



Elemental **GI** Ltd

REPORT: REMEDIAL METHOD STATEMENT FOR LAND
TO NORTH OF STATION ROAD, SURFLEET

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REMEDIAL METHOD STATEMENT: LAND TO NORTH OF STATION ROAD, SURFLEET

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Semi-Technical Summary

The reader is referred to the terms and conditions which accompany this report, and which are presented at the end of this document.

This semi-technical summary provides a brief overview of the main conditions which have been noted on site. These features / factors (alongside others) are explained fully in the following report and the following should therefore not be referred to in isolation. **No reliance should be placed on the summary until the whole report and related documents have been read in full.**

Contamination	Our ground investigation found a single exceedance of mercury at one location, and a single exceedance of benzo(a)pyrene at another location at shallow depths. At this stage we consider it likely that these are hotspots, which are small isolated areas of contamination within otherwise 'clean' soils / made ground. However, this needs to be proven through the sampling of soils around / beneath these suspected hotspots, which has been recommended <u>as part of the remediation works</u>. If these hotspots are larger than expected, then contingencies are presented in this document to manage such scenarios. At the time of our ground investigation, access was not possible within the 3 No. structures at the site. Once these have been demolished / removed (including removal of the tank) then sampling of the ground beneath their former positions should be undertaken to confirm if it is uncontaminated. Contingencies are presented in this document to manage scenarios where contamination is found in such areas. The soils which are excavated from the ground can be either removed from site for disposal (i.e. landfill) or they may be retained on site beneath permanent buildings / driveways etc.
Conceptual Site Model	Potential pollutant linkages exist which relate to the contamination and to the future residential end users. These need to be broken in order to ensure that risks to future site users are negated. This document presents methodologies to break the identified pollutant linkages (and potential future pollutant linkages).
Remediation Specification	The hotspots should be excavated to the base of the impacted materials or to 600mm depth (whichever is shallowest). Samples should be taken in the edges and base of each excavation to prove that the contaminated materials have been removed. If exceedances are reported within the validation samples, then the excavation must be extended until 'clean' soils are reached. The excavations may then be re-filled with site won materials. The ground beneath buildings should be inspected, sampled and analysed following their demolition and the removal of the tank etc. If any contamination is found to be present, then the general steps outlined for the identified mercury and benzo(a)pyrene hotspots should be implemented under engineer's supervision until contaminated materials are no longer present. If / when contaminated soils are present at depths which are considered to break feasible exposure pathways (i.e. they are too deep to harm future residents, off-site receptors etc.) then they may be left <i>in situ</i> pending a revised risk assessment and agreement with the appropriate regulators.

1.0 INTRODUCTION

1.1 Report Status

Elemental GI Ltd were appointed by Seven22 Architecture Ltd on behalf of M. Foden, T. Laud and J. Bailey-Scott (hereafter referred to as 'the Client') to prepare a Remedial Method Statement ("RMS") for the Land to the North of Station Road, Surfleet (hereafter referred to as 'the site').

This report has been prepared on the understanding that the site is to be redeveloped to support residential housing. We have been supplied with a copy of the proposed layout Ref. 062/063 PO1 (Rev. A), and extracts of this plan are presented in the Proposed Site Layout Plan (Drawing 001) in Appendix I.

This report has been prepared in accordance with our notes concerning the terms and conditions of these works and of our engagement, which are presented at the end of this report.

Should the development proposals alter, then the recommendations in this report may be subject to change. Whilst it may be utilised by others for reference purposes at the Client's discretion, it has not been prepared for any other purposes (e.g. waste classification etc.) and therefore additional works may be required by third parties dependent upon their own requirements / works. Users of any / all of our reports, letters etc. must always ensure that they are reading the latest version / revision before undertaking any works and / or making any assessments, designs, decisions or related ventures. Please stop and check that this is the latest version for this site / project before proceeding any further.

All recommendations are subject to the approval of the relevant Regulatory Authorities, and copies of this document should be submitted for approval by the Client before the start of any works on site.

It should be noted that this RMS has not been written to consider risks arising from the completion of foundation construction works (e.g. piling) and that risks from such works should be considered fully by the relevant contractor once their designs are confirmed. Approval may be required from the relevant regulators / warranty providers for such works.

It is recommended that the Client should forward a copy of this document to your appointed builder / groundworker / remediation contractor (as appropriate) so that they can discuss the next steps, costs etc. with you regarding remediation and any associated costs / works (e.g. removal of soils from the site for disposal, application for permits etc.).

1.2 Previous Reports

Elemental GI Ltd have been supplied with a copy of the following report by the Client which relates to the subject site:

- GeoSmart: Phase 1 Contaminated Land Assessment, Land Adjacent to 110 Station Road, Surfleet (Ref. 77712R1 dated Sep. 2022).

In addition to the above, Elemental GI Ltd have prepared the following report which relates to the subject site:

- Elemental GI Ltd: Phase 2 Geo-Environmental Investigation For Land to North of Station Road, Surfleet (Ref. E23109/2/2 Rev. 2 dated June 2023).

The above referenced documents have not been reproduced herein, and they should be referred to in full alongside this report.

1.2.1 Summary of Previous Reports

GeoSmart Phase 1 Report

The Phase 1 Report presents a review of the site's historical and current setting alongside a review of geological, hydrogeological and environmental database information. It presents an overall 'site analysis' risk rating of 'Moderate/Low' for the site.

The summary presented within the report includes the following:

- *"The Site is currently used within a domestic capacity including lawned areas and a number of small former agricultural buildings. Development proposals include the demolition of the existing buildings and the construction of two dwellings with associated gardens and parking.*
- *The underlying superficial geology consists of Tidal Flat Deposits which are classified as Unproductive Strata; the bedrock geology consists of the Oxford Clay Formation which is also classified as Unproductive Strata.*
- *The nearest water feature is a drainage ditch, located c. 14m north of the Site boundary. The River Glen is located c. 100m southeast of the Site.*
- *The earliest mapping of the Site, dating from 1887, shows the Site split across a number of agricultural fields with several containing trees (possible orchard(s)); two buildings are also mapped in the south of the Site at this time; a cluster of buildings (a possible farm) is mapped adjacent to the southeast of the Site. By the mid 1970s the Site has been cleared of previous structures and several large warehouses/barns had been built in the centre and north of the Site (some extending onto the adjoining land to the east). Aerial Imagery from 2004 shows that the larger warehouse/barns*

in the north of the Site had been demolished. Three small buildings remain on-Site to the present day.

- *The Site lies in an area where <1% of homes are at or above the UK radon action level (200 Bq/m³).*
- *The Site does not lie within an identified coal mining area and is therefore unlikely to be affected by related ground stability or mine gas issues.”*

The third party's report constructed a site-specific conceptual site model (CSM) which considered the potential sources, pathways and receptors in relation to a proposed residential development.

