ADDENDUM TO 'REVIEW OF THE WARBLINGTON FARM MITIGATION OPTION FOR NUTRIENT NEUTRAL DEVELOPMENT IN THE HAVANT BOROUGH'

Natural England (NE) recently (March 2022) published new advice on nutrient neutrality (NN). Ricardo supported NE in the production the nutrient budget calculators that accompanied this guidance. Part of the process of creating the new nutrient budget calculators involved an update to the agricultural export coefficients that are used in the nutrient budget calculations to determine nitrogen export from land uses on pre-development residential sites. NE had previously published a set of average agricultural export coefficients for different farm types in the original NN advice for the Solent region[1]. These export coefficients had been used by Havant Borough Council (BC) to calculate the nitrogen mitigation potential of Warblington Farm, a farm on the edge of Langstone Harbour that is under the ownership of the Council. There is an opportunity for Warblington Farm to be taken out of intensive agricultural production in order to offset additional nitrogen produced by new developments within the borough.

Ricardo previously reviewed the Warblington Farm scheme to assess whether it could be used as mitigation in a Habitats Regulations Assessment (HRA) Appropriate Assessment (AA) and it was found that the scheme was suitable for providing nitrogen offsetting for new development in Havant Borough[2]. In light of the new NN guidance from NE, Havant BC have requested that Ricardo prepare an Addendum to the Warblington Farm review. This Addendum will assess whether the amount of nitrogen mitigation provided by Warblington Farm has changed due to the changes in the agricultural export coefficients in the new nutrient budget calculator methodology. NE's new NN advice also contained a set of Principles to guide how mitigation should be delivered to comply with the Habitat Regulations. This Addendum also assesses the Warblington Farm scheme is respect of these NN Principles.

1. REVISION OF A NUTRIENT BUDGET FOR THE WARBLINGTON FARM SITE

Havant BC completed nitrogen budget calculations to determine the amount of nitrogen that is produced annually by the existing land use on Warblington Farm. The scheme is being delivered in phases. Phase 1 is active, with agricultural land in this part of the site having already ceased. Phase 1 is currently being used for offsetting nitrogen from new development in Havant Borough. The remaining phases will see the cessation of agriculture in the remaining areas of the site not used covered by Phase 1.

Calculations to revise the nutrient budget and offsetting potential for Warblington Farm were therefore carried out for both Phase 1 of the scheme for the entire Warblington Farm site, which will comprise the total available nitrogen offset once all phases of the scheme has begun. Below, the nitrogen budget outputs from the previous NE Solent nutrient budget methodology are provided alongside the revised nutrient budget outputs based on the new methodology, in order to aid comparison of any changes.

1.1 PHASE 1 NUTRIENT BUDGET

1.1.1 Original Solent Nutrient Budget Methodology

Havant BC classified Warblington Farm as a dairy farm as more than two thirds of the farm is used for dairy farming and thus can be classified as the Dairy farm type under the Defra robust farm types. To calculate the annual nutrient loading from Phase 1 of the Warblington Farm mitigation scheme (Figure 1.1), the area of the site was multiplied by the relevant nitrogen loss coefficient for dairy farms. The Solent dairy farm export coefficient, as detailed in the NE Solent advice[1] note, is 36.2 kg N/ha/year. This export coefficient was derived using Farmscoper modelling. To

[1] Natural England. 2020. ADVICE ON ACHIEVING NUTRIENT NEUTRALITY FOR NEW DEVELOPMENT IN THE SOLENT REGION (Version 5).
[2] Ricardo. 2020. Review of the Warblington Farm Mitigation Option for Nutrient Neutral Development in the Havant Borough. Report for Havant Borough Council.

account for the future background export of nitrogen from the site, 5 kg N/ha/year[3] was subtracted from the dairy farm export coefficient, indicating a long-term reduction in nitrogen export from the site of 31.2 kg N/ha/year. The area of Phase 1 of the scheme is 24.92 ha, which when multiplied by the revised nitrogen export coefficient (31.2 kg N/ha/year) suggests that Phase 1 will provide a nitrogen offset of 777.5 kg N/year. It is worth noting that the nitrogen export coefficient provided by NE in the original Solent NN advice[1] was based on averages for each farm type calculated for the whole Solent region and did not incorporate site-specific information.

