

Written evidence submitted by Marinet Limited.

The Issue of Water Quality and the Environment Bill 2021.

Now more than at any-time in modern history there is a real need for this Committee to step up and take an active role in delivering a Parliamentary Act that is fit for purpose.

Current practice by water companies is totally inadequate. Not only is secondary treatment rather than tertiary treatment still the default level at far too many sewage treatment works ⁽¹⁾, but also the capacity of too many sewage works is seriously inadequate. The result is that their capacity is exceeded whenever there is a period of rainfall, too often at modest rainfall levels. This results in ‘storm overflows’ which ought to be exceptional events (maximum 4 to 6 times per year) but are which are being brought into operation almost routinely in some areas⁽²⁾. When this occurs – storm overflows – the discharges to rivers are of raw sewage with no treatment whatsoever.

How do we know this to be true? This is because there are currently no rivers in England which are in high class condition – meaning near natural condition, with no clear impact on their ecology or amenity. Only 14% are in good condition – meaning only slight impact on ecology and amenity. 61% are in moderate condition – a moderate impact on ecology and amenity. 22% are in poor condition – major impact on ecology and amenity. 3% in bad condition – resulting in a severe change from natural conditions which greatly impacts on wildlife, plants and amenity⁽³⁾ also, see table below). All rivers are adversely affected chemically. All this is due to human activity, with the overwhelming cause being sewage discharges. The principal source of this sewage pollution is human (sewerage and drainage systems) but a very important source is also agriculture and, particularly, livestock farming with intensive livestock farms being the most significant.

Latest Data: Rivers in England, Environment Agency Annual Report 2020 : EA Catchment Data Explorer.

Grade	Total	High	Good	Moderate	Poor	Bad	Fail Chemically
Numbers	3470	0	523	2287	793	137	3470 (all)
%	100%	0%	14%	61%	22%	3%	100%

Action 1: It has been reported to Marinet that the ratio of input into English and Welsh rivers of sewage material from human sources relative to animal husbandry is a ratio of 9 : 1. However it has proved impossible to verify this ratio. What is known is that although human sewage may be the dominant factor in terms of volume, the input from animal husbandry (particularly intensive livestock units) is of great concern for two reasons. First this sewage, except in rare cases⁽⁴⁾, is not granted sewage treatment (anaerobic digestion). Second intensive livestock units (cattle, pigs, poultry) are engaged in heavy use of antibiotics and this use is leading to significant levels of antibiotic resistance (antimicrobial resistance, aka. AMR). Thus when this livestock sewage is released untreated into the environment and watercourses, it contains a significant range of antibiotic resistant pathogens⁽⁵⁾ and, further, 80% of antibiotics which are manufactured are now used in animal husbandry with antibiotic resistance now the focus of significant research by Oxford University⁽⁶⁾. Accordingly we **recommend** that the Environmental Audit Committee ask Defra:

- a/. **To establish** for the benefit of the Committee the ratio of input between human and animal livestock sewage into rivers so that this quantity of animal sewage from livestock farming is fully quantified.
- b/. **To establish** for the benefit of the Committee the number of animal livestock farms in England and Wales employing anaerobic digestion of the animal waste arising on those farms.
- c/. **To establish** the number of intensive animal livestock in England and Wales, along with the percentage of these intensive livestock units, which are using anaerobic digestion of the animal sewage arising on these farms.

Thus, as evident from Environment Agency data, 2020, one-quarter of our rivers are in poor condition or worse and only one in 10 are actually in a good condition when assessed in terms of their ecology and amenity. Why is this so?

The answer is distressingly simple. It is because they are still polluted by sewage. Rivers are still effectively being treated as sewers which eventually flow into the sea. The consequence is that much of their biodiversity and life-force dies.

Environment Agency (EA) data suggests that the dominant source of this sewage is human sewage but it is well established that agricultural sewage from livestock including poultry is playing a significant role, particularly large-scale intensive pig and cattle units

whose sewage appears to often be entering our watercourses with very poorly publicly documented levels of treatment, and very possibly, with no treatment whatsoever.

In the case of the human sewage, under half (46%) of sewage treatment works (STWs) have tertiary treatment which fully neutralises the bacterial and viral pathological load that still remains after secondary treatment; and, in many of these tertiary STWs it has been reported to Marinet, albeit anecdotally, that the tertiary function is maintained in a poor condition (lack of cleaning and maintenance of the ultra-violet lights) so their efficiency is all too often only a fraction of what it should be.

