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TE1582-TE-00-XX-CO-GE-001-V02

FAO Jonathon Parr (Environmental Health Senior Officer (Environment Protection))

Rochdale Borough Council
Number One Riverside,
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22 September 2026

LETTER RESPONSE TO ENVIRONMENTAL CONTROL LETTER (REF: OTH/2026/0368, DATED 5th MAY 2026)

Dear Jonathon,

Tier Environmental have produced this letter in response to the letter (dated 5th May 2026 and received by Tier on 24th August 2026) with comments following your review of the Tier Environmental Ltd, Supplementary Ground Gas Risk Assessment Report, Richard Street, Rochdale (Report Reference TE1582-TE-00-XX-RP-GE-004-V03, dated 9th January 2026).

For ease, each individual comment has been reproduced and a Tier Environmental response provided in each instance in the table below. We hope this represents the most straightforward manner to address the items raised.

In addition, and to provide additional confidence in the below, Ground Gas Solutions (GGS) have produced a Review of the gas Conceptual Site Model for Richard Street, Rochdale which has also concluded that a Characteristic Situation 1 – Very Low Risk scenario is appropriate for the site.

Table 1 – Tier Environmental Response to Items Raised in Environmental Control Letter (Ref: OTH/2026/0368, dated 5th May 2026)

Rochdale Borough Council (Jonathon Parr) Comment	Tier Environmental Response
Why wasn't the ground gas monitoring from previous rounds of ground investigations (Delta Simmons and Curtins) utilised in this assessment? Section 4.6 makes a point relating to the total number of visits over 6 years. However, it appears that only the most recent data has been assessed. Why is this? Why not also use the historical data?	The historical monitoring data and previous risk assessment conclusions were utilised. Section 3 of the Tier report summarises the Delta Simmons and Curtins monitoring, the calculated GSVs and the provisional or zoned classifications. Section 4.6 then considers the 7 No. Tier visits together with the earlier nine visits: 16 monitoring visits across three campaigns over approximately six years. The numerical datasets were not pooled indiscriminately into one post-earthworks GSV. Importantly, and crucial to the objectives of this Supplementary Gas Risk Assessment, the Delta Simmons and Curtins installations represented pre-remediation and pre-earthworks ground conditions. Directly merging those results with the Tier data would imply that the monitoring points and site conditions were interchangeable. The Tier wells (WS101-WS109) were installed after the remediation and earthworks, around the revised layout and beneath the current low-rise building footprints, and are therefore the appropriate primary dataset for the current receptor assessment for the site post-remediation and post-earthworks. The earlier results nevertheless form an important longitudinal line of evidence which is why we reference these in Section 4.6. Delta Simmons undertook three visits of ten wells in 2018. One calculated borehole hazardous gas flow was within CS2; the material exception was flooded well CP202, which recorded 19.2% steady methane and one 2.7 l/hr steady flow, while methane in the other wells was below 0.1%. Curtins undertook six visits of twelve wells in 2021; methane was generally below detection (apart from 0.2% and 0.4% at WS07), maximum carbon dioxide was 8.8%, and every steady flow was below 0.1 l/hr. Tier undertook seven post-earthworks visits to nine footprint-specific wells in 2024; maximum steady methane and carbon dioxide were 5.9% and 15.4% respectively, and every steady flow was at or below 0.1 l/hr. Accordingly, the historical data support, not undermine, the interpretation of a concentration-bearing but predominantly very low-flow regime.
Section 4.2 states that "7 no. hotspots of black odorous material" were identified during the site turnover and were relocated to squares F1-G1 and B6. A "pocket of black material containing potentially large amounts of asbestos containing material" was also encountered and relocated to squares D5 and A6. Soil around the encountered underground fuel tank was relocated to I5. Where were these soils found in relation to detected concentrations of methane and carbon dioxide within the site? Are they a potential source? What implications does this movement have for the ground gas risk assessment?	The materials were not relocated without assessment. The enabling-works records describe quarantine, sampling, testing, tracking and controlled re-use, independently reviewed by Booth King Partnership (BKP). The final placement areas were within public open space (POS), not beneath the low-rise building footprints. Seven hotspots originated at B-C/6-7, E9, I3, F6, E9 and D4, were quarantined and tested, and were finally placed at F1-G1 and B6 within POS. Sample CON01 had higher organic matter and was expressly restricted to POS rather than use below houses or the apartment block. F1-G1 is closest to the northern monitoring area represented by WS103; WS103 recorded maximum steady methane of 0.2%, maximum steady carbon dioxide of 5.5% and steady flow below 0.1 l/hr. Although the maximum steady carbon-dioxide concentration from WS103 marginally exceeded 5%, the absence of measurable steady flow indicates that it was not associated with a significant mobile gas flux. Even adopting a conservative flow of 0.1 l/hr gives a carbon-dioxide GSV of 0.0055 l/hr, well below the 0.07 l/hr CS1/CS2 boundary. B6 is within the western POS and outside the low-rise housing assessment (see below for further commentary). Accordingly, given the testing undertaken, the restriction of the material to POS and the post-earthworks monitoring results, its placement does not present a material ground-gas concern to the proposed low-rise housing on the available evidence. With regards to the ACM-impacted black material; the material originated around D5, E4 and E3, was transferred to H8 for specialist screening and two rounds of hand-picking, and the residual treated material was placed at A6 at approximately 3m below final formation in POS. Samples CON101-CON106 did not identify elevated TPH or PAH concentrations, visible ACM was removed as far as reasonably practicable, and the recovered ACM was disposed of off site. With respect to the materials emplaced in areas of POS at grid locations A6 and B6 - WS101 is the closest monitoring well to A6 and B6 and was installed post-earthworks; its results therefore capture any contribution from the relocated material alongside the underlying Made Ground and organic alluvium/peat. Although maximum steady methane and carbon dioxide concentrations of 5.9% and 14.0% respectively were recorded, steady flow remained below 0.1 l/hr during all seven visits. The single initial peak flow of 5.5 l/hr was neither sustained nor reproduced. Using the maximum concentrations and a conservative flow of 0.1 l/hr gives GSVs of 0.006 l/hr for methane and 0.0146 l/hr for carbon dioxide, both below the 0.07 l/hr CS1/CS2 boundary. Accordingly, the post-placement data do not demonstrate that it has created a significant mobile gas source or a material ground-gas concern for the low-rise housing. The tank was removed from I4. Five surrounding-soil samples (FT01-FT05) did not identify significant petroleum hydrocarbon impact; most TPH fractions and all BTEX were below detection. The acceptable surrounding fill was reused at I5. I5 is better represented by WS107, which recorded maximum steady methane of 0.2%, maximum steady carbon dioxide of 13.1% and steady flow below 0.1 l/hr. Although carbon dioxide was elevated at WS107, the low methane and negligible steady flow, together with the absence of significant petroleum hydrocarbon impact in FT01-FT05, do not support the tank-surrounding soil as a hydrocarbon gas source. The Tier wells were installed after excavation and turnover and directly measure the residual post-earthworks gas regime. The results confirm local gas concentrations but not a sustained emission rate. The apartment block is outside the proposed removal of protection and retains precautionary measures.

