Contents

Overview of water quality report findings

The report is dismissive of the risks to water quality in the reservoir, Riders Lane & Hermitage Streams, Langstone Harbour, and The Solent, without adequately considering all of the risks.

There will be thousands of contaminants in the final effluent from Budds Farm sewage works and the report only considers a very small number, missing many of the contaminants of concern including pharmaceuticals and 'forever' chemicals. The suggestion from the Southern Water report seems to be that the water quality in any of the water bodies impacted can be allowed to deteriorate as a result of the effluent recycling plant discharges, as long as they can meet a few threshold levels for a small number of parameters set out in water quality guidance. However, it is not acceptable to only consider parameters with a water quality standard threshold, as many other contaminants can pose a risk to fauna and flora.

It is not credible for the report to conclude that there are no potential environmental effects from storing recycled effluent in the reservoir, other than the likely change in trophic state to eutrophic due to phosphorus, as there will be other effects from the discharge of recycled effluent into the reservoir. As a result simply adding phosphate treatment as proposed will not address the concerns.

Portsmouth Water previously committed to their being no detrimental effect on the benefits of the original spring fed reservoir, yet any deterioration in water quality would represent a detrimental impact from the effluent recycling process, which is likely in turn to have adverse impacts on the reservoir and downstream ecology.

The planned change in operation to top up the reservoir in a drought situation with recycled effluent will result in a reduced nitrate benefit to Langstone Harbour which has not been assessed. The benefit was demonstrated in the 2011 and 2020 Water Quality Reports.

The conclusion that environmental water quality in the downstream watercourses and Langstone Harbour is predicted to be largely unaffected by the addition of recycled effluent to the reservoir is not credible. No such conclusion can be based on the modelling work completed to date, which is wholly inadequate to assess the risk.

The water quality risk to Langstone Harbour from mobilisation of leachate from the contaminated landfill at Broadmarsh, where Southern Water plan to build the new Water Recycling Plant, has not been considered in the report. The construction of hundreds of piles and multiple c.8m wide shafts for tunnels & pipelines will open up new migration pathways through the contaminated waste into the chalk aquifer below, which is in hydraulic continuity with Langstone Harbour, significantly increasing the risk of leachate reaching the SPA/SAC.

This risk cannot be mitigated as there is no engineered lining to the landfill against which a seal could be created.

Thousands of contaminants will be discharged with the reject water into the Solent at levels 3 or 4 times more concentrated than the current final effluent output through the long sea outfall. Yet only 7 parameters have been modelled. The impact of the discharge of new treatment chemicals and disinfection by-products is not adequately considered. As a result the report does not provide a robust assessment of the risks to the Solent, or its protected habitats.

Overall, the report is very disappointing, lacking in significant details and does not consider many of the contaminants or risks of concern. Even if a risk to water quality is outside of the scope of the report it should at least be acknowledged. Insufficient information is provided on the data, assumptions and scenarios used in the modelling, as a result it is impossible to assess the validity of even the limited outputs that are presented in the report.

The significant increase in pollution risk to the reservoir and harbour is not adequately considered in the report. Incidents are inevitable given Southern Water's poor track record on pollution, plant failures and prosecution, the potential impact of pollution incidents must be considered, especially as the risks did not exist in the spring fed reservoir 'classic' scenario.

Customers and stakeholders do not trust Southern Water to run and maintain the plant without incidents, nor to model or report accurately on the potential impacts. It is not even clear who has completed the environmental water quality screening and modelling for the report, nor in some cases what data it is based on.

Specific comments and concerns on the modelling and outputs are set out in the sections below.

A. Reservoir & downstream concerns

B. Langstone Harbour concerns

C. The Solent modelling concerns

D. New surface water drainage system concerns

E. Other concerns

A. Reservoir & Downstream Concerns

The assessment of risks to the reservoir is very disappointing. Risks are dismissed even though **most of the contaminants of concern have NOT even been considered.** This includes contaminants found in the output water from the effluent recycling trial plant which operated at Budds Farm Sewage Works for a short period (A4 below). Other factors not adequately considered in the report include.

- Impact of treatment chemicals and byproducts.
- The cumulative impact of day-on-day discharges into the reservoir.
- The change in water chemistry in the reservoir and the impact it will have on flora and flora, including increases in salinity and temperature.
- Accumulation of contaminants in plants, animals and sediments.

Concerns about the water quality modelling, assessment and findings for the reservoir and downstream water courses is provided in more detail below.

A1. A two stage drop in trophic status as a result of effluent recycling is NOT acceptable

The modelling for the original 'classic' spring fed reservoir predicted;

- In 2011 the reservoir will be oligotrophic, but with time could become mesotrophic, with minimal risk of it being eutrophic.
- In 2020 the modelling confirmed the spring fed reservoir was likely to be oligotrophic to mesotrophic.

The 2025 modelling report confirms that **the increase in phosphate as a result of the discharge of recycled effluent will cause a deterioration to the trophic status of the reservoir to EUTROPHIC** based on the 2025 forecast increase in Total Phosphorus (TP) and chlorophyll concentrations (see Figure 5-1, page 59). The increase is predicted to stimulate the growth of algae in the reservoir, which in turn will have **negative biodiversity impacts, with the reservoir becoming home to a "smaller range of aquatic wildlife", than under the original spring fed 'classic' reservoir scheme.**

A two stage drop in trophic status as a result of effluent recycling, when compared to the original modelling, is NOT acceptable and shows the additional risk to water quality and biodiversity that effluent recycling introduces.

- To address the forecast deterioration in water quality Southern Water proposes to add a phosphate treatment process/ plant, which will need to operate daily, as recycled effluent will be discharged into the reservoir every day.
- Any method of phosphate treatment will increase the amount of sludge produced, increase the energy and carbon footprint of the project (which is already extremely high) and significantly increase the cost of construction and operation.
- Page 3 indicates the Environment Agency will set the water quality requirements of the recycled water that can be discharged to the reservoir.

Page 61, Section 5.2.15 refers to modelling where the TP concentration of the recycled water is reduced (presumably by the phosphate removal plant). It indicates that this is predicted to improve the ecological potential of the reservoir '*closer*' to that predicted for the 'classic' spring fed reservoir under mesotrophic conditions. **Closer is <u>not</u> good enough, that is still a deterioration**.

The quality of the discharge must be set at a level adequate to **prevent any deterioration of the water quality in the reservoir compared to that of the spring fed reservoir**. This is likely to require a <u>more stringent standard</u> of phosphate removal than the minimum that may be considered acceptable to the EA, who might just look at the general water body classification when determining an acceptable level of phosphate, and that could still have an adverse impact on the diversity of flora and fauna in the reservoir and downstream.

Portsmouth Water have committed publicly to <u>no</u> loss of benefit, including biodiversity benefit, at the reservoir, when compared to what would have been delivered by the original 'classic' spring fed reservoir proposal if effluent recycling is to go ahead.

Portsmouth Water must ensure that Southern Water **apply a more stringent 'no deterioration' discharge condition for Total Phosphorus and orthophosphorus**.

A2. Modelling conclusions related to BOD and Dissolved Oxygen look suspect

The modelling conclusions relating to Biological Oxygen Demand (BOD) and Dissolved Oxygen (DO) appear to be suspect. When BOD in a water body increases it would be expected that DO would decrease, as the oxygen in the water is being used up. Yet the 2025 Water Quality (WQ) Report confirms that BOD is predicted to increase in the reservoir and downstream, yet the DO in the reservoir and downstream is indicated on to increase giving a potential biodiversity benefit. Adding recycled effluent to the reservoir is claimed to support this benefit (Page 4).

- These **claims relating to DO increasing when BOD has also increased need to be scrutinised more carefully and substantiated** as it is counterintuitive that this would be the case.

A3. The impact of any deterioration in water quality must be considered (not just water quality thresholds)

It is NOT adequate to only consider the few parameters for which there is a water quality threshold for evaluating water body status. That is to miss the point. Just because the contaminants introduced by effluent recycling process do not cause a wholesale change from a 'good' to 'bad' water body classification, that does not mean that the contaminants will not have an adverse impact on water quality, or ecology, in the reservoir or downstream water bodies.

- Each contaminant present in the recycled effluent must be risk assessed and its potential impact on water quality and ecology considered.
- The in-combination impacts of a variety of contaminants being added to the reservoir water must be considered in the reservoir and downstream.
- Experts need to confirm what contaminants mixing together could make things worse? For example, could the higher temperature or presence of disinfection byproducts change the way contaminants behave, perhaps increasing reactions, clumping or settlement?
- Could new compounds be formed in the reservoir as a result of the discharge of recycled effluent that could impact water quality or ecology, in the reservoir, or downstream.
- The impacts of sedimentation and remobilisation of contaminants must be properly considered and assessed. For example, the 2020 Atkins WQ Report (Section 2.3.4) highlighted that phosphates can accumulate in sediment, and its subsequent release can increase the trophic state of a reservoir. The potential for re-suspension of phosphates and other contaminants need to be considered, including in shallow areas of the reservoir and wetland.
- Potential impacts of bioaccumulation must be properly considered and assessed. For example, the types of PFAS recorded in the treated final effluent match those found to bioaccumulate in some algae in Langstone Harbour. Portsmouth University are now looking in other creatures.
- Not all pharmaceuticals are removed by effluent recycling plants. For example, the venlafaxine (anti-depressant) was found in the B. Farm trial plant output. The impact that such chemicals could have in the reservoir and downstream must be considered in the WQ assessment.