Source: OFWAT 2011: Sewage Treatment Works in England and Wales - grade of sewage treatment at STW (?).

Water Company	No. STWs with Primary/Secondary	No. STWs with Tertiary	Total No. STWs	% of STWs with Tertiary
Anglian	710	419	1129	37%
Welsh	711	122	833	15%
Northumbrian	374	40	414	10%
Severn Trent	544	482	1026	47%
South West	419	214	633	34%
Southern	207	162	369	44%
Thames	164	186	350	53%
United Utilities	430	147	577	25%
Wessex	261	144	405	36%
Yorkshire	524	98	622	19%
Totals	4344	2014	6358	46%

Action 2: Ofwat 2011 recorded levels of STWs with tertiary treatment, as above. Establishing exactly how many STWs in England and Wales do actually have tertiary treatment is very difficult. Whilst the figures in the above table are correct, using Ofwat 2011, if one views the levels of STWs with tertiary treatment in Defra's 2012 Report on the Urban Waste Water Treatment Directive – see first link in footnote 1 – where Defra record STWs by region, the actual figure for STWs with tertiary treatment in England is just 183 STWs. Therefore there is an open question as to how many STWs in England and Wales actually do have tertiary treatment. Clearly this is a crucial question. At best, the figure looks as though it is on the short side of 50%.

Therefore we **recommend** that the Environmental Audit Committee specifically ask Defra to state clearly how many sewage treatment works there are in England and Wales in 2021, and how many of these have tertiary treatment?

Action 3: According to Ofwat 2011, see footnote 7 link, tertiary treatment can be installed in 4 different forms (see link to 'Definitions' in Ofwat document, footnote 7). However none of these definitions of tertiary treatment specifically mentions the use of ultra-violet treatment which is capable of ensuring that all discharges from a STW have had all viruses and bacteria neutralised so that the discharge is pathogen free. In public health terms the universal use of ultra-violet treatment is clearly essential. However not only is the number of STWs with tertiary treatment in England and Wales on the short side of 50% (see above) but it is also unknown whether this first class level of sewage treatment is actually being employed at those sites where it is stated that tertiary treatment is employed. For a clear exposition of sewage treatment stages, see⁽⁸⁾. Additionally for ultra-violet treatment to work effectively it is essential that the equipment is kept scrupulously clean in order to ensure that exposure of the pathogens in the effluent is fully exposed to these ultra-violet rays. If not, neutralisation will only be partial.

Therefore we **recommend** that the Environmental Audit Committee specifically ask Defra to state clearly :

- a/**. How many sewage treatment works in England and Wales have sewage treatment which uses ultra-violet treatment at the tertiary stage.
- b/**. What procedures and supervisory inspection is employed to ensure that ultra-violet treatment facilities are kept scrupulously clean and thus 100% efficient.

In the case of animal sewage, which may often receive no treatment whatsoever, the situation is even more worrying. The particularly worrying portion of animal sewage is that originating from intensive livestock farming units⁽⁹⁾. Sewage from these intensive livestock units now contains, due to heavy use of antibiotics in their husbandry regime^(5/6), a broad spectrum of bacterial pathogens which, from the human perspective, have become resistant to antibiotics (aka. anti-microbial resistance or AMR).

Thus intensive animal husbandry and its associated sewage disposal practices may not just be releasing, but also raising the spectre, of a broad range of AMR resistant pathogens (diseases) being released into the environment. If the human population comes into contact with these AMR diseases, then serious public health consequences will follow. Is this happening?

Current evidence shows that rats, historically a principal vector in the transmission of disease, are growing rapidly in numbers and this is due in part to increasing rat resistance to traditional pest control methods (e.g. rats are now warfarin tolerant), and

also due to poor waste disposal regimes in urban populations (e.g. household bin collections have moved from weekly to fortnightly).

The brown rat population in England has grown from an estimated 70 million in 1990 to 145 million in 2020 – an increase of over 100% (sources: various, including British Pest Control Association – B. Morgan, Marinet Limited, see *Appendix 1*). Rats can be a significant vector of disease. They readily come into contact with sewage pathogens, including those displaying AMR.