Rochdale Borough Council (Jonathon Parr) Comment	Tier Environmental Response
Table 4.1 sets out the reasons for the installation of gas monitoring locations. WS101 is targeted at “potential ground gas sources associated with Made Ground and organic clay with peat.” WS102 was targeted at “potential ground gas sources associated with Made Ground and viable pathway offered by granular GFD”. WS104 was targeted at “potential identified source soft dark grey colouration in Made Ground and black silt with frequent pockets of fine grained, black sand”. These three locations had the highest concentrations of methane (all >1%), and all were targeted at different sources. What is the cause of this? Are there three separate sources? Is there gas from one source but detected in three different locations? What implications does this have for the ground gas risk assessment?	Table 4.1 identifies the strata and potential pathways targeted by each installation; it was not intended to assign a separate proven source to each well. The site contains heterogeneous Made Ground, natural organic alluvium/peat and granular glaciofluvial deposits associated with the former canal basins. More than one local gas-bearing pocket or zone may therefore be present, but concentration data alone cannot establish whether there is one source or several discrete sources. The three wells do not show the same temporal behaviour. WS101 recorded steady methane above 1% on five visits (maximum 5.9%) in a mixed response zone containing Made Ground and organic alluvium/peat. WS102 recorded 4.4% on one visit but otherwise steady methane of 0.0-0.1%; its more persistent elevation was carbon dioxide on three visits. WS104 recorded 2.4% on one visit and 0.1-0.7% on the other six visits. Maximum steady flow was below 0.1 l/hr at WS101 and WS102 and 0.1 l/hr at WS104. The technically relevant implication is source strength and mobility, not merely the number of locations containing gas. The ternary plot interpretation is consistent with microbial respiration in Made Ground and natural organic deposits. The spatial variability is compatible with several low-output gas-bearing zones, but there is no evidence of either one continuous high-output source or three separate sources capable of materially loading the low-rise buildings. This conclusion is supported by the consistently negligible steady-flow record.
Within Section 4.6, under the “Consideration of Peak Gas Flow Rates” heading, the report states that the gas flow of 5.5L/hr can be discounted as the elevated gas flow rate is “not resultant of the ground gases at the site.” The report states that there is no groundwater pumping at the site which would be the likely driver. If heavy rainfall was the cause, why was there no elevated flow during the 6th visit, which was also undertaken after a period of rainfall as noted within the report? What else could be the cause of the elevated flow? Again, no reference is made to historic monitoring data at the site. Why is that?	The 5.5 l/hr result was an isolated initial pulse, not a sustained flow. It occurred once, at the start of WS101 Visit 7, and rapidly reduced to a steady flow below the 0.1 l/hr detection limit. No positive flow had been recorded at WS101 during the preceding six visits and no other well recorded a positive flow on Visit 7. On Visit 6, the atmospheric pressure was lower and falling at 968 mbar and the WS101 water depth was the same (2.85m bgl), yet no flow was detected. Visit 7 was undertaken at 1003 mbar with rising pressure. The result was therefore not reproduced under the more adverse pressure condition or elsewhere on the site. The historic records have also been considered. Curtins recorded every steady flow below 0.1 l/hr. The only material Delta Simons exception was a one-off steady-flow result at flooded CP202; this was not reproduced by the subsequent Curtins or post-earthworks Tier datasets. The cause of the initial pulse cannot be assigned conclusively from the field record; however, we sought to ascertain whether there was any correlation with noticeable weather conditions. Plausible short-lived mechanisms include pressure equalisation within the standpipe or a monitoring-connection effect. The technically robust basis for excluding it from the representative GSV is its immediate reduction below detection, lack of repeatability, lack of spatial coherence and the wider steady-flow record.
Within Section 4.6, under the “Consideration of Peak Ground Gas Concentrations” heading, it is stated that “it is not considered that there is evidence of significant gas generation from the Made Ground.” The section goes on to state that “Similarly, for organic rich alluvium / peat, the peak concentrations and flow rates are not representative of sustained gas flow that would cause elevated emissions from the ground”. Peak and steady concentrations of methane within WS101 track each other closely, particularly during the 1st, 2nd, 3rd, 4th and 6th visits. I note that this relationship also holds true for WS102, WS104, WS106, WS107, WS108, and WS109, and less so for WS103, WS105. I would argue, based on this, that the concentrations of peak and steady methane are representative of sustained gas flow that would cause the elevated concentrations detected, which generally did not change during the period monitored on the individual site visit. This mirroring is also true for concentrations of carbon dioxide and oxygen within the ground, even though the gas flow rate is low. Gas concentrations change over the monitoring period (both falling and rising), suggesting there is some generation and flow of ground gas within the site. If the site had just pierced pockets of ground gas, I would expect these to decrease over time, not fluctuate as they have done.	Tier considers that the observations made demonstrate that the composition of gas within the standpipe remained stable during the monitoring period; it does not demonstrate sustained gas flux from the ground. A low-flow or effectively static standpipe can retain a stable methane or carbon-dioxide concentration because there is little air exchange or dilution. Concentration and flow are separate measured parameters, and the GSV combines them for precisely that reason. The dataset also contains clear examples where peak concentrations were not sustained. At WS101 Visit 5, methane reduced from 6.0% to 1.3% and carbon dioxide from 14.6% to 0.1%. At WS108 Visits 4-6, peak carbon dioxide of 10.4-11.6% reduced to steady values of 0.1-0.3%. At WS109 Visit 7, peak carbon dioxide reduced from 8.7% to 0.2%. Across all nine wells and seven visits there were 63 steady-state flow observations: 61 were below the 0.1 l/hr detection limit and two were reported at 0.1 l/hr. Fluctuating concentrations do not require a high or increasing generation rate. Gas held within heterogeneous Made Ground, peat/alluvium and discontinuous granular pathways can fluctuate with barometric pressure, groundwater and local well equilibration while the transmissive flow remains negligible. We do not contend that no gas exists or that all microbial generation has ceased. The intended conclusion is that there is no evidence of a significant mobile gas flux capable of sustaining material emissions towards the proposed low-rise buildings. That formulation distinguishes the acknowledged presence of gas from the rate at which it can be supplied to a receptor.
If the source is considered to be the organic matter within made ground and alluvium, then continued monitoring should demonstrate that the concentrations of gas has reduced, and that there is no need for any gas ingress prevention measures. This has not been done.	Tier considers that a monotonic decline in concentration is not a prerequisite for a CS1 classification. Gas associated with old Made Ground, peat or organic alluvium can remain in pore spaces or be generated at a very low rate for a prolonged period. Concentrations may therefore recur or fluctuate even where source strength and transmissive flow are very low. We have considered the relevant risk question of whether the source-pathway combination can deliver gas to a building at a hazardous rate, rather than whether every trace of gas has disappeared. The completed monitoring programme already tests the post-earthworks condition. It comprised seven visits across nine wells installed around the low-rise footprints, including a visit at 968 mbar under falling atmospheric pressure, together with the nine earlier visits. The combined record covers 968-1014 mbar and rising and falling pressure conditions. All 63 post-earthworks steady-flow observations were at or below 0.1 l/hr. Additional monitoring is therefore not technically necessary to convert elevated concentrations into a lower classification. The classification follows from the measured flow regime, the source-pathway-receptor model and the post-remediation setting.