This identified the following:

- Sources:
 - *“Potential for inorganic and low volatility organic contaminants to be present within the subsurface soils, and potential for asbestos containing materials within the subsurface soils.”*
 - In other parts of the report the third party also listed potential sources to be part of any former agricultural land use, including bulk storage of fuels and ‘chemicals’, pesticides, paints, deposition of domestic / agricultural waste, slurry wastes and others. A suspected septic tank was also noted on site.
 - A disused above ground storage fuel tank is present in the north-westernmost structure.
 - Potential ground gas risks (methane and carbon dioxide) were also identified by the third party, associated with the “...localised deposition of agricultural waste, accumulation of slurry, possible animal effluent, likely Made Ground from former development and demolition activities...”
- Pathways:
 - *“Human Health (pathway): Dermal contact, ingestion & inhalation of soils & soil dust and consumption of home grown produce. Ingress into water supply pipework and subsequent water ingestion. Liberation of sub surface ACMs and inhalation of asbestos fibres.*
 - *Controlled Waters (pathway): Dissolution into pore water/shallow groundwater and subsequent migration and dissolution into aqueous phase and preferential migration via drainage structures.”*
- Receptors:
 - *“Human Health”*

Elemental GI Ltd Phase 2 Report

Our Phase 2 Report for the subject site described the completion of the following works in early 2023:

- Completion of 5 No. window sampler boreholes to depths of up to 5.00m below existing ground level (begl);
- Completion of 3 No. hand-dug trial pits to depths of up to 0.40m below existing ground level (begl);
- Completion of 1 No. deep 'dynamic probe' location;
- Analysis of soils for various determinands including:
 - Heavy metals;
 - Polycyclic Aromatic Hydrocarbons ('PAHs');
 - Speciated Total Petroleum Hydrocarbons ('TPH');
 - Benzene, Toluene, Ethylbenzene and Xylene ('BTEX');
 - Polychlorinated Biphenyls ('PCBs');
 - Pesticides;
 - Pathogenic Bacteria; and
 - Asbestos.

Made ground was encountered in all exploratory holes with the exception of WS05 and HTP03 to a maximum total depth of 1.35m below existing ground level (begl). This generally comprised reworked natural topsoil or natural silt soils with variable quantities of anthropogenic materials including clinker and brick fragments. Other materials including plastic and wire were encountered in HTP01. The made ground encountered at locations WS01 and WS03 was predominantly granular and comprised reworked sand / gravel with fragments of brick and / or clinker. No putrescible or potentially significantly biodegradable materials were encountered in the made ground inspected at the site. The natural soils in central / northern areas of the site (WS01 and WS05) typically comprised sandy clay / silt soils overlying silty sands. In remaining areas the natural soils typically comprised very clayey / silty sands.

An Exploratory Hole Layout Plan (Drawing 002) and a General Photographic Record (Drawing 003) are included in Appendix I.

Water was recorded at the following locations during our recent investigation:

- WS01: Water encountered at 1.70m depth during drilling;
- WS02: Water encountered at 2.00m depth during drilling;
- WS03: Water encountered at 2.00m depth during drilling. Water encountered at 2.65m depth after drilling;

- WS04: Water encountered at 1.90m depth during drilling; and
- WS05: Water encountered at 1.60m depth during drilling. Water encountered at 1.85m depth after drilling.

It was considered that the water encountered / noted during our recent investigation was indicative of the groundwater levels locally and was not a perched water body (or similar).

Our Phase II Report compared the results of the soil analyses to conservatively-selected screening values based on the proposed residential end-use with private gardens. This revealed the following exceedances:

- 1 No. exceedance of mercury:
 - Samples from HTP02 of made ground / topsoil at 0.1m begl.
- 1 No. exceedance of benzo(a)pyrene:
 - Samples from WS02 of made ground at 0.2m begl.

It was noted that the exceedances summarised above were all within samples retrieved from made ground materials. No exceedances from samples retrieved from the underlying natural soils were encountered. It was considered likely that these are 'hotspots'. This is because of the 4 No. samples of made ground / topsoil analysed, only 1 No. recorded elevated mercury and only 1 No. recorded elevated benzo(a)pyrene, strongly indicating that these contaminants are not widespread at this site.

It was recommended in our Phase 2 report that inspection of ground should be undertaken beneath building footprints following their demolition (including targeted sampling as appropriate e.g. beneath storage tank). However, remediation works to protect human health were considered necessary regardless based on the exceedances noted during the works already undertaken (as listed above).

A Remedial Works / Validation Sampling Plan (Drawing 004) is included in Appendix I.

With regards to controlled waters, the recent investigation did not identify any feasible risk sources from the site to controlled waters (based on the soils analysed). However, it was recommended that final / further assessment was completed following demolition to confirm that soils directly beneath the bulk fuel storage tank were not actively impacting the local / underlying groundwater. However, it was noted that boreholes completed adjacent to this feature intercepted the groundwater, which proved 'clean'.

Ground Gas and Radon

The site is not set within an area which is known to be at risk from radon gas and therefore no precautions are necessary, subject to regulatory approval.

An initial ground gas monitoring programme was commissioned for the site which has not recorded any significant concentrations of ground gas and therefore ground gas protection measure would not be recommended, subject to regulatory approval.

