

An investigation of reports of untreated effluent being discharged into Pagham Harbour

PART 2

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Index

Effluent sampling	2
Spills	4
Environment Agency Environment Performance Report	5
Natural England Nutrient Neutrality	6
Water. Supply and Demand	7
Presumption in favour of sustainable development	7

Appendix

EA Common Incident Classification Scheme

An investigation of reports of untreated effluent being discharged into Pagham Harbour [PART 2]

The following Report is supplementary to Report PART 1 v3.0 issued under same title 18th Dec 2020. This Part 2 explores some aspects in more depth, reports back on additional information gathered from any subsequent correspondence that has arisen and introduces additional areas not previously explored.

Effluent sampling

In Report part 1 effluent testing results largely focused on Sidlesham WTW. We will not look more closely at Pagham WTW and also the sample components.

The Aerial photo shots of both Pagham and Sidlesham wastewater treatment works provided in Part 1 Report show very clearly that Pagham Wastewater Treatment Works is a much smaller facility than Sidlesham WTW and this is reflected in their respective Combined Sewer Overflow flow rate control parameters. For Pagham WTW this is 59 Litres per second and Sidlesham WTW a more substantial 201 Litres per second. These control mechanisms are there in order to protect the works equipment and avoid backflow to domestic premises.

Spills occur when the storm containment tank is full and this flow rate continues to exceed 59 l/sec at Pagham WTW and 201 l/sec at Sidlesham. As explained previously, Pagham has a storm containment tank of 597m³ (597,000 litres) capacity and Sidlesham 1,266m³ (1,266,000 litres). Nonetheless, Pagham WTW had 9 spills for a total duration of 596.34 hours and Sidlesham WTW had 14 spills of a total duration of 538.20 hours. On a best-case scenario this all adds up to a minimum 4.083 million litres containing 41-45% untreated or only partially treated effluent. In a worse-case scenario the author calculated this could be 40.843 million litres. But Southern Water advised that by their calculation it could actually be in the most extreme worse-case scenario possibly an amount of 144.7 million litres in 2019.

But there is also significant difference in the effluent testing protocols conducted by Southern Water in relation to these 2 WTWs.

Pagham sampling does not include elements such as Cadmium, Chloride, Chromium, Conductivity, Copper, Lead, Nickel, Nitrates, Nitrogen, Ortho-Phosphate, Phosphorus, Total Nitrogen or Zinc which are more extensively tested at Sidlesham WTW. Pagham WTW is being sample tested only according to the minimum regulatory UWWTD standards requirement plus Ammonia and not at more extensive WRA standards (as explained in more detail below) and, presumably, Pagham WTW, and therefore Pagham Harbour, is not considered sufficiently important to warrant the same level of sampling or as at other WTWs. This decision will have been made by the Environment Agency.

But if the numbers of dwellings within the Pagham WTW catchment area have over the last few decades increased significantly since its WTW was built and last reviewed and is now expected to substantively increase further with present consented developments in the Pagham WTW catchment area (including North Mundham, Hunston and maybe some of Bersted), then this level of sampling is surely no longer adequate and especially given Pagham WTW's obvious limited operational process capability. A further dimension to all this however is actual process efficacy, and also total gross concentration by weight of pollutants that still remain in that effluent released.

The following Table shows the full extent of reported Pagham sample testing for representative dates in 2019.

Information is taken from the Southern Water process sampling report	UWWTD CRUDE INFLUENT 3/06/2019	WRA FINAL EFFLUENT 02/06/2019	Efficacy
	FLOW ON DAY 1,864m ³ (1,864m litres at 21.57 l/sec average flow rate)	FLOW ON DAY 1,989m ³ (1.989 million litres at 23.02 l/sec	
Alkalinity	-	320 mg/l	
Ammonia (Homogenised)	45.1 mg/l	4.68 mg/l	89.62%
Average sample temperature	2.8 deg C	-	
Biochemical Oxygen Demand (Homogenised)	305 mg/l	9.97 mg/l	96.73%
Chemical Oxygen Demand (Homogenised)	686 mg/l	55 mg/l	91.98%
Iron	-	0.096 mg/l	
Iron (Dissolved)	-	0.059 mg/l	
Number of samples	48	Not sampled	
Solids Suspended at 105c (Homogenised)	347 mg/l	7.15 mg/l	97.94%
Temperature	-	18.6 deg C	
Turbidity	-	8.6 FTU	

Information is taken from the Southern Water process sampling report	UWWTD CRUDE INFLUENT 22/11/2019	WRA FINAL EFFLUENT 21/11/2019	Efficacy
	FLOW ON DAY 3,389m ³ (3,389m litres at 39.22 l/sec average flow rate)	FLOW ON DAY 3,159m ³ (3.159 million litres at 36.56 l/sec flow rate)	
Alkalinity	-	215 mg/l	
Ammonia (Homogenised)	20.2 mg/l	0.239 mg/l	98.82%
Average sample temperature **	4.5 deg C	-	
Biochemical Oxygen Demand (Homogenised)	157 mg/l	3.9 mg/l	97.5%
Chemical Oxygen Demand (Homogenised)	355 mg/l	32.8 mg/l	90.76%
Iron	-	0.128 mg/l	
Iron (Dissolved)	-	0.0616 mg/l	
Number of samples	48	-	
Solids Suspended at 105c (Homogenised)	216 mg/l	7.7 mg/l	96.4%
Temperature	-	10.5 deg C	
Turbidity	-	8.03 FTU	