Rochdale Borough Council (Jonathon Parr) Comment	Tier Environmental Response
I am not convinced by the explanations provided to date that this site does not warrant ground gas ingress prevention measures; the data suggest to me that there is a source of ground gas, whatever it may be, existing on site, with methane and carbon dioxide migrating in small but detectable concentrations with fluctuating flow rates across the central portion of the site.	We agree that methane and carbon dioxide are present beneath parts of the site; however, we contest that their presence alone demonstrates a CS2 regime for the low-rise housing. The distinction is between gas concentration in a standpipe and the rate at which the ground can supply that gas towards a receptor. The post-earthworks dataset comprises 63 steady-state flow observations: 61 were below the 0.1 l/hr instrument detection limit and two were 0.1 l/hr. We therefore contest that this represents a fluctuating positive-flow regime across the central site; rather, it is a consistently negligible steady-flow regime with isolated initial pulses that was not sustained (see discussion above about potential reasons for these). The resulting individual borehole hazardous gas flow rates and gas-specific worst-case checks remain below the CS1/CS2 GSV boundary. Using the conservative upper-bound representative flow of 0.1 l/hr gives methane GSV = $0.06 \times 0.1 = 0.006$ l/hr and carbon-dioxide GSV = $0.154 \times 0.1 = 0.0154$ l/hr. Both are below 0.07 l/hr. The higher concentrations have nevertheless been considered through the source model, remediation record, temporal and spatial distribution, ternary interpretation, foundation/floor arrangement and steady-flow evidence; and therefore we do not consider that these have been ignored. The conclusion is specific to the low-rise housing. The apartment block is outside the proposed removal of precautionary gas protection. On the evidence available, a sustained mobile gas regime requiring CS2 measures beneath the low-rise footprints has not been demonstrated.
I also note that black odorous material has been moved across site, but if this is a contributor to the ground gas present on site, then surely this source has just been relocated, and therefore the pathway still exists?	Relocation would be relevant if the material were a material gas source, a viable pathway existed to the receptor, and monitoring demonstrated sufficient mobile flux; however, the records do not establish that complete linkage. The black odorous hotspot material was quarantined, sampled and tested before being retained, and was placed at F1-G1 and B6 within POS rather than beneath the low-rise houses. Material with higher organic matter (CON01) was expressly restricted to POS. The material was not treated as inert merely because it had been moved; its final location and the post-earthworks monitoring results were considered in the conceptual site model. The CIEH guide (The Local Authority Guide to Ground Gas, CIEH (2008)) assigns a negligible risk of lateral migration to Made Ground with low degradable organic content and to alluvium/peat with low current generation potential, which is relevant given the placement of the materials outwith the building footprints and specifically with POS areas. The spatial monitoring evidence has been discussed above. The available evidence does not support the proposition that a significant source has merely been relocated beneath, or on a pathway to, the low-rise buildings.
Because of this, I cannot currently accept the GSV calculated within Table 4.5 within the “Worst-Case’ GSV Check Calculation – Carbon Dioxide and Methane” section. This should be 0.033 for methane, which places the site as a CS2 site. I note table 8.5 within CIRIA C665 states that sites which are CS2 have typical sources such as “natural soil, high peat/organic content” and “Typical” made ground”, which somewhat describe this site. I do not believe the evidence presented within the report up to this point allows any other interpretation than CS2 at this time. Further monitoring should have been undertaken between when this original monitoring was undertaken and prior to submission to the Local Planning Authority to determine whether gas concentrations have decreased across the site, especially where no gas ingress prevention measures are recommended.	The stated methane GSV of 0.033 l/hr cannot be reproduced from the reported values. GSV is calculated as gas concentration expressed as a decimal fraction multiplied by flow rate. The gas-specific worst-case checks are: Methane: $6.0\% = 0.06$; 0.06×0.1 l/hr = 0.006 l/hr. Carbon dioxide: $15.4\% = 0.154$; 0.154×0.1 l/hr = 0.0154 l/hr. Regardless, both the gas-specific values are below the 0.07 l/hr CS1/CS2 boundary. The value 0.033 l/hr appears consistent with a factor-of-ten percentage-conversion error. Multiplying the isolated 5.5 l/hr initial flow by 0.006 gives 0.033, but 6.0% is 0.06—not 0.006. If 6.0% methane were paired with 5.5 l/hr, the arithmetic product would be 0.33 l/hr, not 0.033 l/hr. That 0.33 calculation would depend entirely on treating the isolated, non-sustained initial pulse as representative, which is not technically justified for the reasons given above. Further, even if 0.033 l/hr were accepted, it remains below 0.07 l/hr and would not, on GSV alone, place the site in CS2. We respectfully request clarification of the Council's calculation route. The source descriptions in CIRIA C665 are indicative, not determinative. The presence of typical Made Ground or natural organic soil does not automatically assign CS2. Likewise, methane above 1% and/or carbon dioxide above 5% requires consideration of an upward adjustment; it is not an automatic override of the GSV. That consideration has been undertaken using the source assessment, remediation evidence, monitoring pattern, building configuration and consistently negligible steady-flow data. Accordingly, we maintain that the evidence does not require CS2 for the low-rise housing.