A4. Contaminants of concern found in the output water from the effluent recycling trial plant are not considered

Contaminants of significant concern which were recorded in the final output water from the effluent recycling trial plant that would <u>not</u> be expected in significant quantities in spring water, and which have NOT been considered in the water quality report include;

- PFAS parameters including Perfluorooctane sulfonic acid and Perfluorooctanoic acid (PFOA). The water industry has recently been campaigning through Water UK for PFAS chemicals to be banned because they are so difficult to remove during treatment.
- Pharmaceuticals – 15 substances including Caffeine, trimethoprim, theobromine, loperamide, venlafaxine (anti-depressant)
- Pesticides including DEET, Chlormequat and 2(4-dichlorphenoxy) botanoic acid. It is of concern that there was a very low rate of sampling for pesticides and not

all pesticides found in the final B. Farm effluent were tested in the output water from the recycling trial plant.
- Trace organics – 11 substances including phenol, 1,4 dioxine and acrylamide.
- Volatile Organic Compounds (VOC's) – 4 substances including toluene and xylene.

Note: Many contaminants of concern to water quality that were recorded in the B. Farm final effluent were not even tested for in the output water from the effluent recycling trial plant. This makes a robust evaluation of risks very difficult.

A5. Inadequate consideration of treatment / disinfection by-products and their potential impact

There is inadequate consideration of treatment / disinfection byproducts in the water quality report. Treatment chemicals would not be expected to be present in the spring water. The B.Farm trial plant data confirmed the presence of many byproducts in the final recycled effluent and it is essential that the impact of treatment chemicals is robustly considered, especially given Southern Water's poor track record on maintenance and treatment failures. Examples include;

- Bromodichlormethane, Bromoform. Chloroform and Chlorate were all in the final output from the effluent recycling plant but were not in the final effluent leaving B.Farm, demonstrating that they were generated by the effluent recycling treatment processes.
- Trihalomethanes
- Bromide ranged from 66.6 to 752ug/l in the final output from the trial plant. With this level of bromide there is the potential for bromate to be formed with oxidation in the final drinking water treatment works.

A6. Baseline data looks suspect when compared to previous water quality reports

The baseline data for some of the limited parameters reported looks suspect when compared to the previous data used in the water quality reports undertaken by independent experts in 2011 and 2020 and peer reviewed by the EA. For example,

- The baseline figures used in the Riders Lane Streams for nitrate and orthophosphate are higher in 2025. This makes the subsequent changes in water quality appear less significant.
- The baseline figure for Dissolved Oxygen has decreased in the Riders Lane and Hermitage Streams making the claimed improvement look better than it might be.

As the latest 2025 Southern Water report uses mainly the same sampling data for the streams to establish the baseline there should be an explanation where the baseline data shows changes from the data used for previous modelling.

A7. Some modelled outputs look suspect when compared to previous independent modelling

Some of the outputs for the limited parameters modelled look suspect when compared to the modelling previously undertaken by independent experts in 2011 and 2020 which was peer reviewed by the EA.

- The modelled concentration in the reservoir can be significantly different to the previous studies, which can make the change resulting from the input of recycled effluent look less significant. For example, in relation to pH, nitrate and Total Phosphorus.

- The modelled downstream concentrations for the spring fed 'classic' reservoir can be higher in the 2025 report making the impact of the effluent recycling plant discharge appear less. For example, in relation to changes in BOD, alkalinity, DO and orthophosphate.

Where the model outputs for the 'classic' reservoir are different to those previously reported in 2011 and 2020 there must be a robust assessment of the changes, why they have happened and whether they are justified. As these form the basis of the comparison to the changes that will result when recycled effluent is introduced to the catchment.

A8. Less parameters / contaminants modelled in 2025 than in previous studies

It is a concern that far fewer contaminants were modelled in the latest study than in previous reservoir studies (2011 & 2020), despite the fact that effluent recycling will introduce more new contaminants.

- Why have the contaminants modelled previously not been considered for the 2025 report?
- Why have new contaminants of concern related to effluent recycling not been modelled in 2025?

A9. Increased pollution risk to the reservoir <u>not</u> considered

The water quality assessment must <u>not</u> only consider the impact of fully treated recycled effluent being discharged into the reservoir, **it must also robustly consider the risk of 'out of specification' or contaminated recycled effluent reaching the water body.** Live monitoring of the effluent recycling process will largely be for surrogate parameters and cannot guarantee that higher concentrations of some contaminants of concern will not reach the reservoir.

- The Budds Farm effluent recycling trial plant data gives no confidence that Southern Water can prevent the discharge of out of specification water to the reservoir, as even contaminants with large particle size such as bacteria and suspended solids were able to pass through the treatment process.
- Southern Water's poor track record of plant malfunctions, pollution incidents, prosecutions, and fix on fail maintenance gives no confidence that pollution of the reservoir will be prevented from occurring. **Instead, the presumption of the water quality assessment should be that incidents will occur and their potential impact on water quality and ecology must be robustly assessed in the reservoir and downstream.** It is really important that this pollution risk is assessed given the largely confined nature of the reservoir water body. Once in contaminants could not be removed.
- Analysis for most contaminants of concern cannot be undertaken 'live', instead samples will be taken once or twice a month for laboratory analysis, for many contaminants the results will not be available for 28 days. By the time a problem is detected the contaminants will already be in the reservoir, with no way of removing them.
- Elements of the treatment plant will be very expensive to maintain and replace, such as the Reverse Osmosis membranes. The community have no confidence that Southern Water will replace these sufficiently frequently to ensure treatment is optimised at all times.

Risks associated with effluent recycling did <u>not</u> exist in the spring fed reservoir 'classic' scenario as a result they must be robustly considered now as a part of the water quality assessment.

A10. Temperature changes in the reservoir/ downstream <u>not</u> adequately considered

Temperature changes caused by the warmer recycled effluent entering the reservoir have NOT been adequately considered. Temperature can have a significant impact on a number of critical parameters, geochemical and ecological processes. The EA have previously raised concerns about the risk of temperature changes in the reservoir for the 'classic' spring fed reservoir. The concern must be even greater if warmer recycled effluent is introduced, and this must be robustly considered.

- Temperature changes could impact the downstream temperature gradient, it can also impact the amount of dissolved oxygen (DO) in the reservoir and downstream waters (see Section 3.2.36 & 3.2.37 page 35 and Figure 5-3 on page 60).
- Section 3.2.33 in the 2025 report indicated that winter and summer temperatures had been considered. However, **it is not clear how changes in the water temperature as a result of effluent recycling have been assessed in the 2025 report for the reservoir and downstream.**

Given the importance of this parameter it is essential that the environmental water quality report documents how temperature has been assessed before and after the introduction of effluent recycling, as well as recording the impacts in the reservoir and downstream.

- Potential changes in water temperature were considered in the 2011 and 2020 Water Quality reports for the spring fed reservoir, where changes to the downstream water bodies were assessed to be less than 3^{o}C. A change of 3 ^{o}C was indicated to be a significant change in terms of the WFD and freshwater fish directive.

Previous studies highlighted the impact of the mixing ratios in terms of assessing temperature changes. The ratio of natural water, spring water, and recycled effluent will play an important part in determining the temperature of the water in the reservoir and compensation flow. Residence time will also be a factor. There **needs to be more transparent information provided on how the mixing ratio and residence time have been taken into account when assessing temperature changes**.

A11. Salinity changes in the reservoir/ downstream have <u>not</u> been adequately considered

Salinity changes as a result of the input of recycled effluent to the reservoir have NOT been adequately considered. B. Farm WWTW has a known issue with saline intrusion. The pressure to be used in the reverse osmosis treatment process is not as high as that of a desalination plant. As a result the recycled effluent discharged into the reservoir will have a higher salinity than the spring water. The water quality modelling must robustly consider this change, as it is anticipated that this will have an adverse impact on reservoir water quality, ecology and potentially water quality downstream of the reservoir.

A12. No assessment of the impact of effluent recycling on water quality in the wetland

The report makes no reference to water quality in the wetland. Why not?

- Presumably this has not been modelled?
- The wetland is a relatively shallow body of water with a greater vulnerability to algal blooms which must be considered in the modelling, especially in relation to any change in tropic state, and for parameters which have the potential to adversely impact ecological functions (e.g. BOD, DO, calcium)
- There are weirs in the wetland retaining structure close to the proposed position of the reservoir inlet where recycled effluent will be discharged. With a SW prevailing wind it is inevitable that recycled effluent will disperse into the wetland.

- Section 5.2.14 of the report confirms that the potential impact of the bubbler system on water column mixing and phytoplankton growth in marginal areas of the reservoir is unknown **as the modelling exercise focused on open water areas** (i.e. Southern Water have not assessed the impact of changes in water quality the wetland, nor in marginal shallows, which are the most important areas for biodiversity).

The potential impact of the recycled effluent on the wetland must be considered in the water quality modelling report, as this is the most sensitive ecological area in the reservoir with the most sensitive receptors.

A13. Effluent recycling increases concentrations in the reservoir & Riders Lane Stream

The fact that effluent recycling increases the concentration of all of the parameters modelled for the reservoir and Riders Lane Steam (Table 4.2 on page 48) is not mentioned in the text discussion. This is a significant finding which you would expect to be discussed in the report.

Concentrations are also likely to increase for other contaminants of concern that have not been modelled and could be more persistent in the environment.

A14. No assessment of the impact on the stream to the south-east of the reservoir

No modelling has been undertaken for the stream that flows out from the east side of the reservoir site. This is a feeder channel to the Lavant Stream.

- Is there an EA post reservoir construction flow requirement for the Lavant Stream?
- Will there be any compensation flow discharge requirements?
- What water will discharge into this stream after completion of the reservoir?

The answers to these questions will determine what water quality assessment is needed.

