Impact of Roof Drainage Connections to the Foul Sewer

1. Introduction

Most people are aware that there are frequent spills of foul sewage into the watercourses and that this is a major reason for the poor water quality of our rivers.

Rivers are also polluted from other sources: while all rivers are different, typically pollution can be attributed as 1/3 is from foul sewerage, 1/3, agricultural run off and 1/3 from industry.

The purpose of this brief paper is explain why there are so many foul sewage spills into the water courses and put into context the impact of roof and surface water connections to the foul sewer.

2. Typical design criteria for rates of flow

Assumptions are made to calculate the flows in a sewerage system and receiving flow to a treatment works (STW). For example:

Average property occupancy of 2.4 people
Water usage 140 liters per head per day
For a catchment of say 100 properties, the average flow known as dry weather flow (DWF) is:

So DWF is: 100x140x2.4=33,600 litres/day or 0.389litres/second

Sewage treatment works normally treat biologically 3xDWF (1.67litres/second) to allow for variation in flow during the day and can treat up to 6xDWF (2.33litres/second) to allow for peak wet weather flows.

In **exceptional** circumstances, i.e. extreme rainfall events, water companies are allowed to bypass the STW or overflow from the sewerage system and spill/discharge untreated sewage into the watercourse. This is because the alternative would be to restrict the flow or allow natural throtteling, the result would be uncontrolled foul sewage flooding, possibly also inside some low-lying properties. It is well known that spills occur at **very regular** intervals and not just at exceptional circumstances. The major contributing factor causing this is the number of properties that discharge their roof drainage into the foul sewer. Another significant factor can be ground water leakage into the sewerage system resulting in a less peaky flow pattern.

3. Consequence of roof drainage being discharged into the foul sewer.

Typically a STW is designed to contain in storm tanks the flow over 3 DWF up to 6 DWF for 2 hours. So for the 100 properties considered above, this would be 1.67litres/second for 2 hours.

To make a comparison with the potential excess flow from roofs of 100 properties I have made the following assumptions:

- Only 20% (1 in 5) of the properties have roof drainage connected to the foul sewer. (I understand in Holbeton 90% are connected)
- The average roof and paved garden area of the connected properties is 100m2
- A rainfall event of 10mm/hour is considered.

Most intensity rainfall predictions only go down to a 1 in one year event. We know that spills occur very frequently so I have picked a figure from a web site extract shown in Annex A. This gives a definition of rainfall rates for: Very light - light – moderate - heavy, -very heavy - extreme. I have taken the average figure for the heavy rain category, 10mm/hour. The figure for the extreme category is 5 times as intense.

The above gives a run off from each roof and paved garden of 1m3/hour or a flow rate from the connected 20 properties of 5,56litres/second, 3.33 times more than 1.67litres/second that the system should be expected to cope with.

4. Conclusions

This analysis if a simplification and there are other significant factors, like in line storage. However it demonstrates that:

The flow from the roof drainage considered above, of connected properties in **average heavy rainfall** conditions produce a flow that is more than 3 times as great as the system might be expected to cope with. So using the rainfall rates given in Annex A, overflowing will start to occur at the higher end of the **moderate** rainfall band.

Hence very frequent spills occur and a significant reduction in pollution of our watercourses can be achieved by persuading property owners to disconnect roof drainage from the foul sewer. The water companies need to provide more storage and overflow treatment, but the roof drainage contribution to the problem can also be addressed as proposed in recent response to SWWS Catchment Plan Consultation reproduced as Annex B

With climate change, the problem will get progressively worse so action needs to be taken now even to stand still.

Annex A

https://cumulus.hosiene.co.uk/viewtopic.php?t=3474

Very light rain (Drizzle) describes rainfall with a precipitation rate of less than 0.25 millimetres (0.0098 in) per hour.
Light rain describes rainfall which falls at a rate of between 0.25 millimetres (0.0098 in) and 1 millimetre (0.039 in) per hour.
Moderate rain describes rainfall with a precipitation rate of between 1 millimetre (0.039 in) and 4 millimetres (0.16 in) per hour.
Heavy rain describes rainfall with a precipitation rate of between 4 millimetres (0.16 in) and 16 millimetres (0.63 in) per hour.
Very heavy rain terminology can be used when the precipitation rate is between 16 millimetres (0.63 in) and 50 millimetres (2.0 in) per hour.
Extreme rain (Cloud Burst/Downpour) can describe rainfall with precipitation rates exceeding 50 millimetres (2.0 in) per hour.