In additional to the above comments, it is important to note that:

- It is current proposed that there will be a 200mm clear ventilated void (with periscopic vents) that may contribute a point score of at least 1.5 points (assuming a worst-case of 'good ventilation') in accordance with Table 6 in BS 8485. Therefore, the inherent floor slab design and ventilation do provide some contribution towards gas protection and is relevant within the CSM considerations.
- Tier Environmental has been informed that the final selected foundation solution for the site is a Rigid Inclusions (aka Controlled Modulus Columns (CMCs)) solution. RI / CMCs are cast-in-situ, cementitious, intrinsically low-permeability inclusions that do not adversely change the diffuse flow mechanisms baked into the risk assessment or introduce preferential pathways that would otherwise act as 'chimneys' for gas to migrate through.

It is sincerely hoped that the above provides additional confidence in the conclusions of the report.

For and on behalf of

TIER ENVIRONMENTAL LTD

A handwritten signature in black ink, appearing to read 'Adrian Read'.

Adrian Read MEng (Hons)

Technical Director

Tier Environmental Ltd

**Enc – Ground Gas Solutions - Review of the gas Conceptual Site Model for Richard Street, Rochdale
(Ref: GGS4533LR01/21.09.2026, dated: 21st September 2026)**

21 September 2026

Ref: GGS4533LR01/21.09.2026

Tier Environmental Limited
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Review of the gas Conceptual Site Model for Richard Street, Rochdale

Ground Gas Solutions Ltd (GGS) has been commissioned by Tier Environmental Limited to undertake an independent technical review of the ground gas conceptual site model and supporting evidence relating to the Neighbourhood Development, Land off Richard Street, Rochdale, OL11 1DU ("the Site"). The purpose of this review is to consider the available lines of evidence, including historical investigations, remediation works, validation records, supplementary monitoring data and the comments raised by Jonathon Parr of Rochdale Borough Council, and to provide an independent opinion regarding the ground gas risk assessment and proposed gas protection strategy.