1.1.2 Revised Nutrient Budget Methodology

Based on the updated 2022 NN guidance, Ricardo have re-calculated the nitrogen budget to provide an up-to-date estimate of the annual nutrient load Havant BC can expect to mitigate through Phase 1 of taking Warblington Farm out of intensive agricultural production. This method considers site-specific information such as the Water Framework Directive Operational Catchment the mitigation scheme is in, soil drainage type, annual average rainfall and whether or not the site is within a Nitrate Vulnerable Zone (NVZ).

In line with the methodology as described in the new Ricardo / NE nutrient budget calculators, Warblington Farm's Operational Catchment (OC) was established as the Western Streams catchment using the Environment Agency's Catchment Data Explorer[4]. The soil drainage type for the site was obtained using Soilscapes[5]. Soils at Warblington Farm are classified as 'naturally wet' in Soilscapes. Annual average rainfall of 675-700 mm/yr for the site was obtained from the National River Flow Archive[6]. Finally, the UK Soil Observatory[7] was used to determine whether Warblington Farm is within a Nitrate Vulnerable Zone. The combination of these variables determines which nitrogen export coefficient for dairy farms is used to calculate the estimated nitrogen offset that the Warblington Farm scheme will deliver. However, where no data for the exact combination of these variables is returned, an average is taken of all the farm types within a given region. The combination of the above variables for Warblington Farm did not match any of the combinations present in the new nutrient budget calculators and thus a default nitrogen export coefficient of 36.3 kg N/ha for dairy farms in the Solent region was used. This default value is based on updated Farmscoper modelling done to support the new nutrient budget methodology.

The background export from the future land use on the Warblington Farm site was then subtracted from the dairy farm export coefficient. As in the original nutrient budget methodology, the greenspace nitrogen export coefficient was used to describe future nitrogen export from the site. In the 2022 nutrient budget methodology, the greenspace nitrogen export value has been revised down from 5 kg N/ha/year to 3 kg N/ha/year, due to the removal of pet waste inputs from the greenspace coefficient, as it is now assumed that pet waste inputs are accounted for within the urban residential export calculated for new developments. Thus, subtracting the new greenspace export coefficient (3 kg N/ha/year) from the new dairy farm export coefficient for the site (36.3 kg N/ha/year), results in a future reduction in nitrogen export from Warblington Farm of 33.3 kg N/ha/year.

Finally, the area of Phase 1 of the Warblington Farm scheme (24.92 ha) was multiplied with the new export coefficient (33.3 kg N/ha/year). This provides an updated annual nutrient offset from the site of 830.8 kg N/year. This figure does not take into consideration mitigation which has already been secured by development from Phase 1. Therefore, it is incumbent on the Council to calculate the remaining capacity of Phase 1 using the new Natural England guidance.

1.1.3 Comparison of the outputs from the original and revised nutrient budget methodologies

The revised nutrient budget calculations differ slightly from the values initially calculated (Table 1.1). The nitrogen offset the farm can deliver has been recalculated as being higher than previously expected. This is due to using a lower greenspace nitrogen export coefficient, as well as a slightly higher dairy export coefficient.

[3] This is value is the assumed background export of nitrogen from greenspace as detailed in NE's original Solent NN advice.
[4] See: https://environment.data.gov.uk/catchment-planning/, accessed on 29/04/2022.
[5] See: http://www.landis.org.uk/soilscapes/, accessed on 29/04/2022.
[6] See: https://nrfa.ceh.ac.uk/data/search, accessed on 29/04/2022.
[7] See: http://mapapps2.bgs.ac.uk/ukso/home.html, accessed on 29/04/2022.