A15. Inadequate recognition and consideration of the downstream benefits the original spring fed reservoir provided when comparing the impact

There is inadequate consideration of the significant benefits that are being delivered by the 'classic' original spring fed reservoir project on downstream water courses which include;

- Improved water quality – the spring fed reservoir will dilute and buffer the effects of high concentrations of iron, manganese and magnesium generated from the head water streams.
- Improve flow – EA agreed compensation flow from the reservoir to operate throughout the year, stopping the stream drying up in summer.
- Ecology – lower BOD and higher calcium concentrations will be beneficial to creating a more diverse fauna and flora
- S106 improvements to the Riders Lane & Hermitage streams for the benefit of stream morphology and biodiversity, removing the concrete channel lining etc. to create natural channels.

The impact of introducing recycled effluent into this much improved water catchment (post classic reservoir construction and filling), must be comprehensively assessed, as all of these improvements are scheduled to be in place before the effluent recycling scheme would start.

A16. Loss of a unique biodiversity opportunity to create a chalk spring fed reservoir

Creating a chalk spring fed reservoir created a unique biodiversity opportunity**,** as research undertaken by Portsmouth Water indicated there was no similar chalk spring fed reservoir anywhere in the world. The 2011 WQ report (page 23) noted that the high calcium

concentrations in the water was likely to increase the number and diversity of species that utilise calcium in their exoskeleton like molluscs, shrimps etc., which in turn would increase the number of predators that feed on them (e.g. fish). In addition, the geochemistry of the spring water would encourage more calcareous plant species to develop, increasing the diversity of submerged and marginal plant assemblages in the reservoir, but also downstream.

- The input of recycled effluent will change the geochemistry of the reservoir.
- The treatment process will strip the recycled water of its mineral content.
- No information is provided in the 2025 WQ report on the level of remineralisation that the recycled effluent will be subject to, or what has been assumed in the modelling.
- Southern Water have previously confirmed that they will <u>not</u> remineralise the water to that of the spring water input.

The change in reservoir geochemistry and its impacts has <u>not</u> been adequately assessed in the 2025 report.

As a result of introducing recycled effluent into the reservoir **there will be an adverse impact on the diversity and number of species that can thrive in the reservoir and downstream, giving a negative impact that is <u>not</u> discussed in the 2025 WQ report.**

- **The impact of the input of recycled effluent in the reservoir must be assessed against the expected improvement in downstream water quality** which results from the original spring fed reservoir.

A17. Unclear what data has been used for effluent recycling inputs to the reservoir

The data being used as the input for modelling the impact of effluent recycling discharged into the reservoir is not identified/ clear? As with any modelling exercise if you put rubbish data in you get rubbish data out which cannot be relied upon.

- Is the data used from the effluent recycling trial plant, and if not, why not?
- The data used for modelling the impact of effluent recycling must be representative of a realistic and comparable scenario, in terms of the sewer catchment and treatment processes, not just the data provided as ‘typical’ by the manufacturer of the plant.

A18. Lack of sensitivity analysis to changes in the inputs and outputs

What is the sensitivity of the data to model inputs and outputs?

- Concern at the low number of samples and short time period over which the B. Farm trial effluent recycling plant operated. Given the complex catchment and fact that 16% of the sewage entering B. Farm comes from industrial/ commercial uses there must be variation in the presence of some contaminants across the year. This must impact the reliance that can be placed on the data and the quality of the sensitivity analysis.
- Southern Water previously indicated that the quality of the water arriving at the water recycling plant needed to be fairly consistent for the advanced treatment process to be most effective. The data for the final effluent arriving from B. Farm at the effluent recycling trial plant was very variable, which is not surprising as the effectiveness of the B. Farm treatment process is dependent on a number of factors including the impact of storm events.
- The final effluent input data to the trial recycling plant shows a high level of variation in pH, Total dissolved solids, Turbidity, Conductivity, Ammonia, Nitrate, Total Nitrogen, Phosphorus and Bromide.

- What work has been undertaken to determine the impact of variable effluent input to the recycling plant?
- Has reasonable worst case data been used in the modelling and assessment?

A19. Inadequate data to assess the baseline conditions in the streams

The data used to assess the baseline water quality of the existing streams is limited to that previously collected by Portsmouth Water (2008-2010 and 2018-2019). It is not clear why Southern Water did not continue the water quality monitoring originally started by Portsmouth Water, given they have known since 2021 that effluent recycling via Havant Thicket Reservoir was their preferred option. Four years on in 2025 there should by now have been a very robust set of data for the water courses downstream of the reservoir, but there is not. Instead, Southern Water state on page 24 of the 2025 WQ report that they are currently collecting more data for the Riders Lane and Hermitage Streams. The lack of available data over a longer period is a concern that by now should have been addressed, to be able to assess more robustly the impact of the proposed effluent recycling scheme on downstream water bodies.

A20. Impact of seasonal variation in downstream flow not adequately considered

The report does not adequately consider the impact of seasonal variations in water quality downstream from the reservoir, instead the modelling analysis just relies on a median value for all parameters in the reservoir and downstream.

- Concerned that using a median value is not adequate to assess the impacts of effluent recycling.
- The impact of new contaminants introduced by effluent recycling such as pesticides, PFAS, salinity and metals must be greatest when the stream flows are at their lowest, yet this is not assessed.
- For example, the 2011 water quality modelling report for the spring fed (classic) reservoir considered the seasonal variation in calcium in the reservoir and downstream, determining that the seasonal variation would not have a significant effect, but that might not be the case for other contaminants.
- Water quality could vary even more with the input of recycled effluent affecting the ratio of spring to recycled water in the reservoir at different times of the year, and depending on which water is used to fill the reservoir under different operating scenarios. This is not considered in the current modelling report.
- **What parameters could change seasonally and need to be considered in the assessment for the effluent recycling input in a normal year and in a drought year?**

A21. Lack of assessment points in the downstream water courses

Concern that there is only one evaluation point in the Riders Lane Stream and just one in the Hermitage Stream (New Road), the latter will be at a point where dilution from other stream (non-reservoir) inputs will be greatest. For the 2011 and 2020 modelling undertaken to assess the impacts of the original spring fed reservoir on downstream water courses there was also a sample and modelling point at the confluence of the Riders Lane and Hermitage Streams.

- Why is modelling no longer being undertaken at the confluence of the two streams? (especially as this is a stream section that will be significantly improved under the original spring fed reservoir Section 106 agreement signed by Portsmouth Water)

A22. Not clear that all relevant information has been used to evaluate the current value and impact on the streams

The report appears to underplay the value of the Riders Lane Stream at 2.4.6, referencing a macroinvertebrate survey undertaken in 2024. Time of year is critical to the value of such surveys. It is not clear if earlier stream surveys commissioned by Portsmouth Water have been taken into consideration when assessing the quality of the habitat and potential impacts. For example, have the 2020 invertebrate surveys been considered which did find interesting species present in the streams?

A23. Insufficient information is provided on the operating scenarios modelled to assess the validity and adequacy of the modelling.

For example;

- Not clear how many model runs were used to achieve the range of results displayed in the figures.
- **Not clear where the modelled results in the reservoir are for?** Is it a point in the main deep bowl of the reservoir? How far from the reservoir inlet discharge pipe?
- What does the range of results for each parameter shown in the figures represent? Is it the results from a range of model runs, or is it the range for a number of modelled points within the reservoir.
- What drawdown scenarios have been modelled? (single or multiple?). The previous Atkins 2020 report confirmed water quality risks increased during drawdown and refilling events, how has this been taken into account/ assessed in the latest modelling?

A24. Concern at use of median values to assess impacts

Section 3.2.7 suggests they have used the maximum values for each parameter, but that is not how they have presented the results for their assessment. Instead, they use a median value for the reservoir and downstream, removing the peaks from their assessment. Why not a 90th or 95th percentile?

The decision to use median concentrations in the comparison of modelled outputs to baseline values in Section 3.2 is not adequately explained/ justified in the 2025 WQ report. What impact does this have compared to other criteria that could have been used?

- The median value will not take into account seasonal variation and excludes contaminant peaks which could have a significant impact.
- When assessing environmental effects the tables in Section 4.2 use a variety of criteria. For example, mean July to August for Dissolved Oxygen in the reservoir, 10th percentile for Dissolved Oxygen downstream, 90th percentile for BOD downstream, and mean for Orthophosphate downstream.
- The inconsistency in the method of reporting water quality should be considered and explained.
- In the 2011 Water Quality Report the consultant only used spring water data analysed between October to March as that is when spring water would be used to fill the reservoir. Has that sensible approach been followed in the latest modelling?

Southern Water indicated in a recent briefing to stakeholders that they have modelled reasonable worst-case scenarios. However, there assessment for the reservoir and downstream water bodies is based on the median value.

A25. Insufficient information is provided on the assumptions and scenarios used to assess the validity of the modelling and its outputs.

For example;

- No information is provided on the level of planned remineralisation. This impacts the change that effluent recycling will have on the geochemistry of the reservoir, which in turn will impact its biodiversity potential.
- Assumptions on frequency of drawdown are not provided, they were provided for the previous 2011 and 2020 water quality reports.
- Where in the reservoir and at what depth is the water quality predicted. Section 3.1.2 refers to the "model predicts reservoir water quality at depth intervals at several locations in the reservoir." (no map or further information)
- Section 3.1.10 indicated that the modelling is based on several key assumptions, agreed by Southern Water and Portsmouth Water, informed by best available information and expert judgement. What are these assumptions?
- What volume of compensation discharge is assumed, and does it vary through the year to reflect seasonal variation in rainfall? (have the compensation flow requirements been agreed with the Environment Agency, is that what has been modelled?)