The Site comprises a prominent brownfield redevelopment area centred on the former Richard Street and Central Retail Park area of Rochdale. Historical mapping and previous site investigations indicate that the Site has been subject to a range of industrial, commercial and retail uses, resulting in extensive redevelopment and ground disturbance over time. More recently, the Site has undergone enabling and remediation works to facilitate regeneration of the area and prepare the land for future development.

The proposed development comprises a residential-led mixed-use scheme forming part of the wider regeneration of the area. The development includes new residential accommodation together with associated infrastructure, landscaping, public realm and supporting commercial and community uses, transforming the previously developed site into a sustainable urban neighbourhood.

The following documents were provided by Tier Environmental Limited and reviewed as part of GGS's independent technical review of the supplementary ground gas assessment and associated responses to Environmental Control comments:

- **Preliminary Phase 2 Geoenvironmental Assessment. Clarke Bond, 2011. ZM01991E/R1.**
- **18-0848.01_REP_Rochdale-Central-Retail-Park_PHSI_18-08-08-RAL. Phase 1 Historical Site Investigation (PHSI), Delta-Simons, August 2018.**
- **075882-CUR-00-XX-RP-GE-002-V02_Phase 2_Neighbourhood. Phase 2 Ground Investigation Report. Curtins, 2021.**
- **Remediation Strategy and Implementation Plan. Booth King, 2022.**
- **ORRD-BKP-XX-XX-RP-C-00010 - Neighbourhood Remediation Validation Report Enabling Works v1.1. Booth King, Version 1.1, 2023.**
- **TE1582-TE-00-XX-RP-GE-004-V03 Richard St Supplementary Gas Risk Assessment. Tier Consult, Version 03, 2026.**

- **Environmental Control Consultation Response / Review Comments. Rochdale Borough Council Environmental Control, 2026.**
- **TE1582-TE-00-XX-CO-GE-001-V02 - Env Control Response Letter. Tier Consult, Version 02, 2026.**

Limitations and exclusions

GGs has prepared this letter report for the sole use of the Client and those parties with whom a reliance agreement has been executed. The review relates solely to the land at Richard Street, Rochdale and is based exclusively on the information and documentation provided to GGS by the Client.

The opinions and conclusions presented herein are based on the information available at the time of writing. Should additional information become available, or should further site works be undertaken that materially alter the understanding of site conditions, the findings and conclusions of this letter report may require review and updating.

The scope of this review is limited to consideration of the ground gas conceptual site model, ground gas monitoring data, gas risk assessments and related technical documentation provided to GGS. No independent site investigation, monitoring, sampling or validation works have been undertaken by GGS as part of this commission. Furthermore, GGS has not reviewed soil quality, groundwater quality, or wider contamination assessment data except where such information is directly relevant to the understanding of the ground gas conceptual site model.

This letter report has been prepared to provide an independent technical opinion on the information reviewed and should be read in conjunction with the source documents referenced herein.

Brief overview of available reporting

Clarke Bond Preliminary Phase 2 Geoenvironmental Assessment (May 2011):

This represents the earliest geo-environmental assessment identified for the site and was completed to support redevelopment of part of the former Central Retail Park. The investigation included seven boreholes, installation of ten gas and groundwater monitoring wells, and environmental and geotechnical assessment of the site. The report established the historical industrial setting, former canal basins, made ground distribution and baseline environmental conditions that subsequently informed later investigations.

Delta Simons Preliminary Site Assessment (August 2018):

This assessment formed part of the environmental due diligence process for redevelopment of the former retail park. The report reviewed site history, environmental setting and potential contamination risks associated with historic commercial and industrial land uses. The findings provided additional historical context and contributed to the development of later conceptual site models.

Curtins Phase 2 Ground Investigation (July 2021):

The Curtins investigation represents the principal pre-development site characterisation undertaken for the proposed residential development. The works included window samples, cable percussion boreholes, trial pits and six rounds of ground gas monitoring.

The investigation confirmed the presence of made ground, alluvium and localised peat or organic-rich deposits across parts of the site. Ground gas monitoring recorded carbon dioxide concentrations up to 8.8% v/v and methane concentrations generally below detection limits, with a maximum methane concentration of 0.4% v/v. Curtins concluded that localised Characteristic Situation 2 (CS2) conditions were present and recommended that gas protection measures be incorporated into the development. Importantly, the report also recommended that further gas monitoring be undertaken following the completion of earthworks to reassess the gas regime and review the preliminary zoning.

Booth King Remediation Strategy and Implementation Plan (September 2022):

The remediation strategy was prepared following completion of the Curtins investigation and supplementary works undertaken by LK Remediate. The document established the remediation objectives for the site and identified measures required to address contamination and ground gas risks.

The strategy recognised that site turnover and enabling works would provide an opportunity to remove organic-rich and potentially putrescible materials associated with both made ground and former canal deposits. The report specifically noted that further monitoring and reassessment of ground gas risks may be appropriate following completion of earthworks and source removal activities.

Booth King Remediation Validation Report (September 2023):

This report documents and validates the enabling works undertaken between December 2022 and May 2023. The works included site clearance, excavation and processing of made ground, removal of structures and foundations, management of asbestos-containing materials, identification and removal of hydrocarbon-impacted soils and re-engineering of the development platform.

The report confirmed that the remediation works had been completed generally in accordance with the approved remediation strategy and provided evidence that identified contaminant sources, including potential ground gas generating materials, had been subject to screening, relocation or removal as part of the enabling works.