Are serious diseases in the human population which display AMR characteristics on the increase? Take two examples: Bacteraemia E coli 157 (an animal sourced pathogen and thus linked to intensive livestock farming) and Sepsis (a severe human condition induced due to a range of prior incompletely diagnosed/treated conditions and itself now showing increased AMR resistance).

Bacteraemia E coli 157 was at a rate of 19.3 cases per 10,000 population in 1990 and now stands at 82.0 cases per 10,000 in 2020 – a rise of 325%. Sepsis stood at 3479 cases nationally in 2000 and now stands at 52,080 cases in 2020 - a rise of 149.6% (Source: NHS data, compiled by B. Morgan, Marinet Limited, see *Appendix 2* for this data).

Thus there is clear, stark evidence that poor sewage disposal practices – both human and animal – practiced in England and Wales today – are not only widespread throughout England and Wales, but also threaten a nationwide health crisis in the future.

The scale of these practices – poor STWs standards and sewerage/drainage infrastructure, and poor animal husbandry regimes – requires urgent attention and deep remedial measures. This is an imperative requirement of the water industry and the farming industry.

Central to the delivery of this urgent reform is Parliament (including the Environmental Audit Committee), the Government and the Environment Bill 2019-2021.

Historically, the action needed by the water companies and the agriculture industry has been traded away by Ministries and politicians (Parliament) claiming a need for more time to change. As a result action is not just slow, it is sometimes also in regression.

Meantime the reality is one where the water companies may be delivering dividends for pension funds, but the perception is that they are doing so at the cost of deteriorating standards in public health. The animal livestock industry may be delivering cheap meat but again the perception is that it is doing so at the cost of river quality and public health. The evidence is strong that there is inadequate investment in the full and safe treatment of human and animal sewage which, as a result, is being discharged in a pathogenic condition into our rivers and seas⁽¹⁰⁾.

A simple question now faces politicians and Parliament : Is the default position in the future to be one of doing what is right for public health, or doing what is expedient for the Exchequer?

Although all these aspects of poor practice are well documented and will be expounded by others in this review (for its marine implications, see *Sand Sea and Sewage*, published May 2020 by Marinet Limited www.marinet.org.uk), Marinet wishes within the context of this Committee's audit investigation to *specifically* draw the Committee's attention to the issue of factory farm effluent because it appears that, in a very large number of cases, this effluent may be entering untreated into rivers around the country.

For the matter to be addressed we have to look and learn from other countries which rely heavily on intensive factory farming, such as Denmark and their pig industry.

From the earliest stage in the conception of these factory farms, planning incorporates what to do with the effluent, and it is *anaerobic digestion* (AD) which has provided the ways and means of treating animal waste for generations. What is left as a result of this anaerobic treatment process is largely pathogen-free and it can then go on to treat and enrich farm land as an important bi-product added to the soil. Methane is a bi-product of anaerobic digestion and energy in the form of gas powered electrical production is then used to provide lighting and heat generation for the housing units.

Given the development of AMR bacteria and the emergence of new viruses amongst animals it is important that anaerobic digestion is made as effective as possible in order to neutralise all pathogens. Recent research⁽¹¹⁾ has shown that the AD process temperature is very important. Below 55°C the AD process is efficient but does not achieve full neutralisation. If the AD temperature is raised above 55°C the efficiency increases significantly and, if the methane generated from the AD process is used to conduct the AD

process at 65-75°C (pasteurise) then neutralisation of pathogens is total. The latter is clearly desirable, especially when the biosludge is placed on fields.

Yet in terms of intensive animal husbandry, what is allowed in the United Kingdom?

Waste from many of our farms, including factory farms, is being discharged onto the land and into the rivers. Whether it has been treated (via AD and to what precise temperature) is far from transparent and is very difficult to establish, and this may be contributing to a possible increase in the prevalence of viral and bacterial disease and, if so, is a major concern for public health. Antibiotics are given to animals which are kept in large numbers in close housing proximity, and this has led to a rise in the number of bacterial diseases resistant to these drugs. Consequently there is the spectre that this is then passed on to the human population via contact with our rivers or via rat infestations.

Without challenge to these practices *now* (we emphasise this urgency) we will shortly be experiencing a growing problem in bacterial AMR but also possibly a growth in new types of viruses and we will not have the ability to combat them, however clever we feel we are - do not be deceived by our speedy delivery of the vaccine against COVID19.

