CALCULATION RECORD

Job Name: Deal Ground and May Gurney

Job No: 332511371/4001

Note No: TN001 Rev B

Date: 21 June 2023

Prepared By: A Harman/ E Yetton

Subject: **Nutrient Budget Calculation Record**

1 Overview

1.1 Introduction

1.1.1 This Calculation Record has been prepared by Stantec, on behalf of Serruys, to provide guidance in support of development proposals at the Deal Ground and May Gurney site, Norwich.

1.1.2 All work has been undertaken following the advice provided by Natural England (NE) that development should not increase the loadings of nitrogen or phosphorous entering the hydrological catchment of The Broads and Wensum designated sites.

1.1.3 Following the guidance provided by Natural England (NE), the Norfolk LPAs in October 2022 released the River Wensum SAC & Broads SAC Nutrient Budget Calculator (v1.1) created by Royal Haskoning. This calculator has been designed to be more specific to the local area. This calculation record uses the Royal Haskoning calculator.

1.1.4 This nutrient budget calculation record is based upon the fixed masterplan available at the time of preparing this Calculation Record.

1.1.5 The information given within this calculation record is based on publicly available data at the time of writing, and no discussions with consultees have been undertaken.

1.2 Context

1.2.1 NE guidance outlines that there is evidence showing high levels of nutrient input to the environment causing eutrophication at specific sites with environmental designations. These nutrient inputs are often currently caused by wastewater from existing housing and agricultural sources, and there is uncertainty as to whether new growth will further deteriorate designated sites.

1.2.2 The Broads are designated as a Special Area of Conservation (SAC). The interest features are considered unfavourable, or at risk, from the effects of eutrophication caused by excessive nutrients. As such, any increase in nutrient supply caused by development within the catchment of the designation must be offset. One way to address this uncertainty is for new developments to achieve nutrient neutrality.

1.2.3 Nutrient neutrality is a means of ensuring that development does not add to existing nutrient burdens and aims to provide certainty that the whole scheme is deliverable in line with the requirements of the Conservation of Habitats and Species Regulation 2017 (as amended). Therefore, in line with national planning policy, the advice is that the competent authority should consider the implications of these matters on the SAC by undertaking a Habitats Regulation Assessment (HRA), proceeding to an appropriate assessment.

1.2.4 The appropriate assessment must rule out any reasonable doubt as to the likelihood of an adverse impact on the integrity of the site, having regard to its conservation objectives. In relation to mitigation, it should be in place so as to avoid either permanent, or temporary increases in nutrient loads to the designated site and must be effective for the duration of the effect. In the case of new housing the duration of the effect is typically taken as in perpetuity, with the costs of maintaining, monitoring and enforcing mitigation calculated for a minimum of 80 – 125 years.

1.3 Development Proposals

1.3.1 This Calculation Record will review the nutrient budget for 670 dwellings and associated greenspace (Figure 1.1) across 12.21ha. The site is transected by the River Yare and bounded to the north by the River Wensum.

1.3.2 The surface water drainage strategy proposes to discharge via watercourse. The Foul water has been assumed to convey to the Whitlingham Trowse WwTW.

Figure 1.1: Masterplan

2 Nutrient Budget

2.1 Parameters

2.1.1 To calculate a nutrient budget, a series of parameters have been defined, based on the hydrological setting of the site and development proposals. The nutrient budget has been calculated using the River Wensum SAC & Broads SAC Nutrient Budget Calculator created by Royal Haskoning for the present permit. Whitlingham Trowse WwTW is not proposed to undergo upgrades in the AMP 7 period and as such it is assumed that no permit change will occur by December 2024. The calculation parameters are included in **Table 2.1**.