A26. Inadequate assessment of the risks arising from the sewer catchment

Despite the fact that 16% of the raw sewage entering the B. Farm Waste Water Treatment Works (WWTW) is from industrial and commercial sources there is **no reference to a robust and thorough risk assessment of the sewer catchment to inform the sampling and modelling work**. A risk assessment of the sewage network is essential to identify what contaminants could be present from hospitals (e.g. pharmaceuticals, radiotherapy and chemotherapy drugs) industrial discharges (e.g. silver/ nickel plating and boat building), commercial premises and Ministry of Defence (MOD) sites. **A risk assessment should have been conducted before sampling and modelling commenced** to consider;

- What contaminants could be present?
- Can contaminants combine in the sewer system to become something of more concern?
- What contaminants have the potential to pass through the proposed treatment processes?
- What can be done to prevent or reduce the contaminants of most concern to the reservoir environment and drinking water entering the sewage network that feeds B.Farm. For example, by working with industry to introduce new more stringent sewer discharge consents and monitoring.
- What new contaminants could be created when pollutants pass through the effluent recycling treatment process.

Southern Water has previously indicated that they do <u>not</u> need to assess and reduce the risks in the sewer catchment, they will just rely solely on the advanced treatment processes to remove contaminants. **Relying on treatment alone is <u>not</u> acceptable and is <u>not</u> in line with the Drinking Water Safety Plan approach required by the Drinking Water Inspectorate, which demands that risks are to be assessed and reduced at every step of the waters journey.**

A27. Impact on shallow areas of the reservoir are <u>not</u> assessed

The modelling only applies to open water areas. It does not help us to understand the impact of the input of recycled effluent in shallower water areas of the reservoir or in the wetland, where the ecological impact could be greatest.

A28. Only one set of model outputs provided which is inadequate to assess the range of scenarios

There is only one set of model outputs, which suggests they have not modelled a variety of operational scenarios. For example, a typical year with 30Ml/d recycled effluent input, multiple typical years with no drawdown, compared to a drought year when 60Ml/d input and greater drawdown, or multiple back to back drought years.

- How will the daily input of recycled effluent impact reservoir water quality in the short and longer term?
- How often is drought drawdown and filling expected to occur?

A29. Inlet position in the reservoir has changed and as a result the modelling is out of date

The water quality modelling is already out of date as the position of the inlet pipe shown in Figure 1.1 inset map is different to the 2024 Future Water drawings, which show it extending further east into the reservoir. (Note: SW Design Refinement 4 - Figure 10 also indicates a different extent for the inlet pipeline)

A30 Concern regarding increased risk of blue green algae

The bubbler system proposed is indicated to reduce the risk of blue-green algae (cyanobacteria) which reduces the risk posed to human health and animal health (Section 5.2.13), this is reliant on the efficiency of mixing in the water column. Even with a bubbler system in place water storage reservoirs can still experience blue-green algae issues.

As blue green algae have less chlorophyll-a than other green algae they can be harder to detect forming and blooming.

- Blue-green algae remain a concern.

A31. Additional cost due to proposed phosphate treatment and bubbler mixing system

Concerns have already been raised by stakeholders and the community about the huge cost of effluent recycling, challenging the assertion that effluent recycling is a best value solution. The cost of the effluent recycling scheme will now be much higher to both construct and operate as the modelling has shown the need for additional infrastructure to address significant water quality concerns including a new phosphate treatment plant and bubbler aeration system.

- What is the additional construction cost?
- What is the additional operational cost? (daily operation needed of both)
- What is the expected life of a phosphate treatment plant, how quickly is it likely to need replacing? (or major maintenance)
- What is the expected life of a bubbler system and how quickly is it likely to need replacing?
- Is in reservoir maintenance needed for the bubbler system, how often, does it require drawdown of the reservoir, and if not drawdown, what disturbance would maintenance of the system cause to wildlife in the reservoir?
- How are the additional costs being taken into account in reviewing whether effluent recycling remains a ‘best value’ solution? (both to construct and operate for the life of the plant)

A32. Impact of the bubbler aeration system operating for longer in the reservoir

A bubbler aeration system is proposed to operate between April and August each year to improve mixing. It is not clear where this will be installed so difficult to assess the impact. For example;

- Will it be located in the borrow pit close to the inlet, or over a wider area? (Section 3.1.9 suggests it will be installed in two basins of the reservoir to mix the water)
- Will it just be a limited curtain line or something more extensive in each basin?
- Will it only be in water more than 6m deep where stratification is more likely?
- What is the additional energy and carbon cost to operate the bubbler for 5 months of the year as proposed? (noting that as a result of effluent recycling input the aeration system will need to operate more frequently and for longer periods)

A33. Not clear who has undertaken the water quality modelling/ assessment?

There is no information on who has undertaken the modelling, nor what their experience is?

It was clear that the previous reservoir modelling commissioned by Portsmouth Water in 2011 and 2020 for the spring fed reservoir had been completed by very experienced independent expert consultants. The 2020 report confirmed that any change to the modelling, and the final model outputs were peer reviewed by the EA national water quality modelling experts.

There is no such reassurance in relation to the latest modelling. Any modelling led by Southern Water would be considered suspect as they are not trusted by the community.

A34. Not clear if the data from the effluent recycling plant trial has been used to inform the studies

No information is provided in the consultation water quality report on the effluent recycling plant trial which took place at B. Farm for a short period in 2023 (only a few months).

a) **The period of the trial was inadequate to get a good understanding of water quality impacts.** The nature of contaminants entering the sewage works from industrial, commercial and hospital sources may vary over time/ calendar year, as a result the effluent recycling trial at B. Farm WWTW should have been conducted over a longer period.
b) The Peel Common sewer catchment is <u>not</u> the same as the Budds Farm sewer catchment. The latter includes a major hospital, more industry and MOD uses. Results from a trial plant at Peel Common cannot be used as a surrogate for B. Farm WWTW. For example, the limited trials recorded more pharmaceuticals in the recycled effluent at B. Farm than they did in the trial at Peel Common WWTW.
c)There are a number of concerns about the trial plant information supplied to the local community after a Freedom of Information Request. The output water from the effluent recycling trial plant at B. Farm was not tested for many important contaminants including;

- Enterococci, Giardia, Cryptosporidium, legionalla, nor virus (e.g. F+coliphage). These microbiological parameters were tested for in the Peel Common Trial.
- Microplastics or nanoplastics.
- Temperature
- Salinity

d) Contaminants found in the final effluent from Budds Farm that were often not included in the parameters tested in the final output from the effluent recycling trial plant included

- Many metals
- Pesticides
- Trace organics (e.g. p-Toluenesulfonic acid)
- Volatile Organic Compounds

d) There were a very low number of samples for critical contaminants including many PFAS , pesticides, trace organics, volatile organic compounds (often just 6 or 12 samples).

A35. The recycled water is to be introduced into the reservoir before it has stabilised

Section 3.1.5 (last bullet) states that the recycled water is to be introduced into the reservoir before it has stabilised, indicating that this period is predicted to include some stabilisation effects.

- What are the potential stabilisation effects in relation to water quality in the reservoir?
- What impact might this have on fauna and flora which have already established?

A36. Mitigation of adverse impacts are not planned until after a period of operation?

Section 3.1.2 states that details of any future mitigation will be verified following a suitable period of operation of the Project.

- It is not acceptable to wait and determine what the harm will be of introducing recycled effluent into the reservoir, then decide what mitigation action should be taken, as there would be a likely adverse impact on biodiversity in the interim.

A37. Not clear if previous water quality reports have been used to inform the studies

Previous water quality modelling reports for the reservoir and downstream water bodies are not included in the reference list at the end of the report.

- It is not clear as to the extent to which the information in the previous modelling reports peer reviewed by the EA have been drawn upon when completing the latest modelling?
- The previous reports covered far more parameters than are considered in the current water quality modelling report.
- Have they been used as a basis for a comparing/ sense checking the findings of the original spring fed reservoir modelling to the impact of introducing recycled effluent into the reservoir?

B. Langstone Harbour Concerns

The changes in water quality and associated impacts on Langstone Harbour have not been adequately assessed, nor have the risks. The conclusions drawn about the impacts of effluent recycling on water quality and biodiversity are not sound.

B1 Reduced nitrate benefit to Langstone Harbour

A critical advantage of the spring fed (classic) reservoir was the benefit that would be provided to Langstone Harbour in reducing nitrate inputs that contribute to algal blooms which have an adverse impact on the internationally important SAC/ SPA. This is explained in the 2011 water quality modelling report page 3 (vii) and page 25, where a reduction in nitrogen load to the harbour of up to 61kg/day was predicted by modelling (estimated as a 21% reduction). The methodology for calculating this was checked by the EA.

The benefit was reviewed again for the 2020 Atkins Water Quality Report which concluded in Section 4.5; "The nitrogen load in Langstone Harbour is predicted to decline on average by 6.7% as a result of construction of the new reservoir which will help protect the condition of the SAC and SPA site. The decline varies substantially from year to year depending on how much spring water is pumped up to the reservoir (**during and after drought periods the reduction in nitrate to the harbour could be as much as 40%**)" We must not allow this significant benefit to Langstone Harbour to be eroded by the introduction of effluent recycling to top up the reservoir.

This confirms that the benefit of reduced nitrate flow into the harbour would be greatest when Bedhampton spring water is used to fill the reservoir post construction and after a drought drawdown event. If the effluent recycling plant is used as planned to add more water to the reservoir in a drought, then at the end of any drought event the reservoir water level is likely to be higher than it would have been without effluent recycling. This means that less spring water containing elevated nitrate will be needed to top up the reservoir after a drought and the nitrate benefit to the harbour from directing spring water to the reservoir will be reduced.

