

DLUHC LOCAL NUTRIENT MITIGATION FUND: CALL FOR EVIDENCE

INTRODUCTION

The Department of Levelling Up, Homes and Communities (DLUHC) has published the *Local Nutrient Mitigation Fund – Call for Evidence and Expression of Interest*. The Land Promoters and Developers Federation (LPDF) has requested support from WSP to respond to Section B, Question 7:

- Have you assessed the reductions in the mitigation burden on development from the measures in the Levelling Up and Regeneration Bill and the affect this will have on enabling housing delivery? Further, have you considered the specific effects on small sites and rural developments?

The response requested from WSP by the LPDF is specifically focussed on DLUHC's decision to not implement improvements to wastewater treatment works (WWTW) to better treat nitrates and phosphates where the WWTW serves a population of under 2,000 population equivalents (<2,000pe). A high-level summary of the context and implications of this is provided below together with a range of potential solutions.

CONTEXT

The locations of WWTWs in England were provided by LPDF as two .kml files, split into small (<2,000pe) and larger (>2,000pe) systems¹. The data did not contain any information on WWTW size and so were compared against other datasets, at a high-level, to estimate the proportion and number of small WWTWs in nutrient neutrality (NN) catchments.

The analysis indicates that there are approximately 500 WWTWs of all sizes in the 27 nutrient neutrality (NN) catchments in England, with small WWTWs accounting for approximately 75% (or ~375) of the total.

The maximum potential population served by these WWTWs can be estimated by multiplying 375 small WWTWs by 2,000 people per works. This indicates that the decision not to upgrade small WWTWs could affect up to approximately 750,000 people. The actual number is likely to be lower as many of the 375 WWTWs will serve communities that are smaller than 2,000pe.

IMPLICATIONS

Wastewater treatment works that serve smaller populations (<2,000pe) are less likely than those serving larger communities to have discharge permit conditions that impose a limit on the total nitrogen (TN) and/or total phosphorus (TP) concentrations in the treated effluent discharged from the WWTW. In addition, where such permit conditions are in place for small WWTWs, the TN and/or TP limit concentrations are likely to be higher than for larger WWTWs.

Where a WWTW does not have a TN and/or TP discharge consent limit, Natural England's (NE) nutrient load calculation method specifies default concentrations of 27 mg/l for TN and 8 mg/l for TP. These are significantly higher than already achieved at many WWTWs of any size. They are also considerably higher than the Technically Achievable Limits (TAL) of 10 mg/l for TN and 0.25 mg/l for TP as set out in the Levelling Up and Regeneration Bill (LURB) and to which larger WWTWs (>2,000pe) must be upgraded by 2030.

As a consequence, any new development containing overnight accommodation located in the catchments of small WWTWs are disproportionately adversely affected because the higher permit concentration limits (or the default values) generate a larger nutrient load that must then be mitigated to achieve neutrality. Developers of new houses in

¹ WSP has not verified the data. The small WWTW .kml file did not include any WWTWs in the Northumbrian Water region and it is possible that these were missing from the data. This could have caused an underestimate of small WWTWs in the Lindisfarne NN catchment, which is quite extensive. The Roman Wall Loughs NN catchment is small and very rural, and it is likely that it contains no small WWTWs.

rural areas are therefore likely to face a larger mitigation burden than developers of otherwise identical houses in larger more urban communities.

Smaller communities are also likely to offer fewer opportunities for the provision of nutrient mitigation because the smaller number of new developments does not provide the scale required to cost-effectively plan and deliver mitigation schemes.

The development of new homes in more rural areas is therefore likely to be considerably more difficult than in larger communities because of the twin challenges of a larger nutrient load per home and the reduced availability of mitigation options.

POTENTIAL SOLUTIONS

A number of potential solutions are itemised below for consideration.

Optimisation of the Nutrient Load Calculation

Given the challenge and cost of obtaining nutrient mitigation, it is first important to ensure that the nutrient load for a development is calculated correctly. NE's nutrient load calculators are designed to be very conservative. Default input values for the occupancy rate, percentage impermeable area and water usage are typically considerably higher than actual values. The guidance does provide some latitude for deviation from these default values, where justified.

