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Land South of Bryn Lane, Wrexham Industrial Estate, Wrexham

Phosphate Assessment

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Version 1.1

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V1.0	15/04/2026	Phosphate Assessment	ESG	SM	WNL
V1.1	22/04/2026	Phosphate Assessment	ESG	SM	WNL
V1.2	27/04/2026	Phosphate Assessment	ESG	SM	WNL

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Introduction

1.0 Tier Consult have been appointed by Mauna Kea Ltd, to undergo a phosphate assessment for Land South of Bryn Lane, following guidance from Natural Resources Wales and Wrexham County Borough Council.

2.0 Site Description and Development Proposal

2.1 The site is located in Wrexham, Wales. The approximate National Grid Reference for the centre of the site is SJ384508 with coordinates Easting: 338482, Northing: 350843 at postcode LL13 9RX.

2.2 The proposed development is 6.60 Ha.

3.0 Stage 1: Additional Nutrient Loading from Wastewater

3.1 The Stage 1 worksheet calculates the additional phosphorus load associated with wastewater generated by the proposed development (Appendix A). Two tables are used to estimate the load based on site-specific inputs and pre-set calculation parameters.

3.2 Within the phosphate assessment, user inputs are highlighted in lilac, while calculated fields appear in light orange. Inputs include site location, local planning authority, rainfall data, and wastewater treatment details.

3.3 Based on the proposed floor areas, a maximum occupancy of 238 employees has been estimated as per the socioeconomics chapter of the submitted Environmental Statement, based on the Homes and Communities Agency Employment Density Calculator. Based on flows and loads the water usage per employee is 50 litres/person/day. An estimated 27% of employees are assumed to reside outside of Wrexham based on the figures from 'Commuting patterns by Welsh local authority and measure (gov.wales)'. This figure represents a five-year average. A five-year period has been used to provide a more balanced assumption, as the proportion of employees living outside Wrexham has decreased notably since Covid. Using these parameters, the calculated annual total phosphorus (TP) load from wastewater equates to 1.17 kg TP/year.

3.4 The Five Fords Wastewater Treatment Works (WwTW) has been identified as the receiving works for the site, and its phosphorus discharge permit limit has been applied within the assessment tool.

4.0 Stage 2: Nutrient Loading From Pre-Existing Landcovers

4.1 The Stage 2 worksheet quantifies the baseline phosphorus load from existing land uses within the red line boundary prior to development (Appendix B).

4.2 Soil characteristics were derived from the Soilscapes database, which identifies the site as having impeded drainage. Rainfall data were obtained from the National River

Flow Archive (NRFA), with higher rainfall values generally correlating to increased phosphorus export potential.

4.3 The baseline landcover was categorised using ARUP's Nutrient Budget Calculator guidance, as referenced in the Welsh Government Nutrient Budget Calculator (Appendix F), into four land use categories:

- Lowland Grazing

In preparing the calculations, the methodology outlined in the guidance referenced by Natural Resources Wales (NRW), specifically the ARUP Nutrient Budget Calculator Guidance (Appendix F), has been followed. This guidance sets out the accepted land cover categories within the phosphate assessment calculator and explains how baseline land use should be selected where agricultural activities are varied. Evidence indicates the pre-existing use for this site involved horse grazing and, as such, falls under the following description: agricultural areas on which cattle, sheep and other grazing livestock are farmed. A holding is classified as lowland if less than 50 per cent of its total area is in the LFA.

Based on the areas, a phosphorus load for each landcover is calculated and added together to give an overall phosphorus load for the pre-existing landcover of 2.80 kg TP/year.

5.0 Stage 3: Nutrient Loading From New Landcovers.

5.1 The Stage 3 worksheet estimates phosphorus export from the proposed (post-development) land uses within the site boundary (Appendix C).

5.2 The development has been subdivided into two land use categories:

- Commercial / industrial land
- Greenspace

Based on the areas, a phosphorus load for each landcover is calculated and added together to give an overall phosphorus load for the post development of 2.85 kg TP/year.