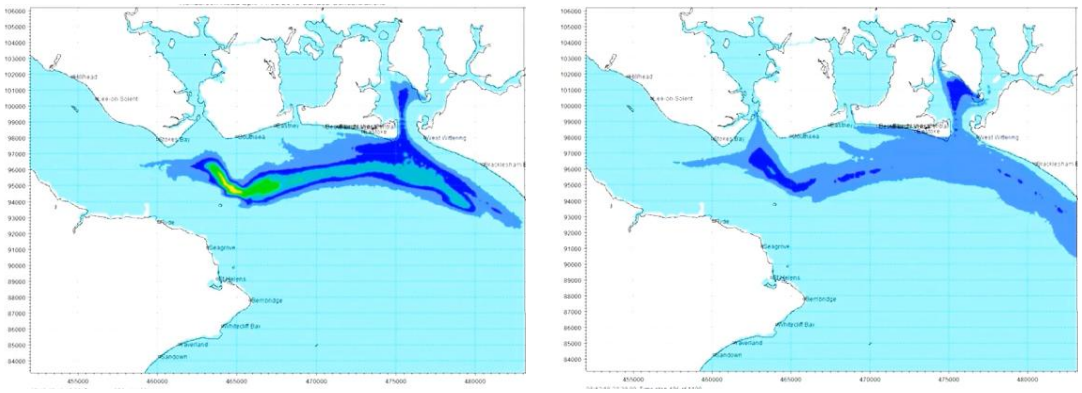
- This is a negative impact that has NOT been considered in the 2025 environmental water quality report.

The impact of the effluent recycling scheme in reducing this critical nitrate benefit to Langstone Harbour must be considered and properly reported.

B2 Discharge of reject water from the Eastney LSO can reach Langstone Harbour

The report dismisses the risk of the plume of reject water from the Eastney Long Sea Outfall (LSO) reaching Langstone Harbour. However, the period over which the modelling of the plume was undertaken is not clear.

Previous modelling of the dispersion plume from the Eastney LSO has shown that the plume does extend as far as both Langstone Harbour and Chichester Harbour, see extracts below. The Environment Agency consider Langstone & Chichester Harbour to be one water body.



B3 Cumulative and in-combination impacts not adequately considered for Langstone and Chichester Harbour

Cumulative impacts from daily discharges and in-combination impacts have not been adequately considered.

a) Cumulative impact from the daily discharge of reject water

The discharge of reject water from the effluent recycling plant via the Eastney LSO is not just a one off, it will be happening daily, if not all of the time. Some chemicals found in sewage do not degrade, or take a long period to degrade, and are persistent in the environment once discharged. The cumulative impact of the daily discharge from the LSO across the full extent of the plume area must be considered, especially for contaminants that are slow to degrade.

b) Combined impact of reject water LSO discharge and reservoir compensation discharge

In Langstone Harbour the in-combination and cumulative impact of both the reject water plume and residual contaminants in the compensation flow from the reservoir must be considered. Some chemicals found in sewage do not degrade, or take a long period to degrade, and are persistent in the environment once discharged. This must be taken into account as part of the assessment.

Lots of small increases in many parameters (including contaminants of concern such as ammonia) may actually result in a significant impact overall

c) More concentrated plumes from multiple long-sea outfalls

Consideration also needs to be given as to whether there are combined or cumulative impacts with outfalls from other sewage works including Peel Common, but also Sandown and Littlehampton where effluent recycling plants are also planned, meaning the output from those plants will also be more concentrated and include treatment by-products from all 3 effluent recycling plants. The potential for in-combination impacts from these additional discharges must also be considered.

B4 Risk to Langstone Harbour of building on the Broadmarsh landfill <u>not</u> considered

A major risk to Langstone Harbour is the development of the Water Recycling Plant (WRP) and associated infrastructure, tunnels and pipelines on the Broadmarsh landfill site, which was constructed without a lining. **The Environmental Water Quality Report does NOT currently consider this significant increased risk to water quality from migration of landfill leachate to the harbour.**

- The site of the WRP is on a mixed waste landfill, tipped between the 1960's to 1980's and is known to contain toxic and mobile contaminants, including hydrocarbons and solvents. The landfill has no lining against which any new construction features can be sealed.
- Constructing hundreds of deep piles, c.8m wide tunnel shafts, and pipelines through the toxic landfill into the chalk aquifer below **will create new pathways for contaminants to reach the harbour via the groundwater**. The chalk aquifer is known to be in hydraulic continuity with the harbour water, with tidal variation in ground water levels
- The new migration pathways to the harbours will remain open post construction along piled foundations, tunnels, pipes and conduits, including those that pass below the tidal section of the Hermitage Stream.
- Dewatering to allow construction of shafts through the landfill waste into the chalk for tunnel access poses a significant risk. Preliminary Env Information Report confirmed "Excavations for shafts are likely to encounter groundwater and require groundwater control measures" (Chapter 19, page 76 & 79). This poses a risk to groundwater and the harbour which are hydraulically connected. Risks associated with potential karstic features in the chalk also need to be considered. Saline intrusion during dewatering of shafts at the WRP site is flagged as an issue on page 112 of Chapter 19.

Section 2.4.14 indicated that Langstone Harbour is currently in ''good' condition for contaminants such as hydrocarbons, dioxins, pesticides and herbicides. The harbour is already not classed as good for both mercury and PBDE. The risk of opening up new pathways to the SPA/ SAC for landfill leachate is not acceptable and pollution from this new source could change the water quality status of Langstone Harbour for other contaminants, as well as having adverse impacts on internationally protected habitats and species.

As the landfill has no engineered lining there is nothing against which the new piles, shafts and pipelines can be sealed to address the risk of leachate migration.

B5 Risk to the harbour from future effluent recycling pipeline construction, maintenance or bursts

Two new pipes are proposed to be constructed below the tidal section of the Hermitage Stream in the north of Langstone Harbour. The pipes will carry liquid waste water.

- Pipe 1 - Final effluent from the Budds Farm sewage works to the Water Recycling Plant at Broadmarsh (pumped).
- Pipe 2 - Reject water from the new Water Recycling Plant to the Budds Farm sewage works for discharge via the long sea outfall which starts at Budds Farm.

Construction of these pipelines poses a risk to water quality and biodiversity in Langstone Harbour. The PEIR report Chapter 9 (Section 9.8.12) highlights **the risk of a blow-out occurring during the drilling or micro-tunnelling process below the Hermitage Stream**. "A blow-out is where the pressure of a tunnel unintentionally causes it to push the soils/sediment towards the river/seabed and may potentially result in waters entering the tunnel causing a possible collapse due to sudden depressurisation. This could lead to pollutants and/or sediments travelling downstream into Langstone Harbour. If the drilling equipment were broken off under the stream, it may require direct excavation for their retrieval which would likely generate further risk of pollution and/or sediment runoff."

A burst or maintenance on either pipeline could result in a significant and damaging discharge into Langstone Harbour. This risk is NOT considered in the Environmental Water Quality Report.

There is no information on where the pipeline washouts will be and whether they could discharge into Langstone Harbour or the Hermitage Stream?

Washouts are built into pipelines and used during maintenance activities, or when there is a need to **flush out a build up of sediment**. In these pipelines the silt will be contaminated and poses a significant risk to the harbour if it escapes or is discharged to the environment. The testing and operation of washouts could occur yearly (PEIR Chapter 9, Section 9.8.20).

B6. The assessment point is too far south into Langstone Harbour

The assessment point for the study shown on Figure 3-1 (page 24) for impacts in Langstone Harbour is set well back from where the mixed compensation flow from the reservoir will discharge into the north of the harbour. It is at a point to the south where multiple channels meet at low tide, meaning that water at that point is more diluted and not necessarily representative of areas further north in the harbour where the discharge could be more significant.

- SW may argue that the assessment point is where they have baseline data for comparison.
- Why have SW not been collecting baseline data for the north of the harbour where any impact would be greatest?
- The assessment point for Langstone Harbour could then have been further north.
- Why is the impact not modelled at more than one point in Langstone Harbour?

B7 Impact of planned reconfiguration of discharges at Budds Farm not considered

There must be no pathway by which concentrated reject water from the effluent recycling plant can discharge into Langstone Harbour. The reject water is to be discharged via the existing Eastney long sea outfall (LSO) into the Solent, it will enter the LSO at Budds Farm.

Southern Water are planning reconfiguration works at Budds Farm Sewage Works that would enable storm water flows to be diverted from the storm tanks to the LSO, at the same time final effluent from Budds Farm would be diverted into Langstone Harbour via the existing short sea outfall. The scheme is referred to on page 9 of the 2025 Environmental Water Quality Report but the text indicated; “that as the potential reconfiguration project is not sufficiently developed at this stage, **the potential interactions with the effluent recycling project have <u>not</u> been considered”.**

Southern Water and the Environment Agency need to ensure that the way the reconfiguration of pipelines and discharges is undertaken will prevent reject water from the effluent recycling plant ever reaching Langstone Harbour. For example, by ensuring that the reject water is discharged into the LSO upstream of the reconfigured pipework.

Note: Page 35 (Section 3.3.5) states that the reject water from the proposed WRP would be released into the existing Eastney transfer tunnel via a new connection, downstream of the existing release from Budds Farm WWTW. The release point into the LSO also needs to be downstream of any reconfiguration pipework for the discharge diversion to Langstone Harbour.

C. Solent Modelling Concerns

C1 The report conclusion of no likely significant effects in the Solent is <u>not</u> sound

The **conclusion of the report in Section 6.2.9 that no significant effects on marine biodiversity are anticipated is not sound**. Nor is there adequate assessment to conclude that given the forecast small changes in concentrations it is unlikely that effects to marine statutory designated sites, marine habitats and species would be observed as a result of the effluent recycling reject water discharge via the long sea outfall (LSO).

- The modelling of the impact on the Solent is not robust.
- Only considers 7 parameters, when there are thousands of chemicals that will be discharged, and many more are contaminants of concern.
- Contaminants of concern have not been adequately considered including pharmaceuticals and forever chemicals.
- Adequate baseline information on water quality and habitats is not available.

As identified in Section 6.2.9 further work requires the addition of baseline concentrations from marine water quality sampling to the modelled outputs.

The summer 2024 Preliminary Environmental Information Report concluded that there **is a potential for significant adverse effects on the marine environment, and that further work on marine dispersion modelling and outputs were necessary. That remains the case.**

Further information on concerns about the modelling and environmental water quality report sections completed for the Solent to date are set out below.