Figure 1.1: Visual representation of the area available for Phase 1 of the mitigation scheme

Table 1.1: Initial and revised calculations for Phase 1 of the mitigation scheme

	Calculation	Result (kg TN/year)
Initial Calculation	24.92 * (36.2 – 5)	777.5
Revised Calculation	24.92 * (36.34 – 3)	830.8

1.2 NUTRIENT BUDGET FOR THE WHOLE WARBLINGTON FARM SITE

1.2.1 Original Solent Nutrient Budget Methodology

To calculate the annual nutrient loading from whole of the Warblington Farm scheme, the same approach as detailed in Section 1.2.1 was used with total area of the Warblington Farm site. Havant BC originally estimated the area of Warblington Farm being given over to nitrogen mitigation at 60 ha. Combining this area with the export coefficient of 31.2 kg N/ha/year (see Section 1.2.1) resulted in an estimated 1872 kg N/year being available from the scheme to offset nitrogen loading from new development.

1.2.2 Revised Nutrient Budget Methodology

Using the same methodology as was used for Phase 1 (see Section 0), Ricardo have re-calculated the nitrogen budget for Warblington Farm based on the new NN advice for the Solent region. It was confirmed that the same site-specific information used to calculate the nitrogen budget for Phase 1 of the site can be used for the entire site. As such, the revised nitrogen export coefficient remains the same: 33.34 kg N/ha/year.

In confirming the area what will be available for nitrogen offsetting at Warblington Farm, the areas of the farm that will be used for nitrogen offsetting were mapped using GIS and the Defra MAGIC mapping service[8]. All pastural land and land in arable rotation were included and classified as dairy, as the arable fields grow crops used for dairy production. The area associated with farmyard and curtilage was mapped and included as these parts of farms are included within Farmscoper outputs. Wetlands, rough grazing, cemeteries, and land not currently available to Havant BC was excluded. As a result, the calculated area available for nitrogen offsetting is 56 ha. Figure 2 shows the land available for mitigation at Warblington Farm.

Using the refined area of the Warblington Farm scheme (56 ha) and the new nutrient export coefficient based on the revised nutrient budget methodology (33.34 kg N/ha/year), the updated annual nutrient load and offset estimate is 1867 kg N/year.

As stated in Section 1.1.2, the Solent nitrogen budget calculator does not have data for the exact combination of site-specific variables found for Warblington Farm. As a result, an average was taken of all the nitrogen exports from dairy farms within the Solent region. The revised annual nutrient load and offset from Warblington Farm is therefore ascertained in a similar manner to the original methodology, though it is based on more up to date Farmscoper modelling and a revised greenspace export coefficient.

1.2.3 Comparison of results between original and revised nutrient budget methodologies

The revised calculation for the entire site differs slightly from the initial calculation carried out by Havant BC, with a marginally lower value returned (Table 1.2). This is due to using a smaller site area following a revision of the area of the site available for nitrogen offsetting. However, it is noted that the use of a lower greenspace export coefficient in the revised methodology cancels out most of the effect of the reduced site area.

Table 1.2: Initial and revised calculations for the entire site of the mitigation scheme

	Calculation	Result (kg TN/year)
Initial Calculation	60 * (36.2 – 5)	1872
Revised Calculation	56 * (36.34 – 3)	1867

[8] See: https://magic.defra.gov.uk/magicmap.aspx, accessed on 03/05/2022

Figure 1.2: Total area available for mitigation at Warblington Farm, shown by the blue outline.

2. ALIGNMENT WITH NUTRIENT NEUTRALITY PRINCIPLES

Since the initial development of the Warblington Farm mitigation proposal, NE have published a set of NN Principles. Any form of nutrient mitigation going forward must conform to these Principles in order to meet the requirements of the Habitat Regulations. As such, this section verifies the alignment of the mitigation scheme with these Principles to establish that the scheme remains appropriate in light of this new guidance.