However:

- This is not clearly highlighted by NE.
- The adoption of an alternative occupancy rate is reliant upon the local planning authority (LPA) deciding on a locally specific number; many LPAs do not have the technical capacity or will to derive these and/or are unwilling to challenge NE.
- The use of other non-default values also requires LPA approval and they, in turn, are reliant on NE advice and approval – which can be contradictory and vary between NE regions and officers.

Examples of default and accepted alternative values include:

- The Norfolk LPAs have confirmed a local occupancy rate of 1.88 per unit compared to NE's national default of 2.4/unit. Darlington Borough Council has adopted 0.8/unit. The occupancy rate is the greatest driver of the nutrient load, and a locally specific value should be used for every development. Each LPA should be encouraged (or required) to define their locally specific rate and, where appropriate, be funded to do so.
- NE specifies a default water use of 110 litres per person per day (lppd) plus 10 lppd to account for future downgrades in water efficient fixtures and fittings. Several LPAs have adopted the regulation-compliant value of 110 lppd for schemes in their areas. Some developers are exploring the use of on-site greywater recycling and reuse schemes, which can reduce water consumption to as low as 55 lppd. We understand from conversations between the LPDF and NE that more flexibility will be built into NE's load calculators to better address this input variable.
- NE's calculator specifies the use of future urban land use nutrient export rates based on an assumption that 80% of a development site is impermeable (for total phosphorus rates) and 100% is impermeable (for total nitrogen rates). In reality, typical developments are likely to have an impermeable percentage area of around 45 – 55% depending on the type of scheme. The percentage impermeable area for a development can be evidenced from the surface water drainage strategy. These values should be applied to the calculations to minimise the surface water runoff nutrient loads.

Optimisation of the nutrient load calculations is the critical first step in achieving nutrient neutrality, as it reduces the nutrient load that must be mitigated, and therefore reduces the challenge, scale and cost of subsequently obtaining nutrient mitigation. Optimising the load calculations also ensures that the limited nutrient mitigation available in a NN

catchment goes further and can be used to mitigate a larger number of homes – providing improved outcomes for all parties.

Nutrient Headroom Mitigation

New schemes in smaller WWTW catchments could be mitigated using the nutrient ‘headroom’ generated by upgrading larger WWTWs to meet TAL. This approach would provide mitigation for all small WWTW catchments by 2030 at the latest, or earlier if larger WWTWs in the wider catchment are upgraded sooner. This mitigation could be priced at the local market rate per kilogram of nutrient mitigation provided with payment made by developers to NE. The funds could be used (by NE or others) to deliver additional mitigation schemes in the wider catchment to recover the small reduction in nutrient headroom used to mitigate the schemes in small WWTW catchments. This would ensure that nutrient neutrality is delivered across the catchment. Delivery routes for the additional mitigation schemes may be through the LPA, NE’s mitigation scheme or via local NGOs such as Rivers Trusts, etc. While there would be a *very small and temporary* reduction in the nutrient improvement delivered by TAL in the affected catchment, this would ultimately be recovered through the additional mitigation schemes funded through the purchase of mitigation credits.

S106 Developer Contributions

The likely smaller scale of individual developments in small WWTW catchments, and of the developers themselves (many of which may be SMEs) means that they are unlikely to have the necessary scale to deliver stand-alone mitigation solutions. Permitting developers to make financial contributions (through the S106 process) to improve the viability of treatment upgrades at smaller WWTWs would facilitate delivery of nutrient headroom by the local water company, which could be used to mitigate new developments. The cost of such upgrades would need to be commensurate to the total number of nutrient mitigation credits that the upgrades would deliver and be priced at a local market rate to ensure that SME developers are not disproportionately financially affected. The upgrades could be treatment process-orientated, or potentially focussed on delivery of a treatment wetland to polish the treated effluent.