Ammonia is interesting as it doesn't appear to be ordinarily mandated under UWWTD standards. On 3rd June 2019 crude (influent) sampling for Pagham had an ammonia load of 45.1mg/l. The flow on the day was 1.864 million Litres and so therefore the total crude influent on the day contained a likely gross ammonia of 84.06kg by weight. We do not know the final effluent sample result for the 3rd June, but based on the sampling result for 2nd June of 4.68mg/L ammonia, the efficacy is approx. 89.62% with only 9.3kg of ammonia by gross weight remaining in the final effluent outflow. The Sidlesham WTW efficacy on the same day 2nd June however was 99.65% for ammonia yet the crude influent load for Sidlesham was reasonably consistent at 45.8mg/l. This clearly illustrates that Pagham WTW operationally is a less capable facility in terms of wastewater handling in relation to this and, likely, in a wider number of other components. This was for the drier DWF summer period.

Looking at 22nd November 2019 when the daily flow was considerably diluted by heavy rainfall contained a crude (influent) ammonia load of only 20.2mg/l but it still contained a gross load by weight of 68.46kg from 3.389 million Litres of flow on the day. Final effluent ammonia sample load on 21st November was 0.239mg/l giving an efficacy of 98.8% but still by total gross weight maybe 0.75kg of ammonia still got released. However, Sidlesham WTW on 21st and 22nd November 2019 demonstrated an efficacy of 99.73%. So, while Pagham WTW appeared to perform much better on 21st November than it did on 2nd June, the presenting load in crude influent terms requiring processing was of course far lower.

The more dwellings being connected to the Pagham WTW public main sewage system of course the greater will be the concentration of sewage and other wastewater pollutants in the crude (influent) and, potentially, also in the final effluent released. Process efficacy therefore becomes increasingly important.

Interestingly, the Part 1 Report used October data and gave an ammonia efficacy at Sidlesham for 15th-16th October of only 92.57% but as Pagham did not it seems carry out any crude influent sampling on the 16th October then we are unable to make any comparison. But a fall to 92.57% nonetheless for Sidlesham WTW on that date is intriguing and suggests it is on occasions process variable.

Sample testing in 2019 at Pagham WTW was carried out as follows:

UWWTD Crude sampling: On 28th March 2019; 3rd June; 23rd August; 22nd November only.

UWWTD Final Effluent sampling: On 28th March 2019; 3rd June; 23rd August; 22nd November.

['UWWTD' means Urban Waste Water Treatment Directive (91/271/EEC) and is intended to monitor and verify a reduction in pollution in freshwater, estuarine and coastal waters by domestic sewage and industrial wastewater. UWWTD for Pagham Final Effluent is only reporting ammonia, water temperature, BOD, COD, iron, No. of samples, Solids (Suspended) and Turbidity]

WRA Final Effluent sampling: 12th January 2019; 14th February; 16th March; 16th April; 8th May; 2nd June; 11th July; 22nd August; 16th September; 15th October; 7th November; 21st November.

['WRA' means Working Rule Agreement between the Environment Agency and Southern Water Services, but for Pagham WTW this WRA test protocol is exactly the same as for UWWTD].

Sample testing in 2019 at For Sidlesham WTW was carried out as follows:

UWWTD Crude and UWWTD Final Effluent sampling: On 13th January 2019; 15th February; 3rd March; 17th April; 9th May; 3rd June; 12th July; 23rd August; 17th September; 16th October; 8th November; 22nd November.

WRA Final Effluent sampling: On 12th January; 14th February; 2nd March; 16th April; 8th May; 2nd June; 11th July; 22nd August; 16th September; 15th October; 7th November; 21st November.

[Sidlesham WTW sample testing under WRA includes: alkalinity, ammonia, water temperature, BOD, COD, iron, No. of samples, Solids (Suspended) and Turbidity, cadmium, chloride, chromium, conductivity, copper, lead, nickel, nitrate, nitrogen, ortho-phosphate, phosphorous, total nitrogen and zinc].

The author is not a marine biologist or ecologist so I do not know at what level any such chemical or other elements in the effluent (outflow) impacts the ecology of Pagham Harbour, its aquatic life or any creature that feeds upon that aquatic life. But as we do not know the efficacy of the Pagham WTW process across all the sampling and tested components it would most certainly be unwise to assume it performs equally to Sidlesham WTW. But let us again examine some of the sampling in more detail.

Ammonia gas is produced industrially by reacting hydrogen and nitrogen at high temperature and pressure. There are many uses for ammonia including the production of fertilisers, plastics, synthetic fibres, dyes, explosives and pharmaceuticals. In the home, ammonia is used in certain cleaning products and garden fertilisers. It occurs naturally at low levels throughout the environment released from the breakdown of organic waste matter and may be elevated where there is a lot of animal waste from intensive farming environments for cattle, pig and chickens and also where human processed sewage sludge is used as fertiliser.

The amount of residual ammonia in the WTW effluent is not likely to be hazardous to humans, and especially if diluted by a larger mass of water. But for aquatic life and particularly fish even at concentrations of only >0.1mg/L and for relatively short exposures can cause skin damage, eye and gill damage. Research carried out and reported on the internet indicates that 0.2mg/L to 2.0mg/L concentration range can actually be fatal to fish... apparently not just gae but also freshwater fish and sea fish. Research also indicates that fish increasingly suffer reduction in hatching rate, reduced growth rates, loss of equilibrium, hyperexcitability, increased respiratory and oxygen uptake, raised heart rate, hyperplasia and at a higher-level fish experience convulsions, coma, liver and kidney damage leading to death.

