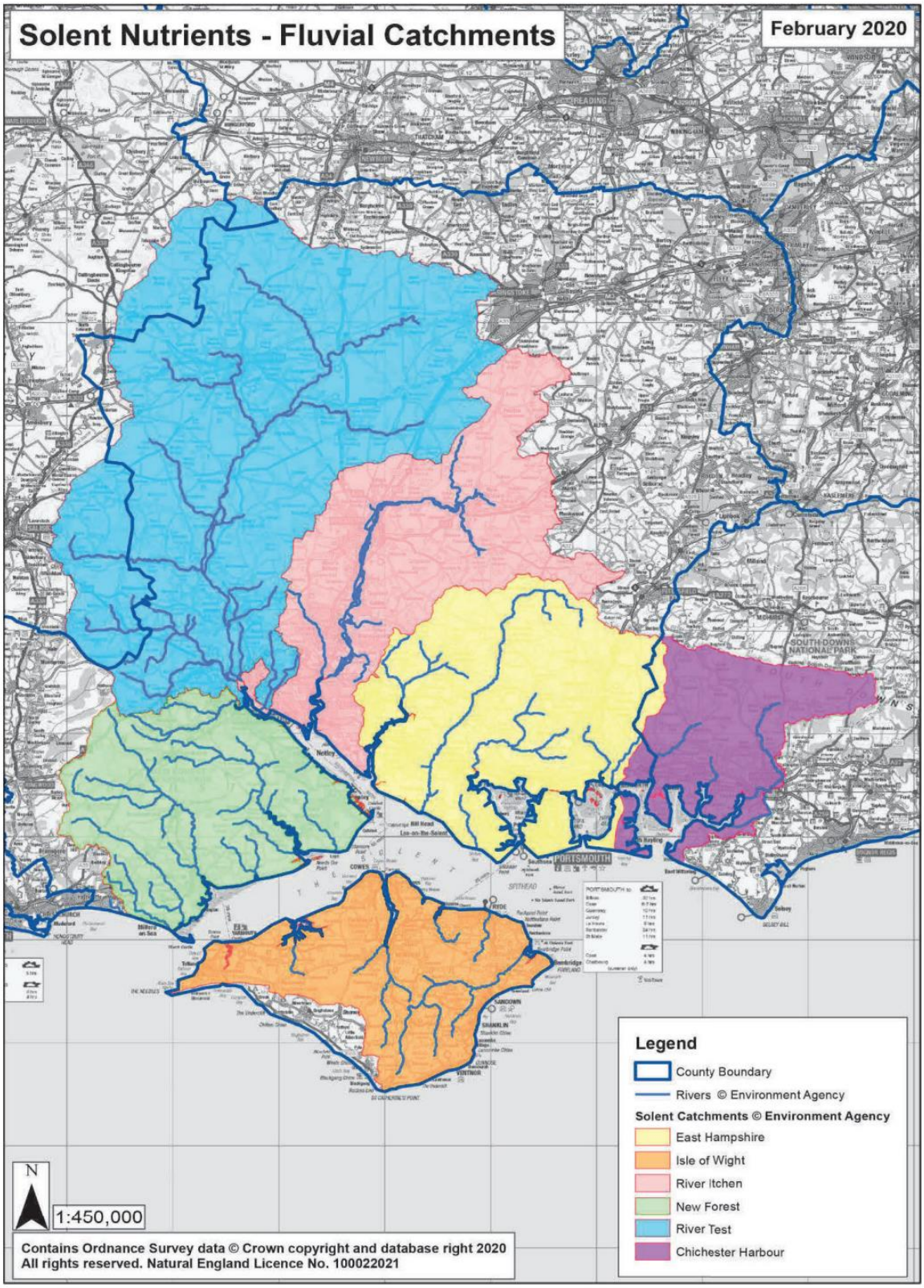
Authorised for BPS Design Consultants Ltd, 22nd July 2024

[redacted]