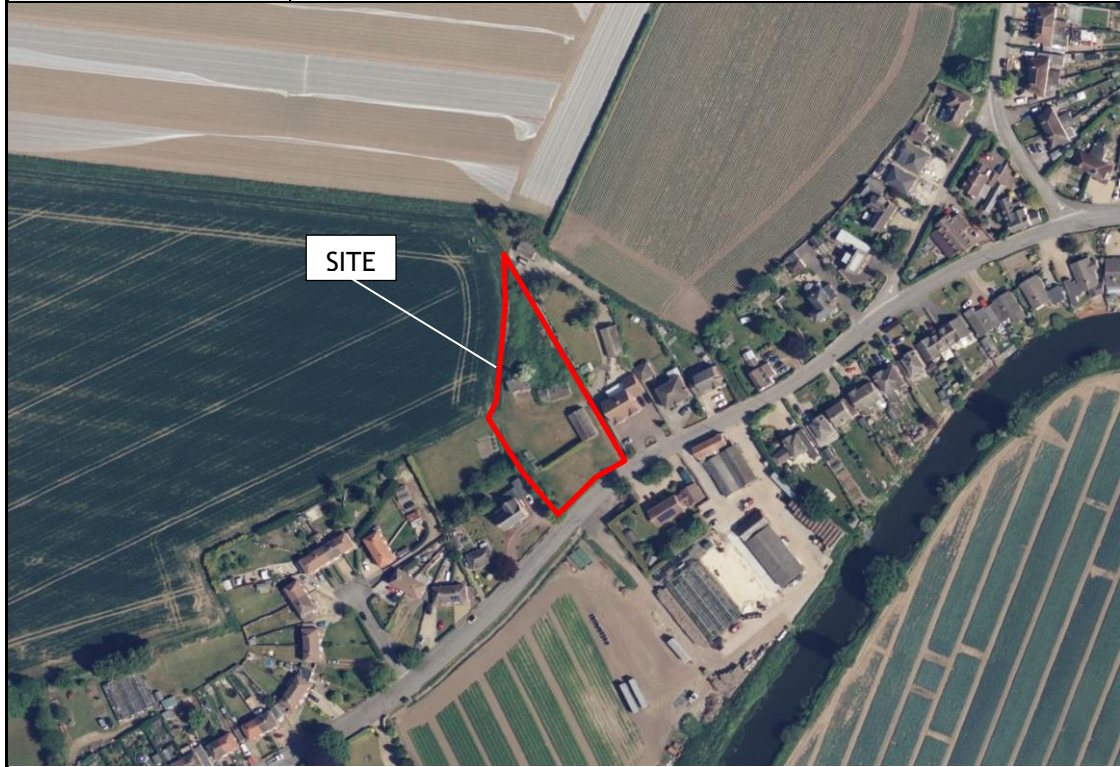
2.0 SITE SETTING

2.1 Location

The address and location of the subject site are shown in Table 2.0 below:

Table 2.0: Site Location and Dimensions

Site Address	Land to North of Station Road, Surfleet
National Grid Ref.	526030, 328760
Area (Approx.)	0.3 ha
Access	The site can be accessed through a locked gate which leads from Station Road.



2.2 Geo-Environmental Setting

The Phase 1 report indicated that the underlying superficial geology consists of Tidal Flat Deposits which are classified as Unproductive Strata; the bedrock geology consists of the Oxford Clay Formation which is also classified as Unproductive Strata. It also reported that • The nearest water feature is a drainage ditch, located c. 14m north of the Site boundary. The River Glen is located c.100m southeast of the Site.

2.2.1 Site:

- The site is approximately 0.3ha in area, and forms an irregularly shaped parcel of land;
- The site currently supports an open grassed / lawn area immediately adjacent to the road. To the north of this are 3 No. disused former agricultural structures and further open / vegetated areas. A row of mature conifer trees is present to the north of the lawned area, beyond which a smaller lawned area is present. Trees are also present around some other boundary areas at the site;

- The 3 No. disused former agricultural structures are of variable construction but mainly comprise single-storey brick buildings. Some suspected asbestos containing building materials were noted as part of these structures;
- The southernmost building was not accessible at the time of our investigation but appeared to have been used for general storage. The buildings to the north of this structure appear to be dilapidated former barns, and the remaining building to the north-west supports a large disused 'gas oil' tank and bulb drying equipment;
- No evidence of spillages etc. was noted in the area of the tank although slight hydrocarbon odours were noted locally within the building;
- A full inspection of the buildings was not undertaken due to their dilapidated nature;
- Land to the north of the dilapidated barns forms a roughly triangular portion of land which was heavily overgrown at the time of our investigation, including the presence of saplings. Some tipped waste materials including bricks and wire strips were present at the surface in some of the less-vegetated areas;
- No obvious topographical gradient was noted on site;
- A gravel track is present on site leading from the access gate to the east of the disused buildings. It continues on to a small concrete pad which is present immediately east of the southernmost disused building. A small inspection cover is present within this area, which was filled with silt (potentially the suspected septic tank noted by the third party);
- Inspection covers are present in the southern area of the site, denoting the path of a large drain that runs beneath the site; and
- The site's boundaries are defined by fencing along the eastern and southern boundaries, although the majority of the western boundary is 'open', leading onto / into the adjacent residential gardens and field.

2.2.2 Surrounding Area:

The site is set within a mixed residential, agricultural and light industrial area. It is surrounded by residential housing to the east and west, by open agricultural fields to the north-west and by housing and agricultural premises to the south (beyond Station Road).

2.3 Ground Conditions

Reference should be made to the reports referenced in section 1 of this RMS for a full description of the site's ground conditions, but in summary made ground was encountered in all exploratory holes with the exception of WS05 and HTP03 to a maximum total depth of 1.35m below existing ground level (begl). This generally comprised reworked natural topsoil or natural silt soils with variable quantities of anthropogenic materials including clinker and brick fragments. No putrescible or potentially significantly biodegradable materials were encountered in the made ground inspected at the site. The natural soils in central / northern

areas of the site (WS01 and WS05) typically comprised sandy clay / silt soils overlying silty sands. In remaining areas the natural soils typically comprised very clayey / silty sands.

2.4 Contamination Summary

Our Phase II Report compared the results of the soil analyses to conservatively-selected screening values based on the proposed residential end-use with private gardens. This revealed the following exceedances:

- 1 No. exceedance of mercury:
 - Samples from HTP02 of made ground / topsoil at 0.1m begl.
- 1 No. exceedance of benzo(a)pyrene:
 - Samples from WS02 of made ground at 0.2m begl.

It was noted that the detections of mercury and benzo(a)pyrene which were recorded were not in excess of the selected screening values for the following end-uses:

- Public Open Space - Scenario 1; and
- Public Open Space - Scenario 2.

In addition, the detection of benzo(a)pyrene which was recorded was also not in excess of the selected screening value for the following end-use:

- Residential end-use without private gardens /plant uptake.

It is recommended that the re-classification of soils / exceedances may be undertaken should site layouts allow for the re-use / retention of the materials listed above in other areas of the site. For example, if final layout proposals show any 'POS' areas or gardens which are not likely to offer 'plant uptake' pathways (which are not included based on current layouts) then the significance of the results may be re-assessed (NB front gardens are typically considered to offer potential 'plant uptake' pathways by most Local Authorities as a conservative approach).

Elemental GI Ltd have received comments / queries relating to the suggestion that the exceedances identified at the site are 'hotspots', and we have also received queries relating to the number of samples analysed as part of our investigation works. It is reiterated (as discussed in our Phase 2 report) that the site works were undertaken in general accordance with prevailing standards and 'best practice' guidance, which included the general and targeted sampling and analysis of made ground / soil samples from the site. This included the retrieval of samples from within / around the potential areas of concern which had been identified in the third party Phase 1 Report. Table 2.1 (overleaf) presents a list of the samples taken and analysed as part of these works.