C2. Increase in the concentration of contaminants discharged to the Solent

The reject water from the effluent recycling plant discharged from the long sea outfall (LSO) **will be 3 or 4 times more concentrated with contaminants than the existing effluent discharge from Budds Farm**, yet the Section 3.3.17 summary claims that none of the modelled parameters will increase significantly. This seems highly unlikely.

- The **conclusion is <u>not</u> credible, the concentration of contaminants <u>must</u> increase close to the end of the outfall.**
- Not clear what they consider would be a significant change?
- Not clear at what point in the Solent they are drawing the conclusion for?
- How far away from the outfall before the discharge changes are not significant?

C3. Most of the contaminants of concern have <u>NOT</u> been considered

The reject water from the effluent recycling plant will contain thousands of contaminants of potential concern to the Solent.

- Most will be **more concentrated than in the existing effluent discharge**.
- There will also be **<u>additional new contaminants</u> of concern in the reject water from the effluent recycling plant including treatment chemicals, cleaning chemicals and treatment by-products which must be considered.** It is not clear if these new contaminants have been considered in the screening?

It is not clear how they got from screening all contaminants of concern that could pose a risk to selecting just 7 parameters to model for the study listed in Section 3.3.3.

- It is <u>not</u> adequate to just consider the impact of 7 parameters on the Solent.
- A list of contaminants identified/ potentially present in the reject water and their likely concentration needs to be made available for public scrutiny.

For example, the effluent recycling trial plant data shows that levels of some pharmaceuticals in the final effluent from the WWTW are already present at significant levels, including venlafaxine (anti-depressant) and ethinyl estradiol (contraceptive pill), which can have ecological impacts (e.g. feminised fish). The concentrations of such contaminants of concern will be even more concentrated in the reject water discharged into the Solent post Water Recycling Plant.

It is not acceptable to only screen in contaminants for which there is an Environmental Quality Standard threshold as was done. Other contaminants can be equally if not more damaging to the marine environment and ALL risks must be considered when assessing the impact on the Solent.

C4. Forecast decrease in predicted concentration of all 7 contaminants is highly suspect

Very sceptical of the fact that small *decreases* in the concentration of all the contaminants are predicted by the modelling, this makes the outputs provided in the report highly suspect. Section 6.2.8 states; Based upon the preliminary Eastney LSO dispersion modelling, small decreases are predicted in the concentrations of the screened chemical compounds releasing into the marine water via the Eastney LSO.

- Surely that makes no sense when the reject water is 3 or 4 times more concentrated than the existing LSO discharge. How could a decrease occur?
- Highly unlikely that would apply to all of the contaminants of concern.
    - Many will be much higher in concentrations in the reject water.
    - There will be contaminants in the effluent recycling reject water that were not previously present in the B. Farm final effluent discharge, so those contaminants must increase.

This only adds to the concern that the report does not consider all of the contaminants of concern.

C5. Inadequate information on screening to establish contaminants of concern

The reject water from the effluent recycling plant will contain thousands of contaminants of potential concern to the Solent.

Southern Water have not provided the full list of all contaminants that pose a risk which will be present in the reject water. Section 3.3.2 refers to identifying the pollutants released.

- What pollutants did they identify?
- Not clear if they have considered treatment chemicals, byproducts and cleaning chemicals that will be in the reject water?
- Have they considered if there are any new compounds that could be created during the mixing process that will take place within the long sea outfall (5.7km) before the release that also need to be considered?

It is not clear how they got from screening all contaminants of concern that could pose a risk to selecting just 7 parameters to model for the study listed in Section 3.3.3. The screening process should be fully explained, documented and made public.

Section 3.3.9 confirms the screening is due to be updated and that this may change the parameters screened into the assessment, confirming that what has been presented in the report is likely to be inadequate to assess the risk.

C6. Impact of change in salinity <u>not</u> adequately considered

The treatment process will remove some of the salt from B. Farm effluent and that will be concentrated in the reject water, making the output from the LSO higher in salinity than the existing effluent discharge. The impact could be significant but there is no plume map provided for salinity in the report. Page 37 of the report indicated that salinity was considered, if so, where are the results of the modelling and the plume map?

C7. Impact of change in temperature of LSO discharge <u>not</u> adequately considered

The treatment process will change the temperature of the reject water. Changes in temperature can have a significant impact on algal and other biological growth, it can also encourage chemical reactions. There is no indication that changes in temperature of the effluent plume have been considered in the assessment.

C8. No consideration of the risks/ impacts of bioaccumulation

Studies by Portsmouth University have already shown that some contaminants can bioaccumulate in algae, such as PFAS. With more concentrated reject water being discharged via the LSO there must be an increased risk of bioaccumulation of contaminants in marine plants and animals. **The risks and impacts of bioaccumulation must be considered in a robust and transparent way. That is not currently the case.**

C9. No consideration of the risks/ impacts of sedimentation

The reject water discharged to the Solent is 3 to 4 times more concentrated than the existing effluent discharge. In a drought most of the final effluent water from B. Farm will be diverted to the reservoir via the treatment plant, leaving little water to dilute the reject water from the effluent recycling plant.

- What sedimentation of contaminants currently takes place from the effluent discharge plume?
- What additional sedimentation of contaminants can be expected to take place as a result of the effluent recycling reject water discharge during normal operation, and when it is even more concentrated at time of drought?
- Can contaminants of concern accumulating in algae add to the risk when the algae die and settle out on the sea bed?
- Is there a risk of any coagulation or other process within the LSO or within the plume that might cause particles to clump together making them more likely to add to the sediment load?
- How has the sediment risk been assessed? (e.g. coating or covering vegetation, or on the sea bed making feeding for some species more difficult?) There is no reference to this being considered in the report.
- What could the cumulative effect be? (day on day, year on year discharge)
- How has the cumulative effect been considered just for the Hampshire scheme reject water discharge?
- How will the cumulative and in-combination effect be considered with other planned schemes including the Littlehampton and Sandown effluent recycling plants?

C10. It is not clear what the cumulative effects will be on the Solent of day on day discharge of more concentrated reject water discharge, and how this is to be assessed?

This will be a day on day, year on year discharge (365 days a year) of more concentrated reject water into the Solent. It is not clear how that has been taken into account when

assessing the immediate and longer term impacts of the discharge? Nor whether it has been considered across the full extent of the effluent plume. Some chemicals found in sewage do not degrade, or take a long period to degrade, and are persistent in the environment once discharged. This must be considered as part of the assessment.

The cumulative effects on the Solent must be considered in a robust and transparent manor. This is <u>not</u> currently the case.

C11. What will be the in-combination effects of day on day discharge of more concentrated reject water discharge from 3 new effluent recycling plants?

In addition to the discharges from other sewage works (e.g. Peel Common) into the Solent that already give rise to concerns in terms of combined or in-combination impact on water quality and biodiversity, Southern Water are planning 3 effluent recycling plants (Hampshire, Littlehampton and Sandown), all of which will discharge in to or close to the eastern Solent. Previous modelling shows that the plumes from each of the LSO discharges form slugs that move up and down the Solent with the tides.

The reject water discharged from the 3 new effluent recycling plants would each discharge everyday and be 3 or 4 more times concentrated than the existing discharges. It will include new treatment chemicals and byproducts not currently present in the existing LSO discharges.

The in-combination effects on the Solent of all 3 of these must be considered in a robust and transparent manor. This is <u>not</u> currently the case.

The in-combination effects with impacts that result from climate change must also be considered in the marine environment (water temperature, carbon dioxide, oxygen and algal growth). PEIR report Chapter 9 (9.7.64 – 9.7.69) refers.

C12. No information is provided on the key habitats present that could be impacted

- How close are the habitats?
- What types of habitats are present?
- How sensitive are they to the more concentrated contaminants being released?
- Are they sensitive to the additional new contaminants being released? For example, treatment chemicals, cleaning chemicals, disinfection by-products.

C13. No information on what happens to the sludge from the effluent recycling plant

The effluent recycling treatment process will produce a sludge which will be contaminated. For example, sludge removed from the reverse osmosis membranes during required cleaning and servicing. No information is provided on what will happen to that sludge.

- Is this also going to be dispersed in the ‘reject water’ via the long sea outfall?

- If so, how is this taken into account in the water quality report/ modelling?

- Or will the sludge be returned back into the wastewater treatment process at Budds Farm to be reprocessed and become combined sludge which is currently recycled as agricultural fertiliser or ’slurry’, or goes to landfill.

- Southern Water need to confirm what will happen to the sludge and what the environmental and water quality impacts of that disposal method will be.

C14. No modifications are planned to the outfall to improve dispersal of contaminants

The report confirmed that no work is planned to the Long sea outfall (LSO) so there is no proposal for installation of additional diffusers to improve dispersal of the contaminants. This is a significant concern.

With a point source of discharge and a 3- or 4-fold increase in contaminants in the reject water there must be an increase in the concentration of contaminants in the water around the outfall. This increase is not acknowledged anywhere in the report or discussed.

C15. No clarity on what data is being used as the basis for the modelling in the Solent

It is not clear what the source of the data is for modelling the discharge of reject water from the effluent recycling plant into the Solent.

Are they using information obtained from the Budds Farm effluent recycling trial plant to inform the studies on the impact to the Solent? If not, why not?

If they are using the effluent recycling plant manufacturers data on the concentration of contaminants in the reject water is their data from a comparable sewer catchment with much industrial, MOD and hospital waste?

Are they using the maximum concentrations when modelling each contaminant (i.e. taking a precautionary approach, modelling a reasonable worst case?)

Southern Water must demonstrate that the data they are using represents a reasonable worst case for all of the contaminants of concern, they have not done this.

