

COVER LETTER

SITE ADDRESS	2 - 6 Seagull Lane, Emsworth, Hampshire PO10 7QH
PLANNING REFERENCE	APP/22/00155
REPORT REFERENCE	GWPR6868
ENGINEER	Natasha Kearl, Ground and Water Limited
AIM	This Letter will aim to bring together the comments raised by the Havant Pollution Team and how these have been/will be addressed to support a subsequent phone call to discuss the parameters used for the P20 modelling. This Cover Letter is to be read alongside the draft report referenced: GWPR6838/CAR&GDQRA/January 2026 V1.2.
COMMENT 1	<i>"The position of the new well looks good – I'm happy that the indicative position be biased toward the Eastern elevation of the former building; hydraulic migration of a local source should be intercepted by this position. I'd expect both groundwater and vapour from this location to be representative."</i> The Trial Hole Location Plan can be viewed within the draft version of the report but has been reproduced below to confirm the new location installed referenced BH101. TP101 was also undertaken as a hand pit to provide extra coverage for chemical testing. The map shows a site layout with Seagull Lane at the top. Buildings are labeled 'Factory' and 'Builders Yard'. Well locations are marked with symbols: blue circles with a cross for well installations, orange circles with a cross for windowless sampler boreholes, and green circles with a cross for cut down cable percussion boreholes. Specific wells shown include TP101, BH101, WS2, WS3, WS4, WS5, and WS1. A red line outlines a specific area of interest. * = well installation 1st Phase: Windowless Sampler Boreholes (June 2023 SI) 2nd Phase: Windowless Sampler Boreholes (Feb 2025) 4th Phase: Cut Down Cable Percussion Borehole with install (Nov 2025) Hand dug trial pit (Nov 2025) The blue well installation locations were destroyed/lost during the demolition process on-site. Soils Samples TP101/0.20-0.40m bgl and BH101/0.50 – 1.00m bgl were sent to I2 Analytical for chemical testing for an asbestos screen, metals, PAHs, TPHs, BTEX Compounds and MTBE on both samples. SVOC and VOC testing was also undertaken on TP101/0.20-0.40m bgl. Chemical laboratory testing of the Made Ground during both phases of site investigation did not reveal any elevated levels of determinands above the guideline levels for a 'Commercial' land-use scenario; therefore, no significant risk to human health was posed by the soils on-site. Chrysotile asbestos fibres (<0.001%) were identified within BH101/0.50-1.00m bgl, however, at this level the asbestos was not considered to pose a risk to human health. With respect of the VOCs/SVOCs, only 2-Methylnaphthalene was marginally noted above the limit of detection (0.1mg/kg) at 0.4mg/kg, all other VOCs and SVOCs were at concentrations lower than the laboratory limit of detection. PAHs were also noted but not elevated.

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Groundwater

A groundwater sample was also obtained from BH101 in December 2025, which had to be taken at least a week post installation in November. The only determinands identified at a level of concern when compared to available assessment criteria were PAHs. During the fourth phase of investigation, no visual or olfactory evidence of contamination was encountered, it should be noted that the two locations were located the furthest away from the former gas works and up groundwater gradient.

Vapours

On 26th November 2025, VOC sampling through vacuum canister was undertaken on 1No. sample obtained from BH101. Worst case falling conditions were not captured during the canister testing. The only determinands that were recorded above the limit of detection of the laboratory were TPHs, compared with the assessment criteria derived as part of the previous report none of the determinands were at a level that warranted further concern.

COMMENT 2

"Further samples from extant wells WS1 & WS4 ('A' positions). Both these positions have been associated with observations of black oily contamination in made soils (absent from natural), and hydrocarbon odours – repeat samples will provide some insight as to concentration range &/or the impact of works on the adjacent site. I'd caution against over-extrapolation in the event that low results are returned, but obviously if that does prove to be the case then it does warrant consideration of environmental context on the sampling day, how this might fit with the CSM, and of whether an additional verification sampling might be helpful. I would expect sampling to include visual/olfactory observations, PID screening, and samples scheduled for a fairly comprehensive hydrocarbon suite (VOC/sVOC at a minimum)."

Additional groundwater sampling was conducted during the November 2025 works (3rd visit). Samples were obtained from WS1, WS3 and WS4. WS2 could not be located. The results show elevations of cyanide (WS1, WS3 and WS4), Aliphatic >C12 – C16 (WS1), Aromatic >EC12 – EC16 (WS1 and WS4), >EC16 – EC21 (WS1 and WS4) and >EC21 – EC35 (WS1 and WS4), Total TPH (WS1, WS3 and WS4) and most PAHs (WS1, WS3 and WS4).