Table 2.1: Phase 2 Investigation Testing Summary

Position	Depth of Sample (m)	Material Type	Analysis	Rationale
WS01	0.3	Made Ground	Asbestos, TPH ¹ , Pesticides	General Coverage, Disused Buildings, Gas Well
WS01	1.0	Sandy Silt	General Suite ²	General Coverage, Disused Buildings, Gas Well
WS02	0.2	Made Ground	General Suite ²	General Coverage, Southern Lawned Area, Disused Buildings
WS03	0.4	Made Ground	General Suite ²	General Coverage, Southern Lawned Area
WS03	1.0-2.0	Silty Sand	General Suite ²	General Coverage, Southern Lawned Area
WS04	0.3	Made Ground	General Suite ² , Asbestos	General Coverage, Southern Lawned Area, Gas Well
WS05	1.0	Clay	TPH ¹	General Coverage, Disused Buildings, Fuel Tank
HTP01	0.1	Made Ground	Asbestos	General Coverage, Overgrown Area
HTP02	0.1	Topsoil	General Suite ² , Pathogenic Bacteria	General Coverage, Overgrown Area, Disused Buildings
HTP03	0.1	Topsoil	General Suite ² , Asbestos	General Coverage, Southern Lawned Area

¹ TPH = Total Petroleum Hydrocarbons, analysed to the 'CWG' aliphatic / aromatic split inc. BTEX;

² General Suite = Selected heavy metals, speciated polycyclic aromatic hydrocarbons, pH and other determinands;

From the above it can be seen that the following material types were selected for analysis:

- Made Ground: 5 No. samples analysed;
- Topsoil: 5 No. samples analysed; and
- Natural Soils: 3 No. samples analysed.

Ground investigations are effectively data-gathering exercises although these are almost invariably limited by multiple factors (including but not limited to access and budgetary constraints). Whilst the full and detailed analysis of all soils / made ground would always be ideal from a data perspective, it is reiterated that the test strategy undertaken at the site was considered sufficient, appropriate and in accordance with the site-specific Phase 1 report, prevailing standards and 'best practice' guidance.

3.0 CONCEPTUAL SITE MODEL

3.1 Sources

As summarised in Section 2.4 above, exceedances (against a 'residential end use with private gardens') have been recorded at the site comprising:

- 1 No. exceedance of mercury:
 - Samples from HTP02 of made ground / topsoil at 0.1m begl.
- 1 No. exceedance of benzo(a)pyrene:
 - Samples from WS02 of made ground at 0.2m begl.

These are considered to comprise 'sources' within the site's conceptual site model (CSM).

Further sources / areas of contamination may be encountered at the site following demolition of buildings, removal of tank (and related infrastructure) and sampling / analysis of the made ground / soils immediately beneath these features.

3.2 Pathways

The following potential pathways have been identified at the site at this stage in relation to the above sources should they remain unchanged / *in situ*:

- Dermal Contact;
- Ingestion of Soil;
- Ingestion of Site-Grown Fruit / Vegetables;
- Ingestion of Soil Attached to Site-Grown Fruit / Vegetables; and
- Inhalation of Dust.

The vapour and controlled water migration pathways have been omitted at this stage because of the limited volatilisation / mobilisation / solubility potential associated with the determinands at the concentrations encountered.

3.3 Receptors

The redevelopment proposals for the site comprise the construction of 2 No. new residential dwellings, which will include front and rear gardens and access / parking areas.

The main / primary receptors considered within this CSM comprise the future residential site users. However, other secondary receptors have also been considered, including ecology, groundwater, construction workers and neighbouring sites.

It is recommended that construction companies involved in any demolition / enabling / construction works should undertake their own health and safety risk assessments in relation to their own works and with due regards to the findings of the previous ground investigations.

3.4 Pollutant Linkages

Based on the above sections, sources, pathways and receptors have been identified at the site and therefore feasible pollutant linkages are considered to have been identified.

This RMS will present steps through which these pollutant linkages may be broken.

This RMS / conceptual site model shall be revisited and updated once the demolition of buildings, removal of tank (and related infrastructure) and sampling / analysis of the made ground / soils immediately beneath these features has been undertaken. Other / new pollutant linkages may be identified following completion of these works (e.g. vapour migration / intrusion pathways) which would be considered specifically as / when fresh contamination was encountered.

4.0 REMEDIATION SPECIFICATION

Elemental GI Ltd consider it likely that the 2 No. slight exceedances recorded at the site are hotspots and are not indicative of site-wide contamination. However, if these areas do prove to be larger than expected, the following steps will record this and manage it appropriately in a manner sufficient to break the identified pollutant linkages. The following steps are therefore recommended at this stage:

- Step 1 - Removal of a nominal area of made ground / topsoil extending to no more than 3m wide x 3m long and being deepened to either 0.6m deep or to the base of the made ground / topsoil at each location (being determined by whichever of these is shallowest);
- Step 2 - Retrieval of samples from the base (1 No. sample) and sides (4 No. samples, comprising one in each 'face') of each excavation followed by laboratory analysis for the determinand which originally exceeded (i.e. mercury at HTP02 and benzo(a)pyrene at WS02);
- Step 3 - Movement of soils for either:
 - Off-site disposal at a suitable landfill facility; or
 - Retention of materials on site beneath permanent structures (e.g. driveways, buildings etc.);
- Step 4 - Review of laboratory analysis results from 'Step 2' followed by either:
 - Extension of the excavation (as necessary) if further exceedances are recorded in the validation samples; or
 - Backfilling of excavation with appropriate (i.e. geotechnically, aesthetically and chemically suitable materials) if further exceedances are not recorded in the validation samples.

A geo-environmental engineer must be in attendance at the site to supervise and record these steps (as necessary).

Whilst this RMS shall be fully reviewed / revised following demolition of buildings, removal of tank (and related infrastructure) and sampling / analysis of the made ground / soils immediately beneath these features, it is recommended that the steps outlined above should be broadly applicable to the majority of any contamination recorded at the site in the future. Whilst it is not anticipated at this stage, it is strongly recommended that allowance should be made to manage and remove hydrocarbon impacted soils / materials beneath the tank (and related infrastructure) if encountered following demolition / removal works.

Where gross contamination is encountered (e.g. 'neat' fuel / oil) or where contaminated soils / groundwater are encountered an allowance must be made for the removal of such materials from site to a suitable disposal facility. We would recommend early discussions with a specialist remediation contractor for further advice.

4.1 Excavation Works

Where materials are removed from the ground as part of remedial works, it is recommended that the following are undertaken:

- **Either** materials should be excavated and loaded directly into wagons for off-site disposal;
- **Or** materials should be excavated and placed on an impermeable membrane on site (with a system in place to contain and remove all run-off fluids) awaiting removal or re-placement beneath structures etc. Where such materials are stored on site, they must be fully covered with an impermeable membrane until their removal to prevent the creation of additional leachate and to prevent migration of dust etc.