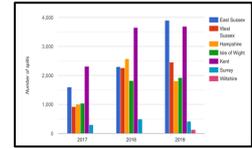
Ammonia toxicity is apparently believed to be the main cause of unexplained losses at fish hatcheries. It therefore follows that if such levels of ammonia arise in a concentrated spill (or 'surge affect' as explained in Part 1 Report), then this could conceivably create in a Rife (and at the point it enters Pagham Harbour) an aquatic kill zone.

Biochemical oxygen demand (BOD) represents the amount of dissolved oxygen needed by aerobic biological organisms to break down organic material present in a given water sample at a certain temperature and over a specific time period. The BOD value is commonly expressed in mg / Litre of oxygen consumed per litre of sample during 5 days of incubation at 20 °C and is used as an indicator as to the degree of organic pollution of water and, therefore, is used to monitor the efficacy (effectiveness) of wastewater treatment works. Crystal clear unpolluted rivers typically has a BOD below 1 mg/L. Moderately polluted rivers vary between 2 to 8 mg/L. But over 8 mg/l is regarded as seriously polluted. Untreated sewage can vary but averages around BOD 200-600 mg/L. It is noted that Pagham WTW result on 2nd June 2019 was releasing at 'serious' level and on 21st November 2019 at 'moderate' level but at least effluent was going into a larger water mass (subject to tidal pattern) and not into the upper reaches of a stream or river. Spills of unprocessed or only partially processed wastewater however is a totally different matter as this is a concentrated release at influent concentrations.

Chemical oxygen demand (COD) is the measurement of the amount of oxygen that can be consumed by reactions in a measured solution and again is expressed in mg/L. The COD test is used to quantifying the amount of oxidizable pollutants found in wastewater effluent or in surface water to determine the effect effluent has on the receiving body of water. Domestic wastewater influent is generally in a range 600 – 900 mg/l and is required to be processed to less than 75 -100 mg/l before being released to minimise pollution impact. The results for Pagham WTW on both 2nd June and 21st November therefore look very good.

Spillscontinued

Spills as explained in Part 1 Report are essentially ‘consented’ (authorised) under the Environment Agency works permit as they are fully informed and aware of the WTW combined sewer overflow control parameter and are provided with regular flow and spill reporting. Meaning, EA has known for a very long-time what spills have been occurring, where and the total time duration of such spills. What apparently is not required to be reported is the actual volume of whatever gets released.



The 2019 SW Spill report for all of its WTW, WPS and CSOs in West Sussex for Settled Storm, Storm, Flow to Storm, Emergency (but excluding Chichester and its ‘disinfected’ spills) states a total duration count of 24,168 hours from a reported 2,456 incidents as illustrated in this graphic appearing on page 6 of the Report Part 1 and taken from the Southern Water web site.

Part 1 Report provided analysis of likely proportion of wastewater (including sewage) using as a baseline a largely dry month (ie May 2019) with the 9 highest May days flow rates likely caused by limited rainfall excluded from this baseline calculation. This gives us the typical historic daily wastewater and which would be reasonably consistent 365 days in the year and therefore a reasonable and representative basis to arrive at a 41.67% wastewater concentration at times of ‘spill’. This is certainly sufficient to adequately illustrate the point being made in the table below, but if anyone wishes to challenge these numbers then they can do so but they will need to recalculate each spill by day by day against flow rate of presenting total influent on the same day and then add up the total. But without knowing precisely the volume of the spill they cannot really dispute the estimates given in this Table of 1 Litre (which is the minimal absolute best-case scenario), then at 5 Litres per second (a likely), or, then at 10 Litres per second (a higher maybe) flow rate.

	Spill time (hours)	Estimated Effluent volume released (2019)					
		1 litre /sec (Total volume)	1 litre /sec (Unprocessed) 41.67%	5 litre /sec (Total volume)	5 litre /sec (Unprocessed) 41.67%	10 l/sec (Total volume)	10 l/sec (Unprocessed) 41.67%
West Sussex 2,456 reported spills	24,168	87,004m3 (87m litres)	36,254m3 (36.25 million litres)	435,020m3 (435.02 million litres)	181,270m3 (181.27 million litres)	870,04m3 (870.04 million litres)	362,540m3 (362.54 million litres)

Chichester ‘disinfected’ Spills not included.

The 1,254.23 hours spill duration attributable to the Chichester WTWs is excluded from the above analysis as this passed through a final UV bacterial protocol. This does not eliminate all remaining pollutants of course, but certainly EC, IE and most other harmful bacteria are thereby ‘disinfected’. It seems in fact that Chichester may be the only location with UV capability and, according to Southern Water, it is only required if so stipulated by the Environment Agency in locations which EA has classifies ‘sensitive’. Meaning Chichester Harbour, but not Pagham Harbour or anywhere else it seems.