Tier Environmental Supplementary Ground Gas Risk Assessment (January 2026):

Tier Environmental was commissioned to undertake a supplementary ground gas risk assessment following completion of the enabling works and site reconfiguration. The stated purpose of the assessment was to review the previous ground gas risk assessment, obtain additional monitoring data, consider the implications of the completed earthworks and reassess the requirement for gas protection measures across the development. The assessment also sought to determine whether the historic gas regime identified by Curtins remained representative following completion of the remediation and earthworks programme.

Rochdale Borough Council Environmental Control Review Letter (May 2026):

Following review of the supplementary gas assessment, Jonathon Parr, Environmental Health Senior Officer, issued a series of technical queries regarding the interpretation of the monitoring data, consideration of historical investigations, implications of material relocation during remediation works, interpretation of gas flow data and the justification for reducing gas protection requirements. The correspondence forms the basis of the current technical review.

Tier Environmental Response Letter (September 2026):

This document provides Tier's formal response to the points raised by Jonathon Parr. The response seeks to address each comment individually and provides further explanation regarding the supplementary gas risk assessment and supporting conceptual site model.

GGs' technical review

GGs has reviewed the available historical investigations, remediation and validation records, Tier's Supplementary Ground Gas Risk Assessment, and the subsequent correspondence with Rochdale Borough Council Environmental Control. The review has considered the available lines of evidence collectively to assess whether the updated ground gas conceptual site model, interpretation of the monitoring data and proposed gas protection strategy are technically supported. The following sections provide GGS's independent technical review of each comment raised by RBC Environmental Control and the corresponding response provided by Tier Environmental.

Comment 1: Consideration of Historical Ground Gas Monitoring Data

GGs agrees that the historical monitoring data remain relevant to the ground gas conceptual site model. However, the Delta-Simons and Curtins installations assessed conditions before the subsequent remediation, earthworks and reconfiguration of the development platform. Directly pooling these data with the post-earthworks results would therefore assume equivalence between monitoring locations, source distribution and site conditions that did not exist.

The historical data should instead be used as contextual and longitudinal evidence. These datasets generally identified elevated gas concentrations in places but predominantly negligible steady-state flow, a pattern broadly consistent with the subsequent Tier monitoring. The Tier installations were completed following the earthworks and targeted the revised development layout; GGS therefore considers these data to be the most representative primary dataset for the current low-rise development, with the earlier data providing supporting context.

Comment 2: Relocation of Black Odorous Materials, ACM-Impacted Materials and Tank Surrounding Soils

The validation records indicate that the materials were identified, quarantined, assessed and subject to controlled management rather than indiscriminate redistribution. Potentially organic-rich material was restricted to public open space, ACM-impacted material was

screened with visible ACM removed, and the soils surrounding the former fuel tank did not show significant residual hydrocarbon impact.

These materials remain potential components of the residual source term and should therefore be retained within the gCSM. However, post-earthworks monitoring near the relevant placement areas recorded local gas concentrations without sustained measurable flow. On review of the available evidence, GGS considers that the relocated materials have not been demonstrated to constitute a significant mobile gas source or to form a material source-pathway-receptor linkage with the proposed low-rise residential plots. The available validation and monitoring evidence indicates that these materials do not materially influence the residual gas risk associated with the assessed development.

Comment 3: Elevated Methane Concentrations at WS101, WS102 and WS104

The Site comprises heterogeneous Made Ground together with localised organic alluvial and peat deposits that are capable of generating ground gases through natural microbial degradation processes. Consequently, localised methane generation may occur at multiple locations across the Site.

The differing installation rationales for WS101, WS102 and WS104 do not establish three separate gas sources. The wells targeted heterogeneous Made Ground, organic alluvium or peat and granular superficial deposits that may all contain local gas-bearing zones or provide local migration pathways.

Methane concentrations varied spatially and temporally, while steady-state flow remained at or below 0.1 l/hr. GGS therefore considers the results consistent with localised residual gas generation and storage within heterogeneous deposits, rather than evidence of a laterally extensive or materially significant gas source capable of generating sustained emissions beneath the proposed development.

Comment 4: Consideration of isolated peak flow rates

The 5.5 l/hr result at WS101 was an initial transient reading that reduced rapidly to below the 0.1 l/hr detection limit and was not reproduced during the preceding monitoring visits or at other wells during the same visit. Notably, no positive flow was recorded at WS101 during monitoring under lower and falling atmospheric pressure conditions.

Although the cause cannot be established retrospectively, the peak flow is likely to reflect short-term pressure equalisation or a monitoring-connection artefact; however, the technical basis for treating it as unrepresentative is its short duration, transient nature, lack of repeatability and inconsistency with the wider steady-state dataset. GGS therefore considers its exclusion from the representative GSV calculation reasonable.

Comment 5: Gas composition and transient behaviour

GGS agrees that methane and carbon dioxide remain present and that low-rate gas generation has not necessarily ceased. However, stable concentrations within a standpipe demonstrate local gas composition and equilibration; they do not, without corresponding measurable flow, demonstrate significant gas flux towards a receptor.

The dataset includes both stable concentration responses and marked reductions between peak and steady-state readings. In combination with the predominantly negligible steady-state flow record, this is consistent with localised gas storage and low-rate replenishment within heterogeneous Made Ground and organic superficial deposits. The results therefore support the presence of a residual gas regime, but not a significant continuously replenished mobile source.