Annex B

Response to South West Water's Drainage and Management Plan to 2050 and Feed back to Waste Water Catchment Management Plan Workshop – 9th September 2022

The following is confirmation and elaboration of comments I made at the workshop, together with additional comments and suggestions. I live in Newton Ferrers near the mouth of the River Yealm, so I am particularly concerned about the deteriorating water quality of the Yealm but I am sure this situation is replicated elsewhere in the region.

1. Introduction.

I was pleased to note from the workshop, SWWS's recognition of the scale of the wide spread pollution problem in our rivers as a result of storm overflows and spillage of raw sewage. It was also pleasing to note how much expenditure is being planned to reducing this pollution, however it was very disappointing to hear how long it was going to take to address this issue even with the fastest time scale proposed.

I have tried in my feedback on the workshop, your publication "Let's Talk Water" and response SWWS's Drainage Management plan to 2050 to suggest approaches that will speed up the process and reduce costs to your customers.

This document has been considered and endorsed by the River Yealm Water Quality Group. I am a member of this group which is comprised of nominated representatives from each riparian Parish (Newton and Noss, Wembury,

Brixton, Yealmpton, Sparkwell, Cornwood) bordering the Yealm. Research by this Group suggests our river is being treated as an open drain, untreated spills from sewage treatment plants regularly being discharged, which with other pollution has led to a clear decline in ecological health, plummeting fish stocks, water quality that is consistently "worse than sufficient" for bathing, loss of amenity value and closure of the shellfish farm.

2. Cause and scale of the foul sewer spillage/overflow problem.

The presentation confirmed that one of the main causes of the problem is surface water entering the foul sewers, mainly from roof drainage. From the figures given in your publication "Let's Talk Water" summer 2022 edition - 480 million litres of clean water are supplied by SWWS every day and 636 million litres are treated each day. By deduction, assuming water supply leakage of 20%, about 40% of flow treated is rain water so it is not surprising that the system can not cope. I realize that there are other factors to considered in this equation including:

-Infiltration into the foul sewer:
-Water used for watering gardens and not returned to the foul sewer.
-Properties that have septic tanks or other forms of waste water treatment and so do not return flow to the foul sewer.

It would be helpful if SWWS made their own assessment of the scale of the problem and publish and discuss this, so that those homeowners who discharge rainwater to the foul sewer can appreciate the impact. This could be presented in the next edition of "Let's talk Water". It could be presented together with various suggestions ranging from separating the flow and diverting to soak aways, to installing inline rainwater butts to reduce peak flows as suggested in the by SWWS in the workshop.

3. Consequence of more development:

All new builds need to have separated systems and it appears that because usually there is spare capacity at the STW, SWWS submit a no comment response to a planning application.

However this seems to be a simplification of the situation as:

- Any new development, including a single property will increase the biological pollution load and hence increase the pollution load in any spills or overflows. Consequently SWWS should object to any new development proposals, unless SWWS can guarantee that with the new development in place, there will be no chance of illegal overflows or spills. If SWWS cannot give this guarantee, the developer should pay a contribution towards mitigation measures, for example provision of storm tank capacity together with associated running costs.

- Any new development increases the biological load and flow through a treatment works. Because the works are generally more efficient at reducing pollution load at lower flows, the receiving watercourse will be more polluted even if consents are not broken.

Many developments are extensions to existing properties. Where the original properties roof drainage connects to the foul sewer it appears that the extension's roof drainage can also be allowed to connect to the foul sewer. A recent example of this was a property that was not only extended but the original free draining garden area (approx. 30m2) was completely paved with surface water draining to the foul sewer. I contacted SWWS, the EA, Building Control and the Planners and no party objected to the proposal, which was then built. I would suggest that if more than say 10% of roof area is increased a, the whole property and paved areas should be separated. If there is not room for a soakaway there is not room for the extension.