The Level 2 (Groundwater) Risk Assessment has been undertaken and found determinands that are likely to have a detrimental effect on the underlying aquifer and potentially impacting the nearby River Ems. Given the hydrogeological model for the site, and the overall CSM, the determinands are thought to be originating from the previous land-uses of the site, such as the gas works (present until the early 20th century on and off-site) or works/yards (noted from the 1970s to current day).

It is more likely that the contamination is gas works sourced due to the following evidence:

- It is noted that the groundwater flow direction is to the south-east, with a gasworks noted immediately to the south and west of the site. With the contaminants also being fairly typical of gasworks, it is likely that the contamination is sourced off-site from the gasworks, rather than on-site sources. Given the location of the site, it is also considered likely that there are tidal effects on the data. The below data summarises the different tides during the sampling visits.

Groundwater Sampling Visit	Tide
05/03/2025 (Visit 1) – WS1, WS2, WS3 (blue locations on location plan)	Low tide
10/07/2025 (Visit 2) – WS1, WS2, WS3, WS4 (orange locations)	Rising tide

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11/11/2025 (Visit 3) – WS1, WS3, WS4 (orange locations)

Low tide

03/12/2025 (Visit 4) – BH101 (green location)

High tide

- Hydrocarbon odours and black oily contamination were noted within WS1 and WS5 of the 1st Phase Boreholes, as well as within WS1, WS3 and WS4 of the 2nd Phase Boreholes. These were mainly localised within the centre and south-east of the site, bordering the gasworks.
- During the third phase of investigation, a significant hydrocarbon odour and black staining was noted within TP5, TP6 and TP7. A site visit to the neighbouring gas works site during excavation of the historic holder also indicted that the material identified on-site was similar in appearance and smell to that seen within the holder. Photos from the visit can be found within Appendix G. It is understood since this visit, the gas holder to the west has been remediated.
- During the fourth phase of investigation, no visual or olfactory evidence of contamination was encountered, it should be noted that the two locations were located the furthest away from the former gas works and up groundwater gradient.
- Cyanide was not found within the on-site soil samples; however, it is found within the groundwater during all three phases of analysis, which may have been contaminated off-site. Cyanide is a typical gas works contaminant.

COMMENT 3

"Agree, physical vapour samples from the new location should be conclusive. Results should be compared with a residential vGAC."

The canister results from BH101 were compared to commercial and residential no elevations recorded.

COMMENT 4

"Numerical model;

a) it may be helpful to agree parameterisation and scope ahead of the modelling work – I'd expect that it should be possible to focus upon a subset of 'worst-case-indicator' parameters for modelling to limit complexity. Parameter choice should be supported by a narrative explanation – e.g. determinand is present in greatest concentration- or at the greatest multiple relative to it's GAC, or has the lowest attenuation potential (is the determinand most likely to reach the river).

When choosing the modelling software, p20 and ConSim were compared given they are both probabilistic modelling and EA approved. Where we don't have vadose zone attenuation and are looking at soil to groundwater dilution, P20 was chosen as the most appropriate.

Aliphatic C12-16, C16-21 and C21-35 were modelled due to these determinands being the greatest concentrations relative to their GAC (or closest derived GAC where one is not available). There is minimal data for half lives of heavy end hydrocarbons (C16 – C35). Studies suggest that the anaerobic degradation is much slower than aerobic degradation. Given the contaminants are within the saturated soil zones it is likely anaerobic conditions are dominant and therefore any degradation would be slower. However, it should be noted that tidal influences can also affect this. The C12 – 16 range has much faster biodegradation rates therefore it is more likely the C21-35 will reach the river as less biodegradation will be occurring.

b) Similarly, it would be helpful to agree the model parameters for hydraulic transport, and the magnitude of the scenario range (best-case/worst-case).

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The following paragraphs outline what assumptions have been made for the model, culminating in the final parameter that was input into the model. No sensitivity analysis has been undertaken at this stage.

Hydraulic conductivity: The superficial soils are classified as a Secondary A Aquifer and are anticipated to support baseflow to rivers. For the purpose of this risk assessment, the permeability of 2×10^{-6} m/s (0.1728m/day) has been assumed as it is the most conservative given the predominantly cohesive deposits.

Hydraulic Gradient: Using the topographical maps available for the site and area, the site is recorded to be at an elevation of ~6 - 8m AOD, where the River Ems is located down gradient/at the same level as the north-east of the site at an elevation of ~6m AOD.