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Parameter				Information Source
Dwellings	Houses		273	Deal Ground and May Gurney Block plan (Dwg ref: 055-S3-ZZ-A002) prepared by Stolon Studios 19/06/2023. Duplexes counted as 1 dwelling.
	Flats		325	
	Duplexes		72	
	Total		670	
Occupancy Rate			1.88	River Wensum SAC & Broads SAC Nutrient Budget Calculator v1.1 default.
Wastewater Treatment Works			Whitlingham Trowse	Assumed to be Whitlingham Trowse based on the WwTW catchment in the Nutrient Catchment Map (overview) prepared by Royal Haskoning.
Permit (mg/L)	N	Current	25.00	River Wensum SAC & Broads SAC Nutrient Budget Calculator v1.1 default.
	P	Current	0.90	
River Catchment			Yare	Environment Catchment Data Explorer [1]
Soil drainage type			Soilscape 23 – Loamy and sandy soils with naturally high groundwater and a peaty surface and Soilscapes 27 – Fen peat soils	Soilscapes [2]
Annual Average Rainfall (mm)			600.1-625	The UK Centre for Ecology & Hydrology National River Flow Archive [3]
Presence in Nitrate Vulnerable Zone			Yes	UK Soil Observatory NVZ Map[4]
Site Area (ha)			12.21	Deal Ground and May Gurney Block plan (Dwg ref: 055-S3-ZZ-A002) prepared by Stolon Studios 19/06/2023.
Pre-Development land use (ha)	Commercial / industrial		5.17	Historic aerial imagery and Deal Ground and May Gurney Block plan (Dwg ref: 055-S3-ZZ-A002) prepared by Stolon Studios 19/06/2023.
	Woodland		3.14	
	Shrub / heathland / bracken / bog		3.90	

[1] England | Catchment Data Explorer
[2] Soilscapes soil types viewer - Cranfield Environment Centre. Cranfield University (landis.org.uk)
[3] Catchment Info for 52016 - Currypool Stream at Currypool Farm (ceh.ac.uk)
[4] UK Soil Observatory (bgs.ac.uk)

Parameter			Information Source
Post Development land use (ha)	Medium Density Residential	6.21	Deal Ground and May Gurney Block plan (Dwg ref: 055-S3-ZZ-A002) prepared by Stolon Studios 19/06/2023. The density of the residential development has been classified as medium density. Medium-density residential land is defined as 'typically have between 25-50 units per hectare'.
	Woodland	1.47	
	Greenspace	4.53	

Table 2.1: Calculation Parameters

2.2 Nutrient Budget

2.2.1 The budget calculation methodology is formed of four stages to quantify the nutrient loading and demonstrate if there is additional loading resulting in the development proposals. Where the proposed development does create additional loading into the system, mitigation to offset these excess nutrients would be required to achieve nutrient neutrality.

2.2.2 The nutrient budget calculation is based upon the masterplan available at the time of preparing this Calculation Record.

2.2.3 Outcomes of the nutrient budget calculations are presented in **Table 2.2**, and a copy of the calculation is appended.

Calculation Stage	Calculation Output	TN	TP
Stage 1	Annual Wastewater load (kg/yr)	1,262.50	45.45
Stage 2	Pre-development Annual Nutrient Export (kg/yr)	52.34	5.04
Stage 3	Post-development Total Annual Nutrient Export (kg/yr)	50.58	2.22
Stage 4	Nutrient Budget excl 20% buffer (kg/yr)	**1260.73**	**42.63**
	Nutrient Budget incl 20% buffer (kg/yr)	**1,512.88**	**51.15**

Table 2.2: Nutrient Budget

2.2.4 The calculator assumes that the phosphorus discharge concentration from Whitlingham Trowse WwTw is 90% of the permit/current discharge. For nitrogen there is no permit/current discharge is known, therefore the standard value of 25mg/l is adopted in accordance with guidance.

2.2.5 A precautionary buffer of 20% is applied to the nutrient budget. This buffer is used to recognise the uncertainty with the data and allows for a precautionary approach. Including the recommended 20% buffer, these calculations set the nutrient budget for the proposed development at **51.15**kgTP/yr and **1512.88**kgTN/yr.

2.2.6 Therefore, based on the calculations presented, the proposed development at the Deal Ground and former May Gurney site does require mitigation to demonstrate nutrient neutrality.

2.3 Mitigation

2.3.1 The nutrient budget assessment indicates there is a requirement for mitigation to achieve neutrality.

2.3.2 The proposed mitigation for the entire nutrient budget will be provided through third-party credits scheme, Norfolk Environmental Credit, for which an expression of interest has been submitted for the quantity of credits required to mitigate **51.15**kgTP/yr and **1512.88**kgTN/yr.