Developer / Consortium Delivery of a Treatment Wetland

Where the number and size of developments permit a degree of economy of scale, it may be an option for local developers to jointly deliver a treatment wetland to polish treated effluent discharged from a small WWTW. As outlined above, smaller WWTWs have higher or no permit limits and the resulting high-nutrient effluent stream is an attractive water source for treatment through a wetland. This approach is already being pursued: Welsh Water has recently published details of their WWTWs at which they are seeking private sector investment to improve the quality of the treated effluent through wetlands². Similar schemes are at various planning stages in England (for example, Ashford Borough Council planning application PA/2023/0393)³.

A WWTW with a TP discharge concentration of 8 mg/l serving a population of 2,000 people each of which generate 150 litres per day of sewage effluent would discharge treated effluent containing approximately 875 kg of TP per year. Treating this effluent through a small wetland with a treatment area of 2,500m² (excluding berms etc) may deliver a treatment efficiency of approximately 20%, resulting in the removal of approximately 175kg of TP per year. Doubling the size of the treatment area to 5,000m² may increase the removal efficiency to 35% generating TP mitigation of approximately 300kg/year. The TP load generated by the foul flow from one new house (excluding any land use loads) would be approximately 0.85kg/year based on NE’s default input values. Small wetlands can therefore generate significant nutrient credits that could be used to mitigate new developments.

Alternative Delivery Partners for a Treatment Wetland

Given the complexity of the required planning, environmental assessment and permitting processes required to deliver a treatment wetland, it may be more appropriate for a wetland to be delivered by an organisation with suitable

² <https://corporate.dwrcymru.com/en/news-media/2023/welsh-water-publishes-long-term-plans-to-help-protect-special-area-of-conservation-rivers>

³ https://ashfordboroughcouncil.my.site.com/pr/s/planning-application/a0h8d000001fGb3AAE/pa20230393?c__r=Arcus_BE_Public_Register

technical and planning experience – such as an LPA or Rivers Trust. The funding for the design, construction and ongoing maintenance of the wetland could be recouped from the developers through the purchase of nutrient credits.

Local Authority / Housing Association Water Efficiency Retrofitting

NE has accepted that water efficiency retrofitting of social tenanted housing stock can be used to generate nutrient mitigation credits. NE has accepted that the Cenergist HL2024 flow control device⁴ provides a water use reduction of 27 lppd. Assuming that the new and existing houses are of a similar nature and occupancy rate, it may be possible to mitigate one new house by retrofitting between four and five existing houses constructed prior to 2010. Cenergist has indicated that their HL2024 flow control devices can be supplied and fitted for £165 per property, offering a potentially inexpensive mitigation option (assuming that the local authority / housing association does not seek to sell the nutrient credits at market prices).

Strategic Mitigation Scheme

As NE's mitigation principles typically require the delivery of neutrality at or upstream of the point of impact to a protected Habitats site, it may be possible to deliver a strategic scheme (such as a wetland and/or land use change) in the upper catchment that can serve as mitigation for most/all housing developments further downstream. This would improve the economy of scale and aggregate potential funding from developers throughout the catchment to deliver the most cost-efficient mitigation solution available in a catchment. The scheme could be focussed on SME developers and smaller developments. Seed funding to set the scheme up, and operational costs, would be recouped from the sale of nutrient mitigation credits to developers. This approach may also deliver biodiversity net gain (BNG) benefits and could potentially generate additional income through the sale of BNG credits to local developers. A strategic mitigation scheme could be delivered by a range of partners either individually or in partnership, including NE, LPAs, Rivers Trusts or private providers.

Reactive Filter Media for Phosphorus Mitigation

Reactive filter media can be used to absorb phosphorus from a water source. Examples include Polonite⁵ and Phosflow⁶. It may be possible to upgrade smaller WWTWs to include a final filtration stage through a reactive filter media, to remove phosphorus and generate mitigation credits for developers.