This is a management problem. We need to retro-fit top grade (65-75°C) anaerobic digestion to all factory farms *now* (again, we emphasise this urgency) and to encourage all regional government bodies to refuse granting approval to factory farms without this measure. In other words, responsible laws and governance.

At one time the NGO organisations would have been more proactive in raising these issues, but the fact is that they have been effectively neutered from challenging Government practice by taking charitable status.

Present practice is a disaster in the making in environmental terms. This is why we have drawn the attention of the Environmental Audit Committee to these matters, both in respect of sewage treatment works and in the livestock husbandry industry.

We insist to the Committee : the need is for action this day is by you, the Environmental Audit Committee.

Marinet proposed Amendment 200 at the House of Commons Committee Stage of the Environment Bill in November 2020. Amendment 200 to the Environment Bill would

have solved the worrying reality of poor sewage and drainage practices sustained by the water companies because it would have placed **in law** an obligation upon the water companies to *include* in their 5 year management plans (clause 76, section 3 of the Environment Bill) improvement to their sewerage and drainage systems – see Appendix 3 for the detail of Amendment 200.

Yet Marinet had to stand by and observe at Committee Stage whilst politicians and Government played their party political manoeuvres, delivering only more delay to a situation that is threatening to run out of control. Once again we observed a Minister who actually *declined* to take on legal powers and the ability to solve the problem via law. It is as if Defra has arrived at a longstanding agreement with the water companies and the agricultural livestock industry to place money (pension fund revenues and cheap food) at a greater priority over public health, with Ministers being powerless, whoever they are and whenever they are in office, to contradict this arrangement made by Defra.

We ask the Committee: Is there any other reason which can explain why the Secretary of State for the environment and farming has consistently declined, as in the present Environment Bill, to take the powers in law – even when offered to them by our Amendment 200 – in order to *solve* this issue and to place public health as a *priority*?

In this submission, we have outlined the worrying dimensions of the sewage problem that exists in the livestock industry and the water industry, and the similar need to act with real resolve today.

If the Environmental Audit Committee fails to get to grips with these multi-factor contamination issues then, with the rise of the current rat population, we could very easily see more pandemics . The Middle Ages saw the Plague. It is arguably true, sadly, that we are courting the same type of fate in this country again today.

At the present time neither the Agriculture Bill nor the Environment Bill have come close to addressing the requirements of reality.

We ask, will the Environmental Audit Committee?

Further to our earlier recommendations above (Action 1, 2 and 3), we submit the following additional specific recommendations:

Action 4. It is clear that human sewage continues to receive inadequate treatment thus failing to neutralise all viral and bacterial pathogens. On best assumptions, less than half of sewage treatment works are equipped with tertiary treatment (i.e. full neutralisation of pathogens). Furthermore, far too many sewage treatment works are persistently overloaded during rainy weather thus causing raw sewage to be discharged routinely the length and breadth of the country.

Therefore we **recommend** to the Environmental Audit Committee that Clause 76, section 3, of the Environment Bill be amended before it reaches Royal Assent to make it a duty **in law** for all water companies to make specific plans in their statutorily required management plans to make provision for the full upgrading of their sewerage and drainage systems, so eliminating untreated and poorly treated sewage being discharged into the country's rivers, except under very exceptional circumstances (genuine emergency). This can be achieved by adoption of our **Amendment 200 to Clause 76, section 3** tabled at Committee Stage in the House of Commons, November 2020, see Appendix 3 for details.

Action 5. It is clear that animal livestock sewage is contaminating rivers in this country. It is clear that some of this sewage, especially from intensive livestock units, contains antibiotic resistant (AMR) pathogens. It is clear that the level of anaerobic treatment (AD) of animal sewage on this country's farms is infrequent, and it is very unclear as to whether AD treatment is being used as a default procedure at intensive livestock units. It is also unclear as to whether the AD treatment process at locations where AD does exist is operating to a process temperature of 65-75°C (pasteurisation) thus ensuring 100% neutralisation of all pathogens. In short, animal livestock standards for the treatment of animal sewage seem worryingly low, are very opaque in terms of publicly published data, and such low standards pose potentially very serious public health consequences.

Therefore we **recommend** that the Environmental Audit Committee requests the Secretary of State at Defra:

- a/. **To inform** the Committee of the levels of anaerobic digestion existing in this country today for all farms rearing livestock.
- b/. **To inform** the Committee of the nature of the AD process temperature operating at existing anaerobic digestion plants.