DOCUMENT ISSUE RECORD

Technical Note No	Rev	Date	Prepared	Checked	Reviewed (Discipline Lead)	Approved (Project Director)
332511371/4001/TN001	-	27/01/23	AJH	KT	KT	ASA
332511371/4001/TN001	A	09/02/23	AJH	KT	AJ	AJ
332511371/4001/TN001	B	21/06/23	EY	KT	GN	ACS

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Appendix A

Deal Ground and May Gurney, May Gurney Block Plan (dwg ref: 055-S3-ZZ-A002) prepared by Stolon Studios dated 19/06/2023

1 : 1000
00_Grd Base

1. All Dimensions in mm unless stated otherwise.
2. Do not scale this drawing. All dimensions to be verified by the contractor befor work is commenced.
3. Architect to be notified immediately if any discrepancies are found.
4. All shop drawings to be approved by Architect before work commences.
5. All details to be in accordance with relevant British Standards and manufactures recommendations and specification.
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9 This drawing is produced based on Survey information by others and Stolon Studio Ltd take no responsibility for the accuracy of this information.

Notes

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Rev	Date	Description
A	19/06/2023	Reserved Matters Issue

Drawing Title:	Block Plan	Scale:	1 : 1000 @ A1
Project No.:	055	First Issue:	19/06/2023
Project Name:	Deal Ground and May Gurney Site	Status:	Stage 3
Project Adress:	Dealground, Norwich	Drawing No.:	055-S3-ZZ-A002 Rev.: A

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Appendix B

Nutrient Budget Calculation Sheet

Stage 1 **Calculate nutrient load (Kg/year) derived from the development as a result of increased population**

*Note: This calculation should only include the **additional** units resulting from the proposed development, including any development that will result in overnight accommodation. For land not currently in residential use, this will be the total units proposed by the development. However, for land already in residential use, this should only be the increase in units.*

The user should input the relevent number of dwellings into options a, b or c below. In the case of residential developments, only option a is required.

1.	Calculate the additional population	Value	Unit
a	Number of dwellings proposed	670	dwellings
	Average occupancy	1.88	persons/dwelling
b	Number of **additional** rooms above 6 residents (sui generis) for houses in multiple occupation		dwellings
	Average occupancy	1.65	persons/dwelling
c	Number of rooms in a hotel or guest house proposed		dwellings
	Average occupancy	1.65	persons/dwelling
	Number of weeks open per year (1-52)		Weeks
	Average occupancy rate (1-100)		%
	Total population increase generated by the development	**1257**	**Persons**

2.	Wastewater volume generated		
	Water use per person	**110**	Litres/person/day
	Wastewater volume generated by the development	**138261**	**Litres/day**

Please select how the sewage from the proposed development will be handled, noting that a development must be handled by either a water recycling centre or onsite treatment plants, and cannot be handled by both. Consideration of wastewater loading is not required where a site drains to a WRC that does not drain in to the River Wensum or the Broads catchments

Is sewage to be handled by water recycling centre? Yes

Is sewage to be handled by Onsite treatment plants? No

3a. TP budget that would exit the Water Recycling Centre (WRC) after treatment

Note: If the sewage is to be treated by WRCs then the user should select "Yes" in the list above. If package treatment plants are to be used instead, then the user should select "No" above.

This is the process of collecting wastewater from houses and guiding it, via the sewage network, to a WRC (also known as sewage works). The nutrient concentration of the influent is calculated by multiplying the number of people by the expected water usage per day. The nutrient concentration within the effluent is calculated by applying the discharge level of the appropriate WRC. The nurtrient loading is expressed in kg/year.

Confirm receiving WRC and discharge level	Value		Unit
Select the WRC the development will connect to	Whitlingham Water Recycling Centre		
	Current discharge	Post 2030 discharge	
Phosphorus WRC discharge level	0.90	0.23	mg/l
Nitrogen WRC discharge level	25.00	9.00	mg/l

Note: Please use the drop down lists to select the WRC that the proposed development will be connected to. If the WRC is not known, then please select 'Unknown' from the drop down list.