C16. Specific concerns about the water quality modelling presented for the Solent

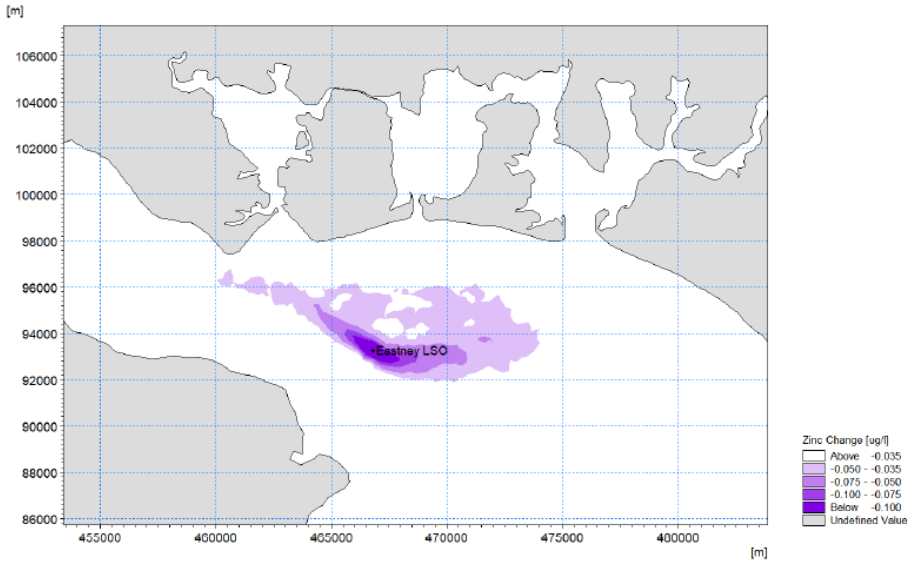
a) More of the contaminants of concern must be screened in and modelled. Section 3.3.9 confirms that the screening needs to be updated.

b) It is not clear if both neap and spring tides have been considered and what the output from the different modelling was. Section 3.3.7 indicated that both neap tides and spring tides had been modelled, but only one set of map outputs are provided.

- Dispersal maps for neap and spring tides must be provided for a 72 hour period to allow scrutiny.

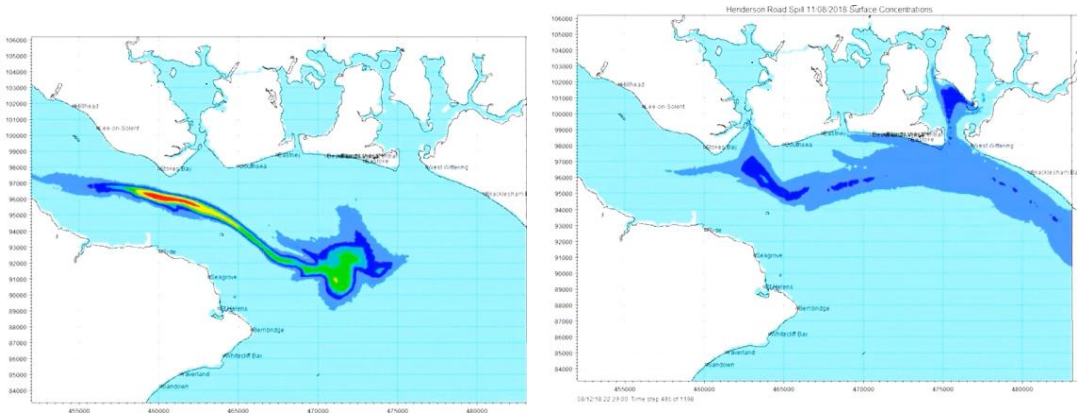
c) The timeframe over which the modelled outputs were generated is unclear. Previous modelling has shown that the LSO effluent plume can disperse across a very wide area of the Solent over a 72-hour period (see maps below and in Appendix A), where the plume dispersal changes over a number of tidal cycles. The length of the plume illustrated on the outputs on page 38 to 44 would suggest that modelling is over a very short timeframe, and therefore does not illustrate the full extent of the plume. The maps below show that it is critical that the modelling takes place over a minimum 72-hour period in order to assess the full extent of the impacts of the discharge of the reject water from the effluent recycling process.

Figure 3-13 Change in zinc concentration between the existing and future scenarios



Model Output from 2025 report

For comparison below are extracts from modelling outputs from the existing LSO outfall showing the plume extent over a much broader area, when considered over a multiple tidal cycles.



For additional images of the plume at different states of tide over a 72 hour period see Appendix A

d) The report indicates that they modelled the extent of the dispersion for the existing effluent discharge and the future (post effluent recycling) discharge, but these maps are <u>not</u> provided. As a result it is not possible to assess and peer review the model outputs. On pages 38 to 44 Southern Water only provide the modelled 'change'. For each parameter they should have provided the modelled dispersal plume for the existing LSO discharge, the future discharge including the more concentrated reject water and the 'change', to provide transparency and the opportunity for peer review against previous studies. The figures should reflect the model outputs for a spring and neap tide over a number of tidal cycles.

e) It is not specifically clear what scenario has been modelled. What was the input volume of reject water compared to effluent from B. Farm sewage works discharging from the LSO?

- Section 3.3.1 refers to the future scenario being at 'peak' operation of the Water Recycling Plant. Is this when the plant is operating to produce 60Ml/d, generating 20Ml/d of reject water (equivalent to the volume of 8 Olympic size swimming pools discharged each day). Why does it not give the volume of reject water assumed for the modelling?

- Section 3.3.8 refers to modelling the scenario during a drought. This is when effluent flow from B. Farm sewage works out of the LSO would be at its lowest (as more final effluent water will have been diverted from B. Farm to the effluent recycling plant), but again the volumes assumed for the reject water and final effluent are not given.

How the volumes have been determined is also not provided.

Are they reasonable worst case volumes?

f) Section 3.3.8 indicated that the only scenario modelled was for a drought, making the assumption that at other times of the year the flows through the proposed water recycling plant would be lower, thus having less effect. This assumption should have been tested by undertaking modelling for a more typical non-drought scenario, when there will be a daily discharge of reject water over a long period (years).

- How has the impact of reject water from the 'normal' operation (30Ml/day output) of the effluent recycling process over a short and long timeframe been assessed for the Solent?

g) The assumptions used in the modelling are not clear. This includes volumes of different inputs and what level of mixing of final effluent and reject water in the LSO has been assumed?

- How has the amount of mixing in the LSO been determined? (what volumes assumed?)

h) Has particle size been taken into consideration when assessing the risks and determining which contaminants are most likely to be present in the reject water?

For example, modelling has been undertaken for dispersal of Perfluoro octane sulfonic acid and its salts (PFOS) from the long sea outfall. Is this a small enough compound that much of it is likely to have passed through the RO membranes and be more likely to discharge into the Havant Thicket Reservoir? (*noting that this was found in the output water from the effluent recycling trial plant*) If so, other larger PFAS compounds should also have been selected for modelling as their concentration in the reject water may be higher. Once again illustrating the importance of a robust screening process for which no detail has been provided in the report.

D. New Surface Water Drainage System Concerns

D1. Increased risk of pollution from chemicals and sewage effluent

Locating the effluent recycling plant on the Broadmarsh Landfill will result in;

- The storage of large volumes of treatment chemicals including peroxide, acids and cleaning chemicals at the site.
- The diversion of treated final effluent from the Budds Farm Sewage Works to the site.
- Storage of reject water

Storing these liquids on site presents an added risk to the surface water drainage system that is NOT currently present. This is not adequately considered in the report, it is dismissed by indicating that pollution control measures will be adequate to control the risk (page 72).

While pollution control measures, such as bunding of chemical storage tanks, can reduce the risk, it cannot eliminate it. Spills during tanker deliveries, pipe ruptures, vandalism and human error do occur in the water industry. The report must therefore consider the impact of a pollution incident occurring at the site in terms of water quality and ecological impacts in the Hermitage Stream and Langstone Harbour SAC, SPA, Ramsar, SSSI.

Given Southern Water's poor track record on maintenance (fix on fail) and pollution incidents during maintenance this is a significant concern. It is certainly not acceptable to assume that there is no pollution risk, as is currently the case.

D2. Increased risk of leachate pollution to stream/ harbour via the surface water collection features/ pipe

The effluent recycling plant will be located on top of the Broadmarsh uncontained landfill site. The landfill contains toxic and mobile contaminants (leachate). Introducing a new surface water drainage system which releases water via a pipe to the tidal section of the Hermitage Stream with swales, a detention basin and carrier ditches increases the risk of leachate dispersal via the new drainage features, or through bedding materials. While the new surface water drainage system can be lined to minimise the risk, settlement at the site is still occurring and there can be no guarantee that new pathways for leachate to reach the tidal section of the Hermitage Stream and Langstone Harbour will not occur over the life of the development.

- This has not been adequately considered in the report.
- Leachate has been observed in the past entering the existing ditches at the Broadmarsh Coastal Park, showing that this is a genuine concern for the future that must be considered and addressed.

D3. Additional construction risk impacts – mobilisation of leachate to the stream/ harbour

Construction of the surface water detention basin and carrier ditches/pipes will require significant excavation of contaminated landfill waste if it is to collect surface water from the lower area around the new water recycling plant buildings and be able to gravity feed across the higher western landfill mound to drain into the Hermitage Stream. Excavating into the landfill increases the risk of pollution to the Hermitage Stream & Langstone Harbour.

- Removing the landfill cover opens up the contaminated waste to increased rainfall infiltration, generating more leachate.