4. Solutions

There are a number of actions that I believe should be taken now to address the problem rather than wait until being forced into action by the Environment Act due in 2023 and consideration of delaying some actions until 2050, as stated in the workshop is not acceptable. These are summarized as follows:

- SWWS should be more open about the problems. I am a member of the Yealm Water Quality Group and so I am aware of the refusal by SWWS to provide details of spills and overflows.

- SWWS should make available by Parish or Post Code, the numbers of properties that discharge rainwater to the foul sewer, i.e. those that pay a 10% surcharge on their bills. If the percentage of properties is significant this will enable the Parish Councils and public at large appreciate the scale of the problem.

- On the basis that the polluter pays, the 10% surcharge on bills should be substantially increased to reflect cost of addressing the issues and also to take note of the inevitable future increase in pollution as a result of the more storminess element of climate change. This will generate revenue to address the issues and encourage separation of flows, hence reducing the problem.

- The Yealm Water Quality Group has sent a planning guidance note to all Riparian Parish Councils (Appendix A). SWWS should review this and send their support to the Parish Councils.

5. Conclusions

SWWS should develop plans now in consultation with all interested parties for inclusion into the Catchment Management Plans due in 18months. These should include proposals for:

- Better publicity to explain to owners of properties with roof drainage connection to the foul sewer, the consequence of their current arrangements and advise on potential mitigation measaures.
- Significantly change charging system to encourage separation and raise money to enable acceleration implementation of improvements.
- Work with planners to get better control and again get revenue to help fund and speed up the implementation of the necessary remedial measures.
- Better storm over flow protection in line.
- Sewage works storm overflow improvements.
- Whole river treatment of low flows by developing inline ponds and wetlands.

George Buckland
4st October 2022

Appendix A

Planning Guidance re Water Quality for the Riparian Parishes of the River Yealm

This guidance has been compiled by the River Yealm Water Quality Group and is being made available for use by Wembury, Brixton, Yealmpton, Newton & Noss, Ermington, Cornwood and Sparkwell Parish Councils in considering planning applications for any new development (single and multiple) and extensions where the issue of the safe and sustainable disposal of surface water on site is part of the application.

1. Planning policy

It is recommended that each Parish Council needs to have a policy statement in its Parish Plan, Neighbourhood Plan and in its Environment Policy protecting water quality of the River Yealm in its parish.

This Parish council will oppose/not support any planning application that is not in line with National Planning Policy Framework (NPPF) in particular sections 170 and 180 and the water framework directive Article 4 (Non deterioration clause). In order to consider these matters the Parish Council may utilise any data made available from any sewage infrastructure which the planning applicant utilises. The Parish council will also always ask to see any FDA1 (foul drainage assessment) forms which have been completed in support of a planning application.

Sections 170 and 180 of the NPPF primarily provide water quality protection.

170.

(e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and

180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.

2. Planning Applications

Question 12 of any planning application for new development and extensions must be looked at in detail. The application must include plans of sustainable drainage of surface water on the site, including a foul drainage assessment, and how this is achieved through permeable or non permeable surface and what materials will be used. A site meeting is recommended if the proposals are not clear that no surface water is draining to the foul sewer.

Parish councils should consider what measures are acceptable to mitigate increased loadings on the sewerage system resulting in increased incidence of polluting storm overflows, installing soakaways for rainwater (that is currently going to foul drains), green roofs, water butts, permeable pavements driveways (any other SUDS solutions) etc.

Fuller guidance is from South Hams District Council is attached in Appendix 1

3. Permitted development i.e. tarmacing gardens to make parking spaces/ bigger drives which create issues for other further down flow. This falls under part F of permitted development, but with restrictions as the guidance copied below

Class F – hard surfaces

This provides permitted development rights within the curtilage of a house for -

(a) the provision of a hard surface for any purpose incidental to the enjoyment of the dwellinghouse as such or

(b) the replacement in whole or in part of such a surface

Development is not permitted by Class F if permission to use the dwellinghouse as a dwellinghouse has been granted only be virtue of Class M, N, P, PA, or Q of Part 2 of this Schedule (change of use)

Conditions

F.1 Development is permitted by Class F subject to the condition that where -

(a) the hard surface would be situated on land between a wall forming the principal elevation of the dwellinghouse and a highway, and

(b) the area of ground covered by the hard surface, or the area of hard surface replaced, would exceed 5 square metres,

either the hard surface shall be made of porous materials, or provision shall be made to direct run-off water from the hard surface to a permeable or porous area or surface within the curtilage of the dwellinghouse

The Department for Communities and Local Government has produced separate guidance on permeable paving. This can be found at:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/7728/pavingfrontgardens.pdf

4. Possible statement for all Riparian Parish Councils to use on surface water drainage in response to a planning application from the District Council.