Comment 6: Continued gas generation and requirement for further monitoring

GGS does not consider that a progressive reduction in ground gas concentrations over time is a prerequisite for demonstrating a low ground gas risk or supporting a CS1 classification. Ground gas associated with aged Made Ground, peat and organic alluvial deposits may persist within the subsurface for prolonged periods and continue to be generated at relatively low rates through ongoing microbial degradation processes. Consequently, fluctuations or recurring gas concentrations are not unexpected and do not, in isolation, indicate a significant gas source.

The post-earthworks programme comprised seven monitoring visits across nine installations and included monitoring during very low and falling atmospheric pressure. These conditions provided a suitably adverse pressure regime for assessing the potential for pressure-driven gas migration. Steady-state flow remained at or below 0.1 l/hr throughout the programme, consistent with the broader historical monitoring record.

Although no finite monitoring programme can capture every possible combination of environmental conditions, the inclusion of low and falling atmospheric pressure, together with the consistency of the results across the wider dataset, provides reasonable confidence that the residual gas regime has been adequately characterised for the proposed low-rise development. On the available evidence, further routine monitoring is unlikely to materially change the gCSM or resulting risk classification. However, the gCSM should be reviewed if the development layout, substructure, earthworks or ground conditions change, or if previously unidentified organic materials, or other unexpected ground conditions are encountered.

Comment 7: Requirement for Gas Protection Measures

GGS agrees that residual methane and carbon dioxide are present beneath parts of the Site. However, identification of a source does not alone demonstrate an unacceptable risk; a credible pathway capable of delivering gas to a receptor at a significant rate must also be present.

The post-earthworks and historical datasets show elevated concentrations locally but predominantly negligible steady-state flow. When considered alongside the remediation history, revised site configuration, monitored spatial distribution and proposed ventilated sub-floor void, the available evidence supports a low-mobility residual gas regime beneath the low-rise plots.

GGS therefore considers a CS1 classification technically supportable for the proposed low-rise housing. This conclusion is specific to the assessed layout and construction

arrangement and does not alter the precautionary protection retained for the apartment development.

Comment 8: Relocation of black odorous materials and Source-Pathway linkages

GGs agrees that the relocated material should remain within the gCSM as a potential residual source. As discussed under Comment 2, the material was assessed and placed within public open space rather than beneath the low-rise residential plots. Post-earthworks monitoring has not identified sustained measurable flow or a coherent migration pattern linking these placement areas to the proposed receptors. GGS therefore considers that a significant complete source-pathway-receptor linkage has not been demonstrated.

Comment 9: Revised gas Conceptual Site Model and Source-Pathway-Receptor linkages

The historical gCSM has changed following the enabling works, excavation, material management and re-engineering of the development platform. The post-earthworks monitoring installations targeted residual source materials and potential pathways beneath the revised development layout and therefore provide a direct assessment of current conditions.

Residual methane and carbon dioxide remain present locally, including concentrations greater than 1% and 5%, respectively. These results require consideration within the classification but do not automatically establish CS2 conditions. The recorded concentrations were not accompanied by sustained measurable flow, reproducible high-emission conditions or a coherent spatial pattern indicative of a significant mobile source.

GGs considers that the available evidence supports a gCSM comprising localised residual gas generation and storage within heterogeneous Made Ground and organic superficial deposits, with limited gas mobility and no significant complete linkage demonstrated to the proposed low-rise dwellings. On this basis, and subject to the assessed development layout and substructure remaining unchanged, the available evidence supports a CS1 classification for the low-rise residential plots.

The proposed ventilated sub-floor void provides an additional inherent dilution mechanism and is relevant to the receptor and pathway model. However, GGS has not relied upon this feature as a substitute for a compliant gas-protection system or as the sole basis for the CS1 classification.

GGs recognises that presentation of the worst-case calculation within the supplementary assessment may have contributed to confusion regarding the methane GSV; however, review of the underlying monitoring data confirms that all representative gas-specific GSV assessments remain below the CS1/CS2 threshold.

Atmospheric pressure review:

GGs considers that the post-earthworks monitoring programme captured atmospheric pressure conditions that would reasonably be expected to promote gas migration if a significant mobile gas regime were present. Monitoring was undertaken following a rapid fall to seasonally very low pressure and during a sustained period of low and falling pressure approaching worst-case seasonal rates of fall.

Atmospheric pressure is considered the principal driver of gas migration at the Site and, therefore, these monitoring events represent conditions under which a measurable response from the ground gas regime would most likely be expected. Despite this, sustained positive gas flow was not recorded.

This lack of response indicates that the residual methane and carbon dioxide identified beneath the Site are characterised by limited mobility and low source strength, with gas largely remaining stored within the subsurface rather than being actively driven towards the ground surface. Whilst residual gas remains present locally, the available evidence does not demonstrate a material pressure-driven gas response during the adverse conditions monitored and is consistent with a low-mobility, low-source-strength residual gas regime.