Other 'best practice' rules and requirements will apply (as usual) with regards to the removal, segregation, crushing etc. of hardstanding or other materials which are unsuitable for retention on site, which should be assessed as necessary and confirmed by the Client prior to the start of works.

4.2 Capping Works

Our recent investigation confirmed that the topsoil at the site around HTP03 is 'clean' and has recorded concentrations of determinands below the selected screening values. Remaining natural soils have also been recorded to be free of contamination.

Subject to Local Authority approval, site-won natural topsoil (with the exception of soils from around HTP02) and deeper natural soil may therefore be re-used for capping if required, although (as always) the movement, import/export and deposition of all soils must be undertaken in accordance with all relevant permits / exemptions (U1, MMP etc.). It is recommended that an additional 2 No. samples be taken and analysed to confirm the quality of remaining topsoil at the site for re-use in gardens etc.

Elemental GI Ltd should be notified once suitable soils are identified for these capping works.

5.0 VALIDATION REQUIREMENTS

5.1 General Procedures

It will be necessary to confirm that the full extent of the significant contamination has been removed from the ground and that areas have been successfully capped etc.

The following validation steps are recommended for each of the impacted areas. At the time of writing this comprises the 2 No. hotspots (WS02 and HTP02), but these steps should also be followed if / when further contamination is encountered following demolition and removal of the tank and related pipework etc. Where further contamination is encountered then these steps should be repeated in full until no further contamination is recorded (to be reviewed by Supervising Engineer).

- Exceedance at HTP02 - Sampling and analysis of materials for mercury in edges and base of excavation;
- Exceedance at WS02 - Sampling and analysis of materials for benzo(a)pyrene (analysed through the 'US EPA 16' speciated polycyclic aromatic hydrocarbon suite) in edges and base of excavation.

Validation of the excavations should be confirmed through the measurement / surveying of depths on-site by the engineer or by site staff / topographical surveyors. Where site-won natural materials are used to backfill the excavations then these should be recorded by site staff (including photographs / plans of their excavation, storage and final placement).

For the areas of the site which are currently uninvestigated the following validation tests are recommended to verify the cleanliness of the underlying materials / soils (minimum of 2 No. samples to be taken from each area):

- General testing of ground beneath structures:
 - 'General Suite' (inc. heavy metals, speciated PAHs, pH), asbestos screen and TPH (to the CWG methodology including BTEX);
- Testing of ground beneath / around tank:
 - TPH (to the CWG methodology including BTEX);
 - NOTE - 1 No. soil sample to be taken at interface with underlying groundwater;
- Testing of ground beneath barns:
 - Pathogenic bacteria (same analytes as Phase 2 investigation);
- Overgrown Areas (General Check / Overview):
 - 'General Suite' (inc. heavy metals, speciated PAHs, pH), asbestos screen and TPH (to the CWG methodology including BTEX).

During the post-demolition sampling and other validation works, additional sampling / testing should be undertaken as necessary should further unexpected / potential contamination be identified.

A Remedial Works / Validation Sampling Plan (Drawing 004) is presented in Appendix I.

5.2 Screening Criteria

The following main screening criteria have been suggested for delineation / validation purposes at this stage at the site:

Table 5.0: General Screening Values - 'Residential with Gardens'

Analyte	Screening Values (mg/kg) ^d
Arsenic	37.0 ^b
Cadmium	11.0 ^b
Chromium (Total)	910.0 ^b
Chromium VI	6.0 ^b
Lead	200.0 ^a
Selenium	250.0 ^b
Nickel	130.0 ^b
Copper	2,400.0 ^b
Zinc	3,700.0 ^b
Mercury	1.20 ^b
Benzo(a)pyrene	2.2 ^b
Dibenzo(a,h)anthracene	0.24 ^b
TPH Aliphatic EC ₅ -EC ₆	42.0 ^b
TPH Aliphatic EC ₆ -EC ₈	100.0 ^b
TPH Aliphatic EC ₈ -EC ₁₀	27.0 ^b
TPH Aliphatic EC ₁₀ -EC ₁₂	130.0 ^b
TPH Aliphatic EC ₁₂ -EC ₁₆	1100.0 ^b
TPH Aliphatic EC ₁₆ -EC ₃₅	65000.0 ^b
TPH Aromatic EC ₅ -EC ₇	70.0 ^b
TPH Aromatic EC ₇ -EC ₈	130.0 ^b
TPH Aromatic EC ₈ -EC ₁₀	34.0 ^b
TPH Aromatic EC ₁₀ -EC ₁₂	74.0 ^b
TPH Aromatic EC ₁₂ -EC ₁₆	140.0 ^b
TPH Aromatic EC ₁₆ -EC ₂₁	260.0 ^b
TPH Aromatic EC ₂₁ -EC ₃₅	1100.0 ^b
Benzene	0.087 ^b
Toluene	130.0 ^b
Ethylbenzene	47.0 ^b
Xylenes (sum of isomers)	56.0 ^b
Asbestos	D ^c

^a DEFRA C4SL values for a 'residential with gardens' end-use;

^b Third party UK screening values e.g. CIEH, CL:AIRE, Elemental GI Ltd and LQM 'S4UL' values for a 'residential with gardens' end-use (licence S4UL3849);

^c 'D' = 'Detected', which is an Elemental GI Ltd general screening level. **A threshold of >0.001% is applicable if / when asbestos is detected as an action level beyond which further remediation should be considered.**

^d Pathogenic Bacteria to be assessed directly / individually.

Further Testing may be required depending upon the hotspot / source / regulatory requirements.

Testing in accordance with BS3882 may be required where topsoil requires formal verification

6.0 RECOMMENDATIONS AND OTHER CONSIDERATIONS

6.1 **General Considerations / Assumptions:** The following assumptions have been made concerning the site and the remedial works described herein:

- **IMPORTANT:** It is understood that some buildings at the site contain asbestos within their building fabrics. Prior to the start of any development works an appropriate asbestos survey and associated subsequent removal works must be undertaken by a suitably licensed / experienced contractor in accordance with all guidelines / regulations. The Client must request and retain copies of all records relating to these works for presentation to the Local Authority (and others) if necessary.
- **IMPORTANT:** Fuel storage containers may contain hazardous substances including vapours. The decommissioning, dismantling and removal of all such containers (including the tank) must be undertaken by a suitably licensed / experienced contractor in accordance with all guidelines / regulations and should include works such as cold-cutting, degassing etc. as necessary.
- The Client is strongly recommended to discuss the next steps at the site with specialist engineers / consultants including (but not limited to) asbestos surveyor / removal specialists, groundworkers, hauliers ('muck shifters' undertaking removal of soils), environmental permitting advisors, remediation contractors and environmental safeguard specialists.
- It always remains possible that ground and groundwater conditions may change between each exploratory hole and therefore such variations cannot be discounted. Seasonal variations may also be expected in relation to groundwater observations etc.
- We have assumed that the Client and their appointed contractors will follow all relevant regulatory requirements including health and safety and demolition works (e.g. Construction (Design and Management) Regulations 2015).
- A suitable environmental advisor (i.e. Elemental GI Ltd) should be appointed to supervise and validate all works described herein. However, representatives of Elemental GI Ltd may not always be on site and cannot verify / approve works which they have not seen or been informed of. Other advisors / contractors may be involved with the site (e.g. remedial contractors) and they would be wholly responsible for their own works as agreed with the Client.
- The importation and re-location of all soils (site-won or otherwise) must be undertaken in full accordance with the relevant permits / exemptions / regulations. The Client / developer should ensure that these are all in place in advance of relevant works. Where soils are re-used on site, or are imported onto site, it is assumed that

they will be tested for suitable determinands prior to their re-use / importation. Please contact us for further advice in advance of all such works.