6.0 Stage 3S: Nutrient Load Removed through SuDS

6.1 The Stage 3S worksheet quantifies phosphorus removal achieved through Sustainable Drainage Systems (SuDS) implemented across the site. (Appendix D).

6.2 SuDS mitigation values were applied based on the proportion of runoff from each landcover draining to a specific SuDS feature. Removal efficiencies for both particulate and dissolved phosphorus were taken from the CIRIA C808F: "Using SuDS to Reduce Phosphorus in Surface Water Runoff" and the SuDS Manual (C753). Each feature's overall phosphorus removal rate was adjusted using the CIRCA index, as recommended by NRW.

6.3 Based on the proposed SuDS features, the development provides a phosphorus mitigation of 0.09 kg TP/year.

7.0 Stage 4: Total Phosphorus Budget

7.1 The Stage 4 worksheet automatically calculates the final nutrient budget using the results from Stages 1–3S (Appendix E)

7.2 The final phosphorus budget is determined using the following equation:

(Stage 1 – Stage 2 + (Stage 3 – Stage 3S)) × 1.2 = Total Phosphorus Budget

This formula accounts for:

- The additional wastewater loading (Stage 1)
- The net change in phosphorus export between pre- and post-development land uses (Stage 3 – Stage 2)
- The phosphorus removal achieved through SuDS mitigation (Stage 3S)
- A 20% precautionary buffer, as required by NRW guidance to account for modelling uncertainty.

Based on the calculation, the total phosphorus mitigation required is 1.35 kg TP/year, inclusive of the 20% buffer.

8.0 Conclusion & Results

8.1 Based on the Stage 4 results, the phosphate assessment indicates that 1.35 kg TP/year must be mitigated to achieve a phosphorus-neutral balance for the development.

8.2 Comparison of the Stage 2 (pre-development) and Stage 3 (post-development) results demonstrates that the existing landcover generates a higher phosphorus export than the proposed post-development condition. Consequently, the implementation of Sustainable Drainage Systems (SuDS) provides an additional reduction in phosphorus loading, further improving the site's nutrient balance.

8.3 The majority of the residual phosphorus load arises from the change in land use, specifically the difference between the phosphorus loading associated with the existing (baseline) land cover & that of the proposed development and the additional wastewater generated by site occupation.

8.4 In order to mitigate the phosphorus loading generated by the proposed development, a greenspace parcel with an area of 1.03 hectares is required to provide sufficient offset. This mitigation area is included in Parcel 1 of Strategic Ecology Corridor proposal. Planning Ref: P/2025/0431.

Appendix A
Stage 1 Worksheet

Special Area of Conservation (SAC):	River Dee and Bala Lake/ Afon Dyfrdwy a Llyn Tegid
Postcode:	LL13 9UT
Local Planning Authority (LPA):	**Wrexham County Borough Council**
Rainfall:	**698**
Project type:	Commercial
Development proposal (number of additional units):	1
Number of customers / users per unit:	
Water usage per customer / user (litres/person/day):	
Percentage of customers / users from outside catchment:	
Number of employees (per unit):	238
Water usage per employee (litres/person/day):	50
Percentage of employees from outside catchment:	27
Wastewater treatment works:	Five Fords STW
Phosphorus permitted limit (mg TP/l):	**1.00**
Nitrogen permitted limit (mg TN/l):	**27.00**
Final calculation of nutrient load from wastewater	
Description of values generated	**Values generated**
Additional population:	**64.26**
Annual wastewater production (litres):	**1173548.25**
Annual phosphorus load (kg TP/year):	**1.17**
Annual nitrogen load (kg TN/year):	**31.69**

Appendix B
Stage 2 Worksheet

Description of required information	Data entry column - user inputs required	
Soil drainage:	Impeded drainage	
Rainfall identified using postcode (mm/year):	**698**	
Is this rainfall value correct?	No	
Rainfall (mm/year):	750.1 – 800.1	
Stage 2 area larger than stage 3		
Landcover	**Area (hectares)**	**Phosphorus load (kg TP/year)**
Lowland Grazing	3.73	**2.80**
		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
Granular treatment media	**3.73**	**2.80**