Calculate the nutrient load discharged by the WRC	Value		Unit
	Current discharge	Post 2030 discharge	
TP discharged by WRC	45.45	11.36	kg/year
TN discharged by WRC	1262.50	454.50	kg/year

3b. TP budget for Onsite treatment plants

Note: If the sewage is to be treated by on-site treatment plants then the user should select "Yes" in the list above. If wastewater treatment works are to be used instead, then the user should select "No" above.

On-site treatment plants are pre-manufactured treatment facilities used to treat wastewater in smaller communities or on individual properties. This concept is defined as decentralized wastewater treatment. The nutrient influent is calculated by multiplying the number of people by the expected loading per person. The nutrient effluent is calculated by applying the reduction efficiency. The nutrient loading is expressed in kg/year.

Calculate nutrient load after treatment	Value	Unit
Select the type of On-site treatment works	Package treatment plant	
Phosphorus discharge level	Please enter effluent concentration in cell to right:	mg/l
Nitrogen discharge level	Please enter effluent concentration in cell to right:	mg/l

Note: The user must input the reduction efficiency of the PTP. The efficiency of the PTP used must be evidenced. The evidence should include the test result documents from the lab (in English) and/ or measured effluent concentrations from real world applications. If the efficiency is unknown then a precautionary default value can be used

Calculate loading from wastewater with onsite treatment plants	Value	Unit
TP discharged by on-site treatment plant	0.00	kg/year
TN discharged by on-site treatment plant	0.00	kg/year

4.	Additional population load	Value Current	Post 2030	Unit
	TP load from additional population	**45.45**	**11.36**	**Kg/year**
	TN load from additional population	**1262.50**	**454.50**	**Kg/year**

Stage 2 **Calculate existing (pre-development) nutrient load from current land use of the development**

Note: Where development sites include existing areas that are to be retained, these areas can be excluded from the calculations in both Stages 2 and 3.

1. Identify current land uses of the development site

	Value	Unit
The user should select the value from the following drop-down list that applies to the development. Use the links below or navigate to the 'Introduction' tab to find instructions on how this information can be acquired.		
Select the Catchment	Yare	
Select the soil drainage type	Impermeable - drained for arable	
Select annual average rainfall band	600-625	mm/yr
Within Nitrate Vulnerable Zone (NVZ)	Yes	

Note: Use the Link in the introduction tab to find the appropriate catchment
Note: Use the criteria table in the introduction tab to identify if the soil type
Note: Rainfall can be identified using the map on the Rainfall tab
Note: Use the Link in the introduction tab to find out whether the development is in a Nitrate Vulnerable Zone (NVZ)

2. Input the area of the existing land use type(s)

			TP loading	TN loading	
High density residential		Hectares	0.00	0.00	Kg/yr
Medium density residential		Hectares	0.00	0.00	Kg/yr
Low density residential		Hectares	0.00	0.00	Kg/yr
Commercial / Industrial	5.170	Hectares	4.90	31.22	Kg/yr
Urban open space		Hectares	0.00	0.00	Kg/yr
Dairy		Hectares	0.00	0.00	Kg/yr
Lowland grazing		Hectares	0.00	0.00	Kg/yr
Mixed		Hectares	0.00	0.00	Kg/yr
Poultry		Hectares	0.00	0.00	Kg/yr
Pigs		Hectares	0.00	0.00	Kg/yr
Horticulture		Hectares	0.00	0.00	Kg/yr
Cereals		Hectares	0.00	0.00	Kg/yr
General arable		Hectares	0.00	0.00	Kg/yr
Allotments and city farms		Hectares	0.00	0.00	Kg/yr
Woodland (e.g. conifer, mixed, broad-leaved)	3.140	Hectares	0.06	9.42	Kg/yr
Greenspace		Hectares	0.00	0.00	Kg/yr
Shrub / heathland / bracken / bog	3.900	Hectares	0.08	11.70	Kg/yr
Water		Hectares	0.00	0.00	Kg/yr
Sum total	**12.210**	**Hectares**	**5.04**	**52.34**	**Kg/yr**

3. Calculate loading from current land usage

	Value	Unit
TP load from proposed land usage	**5.04**	**Kg/yr**
TN load from proposed land usage	**52.34**	**Kg/yr**

Stage 3 **Calculate nutrient load for the proposed development**

Note: This section should include all land uses within the proposed development. Where the proposed scheme is to create new wetlands, woodlands, nature reserves, etc. within the development site area, then this should be included within this section. Any offsite mitigation should not be included below, and should instead be inputted in Stage 5 (if mitigation is required).