- Any previously unexpected / unidentified contamination should be reported to Elemental GI Ltd immediately, and works may need to stop until we can review and discuss the associated risks with you. The regulatory authorities should also be informed.
- The Client / developer should discuss utility construction requirements with the appropriate providers prior to the start of works.
- All soil samples must be retrieved by an Engineer from Elemental GI Ltd, and should be scheduled for analysis at a suitably accredited laboratory.
- The excavation, movement or any other disturbance of contaminated soils could result in the spreading of contamination to other areas of the site. Suitable management procedures should be put in place prior to all such works (e.g. dust suppression) to manage this at all times.
- The Client is responsible for ensuring that all relevant environmental management procedures are in place throughout the works. This includes the safe and appropriate storage of contaminated soils (e.g. on suitable membranes) to ensure that cross-contamination and off-site contamination (e.g. through dust migration) are not possible.
- The Client is responsible for ensuring that their site staff are sufficiently protected from health and safety risks associated with the works outlined herein.

6.2 Local Regulatory Requirements:

South Holland District Council (SHDC) have made the following documents available on / through their 'Contaminated Land' web guidance pages:

- Yorkshire and Lincolnshire Pollution Advisory Group ('YALPAG'): Development on Land Affected by Contamination: Technical Guidance for Developers, Landowners and Consultants (Version 11.2 - June 2020);
- Yorkshire and Lincolnshire Pollution Advisory Group ('YALPAG'): Verification Requirements for Cover Systems: Technical Guidance for Developers, Landowners and Consultants (Version 4.1 - June 2021).

With reference to the 'flow chart' presented in the June 202 YALPAG guidance document, this RMS has been produced following completion of Phase 2 works (across accessible areas), and unacceptable risks have been identified which require remediation. Contingencies including assessment, analysis and remediation steps relating to uninvestigated areas have

also been outlined and it can be confirmed that these shall be undertaken under engineer supervision.

At this stage capping is not considered likely to be necessary if all contaminated made ground / soil is removed from the ground for off-site disposal or encapsulation on site beneath permanent structures.

6.3 Soil Import Criteria

The presented in Table 5.0 (earlier in this document) may be used as a general guide against which the quality of imported and / or site-won soils may be assessed. However, reference should be made to the guidance listed above for further information as the frequency and type of testing will be subject to change and is dependent upon the type and source of material. Please contact us in advance of any testing / importation when you have selected potentially suitable materials for importation onto site.

Terms and Conditions

We have obtained and reviewed information relating to the site, but this may not be complete, and liability cannot be accepted for information not available to Elemental GI Ltd at the time of writing this report. This report has been written in consideration of construction / development proposals (or similar) as described in Section 1.0 of this report. If any of these proposals change (e.g. layout), then this report may be subject to change.

This report has been prepared for the sole use and reliance of the Client. No other third party may rely upon or reproduce the content of this report without our prior written approval. If any unauthorised third party comes into possession of this report, they rely upon it entirely at their own risk and the authors do not owe them any warranty, duty of care or skill.

Our report, including the conclusions and recommendations, are considered reasonable based on the findings of the Phase I assessment. However, these cannot be guaranteed to gain regulatory approval and therefore the Client should submit it to them (as necessary) for their comments and approval prior to undertaking any irrecoverable works associated with the subject site.

The findings and recommendations made in this report are based on published information (as presented in the accompanying appendices). Elemental GI Ltd cannot accept responsibility for the reliability and authenticity of published information or reports prepared by third parties. There may be conditions prevailing on site which have not been revealed by this assessment and which have not been taken into account by this report. Responsibility cannot be accepted for any conditions not revealed by this investigation and assessment. It should be noted that groundwater levels etc. may vary due to seasonal and other effects. Whilst it may be utilised by others for reference purposes at the Client's discretion, it has not been prepared for any other purposes (e.g. waste classification, drainage excavations etc.) and therefore additional works may be required by third parties dependent upon their own requirements / works. Any works which are proposed at greater depths than reported herein may require confirmatory investigation works as necessary.

The conclusions and recommendations presented herein are considered reasonable based on the assessments of the site undertaken by Elemental GI Ltd. However, these cannot be guaranteed to gain regulatory approval and therefore copies of this report should be sent to the appropriate regulatory authorities and / or other organisations (as appropriate) by the Client for their comments and approval prior to undertaking any irrecoverable works associated with the site.

The possibility of significant variation in ground conditions existing between / beneath test locations / depths cannot be discounted and must be considered within the design proposals for the subject site. All soakaway designs should be approved by the relevant statutory authority prior to implementation and must adhere to the standard design and ground setting requirements, upon which your appointed drainage design engineers should advise you.

Where comments / recommendations have been made relating to specific depths it cannot be guaranteed that ground conditions shall be similar at surrounding / underlying depths, which should be taken into consideration as necessary by other.

With respect to the document to which this sheet is appended, the warranty provided with our works / reports etc. shall only apply once all invoices that we have sent in relation to the same site / project discussed herein (i.e. the site discussed within this document) have been paid by the Client

Standard Risk Assessment - Considerations and Methodology

Elemental GI Ltd have based our standard risk assessment methodology upon current legislation and prevailing best practice and available guidance. This includes the following:

- DEFRA / EA document 'Contaminated Land Report 11 (CLR11) Model Procedures for the Management of Land Contamination' (2004) [*withdrawn but used for general reference purposes*];
- NHBC / EA / CIEH document 'Guidance for the Safe Development of Housing on Land Affected by Contamination' (2008);
- DEFRA 'Environmental Protection Act 1990: Part 2A - Contaminated Land Statutory Guidance (2012); and
- Environment Agency 'Collection: Land Contamination Technical Guidance (2014) held at:
 - <https://www.gov.uk/government/collections/land-contamination-technical-guidance>

Construction of Conceptual Site Model

Elemental GI Ltd have based our standard risk assessment methodology upon current legislation and prevailing best practice and available guidance. This includes the assessment of potentially contaminated land in terms of 'significant pollutants' and 'pollutant linkages', using SOURCE-PATHWAY-RECEPTOR scenarios for the site. For a pollutant linkage to exist all three of these elements must be present. These have been clearly defined in the guidance as follows:

-potential source as 'a contaminant which is in, or under the land and which has the potential to cause significant harm or to cause pollution of controlled waters'.
-potential pathway as 'one or more routes or means by, or through, which a receptor is being exposed to, or affected by a contaminant, or could be so exposed or affected'.
-potential receptor as 'a living organism, a group of living organisms, an ecological system or a piece of property which is being or could be, harmed by a contaminant or controlled waters which are being, or could be, polluted by a contaminant'.