Each of the seven Principles are provided verbatim as sub-headings below, followed by an assessment of the Warblington Farm scheme in relation to this Principle.

2.1 HAVE SCIENTIFIC CERTAINTY THAT THE MEASURES AT THE TIME OF THE AA WILL DELIVER THE REQUIRED REDUCTION TO MAKE THE PLAN OR PROJECT 'NEUTRAL'

This Principle requires significant certainty that the mitigation scheme will deliver the proposed nutrient reduction. Taking land out of intensive agricultural use eliminates the input of nitrogen to a designated site via nutrients produced by agricultural land use, e.g. dairy farming in the case of Warblington Farm. The link between agriculture and nutrient pollution is well established, meaning that the nutrient reductions that agricultural offsetting can deliver have scientific certainty. In the instance of novel, highly variable solutions, whereby nutrient pollution is intercepted downstream of the source, precautionary estimates and monitoring are required. In this instance, however, the source itself is entirely mitigated. As such, there remains no reasonable scientific doubt that the solution will provide nutrient mitigation, thus providing the necessary certainty for plans or projects to be nutrient neutral if using the Warblington Farm Mitigation scheme.

2.2 HAVE PRACTICAL CERTAINTY THAT THE MEASURES WILL BE IMPLEMENTED AND IN PLACE AT THE RELEVANT TIME WHEN THE AA IS UNDERTAKEN, E.G. SECURED AND FUNDED FOR THE LIFETIME OF THE DEVELOPMENT'S EFFECTS.

It is essential that agricultural activities and the associated nutrient inputs at Warblington Farm have ceased prior to the occupation of proposed developments that are using the scheme as mitigation, and that Havant BC can evidence that the farm will remain out of agricultural production to provide nutrient mitigation for the lifetime of a development. This is in line with Havant BC's mitigation proposal as the land is owned by Havant BC and they can therefore secure the land in a timely fashion and in perpetuity. The long-term solution begins mitigating pollution immediately after implementation, supporting the certainty of the solution at the time of assessment. Provided the land remains out of agricultural production, the scheme supports this Principle.

2.3 BE PREVENTATIVE IN NATURE SO AS TO AVOID EFFECTS IN THE FIRST PLACE RATHER THAN OFFSET OR COMPENSATE FOR DAMAGE. THIS APPLIES BOTH TEMPORALLY AND SPATIALLY.

To achieve neutrality, nutrient mitigation should be effective at the time when a new nutrient impact starts and at the point within a catchment the impact takes effect.

2.3.1 Ensuring temporal continuity of nutrient neutrality

Consideration must be given to when the measure is expected to come online and whether the benefits will be effective when nutrient pollution from new development comes online. In the case of nitrogen pollution from agriculture, there is a negligible time lag between taking agricultural land out of production and the associated reduction in nutrient pollution. Thus, developments using Warblington Farm as a mitigation solution will see a preventative effect from the scheme assuming that farming at Warblington Farm has ceased prior to occupation of the development, supporting this Principle.

2.3.2 Ensuring spatial continuity of nutrient neutrality

The location of the solution relative to the point within a designated site where the impact will take effect must be considered as this Principle states that no area of a designated site should see an increase in nutrients prior to the point within the waterbody where a mitigation scheme has taken effect. In most cases this point of impact is where sewage discharges from a development enter the designated site, which will normally be via a wastewater treatment works. Havant BC have worked with Natural England to identify the wastewater treatment works for which Warblington Farm can provide mitigation, ensuring that the scheme will be able to provide spatial continuity of NN in the affected areas of the Solent Marine designated sites.

2.4 NOT UNDERMINE THE OBJECTIVE OF RESTORING THE SITE TO FAVOURABLE CONDITION BY MAKING THE 'RESTORE' OBJECTIVE APPRECIABLY MORE DIFFICULT OR PREJUDICING THE FULFILMENT OF THAT OBJECTIVE.