Southern Water had advised that an extreme combined worse-case scenario for Pagham and Sidlesham, could be 144,694,000 litres of spill verses this author’s somewhat more conservative worse-case calculation of only 40.8 million litres at 10 l/sec over a 1,134.6 hours spill duration. If we apply Southern Water’s worse-case Pagham/Sidlesham scenario and pro-rata this to the whole of West Sussex and a total 24,168 hours spill duration, then Southern Water’s extreme worse-case scenario for the whole of West Sussex could be anything up to an unbelievable (theoretical) 3,082 million litres of effluent containing possibly 40-50% domestic wastewater concentration (including sewage) plus whatever is additionally washed in from agricultural and industrial that infiltrates into the spill and onwards to the discharge locations.

It is not solely a problem effecting Pagham Harbour. We should be equally concerned about all other wastewater treatment works, their pumping stations or any remote combined sewage overflows where spills are occurring and which are in close proximity to waterways such as River Rother, River Arun upper reaches, River Store, River Chilt, Lancing Brook, River Adur upper reaches, Parson’s Brook, River Kird and all other rivers and waterways and connecting ditches and Rifes. But even if released directly at coastal beach level this still creates a potential health hazard to bathers at certain tidal stages and of course spills containing wastewater is contrary to our supposedly environmental aims and goals regarding our beaches, seas and oceans.

Spill Definition (2019)	Number of Spills Reported	Discharge Duration (Hours)	
Storm	1,061	6,729.07	26%
Settled Storm	1,276	17,157.31	67.5%
Emergency	28	92.25	0.4%
Disinfected Storm*	78	1,276.94	5%
Non-Disinfected Storm*	5	33.87	0.13%
Flow to Storm**	8	132.79	0.5%
Total	2,456	25,422.23	

Spill Definition (2019)	Number of Spills Reported	
Wastewater Treatment Works	1597	65.2%
Wastewater Pumping Stations	659	26.9%
Combined Sewer Overflows	200	7.9%
Total	2,456	100%

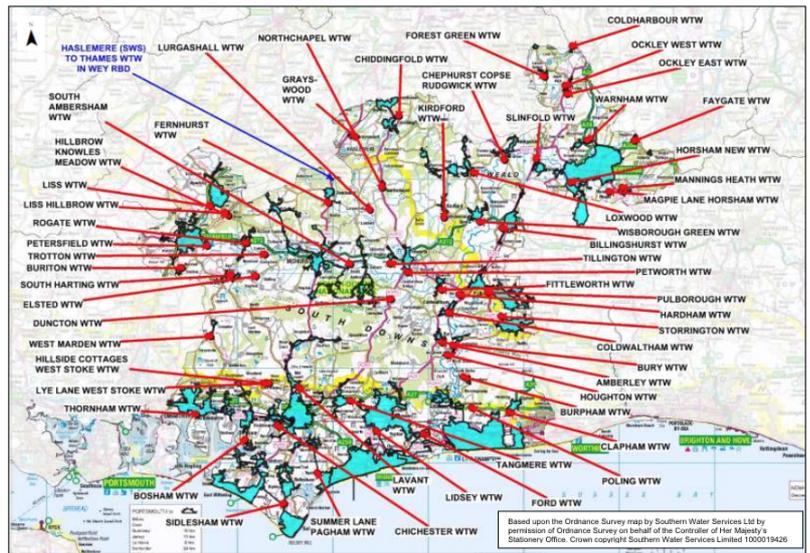
*Chichester only. **Tangmere only

The above Tables for West Sussex are based on data and information provided in the Southern Water Spill reports and gives us greater insight as to the exact nature and source of the spills during 2019.

‘Settled Storm’ is only released if the WTW storm containment tank is full and the CSO flow rate control parameter is exceeded. Some settling of larger heavier particles occurs in the containment tank but the amount of settlement is highly dependent of course on the flow velocity and turbulence, so this can only at best therefore be regarded as partially processed. ‘Storm’ is understood to be otherwise and this passes directly into the environment. The author does not have an official meaning for ‘Emergency’ but takes this to mean something burst, broke, collapsed or flooded and some urgency arose to avoid a severe incidence consequence.

In relation to many of the Pagham planning applications (and maybe elsewhere also), is that Southern Water is not permitting developments to connect to the public main wastewater sewers until it has completed its 'off-site sewerage network reinforcements' and said it needed 24 months to complete these works. But as 65.2% of spills in West Sussex are occurring actually at the wastewater treatment works facility itself then, surely, Southern Water should also be carrying out expansion and enhancement works at many if not all of its WTWs ...or is this what network reinforcement also means if we ignore the reference to 'off-site'?

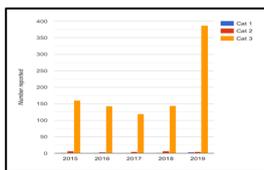
The following diagrammatic is taken from the 'SW Drainage & Wastewater Management (DWMP): Arun & Western Streams Catchment [Draft]' publication of August 2020 and provides the locations of all 56 Southern Water wastewater treatment works in the Southern Water Arun & Western Streams catchment area.



The author has not however included the accompanying narrative for each of these locations in terms of villages and district areas covered within each WTWs catchment area. This is because such document appears to contain a number of potential errors and misspellings [hence it only refers to itself as a draft].

Environment Agency Environmental Performance Report

The graphic appearing on page 7 Part 1 Report presents Category 1 (serious) Category 2 (significant) and Category 3 (Minor) incidents and only adds up to 430 incidents. But the graphic immediately before this on page 6 stated that in West Sussex alone there were 2,456 spills in 2019. This can be confusing.