The supplier of Polonite has indicated that:

- They already supply their product to water companies in the UK (Southern Water and United Utilities).
- The material is effective across a wide range of TP concentrations (<0.5mg/l to 200 – 300mg/l).
- A removal efficiency of >99% is achieved initially, although this reduces as the material depletes over time (with a replacement cycle of 1 – 2 years).
- A dwell time of two hours is required for 90% TP removal, rising to four hours for 95% removal.
- The treated effluent may require pH adjustment.
- Polonite can be delivered in bulk or in 1,000kg bags at a cost of €890/tonne ex-works.

A worked example of a potential approach is provided below – and could be scaled to suit the size of any WWTW:

- A small WWTW serving 2,000 people each generating 150 litres per day of sewage effluent would generate a total daily flow of 300,000 litres/day or 300 m³/day (excluding any combined sewer / surface water flows).
- This daily flow equates to an average flow of 12.5m³ per hour (excluding flow variability during the day).
- To achieve a 90% reduction efficiency a reactive filter media treatment stage would therefore need to provide storage of 25 m³ (plus volume for the filter media itself).

⁴ <https://energysavingtrust.org.uk/products/cenergist-hl2024-inline-3p/>

⁵ <https://polonite.se/>

⁶ <https://www.petwatersolutions.com/water-treatment-phosflow/>

- At a TP discharge concentration of 8 mg/l it would be possible to generate a TP load reduction of 0.18kg/day or 65 kg/year by treating just 25 m³ of the WWTW treated effluent every day.
- As detailed above, the foul flow load from one house would be approximately 0.85kg/year and so this approach could potentially mitigate a number of new houses.

The supplier of Polonite has confirmed that 19 tonnes of the material would be required for the example above, at an ex-works cost of €16,910, and would last for 6 – 12 months and possibly up to 24 months. Assuming a replacement cycle of 12 months and phosphorus removal of 65kg/year, this would equate to a cost of €260/kgP/year. This excludes transport, any civils works required to construct the reaction chamber, a pH balancing system (if required) plus removal and disposal (or potential beneficial reuse outside of the NN catchment) of the depleted material.

Phosphorus credits are currently available in a small number of NN catchments for a one-off cost ranging from £14,000 to upwards of £50,000 per kilogram of phosphorus. This provides mitigation for the lifetime of a new housing development, which is taken to be 80 -125 years. In contrast, while the cost of the Polonite material would be a recurring annual charge, it is very low in comparison to the commercially available phosphorus credits. It may therefore be economic for developers to pay for this as a *temporary* mitigation approach while awaiting a more permanent mitigation solution to be developed in their NN catchment (such as a mitigation wetland or a scheme to use the TAL nutrient headroom as mitigation).

Further work would need to be undertaken to assess the potential civils costs required at typical WWTWs. However, it may be possible to cheaply install bulk bags of Polonite in any redundant trickle filters or tanks, offering a potentially low-cost temporary mitigation approach.

CONCLUSIONS

Developers of housing schemes in rural areas served by small WWTWs are likely to face an increased challenge in complying with nutrient neutrality requirements as:

- The higher nutrient concentrations in effluent discharged from small WWTWs results in their housing having a larger nutrient load to mitigate than an equivalent house in a larger WWTW catchment with lower discharge consent limits.
- The relatively small scale of many rural developments does not provide the economy of scale required for a developer to incorporate their own self-contained nutrient mitigation scheme or develop an off-site mitigation solution.
- The relatively small number of new housing units in a small WWTW catchment reduces the commercial attractiveness required for third parties to develop commercial nutrient mitigation schemes.
- The water company is likely to focus investment on WWTWs that offer the greatest return on investment (i.e the largest).

While the challenges are greater in small or more rural WWTW catchments, a range of potential options are available to mitigate new housing developments:

- Most of the proposed solutions have already been accepted by Natural England but may need scaling to suit smaller developments.
- The nutrient headroom approach is likely to require a temporary relaxation of Natural England's policy approach.
- The reactive filter media option will require further quantification of its performance and cost-benefit but could be scaled to suit a wide range of WWTW sizes and take advantage of any redundant structures.

All of the options will benefit from economies of scale and collaboration and may be more effectively and cost-efficiently delivered by delivery partners with appropriate organisational capacity.