We also **recommend** that the Environment Audit Committee, in the light of the above information from the Defra Secretary of State, make its own **recommendations** on the following:

- a/. The **necessity, as well as the scale of that necessity, for anaerobic digestion** units for treatment of animal livestock sewage which is required in this country today in order to ensure that rivers remain unpolluted and so threaten no risk to public health.
- b/. The **process temperature for anaerobic digestion** that is required in all future anaerobic digestion units, and the **need for the retrofitting of existing** anaerobic digestion units, in order to ensure the 100% neutralisation of all pathogens.
- c/. The **precise target date** for the installation of these levels (scale) and standards (process temperature) for anaerobic digestion units.

In summary, we are asking the Environmental Audit Committee to audit the Government, and specifically Defra, on the standards that currently pertain in the water industry (sewerage and drainage systems) and in the livestock farming industry (anaerobic digestion of sewage) in order to establish a/. current standards, b/. the standards required to eliminate pollution and risks to public health, c/. the timescale for the introduction of these urgent improvements, and d/. whether the Environment Bill and Agriculture Bill currently before Parliament can be amended before securing Royal Assent in order to secure these essential changes.

Written by David Levy, Chair and Director, Stephen Eades, Director, and Brian Morgan, Member.

February 2021

¹ Based on most recent data there are around 7078 Sewage Treatment Works (STWs) in England and Wales, of which less than half have tertiary treatment, see Defra:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69592/pb13811-waste-water-2012.pdf and <https://www.gov.uk/government/publications/water-and-treated-water/water-and-treated-water#:~:text=there%20are%207%2C078%20sewage%20treatment,to%20the%20UK's%20sewerage%20service>

² Reported at over 200,000 sewerage overflow discharges in England during 2019, see <https://www.theguardian.com/environment/2020/jul/01/water-firms-raw-sewage-england->

[rivers#:~:text=Water%20companies%20in%20England%20discharged,1.5m%20hours%20in%202019.](#)

- 3** Rivers in England, Environment Agency Annual Report 2020; and, Birmingham University:
<https://www.birmingham.ac.uk/news/thebirminghambrief/items/2020/10/all-of-england's-rivers-are-polluted-revealing-the-'invisible-water-crisis'.aspx>
- 4** Reading University: Farm Pollution and Waste, see: http://www.ecifm.rdg.ac.uk/farm_waste.htm where the number of livestock farms in England and Wales reported to be giving sewage treatment (anaerobic treatment) to livestock waste is in the region of 30 anaerobic units.
- 5** Antibiotic resistant (AMR) pathogens in animal wastes, see Farms Not Factories:
<https://farmsnotfactories.org/articles/antibiotic-resistance-how-animal-factories-impact-your-health>
- 6** 80% of all antibiotics manufactured are used in the animal husbandry, and AMR diseases are currently causing 1.5 million deaths worldwide: source Professor Louise Richardson, Vice Chancellor of Oxford University, BBC News 19 January 2021
<https://www.bbc.co.uk/news/education-55710528>
- 7** Ofwat, 2011. See, via Google: [sewage-treatment-work-numbers-2011-1.xlsx](#)
- 8** Statement of Sewage Treatment stages, see <https://www.youtube.com/playlist?list=PLqI2Zihh7Zma6CKMOJXyuUbZx-TPtckZC>
- 9** For an insight into the scale and recent growth in intensive livestock farming, see
<https://www.thebureauinvestigates.com/stories/2017-07-17/megafarms-uk-intensive-farming-meat>
- 10** For an insight into the range of pathogens that may be present in rivers and the sea as a result of poor sewage disposal practices see: Marinet, *Sand, Sea and Sewage, Appendix D* <http://www.marinet.org.uk/campaign-article/sand-sea-and-sewage>
- 11** Is anaerobic digestion a reliable barrier for deactivation of pathogens in biosludge?, Science Total Environment June 2019 (updated April 2020) in Elsevier Public Health Emergency Collection, see
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7112049/>

See Appendices below:

Appendix 1.