The Gov.uk Environment Agency assess the performance of all the wastewater treatment and mains water supplier companies each year and the 2019 Environmental Performance Assessment (EPA) metrics report (which was not actually published until 2 October 2020) ranked Southern Water Services as the poorest performing of all the wastewater treatment companies in the UK. The Environment Agency have stated that they only set a flow rate [called Flow to Full Treatment or Pass Forward Flow] below which the wastewater operator is not permitted to 'spill'. But by definition therefore this means they are knowingly default permitting spills in circumstances where because of heavy rainfall and a storm containment tank is full and the CSO control flow rate per second parameter is exceeded.

The EPA v8 Guidelines issued by the Environment Agency October 2020 boldly states 'Incidents from combined sewer overflows that are satisfactory / compliant, deemed not having an unacceptable impact on the environment, will not be included in the EPA'. This publication does not however seem to define what unacceptable means, nor who exactly determines this. But so far as it relates to the whole of Southern Water's region and a combined total of 14,307 reported spills [fact] (West Sussex 2,456, East Sussex 3,893, Kent 3,688, Surrey 415, Isle of Wight 1,919, Hampshire 1,804, Wiltshire 132), the Southern Water spill report spreadsheet adds up to a total combined spill duration for its entire region of 250,036.72 hours [fact]. If the absolute minimum volume best-case scenario in a spill is 1 Litre per second of spill duration, this therefore means that not less than 900,132,192 Litres (900,132m3 or 198,001gallons) of untreated (or only partially minimally treated) wastewater including sewage was discharged into rivers, sea, harbours or rifes in 2019.

Are we really supposed to believe that only 430 out of 14,307 incidents were regarded as 'unacceptable' Cat1, Cat2 or Cat3 by the Environment Agency, and also notwithstanding that such spills could contain 40-50% polluting wastewater (including sewage) and that many are so frequently occurring at the same location that there must surely have been a serious cumulative environmental or ecological impact. So the Environment Agency was asked to explain this.

They confirmed that in 2019 Pagham had 2 Cat3 incidents. A power failure at the WTW, and a sewage network blockage overflow. Sidlesham WTW had one Cat3 incident because of power failure. They said incidents are assessed according to their own Common Incident Classification Scheme which can be viewed on the internet, but look for the 2017 version as there are multiple earlier versions still on the web. Each spill incident is apparently separately assessed. Frequently occurring Cat3 in the same location are not added together they said. They went on to emphasise 'The majority of incidents which occur on these networks do not take place from a discharge point with flow measurement equipment installed, accurate flow estimation is therefore difficult'. We believe that the most important factor to consider when recording an incident is not the volume of effluent released but the impact that it has on the natural environment'.

Now let us pause for a moment and think about this. An Environment Agency Officer remotely determines a Cat classification based on an assessment of the likely impact it has had on the environment, but wasn't likely actually there to witness it, and hasn't the faintest idea how many Litres / cubic metres of volume was released. Really?

Below is the actual Cat classification taken from the 2017 Common Incident Classification Scheme. A larger version is included in the Appendix to this supplementary report. As you read this remember that Pagham had 9 spills + 1 at a North Mundham WPS of a total time duration of 596.34 hours and released at least 2.146 million litres but could have been 21.268 million litres but only 2 of these were regarded as Cat 3. Sidlesham had 14 spills for a total time duration of 538.2 hours and a minimum spill pf 1.937 million litres and could have been 8.07 million litres yet only 1 (one) of these was Cat 3 into an SPA/SSSI Pagham Harbour.

Impact to nature conservation sites and species

Category	Criteria	Definition and guidance on impact criteria (one or more definition or criteria are met)
Category 1	Major damage to nature conservation	<p>Major adverse effect on a statutorily protected site or species or Water Framework Directive (WFD) water body</p> <ul style="list-style-type: none"> Significant adverse effect on a SAC/SPA/Ramsar site reaching or maintaining its favourable conservation status (FCS). Damage to a European protected species or its habitat that has a significant adverse effect on it reaching or maintaining FCS. <p>Note: Assessment of impact on FCS of species must be made using the Natural England guidance document.</p> <ul style="list-style-type: none"> Damage that has an adverse effect on the integrity of a site of special scientific interest. Extensive damage to national protected species (on any stage of the lifecycle) or their habitat. Implications under the Environmental Damage Regulations. Deterioration in the ecological status or potential of a WFD water body. Prevention of a water body to reach its ecological status or potential objective.

Category	Criteria	Definition and guidance on impact criteria (one or more definition or criteria are met)
Category 2	Significant damage to nature conservation	<p>Damage to a statutorily protected site or species or Water Framework Directive water (WFD) body</p> <ul style="list-style-type: none"> Damage (other than category 1) to the habitat of a SAC/SPA/Ramsar/SSI. Damage (other than category 1) to European and nationally protected species or their habitat, with negligible effect on favourable conservation status. No implications under the Environmental Damage Regulations. Significant but localised or temporary deterioration in ecological status or potential of a WFD water body or delaying the water body reaching its ecological objectives. <p>* Note: Any damage to a statutorily protected site or species will have a minimum of a potential category 2 impact.</p> <p>Extensive and/or significant damage to BAP species or habitats and non-statutory protected species</p> <ul style="list-style-type: none"> Significant damage to BAP species (on any stage of the life cycle) or habitat, which affects the viability of the species in the local area. Extensive and/or significant damage to a non-statutorily protected site or BAP habitat that affects the nature conservation status of the site or habitat.
Category 3	Minor damage to nature conservation	<p>Very limited impact on nature conservation or Water Framework Directive (WFD) water body</p> <ul style="list-style-type: none"> Reversible small-scale, short-term damage to non-statutorily protected sites or BAP habitats or species. No effect on the status or objectives of a WFD water body.
Category 4	No impact	<ul style="list-style-type: none"> Substantiated incident with no impact to nature conservation.