Designated sites that have the requirement for NN are currently in unfavourable condition or close to unfavourable condition due to nutrient pollution. These sites will have a 'restore' objective that will require a reduction in nutrient pollution that will enable the site to meet favourable condition status for nutrients, as well as other potential measures depending on the other pressures a site may be under. This principle states, therefore, that a mitigation scheme should not do anything to jeopardise the restoration of a designated site, as could occur in a scenario whereby measures are simply used to enable growth, as opposed to for the purpose of achieving restoration. Taking agricultural land out of intensive production does not prejudice the fulfilment of conservation objectives as it simply removes a source nutrient pollution that would otherwise have continued to have an impact on the designated sites in the Solent. Furthermore, Havant BC plan to rewild the site, providing a benefit to biodiversity. As such, it is considered that the scheme is likely to have an overall positive impact on fulfilling the 'restore' objective for the connected designated sites.

2.5 NOT DIRECTLY USE OR DOUBLE COUNT MEASURES THAT ARE ALREADY IN PLACE OR MUST BE PUT IN PLACE TO PROTECT, CONSERVE OR RESTORE THE SITE (TO MEET ARTICLE 6(1) AND (2) REQUIREMENTS) IN ORDER TO JUSTIFY NEW GROWTH.

Measures that are in place or need to be put in place to solve pre-existing nutrient problems cannot be used to show NN for new developments. The concept of agricultural land abandonment as a tool to restore a site had not been considered prior to NN, hence it is safe to determine that the scheme has come about as a result of NN as the site would otherwise have remained in agricultural use. As such, the scheme is suitable for use as nutrient mitigation and has not been double counted for conservation purposes.

2.6 BE CAREFULLY JUSTIFIED TOGETHER WITH CALCULATIONS OF THE CHANGE IN THE NUTRIENT CONTRIBUTION BEFORE AND AFTER THE DEVELOPMENT TAKING ACCOUNT OF ANY MITIGATION ON LAND OUTSIDE THE DEVELOPMENT

This principle refers primarily to how NN of individual developments should be shown in a suitably precautionary manner. The release of a generic, national methodology for calculating the nutrient budgets for new residential development provides a standardised and precautionary way to calculate the increase in nutrient loading from new developments. Using elements of this methodology to calculate the nutrient mitigation offset that the Warblington Farm scheme can produce provides continuity in accounting for the quantum of mitigation provided by this offsite mitigation scheme. As such, the methodology used to account for the impact of the Warblington Farm scheme is justified, meeting the precautionary needs of the Habitats Regulations and adhering to this Principle.

2.7 ENSURE THAT THERE IS NO REAL RISK THAT THE EXISTING LAND USE, WHICH MAY BE MAINTAINED BY NEUTRALITY (OR AN IMPROVEMENT), UNDERMINES THE CONSERVATION OBJECTIVE TO 'RESTORE' THE SITE TO FAVOURABLE CONDITION. THIS APPLIES TO THE EXISTING LAND USE AT THE DEVELOPMENT SITE AND AT ANY OFF-SITE MITIGATION LAND.

This principle determines that a mitigation option that sustains a certain level of background nutrient loading might undermine the achievement of the restoration objective in an area of high existing nutrient loads. In these locations, plans to alleviate nutrient pollution may need to do more to reduce the nutrient contribution from existing land use, in order to be able to mitigate adverse effects from another source of nutrients. Similarly, a land use may be able to be maintained for nutrient mitigation but this land use may undermine other conservation objectives for a

designated site. As this scheme is not maintaining existing land use and, indeed, is converting agricultural land to a more natural land use this Principle is adhered to.

Version control:

Produced by	Reviewed by	Version	Date
Peggy Lloyd	Dr Gabriel Connor-Streich	1	03/05/2022
Amended by Havant BC	Dr Gabriel Connor-Streich	2	06/05/2022