- The contaminated waste to be excavated is located at a higher level than the Hermitage Stream, this difference in topography can allow leachate and surface water to drain under gravity to the stream during construction.
- The construction of a new pipe(s)from the landfill site to the Hermitage Stream to discharge the surface water collected from the site **creates a new pathway along which leachate can travel.** The pipe itself and the pipe bedding material could provide a conduit along which contaminated leachate could travel to the stream. Noting that Broadmarsh is an uncontained landfill, which makes creating a watertight seal for any new pipe/ bedding very difficult, as there is nothing to seal too.

These additional risks to water quality in the Hermitage Stream and Langstone Harbour have not been considered.

D4. Increased risk of mobilising contaminants during maintenance activities

The detention basin and carrier ditches, pipes and swales will be located on a landfill which is still undergoing settlement. Surface water drainage features will be subject to settlement. Any future maintenance work to restore the profile of these features, remove silt build up etc. risks contaminated water (leachate) entering the drainage system.

Future maintenance, utility maintenance/ new installation work is inevitable over the 60 to 70 year life of the Water Recycling Plant at the Broadmarsh Landfill site. Any such maintenance or new construction work that requires excavation into the ground risks mobilising contaminants from the landfill. It is also presents health and safety risks.

These increased risks would not exist if the site selected for the Water Recycling Plant were not a contaminated uncontained landfill site. The increased risk to water quality associated with any maintenance (or future construction work) at the site must be considered in the water quality assessment.

Given Southern Water's poor track record on maintenance (fix on fail) and pollution incidents during maintenance this is a significant concern. They certainly cannot assume that there is no pollution risk, as they currently appear to be doing in the water quality report.

D5. Lack of detail available to assess surface water modelled outputs

There is very little detail provided on how the modelling was undertaken and over what period. For example, page 46 shows the extent of the plume from the modelled output for a neap and spring tide, but no time period for the modelled extent is shown. If the model is run over a longer period how does the extent of the plume from the surface water discharge change?

Section 3.4.3 highlights that the impermeable area of the site will increase and the new collection system will concentrate surface water flows to a single collection point release. There is no detail on where the existing surface water from the site discharges making it difficult to assess the significance of this change.

Note: Even if a of the water quality risk identified above is outside of the scope of the existing report it is still a risk to the water environment and it should at least be acknowledged.

E. Other Concerns

E1 Definitions used in the glossary are misleading;

- Recycled water; text suggests remaining impurities are removed by the advanced treatment techniques. However, in reality NOT all of the impurities are removed by the treatment processes, some contaminants remain.
- Reject water; confirms impurities removed from the treated waste during the recycling process will be released in the Solent via the existing Eastney LSO. However, it does not refer to the fact that the reject water will also contain treatment and disinfection by-products as well as cleaning chemicals.

E2. Not clear who has undertaken the water quality modelling/ assessments?

There is no information on who has undertaken the modelling for each water body including; the reservoir, downstream, or for the Solent, nor what their experience is?

It was clear that the previous reservoir modelling commissioned by Portsmouth Water in 2011 and 2020 for the spring fed reservoir had been completed by very experienced independent expert consultants. The 2020 report confirmed that any change to the modelling, and the final model outputs were peer reviewed by the EA national water quality modelling experts. There is no such reassurance in relation to the latest modelling.

Any modelling led by Southern Water would be considered suspect as they are not trusted by the community.

E2 What is the significance of the Future Water 2024 Report?

A Future Water report is referenced in Section 4.2.4. This report has not been provided.

- Does any of the data come from that report?
- Who prepared and peer reviewed that report?

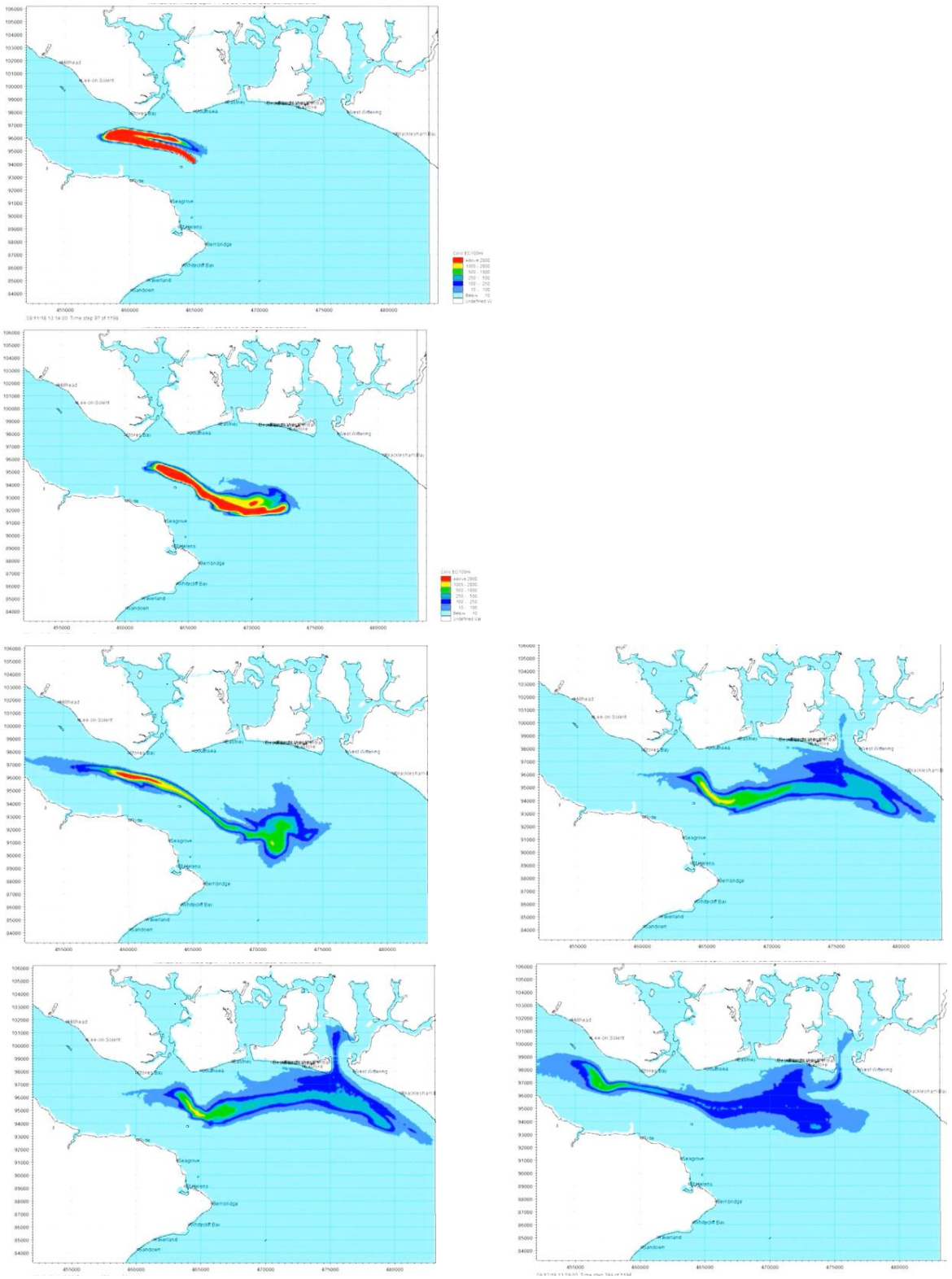
E3 Previous consultation feedback from 39% or respondents not incorporated in numbers

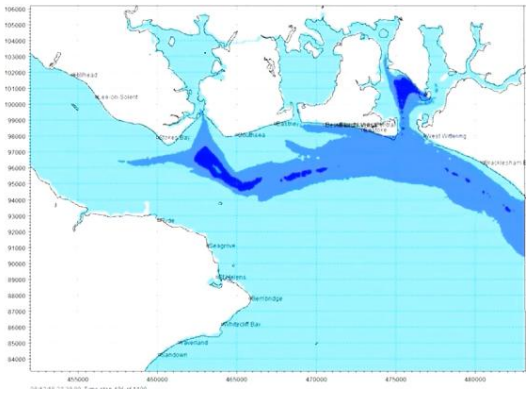
Section 7.1.5 refers to Southern Water actively seeking feedback through the Summer 2024 consultation. It fails to mention the shocking fact that they then deliberately ignored 39% of the feedback provided in letters and emails when collating the figures for the summary Summer 2024 feedback report. This is not acceptable, all consultation responses should be analysed and used in the summary statistics.

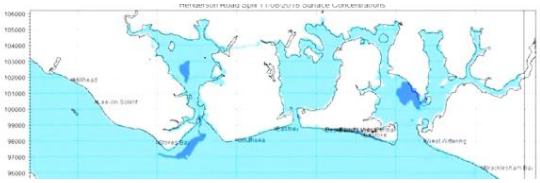
My email response to the Summer 2024 consultation set out each question and my answer, including the fact that I strongly did not support the effluent recycling process. Yet my response to all of the questions was not recorded because they were in an email. This is NOT acceptable.

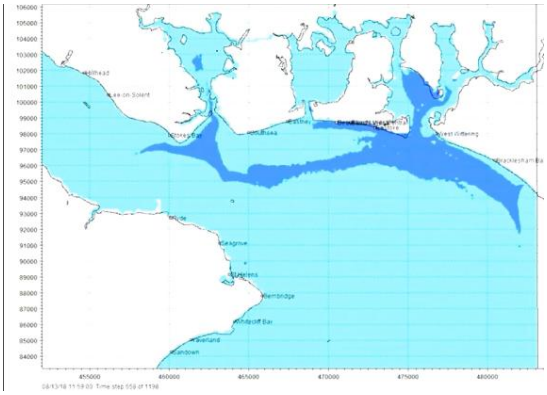
Appendix A

Example of a simulated plume from the existing Eastney Long Sea Outfall dispersing over a 72 hour period, over multiple tidal cycles. *[Example used Escherichia coli (E. coli) levels in discharge]*









Note: Langstone & Chichester Harbours are considered as one water body by the Environment Agency.