EA closed saying that as Pagham Harbour does not contain designated bathing waters it is managed for the purpose of protecting fish and wildlife, not people, so health risks from using the harbour may be higher than at bathing waters. Unlike Chichester Harbour it doesn't contain any designated shellfish waters and commercial shellfish harvesting is not allowed, so there is not a regulatory driver for tertiary [UV] treatment to reduce faecal bacteria and that EA was satisfied that the level of sewage treatment at Pagham and Sidlesham WTW is acceptable.

If any reader wants to check out their own local wastewater treatment works and know which catchment area you are in and where the release location is, then google 'Southern Water Flow & Spill Reports' and scroll down to find your WTW. If you know how to handle excel spread sheets this will help you. And if anyone is thinking this, the answer is Yes. A wastewater and water supply company could indeed get a 5-star performance rating yet have the worst track record of spills.

Nutrient Neutrality

For those of you not familiar with this, there is an initiative essentially driven by Natural England that whenever a change of land use occurs the wastewater effluent such new development generates cannot add to the existing nutrient burden upon nature and the environment. Meaning neutral or better than it was under its original land use.

NE issued in June 2020 (v5) very detailed guidelines and calculation methodologies which emerged from its collaborative efforts with the Environment Agency, District Councils in the Solent Region and Southern Water Services, and these more detailed guidelines have now been sent to most in not all local planning authorities, district councils and developers and their consulting associated specialist companies.

The published guidelines arise from what seems a very successful collaboration in the Solent Region involving the partnership of Natural England, the Environment Agency, Southern Water Services and District Councils of Chichester, Havant, Gosport, New Forest, Test Valley, East Hampshire, Stour catchment, Winchester, Portsmouth et al, to begin to add discipline and control to NE's increasing concerns as to the environmental and ecological impact of housing developments and especially where in excess of 200 dwellings. Apparently, this subject continues to be investigated and studied and this initiative is therefore referred to as an interim measure. Pagham Harbour, however, is in the Arun & Western Streams catchment and not the Solent Region (as is Chichester Harbour) and as yet unfortunately there is no obvious evidence that ADC is embracing this initiative in the same manner as Chichester District Council.

Whilst the intention of this initiative is very praiseworthy, and is the result of a lot of effort no doubt and should be given the fullest of support. A posture that seeks only to achieve 'neutrality' is however exceedingly disappointing and, frankly, somewhat misguided.

The NE report acknowledges that studies had revealed that most, if not all, UK waterways into which final effluent is being released is in 'unfavourable condition'. But instead of introducing (imposing) across-the-board specific improvement goals to be achieved by all land users new or old irrespective and upon the wastewater service companies, NE has essentially designed a methodology that permits massive development to proceed provided the damage it causes to the environment is no greater than the damage which is already being caused by the present land use.

The NE initiative in fact also only focuses on Total Nitrogen and Phosphorous and not the full range of potential pollutants or the impact of increasing incidents of 'spills' releasing wholly unprocessed, or only partially processed, wastewater effluent into the environment. Such initiative therefore seems very much to favour housing developments and being more aligned to the 'presumption in favour of sustained development' we seem constantly to hear from district Planning Officers, Local Plans, Government officials, regulations and especially the Planning Inspectorate when ruling on appeals. This initiative is therefore seriously flawed and very disturbing.

Interestingly, para 4.40 of the NE guidelines states that research indicated that groundwater and river water in more 'natural condition' would only have a concentration of less than 0.45 mg/l of natural nitrate-nitrogen and that by 1960s things had already deteriorated to c2mg/l and [quote] '.....prior to the dramatic increase in N concentrations during subsequent decades.....'. It then goes on to cite Poole Harbour and that to achieve restoration to a favourable status TN would need to be reduced to <2.75mg/l. (Note: Sidlesham WTW in June 2019 final effluent was 2.91mg/l Total Nitrogen and October 2019 it was 5.77mg/l final Total Nitrogen effluent. Because of lack of testing we do not know what the Pagham WTW number is).

As we move at an ever-increasing pace towards green energy, recycling, reusable materials, environment and wildlife protection, all electric vehicles, stricter and more efficient appliances and homes design, limiting use of fertilisers and chemicals in agriculture and in the home, then, surely, shouldn't we have a strategy in relation to wastewater handling and effluent pollution that is better than just status quo?

A number of questions arise. What quality requirement exactly should be set for all waterways and certainly for Pagham Harbour if truly NE desires to restore all to favourable status? What requirement should NE (or whoever) introduce immediately in order to take us in a sensible

direction towards achieving that ultimate goal? If not, then what exactly is the role and purpose of Natural England and DEFRA if all they seek to achieve is status quo and no attempt is made to improve things?

Since the publication of the first version of Report 1 this author has now heard from 2 sources that Natural England and Southern Water have now announced they will commence a study of Pagham Harbour pollution Q1/2021. This is the statement made.