Within this report, pathways including the following have been considered:

- Ingestion of soil;
- Ingestion of site-grown vegetables;
- Ingestion of site-reared livestock / fish;
- Dermal contact with soils;
- Inhalation of vapours;
- Inhalation of soil-derived dust.

The receptors which we have considered are described in Section 1.0 of this report.

Risk Assessment Methodology

Our risk assessment methodology is based upon a phased approach, which takes the following steps:

1. Hazard Identification and Assessment:
 - a. Establishing potential contaminant sources through the derivation of initial conceptual site model (CSM); and
 - b. Analysing the potential for unacceptable risks (what pathways and receptors could be present, what pollutant linkages could result and what could the effects be).
2. Risk Estimation and Evaluation:
 - a. Prediction of the magnitude and probability of the possible consequences;
 - b. Investigation of the potential risks;
 - c. Completion of Generic Quantitative Risk Assessment (GQRA); and
 - d. Evaluation of risks / confirmation of pollutant linkages (leading onto step '3' if identified).
3. Remediation Design / Implementation / Verification:
 - a. Completion of Detailed Quantitative Risk Assessment (DQRA) if necessary;
 - b. Collation of remedial strategy;
 - c. Implementation of remedial strategy / validation; and
 - d. Final reporting.

Risk terminology and classification is defined through standard wording and descriptions, as contained in the documents referenced above. This includes the balance, comparison and assessment of risk as a dynamic categorisation / classification of probability vs. possible consequence(s), as shown in the table A1 below:

Table A1: Risk Categorisation

Probability (Likelihood)		Consequence			
		Severe	Medium	Mild	Minor
	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
	Not likely	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

Risk levels are described as follows:

Table A2: Risk Level Descriptions

Term	Description
Very High Risk	A high probability exists that severe / significant harm could arise to someone or something from the hazard which has been identified. Remedial action is required.
High Risk	Harm is likely to arise to someone or something from the hazard which has been identified. Remedial action is usually required.
Moderate Risk	Harm could potentially arise to someone or something from the hazard which has been identified without remedial action, although it is considered to be relatively <u>unlikely</u> that such harm would be severe.
Low Risk	Harm could theoretically arise to someone or something from the hazard which has been identified without remedial action, although it is considered that any effects would be mild.
Very Low Risk	Harm is not likely to arise to someone or something from the hazard which has been identified.

The NHBC / EA / CIEH document 'Guidance for the Safe Development of Housing on Land Affected by Contamination' (2008) defines the following (reproduced verbatim):

“Severity (consequence) can be defined as the adverse effects (or harm) arising from a defined hazard, which impairs the quality of human health or the environment in the short or longer term. For example a consequence defined as “Severe” could be defined as “Highly elevated concentrations likely to result in ‘significant harm’ to human health as defined by the EPA 1990, Part 2A, if exposure occurs”. The type and form of the contaminant needs to be known in order to understand the effect on humans and therefore severity of potential harm. For instance different forms of cyanide behave differently. Complex cyanide (“blue billy”) is relatively “non toxic” whereas free cyanide is “highly toxic” (Environment Agency 2002b).

Probability can be defined as the chance of a particular event occurring in a given period of time. For example, a “High Likelihood” could be defined as “where an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution”.

APPENDIX I
DRAWINGS



CLIENT: M. Foden, T. Laud, J. Bailey-Scott	TITLE: Proposed Site Layout Plan (Rev. A)	DATE: April 2023	SCALE@SIZE: NOT TO SCALE
		DRAWING No: E23109_001	DESIGN/DRAWN: JR

Elemental GI Ltd

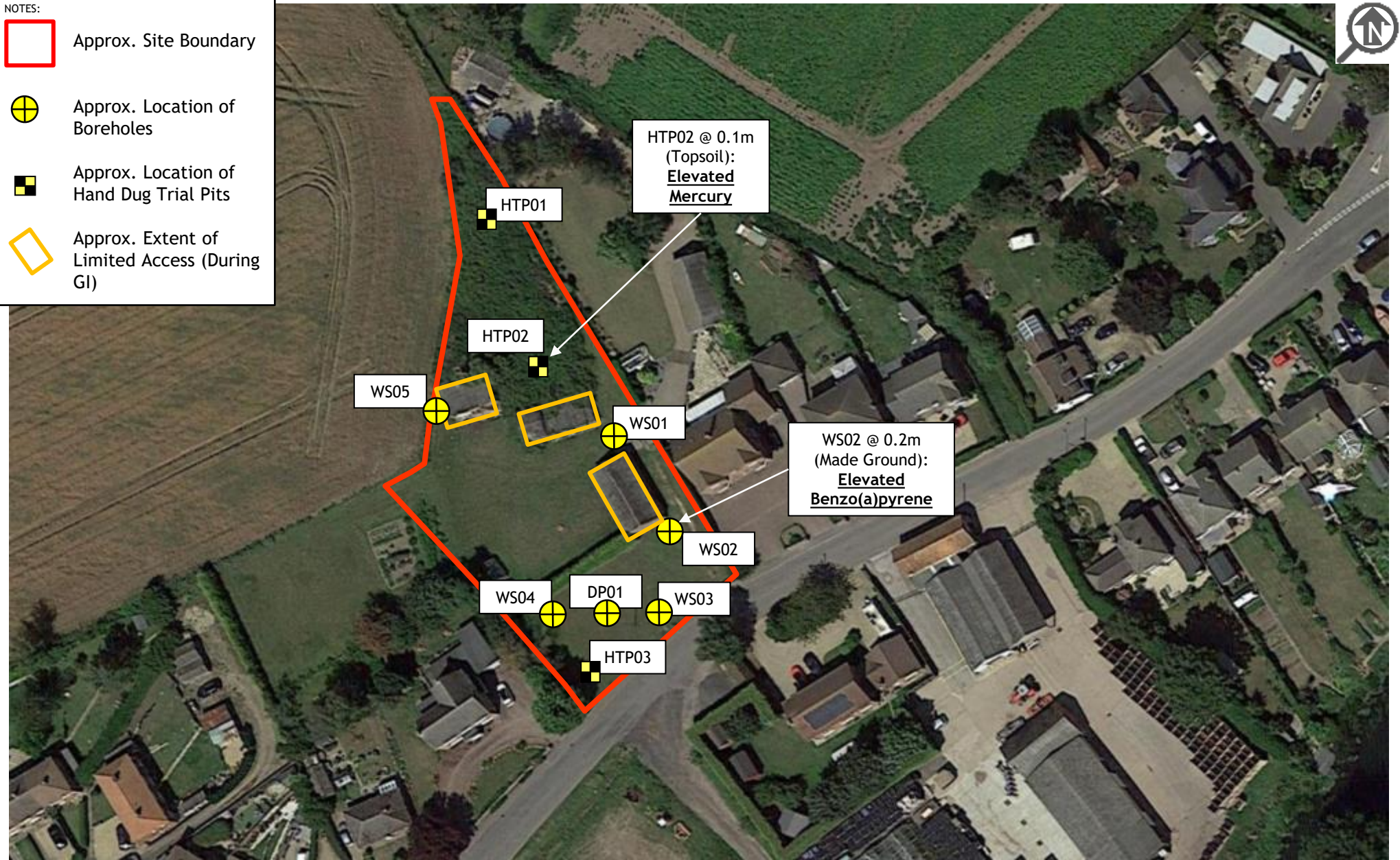
NOTES:

Approx. Site Boundary

Approx. Location of Boreholes

Approx. Location of Hand Dug Trial Pits

Approx. Extent of Limited Access (During GI)



CLIENT: M. Foden, T. Laud, J. Bailey-Scott	TITLE: Exploratory Hole Layout Plan	DATE: June 2023	SCALE@SIZE: NOT TO SCALE	Elemental GI Ltd
		DRAWING No: E23109_002	DESIGN/DRAWN: JR	



Photo 1 - Photo of 'Bulb Drier' and Tank Building



Photo 2 - Above Ground 'Gas Oil' Tank



Photo 3 - Barns / Animal Shelters



Photo 4 - Southern Storage Building

CLIENT: M. Foden, T. Laud, J. Bailey-Scott	TITLE: General Photographic Record	DATE: June 2023 DRAWING No: E23109_003	SCALE@SIZE: NOT TO SCALE DESIGN/DRAWN: JR	Elemental GI Ltd
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NOTES:



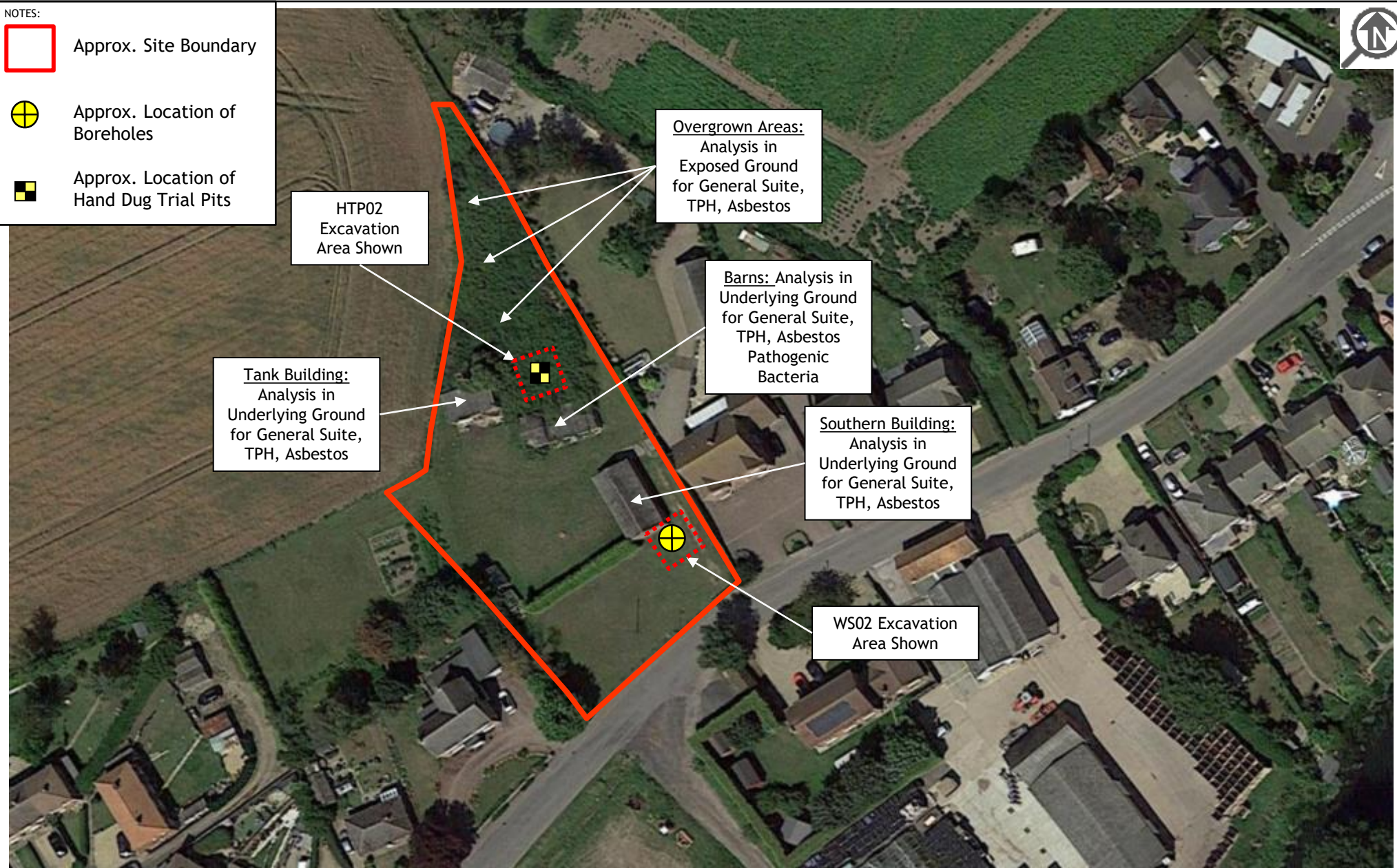
Approx. Site Boundary



Approx. Location of Boreholes



Approx. Location of Hand Dug Trial Pits



CLIENT: M. Foden, T. Laud, J. Bailey-Scott	TITLE: Remedial Works / Validation Sampling Plan	DATE: June 2023	SCALE@SIZE: NOT TO SCALE
		DRAWING No: E23109_004	DESIGN/DRAWN: JR

Elemental GI Ltd