Xxxxxxx Parish Council is committed to the improvement of water quality of the River Yealm by ensuring that all planning applications for new housing and extensions have sustainable and appropriate drainage plans for the disposal of all surface water within the proposed site of the development. For this application……..

5. Fuller guidance is from South Hams District Council is attached in Appendix 1 July 2022

Appendix 1

Planning considerations with regard to the impact of the water quality in the Yealm.

From South Hams District Council

The planning policy framework which most directly comes into play when considering this issue, would begin at national level with the National Planning Policy Framework (NPPF). In particular chapter 15 'Conserving and enhancing the natural environment' paragraph 170 and then 175 regarding Habitats and biodiversity' and paragraph 180 regarding 'Ground conditions and pollution' (the following underlining is my emphasis throughout):

175. When determining planning applications, local planning authorities should apply the following principles:

a) if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;

b) development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interest;

c) development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused,

unless there are wholly exceptional reasons and a suitable compensation strategy exists; and

d) development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to incorporate biodiversity improvements in and around developments should be encouraged, especially where this can secure measurable net gains for biodiversity.

180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

The National planning policy guidance (NPPG) also has advice and guidance around plan-making and decision making in relation to water quality which is a material consideration and can be found here:

https://www.gov.uk/guidance/water-supply-wastewater-and-water-quality#water-quality

This national guidance has then been translated through into the Joint Local Plan (JLP) and is found at DEV2 (p247 of the JLP);

Policy DEV2
Air, water, soil, noise, land and light
Development proposals which will cause unacceptable on- or off-site risk or harm
to human health, the natural environment or living conditions, either individually
or cumulatively, will not be permitted. Development should:

1. Avoid harmful environmental impacts and health risks for both new and existing development arising from soil, air, water, land, or noise pollution or land instability.

2. Where located in or impacting on an Air Quality Management Area, avoid or mitigate its impact through positively contributing towards the implementation of measures contained within air quality action plans and transport programmes, and through green infrastructure provision and

enhancements, building design and layout which helps minimise air quality impacts.

3. Prevent deterioration of and where appropriate protect, enhance and restore
water quality.

4. Limit the impact of light pollution on local amenity, intrinsically dark landscapes and nature conservation.

5. Where appropriate, remediate and mitigate despoiled, degraded, derelict, contaminated and unstable land.

6. Protect soils, safeguarding the long term potential of best and most versatile
agricultural land and conserving soil resources.
247evelopment policies
7. Maintain and where appropriate improve the noise environment in accordance with the Noise Policy Statement for England (including any subsequent updates).

8. Not cause an adverse effect on the integrity of a European Site (see Policy SPT12).

The supporting text to this policy states that:

***6.9** The planning system plays an important role in protecting the environment and*
people from pollution and in managing natural resources. Policy DEV2 considers air,
water, land, noise and light pollution, alongside other natural resource issues such
as land stability and the need to safeguard soils and agricultural land. Its implementation will be amplified in the Plymouth Policy Area and Thriving Towns
and Villages SPDs.

***6.10** Air Quality Management Areas (AQMAs) highlight those areas where air quality presents a particular issue and challenge. In addition to avoiding unacceptable impacts to air quality in any event, Policy DEV2 seeks to ensure that the individual and cumulative impacts of development on AQMAs is appropriately considered and looks to Air Quality Action Plans and transport programmes in the first instance for appropriate measures to be implemented. The context and circumstances of an existing AQMA will inform the extent to which any impact is considered unacceptable. Any development, whether having an impact on an existing AQMA or not, that could have a significant cumulative impact on air quality, would normally be considered in the context of an Air Quality Assessment or Environmental Impact Assessment.*