Robert Narramore IEng MICE

Managing Director

9.0 Appendix A



10.0 Appendix B

Nutrients from wastewater

This sheet contains 2 tables. The tables are separated by a heading, which describes the following table.
Note: You will need to fill in cells B5 to B10 in the first table 'Water infrastructure information'. Cell B11 is automatically calculated and will state '0.00' unless the user inputs have been entered. Cells A12 to A13 and B12 to B13 are automatically generated and will state 'Not applicable' depending on the inputs to cells B5 and B10. You may need to fill in cell C11 depending on the information you entered in cell B10. Cells C5 to C10 and cells C12 to C13 are intentionally blank cells.
You do not need to fill in any cells in the second table 'Final calculation of nutrient load from wastewater'. Cells B17 to B19 are automatically calculated and will state '0.00' unless the user inputs have been entered to the first table 'Water infrastructure information'. Cells A20 to A23, cell B21 and cell B23 are automatically generated and will state 'Not applicable' depending on the user inputs to the first table 'Water infrastructure information'. Cell B16, cell B20 and cell B22 are intentionally blank cells.
How to fill in the table 'Water infrastructure information'
Cell B5: Enter the date of first occupancy.
Cell B6: Enter the average occupancy rate of the development. The default rate is 2.4, this should not be edited without sufficient evidence.
Cell B7: Enter the water usage. This value should be kept at 120 unless other efficiency measures are used.
Cell B8: Enter the total number of dwellings or units that will be within the development site as of the project completion date.
Cell B9: Choose whether the development can apply deductible acceptable loading from the dropdown list.
Cell B10: Choose the receiving wastewater treatment works (WwTW) from the dropdown list.
If you select 'Package Treatment Plant user defined' or 'Septic Tank user defined', you must enter their certified value of total nitrogen (TN) in cell C11. Otherwise the default values will be used in the calculation of the nutrient load associated with wastewater.
Nutrient permits may be changing for the WwTW you select, from 01/01/2025, or 01/04/2030. If the date of first occupancy is in-between changing permit dates, multiple permit limits may be automatically generated in cells B11 to B13. If applicable, up to 3 values for the nutrient loading associated with wastewater will be presented in cell B19, B21, and B23.

Water infrastructure information

Description of required information	Data entry column - user inputs required	Additional data entry column - user inputs may be required
Date of first occupancy (dd/mm/yyyy):	30/06/2025	
Average occupancy rate (people/dwelling or people/unit):	2.40	
Water usage (litres/person/day):	120	
Development proposal (dwellings/units):	1	
Include deductible acceptable loading?	No	
Wastewater treatment works:	Package Treatment Plant user defined	
Current wastewater treatment works N permit (mg TN/litre):	**Enter value in cell C11**	9.1
Not applicable	**Not applicable**	
Not applicable	**Not applicable**	

Final calculation of nutrient load from wastewater

Description of values generated	Values generated
Wastewater nutrient loading	
Additional population (people):	**2.40**
Wastewater by development (litres/day):	**288.00**
Annual wastewater TN load (kg TN/yr):	**0.75**
Not applicable	
Not applicable	**Not applicable**
Not applicable	
Not applicable	**Not applicable**

Nutrients from current land use

This sheet contains 2 tables. The tables are separated by a heading, which describes the following table.
Note: You will need to fill in cells B5 to B8 in the first table 'Current land use information'. You will need to fill in cells A11 to A27, and B11 to B27 in the second table 'Current land uses'.
Cells B28 and C11 to C28 are automatically calculated and will state '0.00' unless the user inputs have been entered. Cells D11 to D27 are automatically generated and will state 'Not applicable' depending on automatically generated data in cells C11 to C27. Row 28 is a Total Row. The Total Row states 'Totals:' in cell A28 and automatically calculates the total sum of cells B11 to B27 in cell B28 and C11 to C27 in cell C28. Cell D28 is intentionally blank.
How to fill in the table 'Current land use information'
Cell B5: Choose the operational catchment the site is located within from the dropdown list.
Cell B6: Choose the soil drainage type associated with the predominant soil type within the development site from the dropdown list.
Cell B7: Choose the annual average rainfall the development will receive from the dropdown list. If the rainfall volume is not on the list, select the nearest value.
Cell B8: Choose whether the development is in a nitrate vulnerable zone (NVZ) from the dropdown list.
How to fill in the table 'Current land uses'
Cell A11-A27: Choose the existing (pre-development) land use type(s) from the dropdown list.
Cells B11-B27: Enter the area in hectares of each land use type.
The nutrient load from current land uses is shown in cells C11-C27 for total nitrogen (TN).
The total nutrient load from current land uses is shown in cell C28 for TN.

Current land use information

Description of required information	Data entry column - user inputs required
Operational catchment:	Itchen
Soil drainage type:	Freely draining
Annual average rainfall (mm):	800.1 - 850
Within nitrate vulnerable zone (NVZ):	Yes

Current land uses

Existing land use type(s) - user inputs required	Area (ha) - user inputs required	Annual nitrogen nutrient export (kg TN/yr)	Notes on data
Residential urban land	0.10	**1.54**	Not applicable
		0.00	Not applicable
		0.00	Not applicable
		0.00	Not applicable
		0.00	Not applicable
		0.00	Not applicable
		0.00	Not applicable
		0.00	Not applicable
		0.00	Not applicable
		0.00	Not applicable
		0.00	Not applicable
		0.00	Not applicable
		0.00	Not applicable
		0.00	Not applicable
		0.00	Not applicable
		0.00	Not applicable
		0.00	Not applicable
Totals:	**0.10**	**1.54**	

Nutrients from future land use

This sheet contains one table.
Note: You will need to fill in cells A5 to A21 and B5 to B21. Cells B22 and C5 to C22 are automatically generated calculations and will state '0.00' unless the user inputs have been entered. Row 22 is a Total Row. The Total Row states 'Totals:' in cell A22 and automatically calculates the total sum of cells B5 to B21 in cell B22 and C5 to C21 in cell C22.

How to fill in the table 'Future land uses'
Cells A5-A21: Choose the future (post-development) land use type(s) of landcover present on the new site from the dropdown list
Cells B5-B21: Enter the area in hectares of each land use type.
The nutrient load from future land uses is shown in cells C5 to C21 for total nitrogen (TN).
The total nutrient load from future land uses is shown in cell C22 for TN.