It is assumed that the water level remains at a constant depth below ground level for this calculation. With a change in elevation of 2m over a distance of 100m, the hydraulic gradient was calculated to be 0.02.

Aquifer thickness: The aquifer is considered to be confined to the granular deposits encountered at the site. The geological memoir for the area does not indicate a thickness for the River Terrace Deposits/Head Deposits due to the irregularity of the deposits. Based on our site works and nearby BGS boreholes it is considered the likely maximum thickness of the aquifer would be 4m thick.

Width of contaminant source: The source was determined to be spread across the south of the site between WS3 and the southern site boundary, with a width of 30.00m.

Plume thickness: The plume of contamination has been assumed to be the entire saturated aquifer of 2.00m.

Effective porosity: A review of the Lovanh et al, 2000. Guidelines to Determine Site-Specific Parameters for Modelling the Fate and Transport of Monoaromatic Hydrocarbons in Groundwater provides a literature review that coarse gravels range between 10% - 25% and sandy clays of 3 - 20%. As the granular material is more porous and allows for more migration, a value of 25% has been used within the model.

Bulk density: A review of the Lovanh et al, 2000. Guidelines to Determine Site-Specific Parameters for Modelling the Fate and Transport of Monoaromatic Hydrocarbons in Groundwater provides a literature review of geotechnical properties. This indicates that soils of a coarse gravel range between 1.36 and 2.19 Mg/m^3 and a range of 1 to 2.4 Mg/m^3 for clays. An average value of 1.80 Mg/m^3 was used.

Fraction of organic carbon: The FOC is considered to be calculated based on a partition coefficient, equating to 167. The FOC is therefore considered to be the SOM (0.693), taken from the sands during the investigation, divided by the partition coefficient of 167, equating to a FOC of 0.0041497006.

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Distance to the compliance point: The most notable down gradient surface water was considered to be the River Ems located 50m east and therefore was considered to be the most suitable compliance point.

Time since pollutant entered groundwater: The time considered has been assumed based on the current understanding of the CSM and that the gas works became disused in 2012 and dismantled around 2016, 9 years ago (~3285 days).

Half-life: There is minimal data for half lives of heavy end hydrocarbons (C16 – C35). Studies suggest that the anaerobic degradation is much slower than aerobic degradation. Given the contaminants are within the saturated soil zones it is likely anaerobic conditions are dominant and therefore any degradation would be slower. However, it should be noted that tidal influences can also affect this. The C12 – 16 range has much faster biodegradation rates.

The following parameters were used for the model and are summarised in the table below.

Model Parameters							
Hydraulic conductivity (m/d)	Hydraulic Gradient	Aquifer Thickness (m)	Width of contaminant source (m)	Plume Thickness (m)	Effective porosity (n)	Bulk Density (g/cm ³)	FOC
5	0.02	2.00	30.00	1.95	25	1.80	0.00414

c) Compliance points/parameters should similarly be agreed – use of strict compliance points would be uncontroversial as this would (by definition) be a conservative starting point; however any need to account for dilution at the receptor would require agreement on what is a reasonable length/area/volume of the watercourse to be above GAC.

The most notable down gradient surface water was considered to be the River Ems located ~50m east and therefore was considered to be the most suitable compliance point.

Based on the parameters listed in the section above the following was concluded:

Determinand	Modelled Concentration at Compliance Point (mg/l)	Drinking Water Standards (DWS) target (mg/l)	Does it exceed DWS Target?
Aliphatic C12-16	0.00348	0.3	No
Aliphatic C16-21	0.00684	Not derived – use 0.3	No
Aliphatic C21-35	0.711	Not derived – use 0.3	Yes

It should be noted that there is not an EQS value available for speciated hydrocarbons and therefore the Drinking Water Standards were utilised which are likely overconservative. It should also be noted that no target values were available for C16-35 and so the closest C12-16 was utilised, again likely an overconservative value. The only value that exceeds the DWS target is the Aliphatic C21 – 35, which is only ~2.4 times the target value. Based on the risk assessment it is considered that Aliphatic C21-35 could pose a risk to end users however, as it is not considered that the source is from our site remedial measures are not possible to clean up the aquifer/protect the River Ems. Precautionary measures

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should be taken with full PPE and good hygiene on site to prevent exposure to contaminants in the groundwater. Given there is not a vapour risk it is not considered any further protection measures would be required on-site, particularly given the commercial end-use.