6.11 *Under the Water Framework Directive (WFD) development should not result in deterioration of the status of the relevant waterbody and should aim to improve water quality where possible to help deliver the South West River Basin Management Plan objectives. This includes protected areas under WFD (bathing waters, shellfish waters etc.) which rely on the surrounding water quality. A catchment based approach will be taken when considering water quality following guidance in the National Planning Practice Guidance. Where there is an issue early engagement should be sought with the Environment Agency and relevant water and sewerage companies to clarify the type of assessment required.*

There are several associated policies around biodiversity protection (DEV 26) and protection of general health and amenity (DEV1). However the other very pertinent policy for consideration is DEV35 'Managing flood risk and water quality impacts', especially point 4 onwards.

4. Developments, new and extensions should incorporate sustainable water management measures to reduce water use, and increase its reuse, minimise surface water run-off, and ensure that it does not increase flood risks or impact water quality elsewhere, in compliance with the Local Flood Risk Management Plan and national standards for sustainable urban drainage systems. Surface water from proposed developments should be discharged in a separate surface water drainage system which should be discharged according to the drainage hierarchies set out in the Plymouth and Devon Local Flood Risk Management Strategies.

5. Proposals for discharges of surface water direct to coastal waters must include measures to remove particulate and dissolved pollutants in order to conserve the quality of coastal environments.

6. Developments which undermine the role of undeveloped estuarine coastal margins in providing resilience to climate change will not be allowed.

7.Developments located within the Critical Drainage Area should include a Drainage Strategy setting out and justifying the option(s) proposed, present supporting evidence, and include proposals for long term maintenance and management.

8. Development will not be permitted without confirmation that sewage / wastewater treatment facilities can accommodate or will be improved to accommodate the new development, in advance of the development taking place.

9. Where necessary, financial contributions will be sought for the maintenance and improvement of drainage infrastructure, fluvial and tidal flood defences, and erosion defences. Development should provide financial contributions,

as necessary, to mitigate impacts on sewer network and to ensure no adverse effect on the integrity of any designated sites.

The recently adopted SPD also adds further guidance to these policies, esp para 9.69 onwards.

The above sets out the planning policy framework and guidance for decision-making which may affect water quality on or off site. In practice what this means with regards to an individual application is that the applicant is required to give us adequate information regarding any waste disposal. In the majority of cases this means foul drainage and/or the possible management of any contaminants on the site which may become mobilised by the development itself and any possible contamination from the process/development being proposed.

Re foul water/sewage - once the application form identifies the method of disposal of foul water officers would then ensure that this is appropriate for the site and proposal. For foul water an FDA1 form has to be completed by the applicant identifying the method of disposal. If it is to mains then SWW comment on whether there is capacity and whether this method of disposal to mains is acceptable, for other methods of disposal such as bio-digesters, either the SHDC drainage specialist or the DCC specialist (for major applications) would review it. Providing these specialist officers are content with the information and methods then, subject to any necessary conditions, this is considered acceptable.

Re contamination, either existing on site or as a result of the proposed development, the applicant' provide a contamination statement or a phase 1 study if this is required, and would have to demonstrate appropriate mitigation of any contamination issues. Again this information is examined by SHDC specialist Environmental Health Officers and, depending on the proposal possibly also the Environment Agency. Assuming these specialist advisors are content then, as above, it would usually be considered acceptable in this regard.

Overall then this sets out the framework for officer/Councillor decision-making relating to development within the catchment which may impact water quality.

However a large part of the ongoing and future issues around the water quality and any contamination of or discharges into the river rest outside Planning or Environmental Health's control and sits instead with the Environment Agency. The EA and SWW in combination are the 2 main bodies in play here. Planning officers at SHDC are currently writing to South West Water to ensure that when they are consulted by planning on applications and respond, they ensure they are very accurate and confident with regards to capacity at their treatment plants as we are aware there is concern that some may be over capacity and/or causing discharges and CEFAS (Centre for Environment, Fisheries and Aquaculture Science) has contacted us in this regard hence we are proactively contacting SWW to address this.

I trust this sets out the planning guidelines, policies and considerations that Officers have to consider when arriving at a recommendation and how we interact with other specialist and authorities on this matter.