Future land uses

New land use type(s) - user inputs required	Area (ha) - user inputs required	Annual nitrogen nutrient export (kg TN/yr)
Residential urban land	0.10	**1.54**
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
		0.00
Totals:	**0.10**	**1.54**

Nutrients from future land use after sustainable urban drainage system (SuDS) treatment

This sheet contains one table.
Note: You will need to fill in cells A5 to A29, cells B5 to B29, cells C5 to C29, cells E5 to E29 and cells F5 to F29 if you are including SuDS to remove nutrients from the surface runoff. Cell B30, cells D5 to D30 and cells G5 to G30 are automatically calculated and will state '0.00' unless the user inputs have been entered. Cells H5 to H29 are automatically generated and will state 'Not applicable' unless the total area of the landcover entered is larger than the total area of the landcover entered into the worksheet 'Nutrients_from_future_land_use'. Row 30 is a Total Row. The Total Row states 'Totals:' in cell A30 and automatically calculates the total sum of cells B5 to B29 in cell B30, cells D5 to D29 in cell D30 and cells G5 to G29 in cell G30. Cell C30, cell E30, cell F30 and cell H30 are intentionally blank.
How to fill in the table 'Suds information'
Cells A5 to A29: Choose the future (post-development) land use type(s) of landcover present on the new site within the SuDS catchment area from the dropdown list. Only landcovers entered into the worksheet titled 'Nutrients_from_future_land_use' can be entered.
Cells B5 to B29: Enter the area in hectares of each new land use type within the SuDS catchment area.
Cells C5 to C29: Enter the percentage of the flow entering the SuDS feature. If all flow is being diverted to the SuDS feature then this value should be set to 100%.
The annual total nitrogen (TN) loads associated with the landcovers in the SuDS catchment area are automatically calculated in cells D5 to D29.
Cells E5 to E29: Enter the name of the SuDS features used to intercept surface flows can be entered in. Any text can be entered into these cells.
Cells F5 to F29: Enter the nutrient removal rates associated with the SuDS features for TN.
Values for columns F must be identified by the user and must be specific to the SuDS features being implemented.
The annual TN loads removed by the SuDS features are automatically calculated in cells G5 to G29 for TN. These values are subtracted from the nutrient budget.
You do not need to fill in column H 'Notes on data'. It will state 'Not applicable' unless the total area of each landcover within the SuDS catchment area exceeds the area of the landcovers entered into the worksheet titled 'Nutrients_from_future_land_use'.
The total nutrient load removed through the SuDS features is shown in cell G30 for TN.

SuDS information

New land use type(s) within SuDS catchment area - user inputs required	SuDS catchment area (ha) - user inputs required	Percentage of flow entering the SuDS (%) - user inputs required	Annual nitrogen inputs to SuDS feature(s) (kg TN/yr)	Name of SuDS feature(s) - user inputs required	TN removal rate for features - user specified (%) - user inputs required	Annual nitrogen load removed by SuDS (kg TN/yr)	Notes on data
			0.00			0.00	Not applicable
			0.00			0.00	Not applicable
			0.00			0.00	Not applicable
			0.00			0.00	Not applicable
			0.00			0.00	Not applicable
			0.00			0.00	Not applicable
			0.00			0.00	Not applicable
			0.00			0.00	Not applicable
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			0.00			0.00	Not applicable
			0.00			0.00	Not applicable
			0.00			0.00	Not applicable
			0.00			0.00	Not applicable
			0.00			0.00	Not applicable
			0.00			0.00	Not applicable
Totals:	0.00		0.00			0.00	

Final nutrient budgets

This worksheet contains one table. This table is automatically populated using the outputs from the previous worksheets.

Note: You do not need to fill in any cells in the table. Cells B5 to B8 and cell B10 are automatically calculated and will state '0.00' unless the user inputs have been entered to all of the required worksheets. Cells A11 to A14, cell B12 and cell B14 are automatically generated and will state 'Not applicable' depending on the user inputs to the worksheet 'Nutrients_from_wastewater'. Cell B9, B11 and B13 are intentionally blank.

This table presents calculations that underpin the final annual nutrient budget for the development site. Up to 3 values for the nutrient budget may be presented in cells B10, B12 and B14 for total nitrogen (TN).

Total nutrient budget calculations

Description of values generated	Values generated
Wastewater TN load (kg TN/year):	**0.75**
Net land use TN change (kg TN/year):	**0.00**
TN budget:	**0.75**
TN budget + 20% buffer:	**0.90**
Annual nutrient budget	
The total annual nitrogen load to mitigate is (kg TN/yr):	**0.90**
Not applicable	
Not applicable	**Not applicable**
Not applicable	
Not applicable	**Not applicable**

11.0 Appendix C

Prüfinstitut für Abwassertechnik GmbH

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 ≥ 12°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

DAkkS Deutsche Akkreditierungs[redacted]

Elmar Lancé November 2016