Appendix C
Stage 3 Worksheet

Landcover	Area (hectares)	Phosphorus load (kg TP/year)
Commercial/industrial land	2.12	**2.41**
Commercial/industrial land	0.36	**0.41**
Greenspace	1.25	**0.03**
Total:	**3.73**	**2.85**

Appendix D
Stage 3S Worksheet

Landcover	Area (hectares)	Proportion of landcover area served by SuDS feature (%)	SuDS feature	P removal rate for SuDS feature
Commercial/industrial land	**2.12**	4	Swale	27.5
Commercial/industrial land	**0.36**	100	Porous Pavement	16.5
Greenspace	**1.25**	0		#N/A
Total:	**3.73**	**Not applicable**	**Not applicable**	**Not applicable**

Appendix E
Stage 4 Worksheet

Description of phosphorus values generated	Values generated
Stage 1 phosphorus load (kg TP/year):	**1.17**
Stage 2 phosphorus reduction (kg TP/year):	**2.80**
Stage 3 phosphorus load (kg TP/year):	**2.85**
Stage 3S phosphorus load removed through SuDS (kg TP/year):	**0.09**
Phosphorus budget ((Stage 1 - Stage 2) + (Stage 3 - Stage 3S)):	**1.13**
Phosphorus budget + 20% buffer	**1.35 kg TP/year requires mitigation**

Appendix F

Nutrient Budget Calculator Guidance

Land use types used in the calculator tool	Description
Cereals	Agricultural areas on which cereals, combinable crops and set aside are farmed.
General	Agricultural areas on which arable crops (including field scale vegetables) are farmed.
Horticulture	Agricultural areas on which fruit (including vineyards), hardy nursery stock, glasshouse flowers and vegetables, market garden scale vegetables, outdoor bulbs and flowers, and mushrooms are farmed.
Indoor Pig farming	Agricultural areas on which pigs are farmed indoors.
Outdoor Pig farming	Agricultural areas on which pigs are farmed outdoors.
Poultry	Agricultural areas on which poultry are farmed.
Dairy	Agricultural areas on which dairy cows are farmed.
Less Favoured Area (LFA) grazing	Agricultural areas on which cattle, sheep and other grazing livestock are farmed in locations where agricultural production is difficult. An area is classified as an LFA holding if 50 per cent or more of its total area is classed as LFA.
Lowland grazing	Agricultural areas on which cattle, sheep and other grazing livestock are farmed. A holding is classified as lowland if less than 50 per cent of its total area is in the LFA.
Mixed	Agricultural areas in which none of the above categories are farmed or where it is too difficult to select a single category to describe the farm type. This farm type does not include horticultural crops or outdoor pig farming.
Greenspace	Natural and semi-natural outdoor spaces provided for recreational use where fertilisers will not be applied and dog waste is managed, e.g. semi-natural parks. This does not include green infrastructure within the built urban environment, such as gardens, or grass verges, as these are included in the residential urban land category for residential developments, or the open land – built environment category for all other development types.
Woodland	Natural and semi-natural outdoor wooded areas.
Shrub	Natural and semi-natural outdoor shrubland area.
Water	Areas of surface water that remain inundated all year round, including rivers, ponds, and lakes.

Land use types used in the calculator tool	Description
Residential land	Areas of houses and associated infrastructure. This is inclusive of residential roads, driveways, grass verges, gardens and SuDS infrastructure that drains a residential development[4].
Commercial/industrial land	Areas that are used for industry. These are businesses that typically manufacture, process or otherwise generate products. Included in the definition of industrial land are factories and storage facilities as well as mining and shipping operations.
Open land – built environment	Areas of land in urban areas used for various purposes, e.g. main roads, built facilities such as schools, sports centres, areas used for leisure and recreation - this may include open land, e.g. caravan sites, camping sites, sports fields, playgrounds, and public squares.
Community food growing	Areas that are used for local food production, such as allotments.