Tabulated data brown rat population UK averages. All sources

Year	Population millions	Percent increase
1990	70	-----
1992	70	-----
1994	70	-----
1996	70	-----
1998	70	-----
2000	71	1.4
2002	71	1.4
2004	72	2.8
2006	73.5	5.0
2008	74	5.7
2010	76.5	9.3
2012	84	20
2014	92	31
2016	104	53
2018	118	69
2020	145	107

Refs;-

1. Northumbria Natural History Society, brown rat, 2017
2. Royal Society, Urban Rat rRces, spatial distribution across multiple cities. 2018.
3. The Social Life of Norway Rats, Schweinfurth, 2020
4. BPCA Annual Report 2016
5. Susan Hall, Ratland, London Assembly, 2017
6. Lambert, 2017. ncbi Scientific Reports on rodents in English Dwellings,

Appendix 2

Tabulated list of diseases : E coli 0157 Bacteraemia.

Year	Deaths	% increase	Deaths per 10,000	% increase
1990	338	-----	19.3	-----
1991	361	7	20.6	7
1992	470	39	26.9	39
1993	385	14	21.9	18
1994	411	21	28.4	39
1995	792	134	45.1	134
1996	660	74	33.7	75
1997	1087	224	61.9	221
1998	890	163	52.5	172
1999	1084	221	63.9	231
2000	896	165	52,8	173
2001	768	127	45.3	134
2002	595	76	35.1	82
2003	675	99	40.5	101
2004	699	106	41.9	117
2005	950	181	53.1	175
2006	1001	196	58.0	201
2007	828	145	48.8	152
2008	950	181	56.0	190
2009	1034	206	45.0	133
2010	773	129	49.7	157
2011	801	136	52.8	174
2012	837	147	53.0	175
2013	882	161	53.1	175
2014	901	167	54.7	183
2015	952	181	58.8	204
2016	973	187	64.3	233
2017	988	192	67.6	251
2018	998	195	70.7	267
2019	1140	237	75.7	292
2020	1307	286	82.0	325

Refs.

1. NHS by CCG all data, acute trusts, Sept 2017, E coli blood stream infections.

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2. Mortality in E coli bloodstream infections, V de Latour, (Paris), Oxford Academia Jour Acute Microbial Chemotherapy, 2020
 3. E coli, Guidance, data and analysis.gov.uk Oct 2017
 4. E coli infections, Healthy rats, healthy people.cdc.gov.usa 2019
 5. Facts about E coli, NHS, 2009
 6. PHE weekly. All cause mortality report, gov.uk 2020

and

Tabulated multiple diseases current epidemics in UK : Sepsis.

Year	Annual cases	Percent increase
2000	3479	nil
2001	3968	11.4
2002	5053	14.5
2003	6019	17.5
2004	6527	18.7
2005	6780	19.5
2006	6756	19.4
2007	7020	20.2
2008	7446	21.4
2009	7807	22.4
2010	8772	25.2
2011	8797	25.3
2012	9115	26.2
2013	11,100	31.9
2014	12,400	35.6
2015	13,415	38.5
2016	14,700	42.3
2017	37,500	107.8
2018	43,905	120.2
2019	48,006	137.9
2020	52,080	149.6

Refs. NHS data.

Appendix 3

Text of the Proposed Amendment 200 at Committee Stage, November 2020, House of Commons.

The amendment is to Part 5, Section 76, clause 3 of the Bill. The precise wording of the amendment and its position in clause 3 is set out below.

Proposed Amendment

Text change in **bold**

PART 5

WATER

Plans and proposals

76. Drainage and sewerage management plans.

In the Water Industry Act 1991, after section 94 insert—

“94A Drainage and sewerage management plans: preparation and review

(1) Each sewerage undertaker must prepare, publish and maintain a drainage and sewerage management plan.

(2) A drainage and sewerage management plan is a plan for how the sewerage undertaker will manage and develop its drainage system and sewerage system so as to be able, and continue to be able, to meet its obligations under this Part.

(3) A drainage and sewerage management plan must address in particular—

(a) the capacity of the undertaker’s drainage system and sewerage system,

(b) an assessment of the current and future demands on the undertaker’s drainage system and sewerage system,

(c) the resilience of the undertaker’s drainage system and sewerage system,

(d) the water quality and impact of the discharges of the undertaker’s drainage system and sewerage system,

(e) the measures the undertaker intends to take or continue for the purpose in subsection (2),

(f) the likely sequence and timing for implementing those measures,

(g) relevant environmental risks and how those risks are to be mitigated, and

(h) any other matters specified by the Minister in directions.