"There is a Pagham harbour scoping study planned for the current Southern Water investment period (2020-25). We expect it to start within the next 4-8 weeks and we will be working closely with the Environment Agency to agree our approach. The scoping study will be detailed and thorough. It will take up to a year to complete. The outcome of the report will determine if further investigation/action is required in relation to the impact of Southern Water discharges from Sidlesham and Pagham Wastewater Treatment Works (WwTWs), including intermittent discharges, on the conservation objectives of Pagham Harbour Marine Conservation Zone (MCZ). As part of the wider environmental improvement programme, there is a drive to align flow requirements across the whole country. This is looking at both the amount of flow treated and also storm tank capacity needs"

Let us think about this. We are now going to wait a whole year to receive a report which might lead to even more investigation being conducted and further protracted delay will follow waiting for budgeting and action planning, to resolve what we, and they certainly know precisely is the cause(s) of the problem(s) and the remedies and actions that should and could be taken forward immediately. If they are uncertain, then perhaps they need to read again Report Part 1 and now this Part 2, and go and look at their own data and reports from which these are derived. Network reinforcement. Expanding/enhancing WTWs to increase operational capability and efficacy. Install larger or a secondary containment tank to eliminate most if not all spills. Install UV to disinfect harmful bacteria irrespective. Increase and widen the sampling protocols. Getting act together, means also Environment Agency.

Water: Supply & Demand

This investigation has focused on effluent, wastewater treatment handling and the related Government agencies involved. But in the context of a change of land use to housing developments also introduces the subject of provision and sustainability of actual water supplies required for human consumption.

Water supply companies must by law and regulation provide an absolute minimum of 1 BAR pressure and 9 litres per second flow rate at a specified level of quality. 'BAR' is short form for barometric atmospheric pressure and 1 BAR is the minimum pressure needed for that water to reach a height of 10 metres. This is what gives you the 'oomph' when you turn on a kitchen tap. Flow rate is the measure of volume of that water and research (internet) suggests anything less than 14 litres flow rate is not actually adequate.

A number of issues arise in relation to housing developments. Sourcing and extraction of water to be purified and pumped to an ever-increasing number of dwellings. The distance this source is from the user location. Maintaining sustainable requisite pressure and flow rate to a catchment area. The domestic systems and appliances used in existing older properties and new builds in what circumstances will cease to function adequately.

In some counties water pressure is more driven by the height of its source and can be so strong that special valves are needed in the home to reduce this pressure to stop it damaging equipment. Otherwise pumping stations are needed to create sufficient pressure and flow to reach the remotest of customer. In hilly Oxted, Surrey, as an example, the water pressure is 7.4 BAR. In Pagham West Sussex it is maybe 2.5 BAR at best and a flow rate of 14-16 litres a second at kitchen tap. For those of you who have lived in the area for many years you may know that once upon a time we used to get >7 BAR and this has been recently reconfirmed to the author when a Southern Water engineer came to check a water meter and was asked about the gradual pressure drop. This drop of pressure is apparently attributable to the forces of supply vs demand but also the water companies having to reduce the pumping rate pressure because of leaks and bursts in the pipe network.

In a property with a 500 or 1,000 litre cold tank in the loft it is this tank which provides the vertical pressure for your showers, bath and toilet cisterns. The kitchen tap always has to be direct mains. Increasing, homes are now being installed or upgraded with mains pressure systems where there is no reserve storage tank in the loft and only a hot water storage vessel. This type of system relies entirely on the mains pressure and flow rate. If you want to know what system you have, then look in your loft. If you have a big tank then you are gravity. If no tank, then you have a mains water pressure system. Check your Operator's User Manual as you might find it requires an absolute minimum of 1 BAR of operating supply and if you have a water softener or any other in-line fitted appliances then you'll need a higher minimum.

Housing developments will obviously need to be provided with all services. In relation to water, it is not just about what happens to it afterwards but also the prerequisite of sustainable quality and volume of supply. We have concerns about wastewater handling, but might we also have issues with mains supply and the environmental and ecological impact arising from groundwater water extraction.

Presumption in favour of sustainable development

Most, if not all of us, have heard or read the expression '*presumption in favour of sustainable development*'. It seems almost repetitively to be used by planning department officials the moment the Councillors on the Development Control Committee waiver, and usually is followed by grave warnings of financial fines and penalty if a development is not consented. Developers and their myriad of specialist planners and associates invariably also use this (or should we say exploit it) by including the 'presumption' statement in their presentations and in planning application supporting material. The Planning Inspectors also when called upon in cases of appeal seem far from impartial and similarly refer to this statement with, additionally, often adding that '*the local planning authority had behaved unreasonably*' as the reason for overturning a decision and awarding costs ruling against the Local Planning Authority.

When interpreting and applying this 'presumption' the author is not entirely convinced that local planning authorities, its officers and the planning inspectorate involved in appeals are not biased or influenced in any way when their annual performance assessment and no doubt awards is determined by turnaround time and housing targets to be approved.

The 'presumption' statement comes essentially from the National Planning Policy Framework which sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced. Core to this and therefore often referred to by developers and planning officers alike is:

“There is a presumption in favour of sustainable development at the heart of the planning system, which should be central to the approach taken to both plan-making and decision-taking. Local planning authorities should plan positively for new development, and approve all individual proposals wherever possible. If decision takers choose not to follow the National Planning Policy Framework, where it is a material consideration, clear and convincing reasons for doing so are needed”.

