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PHASE 3

REMEDIATION STRATEGY REPORT

job number	C3096/23/E/5507	date	20.07.2023
site address	9 Miry Lane, Thongsbridge, Holmfirth, HD9 7SA		
written by	S. Alexander	checked by	R. Palmer
issued by	S. Alexander		



Please consider the environment before printing this report.



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<ENVIRONMENTAL> <GEOTECHNICAL>

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Phase 3: Remediation Statement

Location: 9 Miry Lane, Thongsbridge,
Holmfirth, HD9 7SA.

For: A H Construction

Report No. C3096/23/E/5507

Report date: July 2023

For and on behalf of **Rogers Geotechnical Services Ltd**



Scott Alexander BSc FGS
Geo-Environmental Engineer



Rob Palmer MSc FGS ACIEH
Senior Geo-environmental Engineer

1. Introduction

Further to the site specific risk assessment provided within the environmental report (C3096/22/E/4693, November 2022) and subsequent gas monitoring letter (C3096/22/E/4855, 1st June 2023), it is considered that some remediation will be required at this site. This report provides the strategy for that remediation.

From the environmental investigation, it was considered that the made ground present at the site was contaminated with respect to the intended residential with plant uptake end use. Therefore, it was recommended that garden areas be 'remediated' by providing a clean cover system with a 100mm 'capillary break' between the clean cover system and the underlying made ground.

It should be noted that prior to construction, site levels were to be reduced by approximately 1m to reduce the thickness of made ground beneath the site. Subsequent to this reduction in levels, ground gas monitoring has been undertaken. The ground gas monitoring regime has characterised the site as Characteristic Situation Level 2 (see gas monitoring letter), thus protection from bulk ground gasses (CO₂ and CH₄) is also required.

2. Remediation Strategy

2.1 Remediation Objectives

Based on the site specific risk assessment provided in the geo-environmental report and gas monitoring letter, the object of remediation at the site is as follows:

- To protect the site operatives during the construction process from the ingestion of soil or dust, dermal contact with the soil and inhalation of dust.
- To protect the end user and neighbours from the ingestion of soil or dust, dermal contact with the soil and inhalation of dust.
- To protect the garden plants from contaminated ground and to protect the end user from the ingestion of contaminated fruit and vegetables.
- To protect plastic services from being penetrated by, or degrading due to the presence of contamination in the soil or groundwater.
- To protect controlled waters from run off via drainage/sewers etc.
- To protect buried concrete from being affected by aggressive ground conditions.
- To protect operatives and end users from accumulation of carbon dioxide and methane.

2.2 Development Requirements.

The site is to be developed by the construction of a single residential property with a garden. Therefore, it is considered that the site may be classified as being a residential with plant uptake development.

3. Scope

In order to fulfill the objectives defined above the following remedial strategy will be utilised. A pragmatic approach will be undertaken, with observational techniques being employed at each stage of the work. The design will be in accordance with the following documents and drawings for the proposed structure:

- Drawing 23-001-03A – Proposed Plans
- Drawing 23-001-04A – Proposed Plans
- *Drawing 8603/1 – Topographic survey as of January 2023.*

Copies of these documents are presented in Appendix 1 of this report.

3.1 Groundworks

During the ground-works phase of the development, protection to the site operatives is required. The risk to site operatives is considered under the Health and Safety at Work Act 1974, together with regulations made under the act, which includes the Control of Substances Hazardous to Health (COSHH) regulations. Therefore the risks to site personnel will be considered under the Construction Design and Management (CDM) regulations at the planning stage and be included in

the contractor's Health and Safety Plan and site specific Method Statements. These documents shall include the following main elements.

- Site operatives at all levels shall be made aware of the hazards of working with potentially contaminated soils and the hazards of working in an area where accumulations of bulk ground gasses (carbon dioxide or methane) could occur.
- Personal hygiene facilities, including washing and messing, will be provided and site operatives will be encouraged to use them.
- Where work is undertaken in dry weather the site will be dampened down to avoid dust. In addition, dust masks will be provided to all site operatives for use in dry weather.
- Where vehicles are transferring soil to the landfill site they will be covered to prevent contamination of the surrounding area by dust.
- Any stockpiles of contaminated soil on site will be sheeted over to prevent excessive amounts of airborne dust.
- Where work is undertaken in wet weather, vehicle and wheel washing facilities will be provided to ensure that the vehicles leaving the site do not transfer contamination to surrounding areas.

On completion of the ground-works a careful site inspection of the sub-grade will take place. Should visual or olfactory evidence of contamination be revealed, then suitably qualified specialists will be consulted. Further testing and updates to the site specific ground model, risk assessment, and remediation strategy will be undertaken where necessary

3.2 Construction

During the construction phase of the contract the following items are required to protect the end user from the potential contaminants revealed at this site.

