Redevelopment of Site With 10no. Dwellings, Landscape and Access at Gamford House, Rossett LL12 0EW

Phosphate Statement

Application Reference: P/2023/0738 LPA: Wrexham County Borough Council

Introduction

This report aims to establish a proof on concept for use of a pond at the Gamford House site to address phosphate neutrality requirements. This report is in support of a Full Application to Wrexham County Borough Council for the redevelopment of the site with 10no. detached carbon zero dwellings. This report will also be submitted to Natural Resources Wales, as statutory consultees. The scheme is for 10 residential dwellings. There is 1 pre-existing dwelling on the site, though it has not been occupied for some eight years. The proposed scheme is, therefore, for 9 additional dwellings.

There is a mains sewer that runs just over 200 metres from the site, and as such the development will be required to connect to the mains sewer. The local wastewater treatment works at Lavister has a consent limit of 1.0mg/l1 for Phosphate.

The River Dee is designated as a SAC, and the majority of Wrexham County Borough is located within its catchment. The river is currently failing against NRW's targets.

Site Budget (Source)

Wrexham Borough Council are yet to release a budget calculator for Phosphate. However, for purpose of this report we can make a very close estimation using a calculator from elsewhere. We have used the Carmarthenshire County Council calculator to make our estimations on the Gamford House scheme. We have included these calculations below.

We propose to reduce water consumption at the site via the use of grey water recycling, this will reduce (proportionately) the load on the sewage treatment works. We anticipate that this system will save 25 litres per person per day. We have applied a 20% precautionary buffer to this figure with a 20 litre per person saving applied in the calculator. We have used a 110 litres per person per day figure for the Stage 1 calculations.

Methodology

The following methodology had been employed to calculate the anticipated levels of Phosphates generated by this development:

Stage 1: the new nutrient load associated with the additional wastewater

Stage 2: calculation of the annual phosphorus load from the existing land use on the Gamford House site.

Stage 3: calculation of the annual phosphorus load from new (post-development) land use on the Gamford House site.

Stage 4: The nutrient budget.

The Calculations

Stage 1

Occupancy Rate 2.3 x 10 = 23

Water Usage Per Person

120 litres/person/day which is 10 litres higher than the Building Regulations standard set by the Welsh Ministers of 110 litres/person/day of wholesome water where a dwelling/unit is erected.

We propose to use grey water recycling, to reduce water consumption. This will reduce (proportionately) the load on the sewage treatment works. We anticipate that this system will save approximately 25 litres per person per day.

Total Usage from development = 2,530 litres per day.

This will be treated at the Lavister Wastewater Treatment Works (WwTW).

Stage 2: Calculation of the annual phosphorus load from the existing (pre-development) land use on the development site.

The site is currently vacant. For the purposes of the Nutrient Budget calculation we have assumed 0.0 Kg TP/year. However, it should be noted that one of its previous uses was as a pig farm, which generated substantial Phosphate quantities. There is also an existing residential dwelling on the site.

Stage 3: Calculation of the annual phosphorus load from new (post-development) land use on the Gamford House site.

New Land Use Type(s)	Area (ha)	Annual phosphorus nutrient export (kg TP/year)
Residential land	1.26	4.0

Annual Wastewater TP load is 8.06 Kg TP/year

Annual Phosphorus nutrient export is 4.0Kg TP/year

Phosphorus loading to the Waste Water Treatment Works is 8.06 Kg TP/year

Net P loading from land use change is 1.65 Kg TP/year

Stage 4: The nutrient budget

Sewers (Pathway)

The Lavister WWTW sewage works serving the site has a consent limit of 1mg/l1. There are also two pumping stations between the Gamford House site and the waste water treatment works. The River Dee SAC is the receptor.

Mitigation

In order to provide 0.1kg TP/year mitigation, it is proposed to retain the existing pond that lies in the eastern part of the application site. The phosphate captured by wetlands, can come from numerous sources. In this instance we propose to capture atmospheric phosphorous. Natural systems such as ponds have a banking rate - their capacity to store otherwise free bio-available phosphorous. Studies show a wide variance in removal rates of Phosphates, ranging from 1 to 41 kg/ha/yr.

The main maintenance requirements are weeding, annual cutting of the reeds and general grounds-care around the system. The pond and reed beds would provide ample banking for Atmospheric Phosphate.

Provided that the proposals at Gamford House can provide 0.1ha of pond and reed beds, this should bank 0.1kg/year of atmospheric phosphate.

Total Annual Phosphate Load for Mitigation

This final stage uses the results from Stages 1-3 and calculates the nutrient budget using the equation shown in Figure 3. The output in Stage 4, shows how much nutrient mitigation is required in kilograms per year to achieve nutrient neutrality.

The output from Stage 4 of nutrient budget calculations is the balance of new sources of P from a development minus the existing sources of P from the pre-development site. This balance is multiplied by 1.2, i.e. increased by 20%, which is termed the 'precautionary buffer'.

Phosphate Budget = 9.72kg TP/year

Mitigation due to retention of pond and reed beds 0.1kg/year

Therefore, Phosphate Budget = 9.62kg TP/year

Phosphate Budget + 20% buffer = 11.54kg TP/year

The Total Annual Phosphorus load to mitigate as a result of the Gamford House proposals is:

11.54kg TP/year.