Conclusion:

GGs acknowledges that residual uncertainty is inherent in any finite ground gas monitoring programme and that elevated methane and carbon dioxide concentrations remain present locally beneath parts of the Site. However, the purpose of the post-earthworks monitoring programme was to assess the residual gas regime following remediation and site reconfiguration and, in GGS's opinion, that objective has been achieved. The monitoring programme targeted residual source areas and potential migration pathways beneath the revised development layout and included periods of low atmospheric pressure and falling pressure conditions that would reasonably be expected to promote gas emission and migration. Despite these conditions, steady-state flow remained consistently negligible or below the instrument detection limit. Whilst residual methane and carbon dioxide sources remain locally present, the available evidence does not demonstrate a significant complete source-pathway-receptor linkage to the assessed low-rise residential plots. Accordingly, GGS does not consider that further routine monitoring is technically necessary, as it is unlikely to materially refine the conceptual site model or alter the resulting risk classification.

This conclusion assumes that the final rigid-inclusion design, working platform, load-transfer layer, floor build-up, service penetrations and perimeter details do not create new preferential pathways or materially alter the assessed groundwater and gas-flow regime.

The CS1 classification represents GGS's independent technical opinion on the evidence reviewed. Acceptance of the assessment and discharge of the relevant planning condition remain matters for Rochdale Borough Council and other relevant approval bodies.

Based on its review of the available evidence, GGS has prepared a gas Conceptual Site Model (gCSM) presented on the following page. The gCSM summarises the potential ground gas sources, migration pathways and receptors, together with GGS's overall conclusions. The qualitative risk classification matrix used is presented on the subsequent page.

Should you have any queries regarding the above then please do not hesitate to contact me.

Yours sincerely



Andrew Brunton - Technical Associate Director (on behalf of GGS Ltd)

Table 1.1 GGS gas Conceptual Site Model

Source	Principal Contaminants	Pathway	Receptor	Hazard Assessment	Discussion	Action
On-site Made Ground / alluvium / peat deposits	Methane Carbon dioxide	Vertical and Lateral migration by advection or diffusion through unsaturated Made Ground and granular superficial deposits, including possible movement along artificial preferential pathways.	Current site users and visitors, site workers/contractors, future site visitors, and residential receptors.	Residual methane and carbon dioxide generation is present locally within heterogeneous Made Ground and organic alluvial or peat deposits. However, the historical and post-earthworks datasets predominantly recorded steady-state flow below the 0.1 l/hr detection limit, with no reproducible evidence of a significant mobile gas source. A potentially complete linkage may exist locally, but the available evidence indicates that gas mobility and source strength are very low and that a significant linkage to the proposed low-rise dwellings has not been demonstrated. C = Mild P = Unlikely R = Very low risk Complete linkage may exist; however, available evidence indicates negligible gas mobility and no significant contaminant linkage to the proposed low-rise residential development. Overall risk is assessed as Very Low (CS1).	Historical and post-earthworks monitoring confirm the presence of residual ground gas across parts of the site. Validation records demonstrate the excavation, removal, management and controlled placement of identified source materials during the earthworks phase. The post-earthworks monitoring programme targeted residual source areas and potential migration pathways beneath the revised development layout and recorded predominantly negligible steady-state flow, including during periods of very low falling atmospheric pressure. Whilst elevated methane and carbon dioxide concentrations were recorded locally, the monitoring data indicate very limited gas mobility and do not demonstrate conditions consistent with a significant gas hazard to the proposed development. Collectively, the dataset includes suitably adverse atmospheric-pressure conditions and is considered sufficient to characterise the residual gas regime and supports a Characteristic Situation 1 (CS1) classification for the assessed low-rise residential plots. The apartment development remains subject to the separately proposed precautionary gas-protection measures.	No further routine gas monitoring is considered necessary to refine the current gCSM. With consideration to the available evidence, no special gas protection measures are required for the proposed low-rise residential development. The apartment development remains subject to its separately proposed precautionary measures. Residual ground gas risks should be addressed within construction-phase controls for excavations, service trenches and other confined or poorly ventilated spaces.

Qualitative Risk Classification Matrix

Probability (likelihood)	Consequence			
	Minor	Mild	Medium	Severe
High likelihood	Low risk	Moderate risk	High risk	Very high risk
Likely	Low risk	Low to moderate risk	Moderate risk	High risk
Low likelihood	Very low risk	Low risk	Low to moderate risk	Moderate risk
Unlikely	Very low risk	Very low risk	Low risk	Low to moderate risk
No Pollutant Linkage	No potential risk			
Consequence	Minor	Mild	Medium	Severe
Ratings	-No measureable effect on humans -Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems -Repairable effects of damage to buildings, structures and services	-Exposure to human healthy unlikely to lead to "significant harm" -Equivalent to EA Category 3 pollution incident including minimal or short-lived effect on water quality; marginal effect on amenity value, agriculture or commerce -Minor or short lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long term maintenance of the population -Minor damage to crops, buildings or property	-Elevated concentrations which could result in "significant harm" to humans health as defined by EPA 1990, Part 2A if exposure occurs -Equivalent to EA Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce -Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long term maintenance of the population -Significant damage to crops, buildings or property	-Highly elevated concentrations likely to result in "significant harm" to humans healthy as defined by EPA 1990, Part 2A if exposure occurs -Equivalent to EA Category 1 pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce -Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long term maintenance of the population -Catastrophic damage to crops, buildings or property
Probability	Unlikely	Low likelihood	Likely	High likelihood
Classification	Improbable that exposure/event would occur even in the long term	Possible that exposure/event could occur. However, not certain that even over a long period that exposure/event would occur and is less likely in the shorter term	Probable that exposure/event would occur. However, exposure/event is not inevitable, but is possible in the short term and likely over the long term	Exposure/event very likely in the short term and almost inevitable over the long term, or evidence at the receptor of harm or pollution