Para 8 of the NPPF goes on to state:

‘Achieving sustainable development means that the planning system has 3 overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives):

- **an economic objective** – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;
- **a social objective** – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities’ health, social and cultural well-being; and
- **an environmental objective** – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

But surely this ‘presumption’ should not however overrule or misguide decision makers into thinking that everything is perfectly okay when there is very clear, obvious, compelling and indisputable evidence to the contrary that infrastructure is inadequate, and/or, there remains considerable uncertainty and doubt whether any of the recognised and acknowledged infrastructure improvements needed to resolve this and required to facilitate and provide for new dwellings is actually going to be completed in an aligned and timely manner. Wastewater handling? Highways? Medical care and services? This issue appears to arise across-the-board.

Looking at these 3 overarching objectives a number of questions come to mind. Where exactly is the right place to build all the housing stipulated by the Government? Spread it around using some form of algorithm, use % increase across-the-board and then try and create jobs, or, fundamentally examine where in the UK needs the most help to regenerate after decades of lost industry? How are we doing in establishing the accessible services? How are we doing in building a strong, responsive and competitive economy in West Sussex? If we lose tourism then are we destroying one economy only to be replaced with a different economy? How are we exactly minimising waste and pollution if we are only looking for status quo? How are we helping to improve biodiversity and pollution and enhancing our natural environment if our presumption is merely status quo yet we are knowingly adding greater burden? For every dwelling we add we are also adding 2.4 people per average household, 1.3 cars*, 1.3 dogs *and 1.6 cats*. How effective is this process of identifying and coordinating the provision of infrastructure? [*National data. 10% of dog owners still fail to clean up or just hang the bags on a tree. Dogs urinate and by doing so contaminate. They threaten or hunt wildlife.]

We also need to understand that once a development is given the final ‘green light’ then only for reason of failure on the part of the developer or landowner to meet their obligations (financially or otherwise) can a development be stopped, delayed or suspended. Meaning that if WSCC Highways Dept, or HE, or Southern Water, or Health Authority cannot get their act together and/or don’t have the budget to do so, then after that point nothing can be done to stop or suspend a development. ADC Group Head of Planning has confirmed this and admits it can only suspend a development if the developer or landowner fails to meet their obligations and that there are no exceptional circumstances through which they can do so otherwise. So, if a consent to build is granted without imposing clear caveats or conditions upon infrastructure providers and developers alike to ensure a sensible and intelligent alignment, and also those charged with supervising, managing or facilitation are disincentivised from ensuring this happens owing to their performance and reward mechanisms, then the ‘presumption’ is fundamentally flawed.

We have statements in Local Plans that actions will be taken to mitigate the shortcomings in infrastructure. We have had some proposals presented to us of many of those such actions. And we are told that these will be aligned to development phasing. We therefore have possibly the ‘WHAT’ that needs to be done. We have most certainly the ‘WHO’ responsible to go and do this. But we are it seems still far from certain as to the ‘WHEN’ such actions will start and finished, and a mere ‘presumption’ that something will happen to address the future let alone the present shortcomings in infrastructure.

Keith Meadmore
Aldwick, West Sussex

Part 2 v1.2 26 Jan 2021

Impact to nature conservation sites and species

Category	Criteria	Definition and guidance on impact criteria (one or more definition or criteria are met)
Category 1	Major damage to nature conservation	<p>Major adverse effect on a statutorily protected site or species or Water Framework Directive (WFD) water body</p> <ul style="list-style-type: none"> Significant adverse effect on a SAC/SPA/Ramsar site reaching or maintaining its favourable conservation status (FCS). Damage to a European protected species or its habitat that has a significant adverse effect on it reaching or maintaining FCS. <p>Note: Assessment of impact on FCS of species must be made using the Natural England guidance document.</p> <ul style="list-style-type: none"> Damage that has an adverse effect on the integrity of a site of special scientific interest. Extensive damage to national protected species (on any stage of the lifecycle) or their habitat. Implications under the Environmental Damage Regulations. Deterioration in the ecological status or potential of a WFD water body. Prevention of a water body to reach its ecological status or potential objective.

Category	Criteria	Definition and guidance on impact criteria (one or more definition or criteria are met)
Category 2	Significant damage to nature conservation	<p>Damage to a statutorily protected site or species or Water Framework Directive water (WFD) body</p> <ul style="list-style-type: none"> Damage (other than category 1) to the habitat of a SAC/SPA/Ramsar/SSSI*. Damage (other than category 1) to European and nationally protected species or their habitat, with negligible effect on favourable conservation status*. No implications under the Environmental Damage Regulations. Significant but localised or temporary deterioration in ecological status or potential of a WFD water body or delaying the water body reaching its ecological objectives. <p>* Note: Any damage to a statutorily protected site or species will have a minimum of a potential category 2 impact.</p> <p>Extensive and/or significant damage to BAP species or habitats and non-statutory protected species</p> <ul style="list-style-type: none"> Significant damage to BAP species (on any stage of the life cycle) or habitat, which affects the viability of the species in the local area. Extensive and/or significant damage to a non-statutorily protected site or BAP habitat that affects the nature conservation status of the site or habitat.
Category 3	Minor damage to nature conservation	<p>Very limited impact on nature conservation or Water Framework Directive (WFD) water body</p> <ul style="list-style-type: none"> Reversible small-scale, short-term damage to non-statutorily protected sites or BAP habitats or species. No effect on the status or objectives of a WFD water body.
Category 4	No impact	<ul style="list-style-type: none"> Substantiated incident with no impact to nature conservation.