2.	Identify proposed land uses of the development site	Value	Unit
	High intensity urban land		Hectares
	Medium intensity urban land	6.210	Hectares
	Low intensity urban land		Hectares
	Commercial / Industrial		Hectares
	Open urban space		Hectares
	Allotments and city farms		Hectares
	Woodland (e.g. conifer, mixed, broad-leaved)	1.470	Hectares
	Green space	4.530	Hectares
	Shrub / heathland / bracken / bog		Hectares
	Water		Hectares

3.	Designed Wetlands / SuDS		
	Wetland / SuDS area		Hectares
	TP Banking coefficient		kg/ha/year
	TN Banking coefficient		kg/ha/year

Note: Please input the banking coefficient (i.e. the nutrient removal amount in kg/ha/yr) calculated for the designed wetland / SuDS. The calculated value should be justifiable with supporting evidence.

	Sum total of land uses	**12.210**	**Hectares**

Note: The sum total of land uses must equal the development site area inputted in Stage 2 - the box will colour red if the areas do not match. Wetland refers to specific wetland related to a watercourse. For more information, please refer to the land use definitions in the help tab.

4.	Calculate loading from proposed land usage	Value	Unit
	TP load from proposed land usage	**2.22**	**kg/year**
	TN load from proposed land usage	**50.58**	**kg/year**

Stage 4 **Calculate the net change in nutrient load from the proposed development**

Note: This stage calculates the net change in TP and TN load to the catchment from the proposed development. This is derived by calculating the difference between the load calculated for the proposed development (wastewater, urban area, open space, etc.) and that for the existing land uses. The nutrient budget for the site has been calculated under current and post-2025 WRC permit levels, where applicable.

		Current	Post 2030		Summary	
					No. of dwellings	670
1.	Identify the load from additional population	Value	Value	Unit	WRC location	Whitlingham Water Recycling Centre
					Current TP discharge concentr	0.90
	TP Loading from additional population	**45.45**	**11.36**	**kg/year**	Current TN discharge concentr	25.00
	TN Loading from additional population	**1262.50**	**454.50**	**kg/year**		
					Post 2030 TP discharge concer	0.23
					Post 2030 TN discharge concer	9.00
2.	Calculate net change in nutrient load from land use change	Value	Value	Unit	TP current land use	5.04
	TP load from land use change	**-2.82**	**-2.82**	**kg/year**	TP proposed land use	2.22
	TN load from land use change	**-1.77**	**-1.77**	**kg/year**	TN current land use	52.34
					TN proposed land use	50.58
3.	Calculate nutrient budget for the development site	Value	Value	Unit		
	TP budget for the site	**42.63**	**8.54**	**kg/year**		
	TN budget for the site	**1260.73**	**452.73**	**kg/year**		
4.	Calculate precautionary buffer	Value	Value	Unit		
	Buffer amount	20	20	%		
	TP Precautionary buffer	**8.53**	**1.71**	**kg/year**		
	TN Precautionary buffer	**252.15**	**90.55**	**kg/year**		

Note: The figures used throughout this model are based on scientific research, evidence and modelled catchments and represent the best available evidence. However, it is important that a precautionary buffer is used that recognises the uncertainty with these figures and ensures, with reasonable certainty, that there will be no adverse effect on site integrity. As such, a 10% precautionary buffer added to tthe nutrient budget.

5.	**Total nutrient budget for the development site**	Value		Unit
	Total Phosphorus budget for the site	**51.15**	**10.25**	**Kg/year**
	Total Nitrogen budget for the site	**1512.88**	**543.28**	**Kg/year**

Current TP loading

Development will generate additional Phosphate (Mitigation required) - Please progress to 'Mitigation current' tab

Post 2030 TP loading

Development will generate additional Phosphate (Mitigation required) - Please progress to 'Mitigation - post 2030' tab

Current TN loading

Development will generate additional Nitrate (Mitigation required) - Please progress to 'mitigation - current' tab

Post 2030 TN loading

Development will generate additional Nitrate (Mitigation required) - Please progress to 'Mitigation - post 2030' tab