- Beneath buildings, pavements and hard-standings clean inert granular sub-base shall be employed.
- New plastic services will be constructed in a surround of clean inert material and a risk assessment will be carried as instructed by the statutory water authority for the area. Where necessary testing as recommended in the United Kingdom Water Industry Research (UKWIR) website under Report Ref. No. 10/WM/03/21 - 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites' will be carried out.
- The redundant services revealed at this site will be de-commissioned and piped services sealed. Any existing services that are to be employed in the new development will be carefully inspected to ensure that they are serviceable and will not allow the ingress of contamination.
- Buried concrete placed at the site will conform to the guidance given in BRE Special Digest SD1 in accordance with a design sulphate class of DS-1.

3.3 Garden Areas

In view of the presence of contamination within the made ground and the residential end use of the site, it is considered that remediation will be required in the garden areas. Towards the north-east of the site, a raised terrace is proposed. The current level of the land where this raised terrace is proposed is between 126.5m and 127.5m above Ordnance Datum (AOD) based on topographic *Drawing 8603/1, January 2023*. The final finish level of the raised terrace is proposed to be

127.950m AOD from *Drawing 23-001-03A*. This raised area is expected to form the clean cover system for the raised terrace.

Towards the south-west of the site a garden area is proposed. The final finish level for this garden is approximately 128m AOD from *Drawing 23-001-03A*. From the *Drawing 8603/1, January 2023*, this level is approximately between 128.4m and 128.8m AOD. In this area a clean cover system will be required. In both cases the clean cover shall comprise of a minimum total thickness of 600mm of which a minimum of 150mm shall comprise topsoil. At the base of both clean cover systems a granular capillary break of 100mm of free draining granular soil shall be placed in order to prevent mobile contamination rising upward. The implementation of these measures will put any latent contaminated ground out of the end users' dig range, thus severing the pathway to end users.

3.4 Gas Protection Measures

In order to assess the protection measures required BS8485: 2015: Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings has been employed. In accordance with Table 3, Building types, of the code, the development may be considered to conform to Type A. Therefore, on the basis of Table 4 Gas protection score by CS and type of building, the minimum gas protection score (points) is 3.5. The gas protection system should consist of at least two different elements. The elements work independently and collaboratively, and a single element should not be used because there would be no redundancy to allow for defects in the component.

In order to achieve this score the following shall be undertaken.

Table 1: Combination of Protection Elements (BS8485: 2015) for CS2		
Reference	Protection Element	Score
Table 5	Precast suspended segmental sub-floor (i.e. beam and block).	0
Table 6 ¹	Passive sub-floor dispersal layer (Note 1):	1.5
Table 7	Gas resistant membrane complying with the requirements given in Table 7 (Note 2)	2
Total Score		3.5

Note 1:

Dispersal layers include:

- Clear void beneath sub floor is to be utilised of a minimum thickness of 150mm. See *Drawing 23-001-03A Section A-A' and Section B-B'* for design specifications.

Note 2:

The gas resistant membrane shall meet the following criteria (from Table 7, BS 8485: 2015):

- Sufficiently impervious (methane gas transmission rate <40.0ml/day/m²/atm (average) BS ISO 15105-1 manometric method).
- Sufficiently durable and strong to remain serviceable for the anticipated life of the building, to withstand in-service stresses and installation process.

¹ For details on the criteria for good and very good performance see Annex B of BS8485: 2015.

- Capable, after installation, of providing a complete barrier to the entry of the relevant gas.
- Verified in accordance with CIRIA C735: 2014: *Good practice on the testing and verification of protection systems of buildings against hazardous ground gasses.*
- Chemically resistant to degradation by other contamination that might be present.

It should be appreciated that if the membrane installed does not meet all the criteria above, then the score for the membrane is considered to be zero.

In addition to the above, the following points shall be considered.

- Technical drawings of the incorporation of the gas protection measures into the sub-structure will be provided by a suitably qualified engineer/architect and produced in accordance with the guidance given in BRE 414.
- The sequence of construction indicating when the gas protection system will be installed will be providing within the installers method statement. Where possible the installation of membranes will take place as a unique activity on site and shall not take place until sub-structure construction is complete.
- During and following the installation of the membrane, all parties in attendance at the site shall be made aware that a gas protection system is to be employed within the construction. Such communications should include, but not be limited to, the CDM documentation for the site and site inductions.
- The installation of the membrane shall be carried out only by suitable personnel and the qualifications or experience/training will be included in the chosen contractors method statement. The suitability of personnel will be assessed in accordance with Annex 1 of CIRIA C735.
- The installation shall be in strict accordance with manufacturer specifications and recommendations.
- The membrane system employed will not be an ensemble (i.e. a system comprising a mixture of products from different manufacturers will not be employed).
- Membranes shall be supplied to site on a single wound roll, creased product will not be accepted or employed.
- Whilst membranes are exposed, signage will be provided to indicate the access to the installation area is prohibited unless authorised. Footwear will be checked prior to accessing the membrane surface to ensure no sharp objects are apparent, such as stones caught in treads. The use of sharp objects or hot-works around the exposed membrane will be strictly prohibited unless the risk of damaging the membrane has been full assessed and mitigated.
- Non-conformance of manufacturer recommendations shall be discussed and agreed as acceptable, in writing, with a suitably qualified person from the manufacturer.

3.5 Fill Materials

Any materials to be used as fill at the site, will be subjected to the following assessment to determine its suitability.

Fill materials will be initially screened, by a suitably qualified engineer, for the following.

- It is a suitable growing medium where is to be employed as such, including compliance with BS3883 (2007)
- It is free from obvious contamination i.e. visual or olfactory evidence
- It has not come from areas where Japanese Knotweed or other invasive or injurious plants are suspected to be growing

- It is not a statutory nuisance, such as being odorous
- It is free from unsuitable material i.e. whole bricks, brick ties, timber or glass.

It should also be appreciated that any fill will be subjected to validation testing to assess its suitability. The following table has been taken from YALPAG² documentation and will be used in the first instance. Depending on the origin and nature of the material, not all fill will require the sampling frequency and testing indicated, although this will be in agreement with any regulatory bodies (such as the Local Authority).

Table 2: Validation Sampling and Testing		
Fill Type	Frequency	Minimum Determinands
Virgin Quarried Material	1 or 2 depending on the type of stone (to confirm the inert nature of the material)	Standard metals/metalloids (should include as a minimum As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn)
Crushed Hardcore, Stone, Brick	Minimum 1 per 500m ³	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, Total TPH. Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE).
Greenfield/ Manufactured Soils	Minimum 3 Dependent on source and receptor, between 1 per 50m ³ and 1 per 250m ³	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, pH and soil organic matter (SOM) (or calculated from total organic carbon (TOC)).
Brownfield/ Screened Soils	Minimum 6 Dependent on source and receptor, between 1 per 50m ³ and 1 per 100m ³	Standard metals/ metalloids (as above), PAH (16 USEPA speciation), TPH (CWG banded), asbestos, pH and SOM (or calculated from TOC). Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE).

It should be noted that screening values for the above regime have been included within Appendix 2 of this report. The screening values will need to be agreed with any regulatory bodies. It is anticipated, for example, that 1% SOM values will be employed for typical granular fill and 6% SOM for topsoil. However, organic matter testing will determine which screening values are appropriate for each material. Moreover, testing will comply with UKAS and MCERTS, where applicable, and undertaken by an accredited laboratory.

Where the material has been derived from a commercial company, certificates or other industry quality protocol compliance i.e. WRAP shall be obtained. However, it will be necessary to ensure that this documentation is specifically related to the material being imported, is no more than two months old and complies with the screening and frequency requirements given above.

Suitable fill materials will either be placed immediately or sufficiently quarantined to prevent cross-contamination. If it is necessary, the quarantined material will be placed on appropriate sheeting and covered to prevent it becoming mixed with contaminated soils or dust, or penetrated by mobile contaminants.

² YALPAG Technical Guidance for Developers, Landowners and Consultants – Verification Requirements for Cover Systems V4.1 Appendix 1a, June 2021.

4. Verification Report

In order to demonstrate that the remediation has been sufficiently carried out and risks highlighted in the conceptual ground model are mitigated, a verification report will be produced and submitted to any statutory authorities.

The report will be produced by a suitably qualified engineer or engineers and will include the following:

4.1 Ground Works

- A record of the measures taken to cap and seal any disused services.
- The methods used for handling and final destination of any contaminated soils removed from the site.
- The qualifications or relevant experience/training of the persons carrying out the verification.

4.2 Imported Fill and Removal of Contaminated Made Ground/Topsoil

- Characterisation of the suitability of clean imported fill employed at the site including the derivation of the material, comments from a visual screen, the tests results of chemical screening, delivery tickets where appropriate and the conditions by which the clean material has been stored and handled on site.
- Photographic and logged evidence the clean material has been handled on site and placed in a sufficient thickness over areas where made ground remains. This may be either at the time of placement or after placement by means of hand excavated trialpits. Photographs shall include visual site references or reference boards to prove the location and date taken. A measurement reference shall be visible in the photographs to substantiate the thickness of material placed.

4.3 Ground Gas Protection System

- The qualifications or relevant experience/training of the persons carrying out the installation.
- The independence of the person carrying out the verification, along with evidence of their qualifications or relevant experience/training.
- Details of the verification process including the dates of inspections and findings.
- Signed statements to confirm that protection measures were constructed as agreed. These statements shall also include confirmation that:
 - Membranes were free from tears and punctures, and installed in accordance within manufacturer guidelines.
 - Underfloor voids were clear and free from debris.
- Clear photographic evidence of the construction of membranes and/or underfloor voids, which should include key details such as air vents, membrane penetrations etc.
- Details of non-conformances and how they were rectified.
- A declaration that remedial objectives set out in the conceptual site model have been achieved.

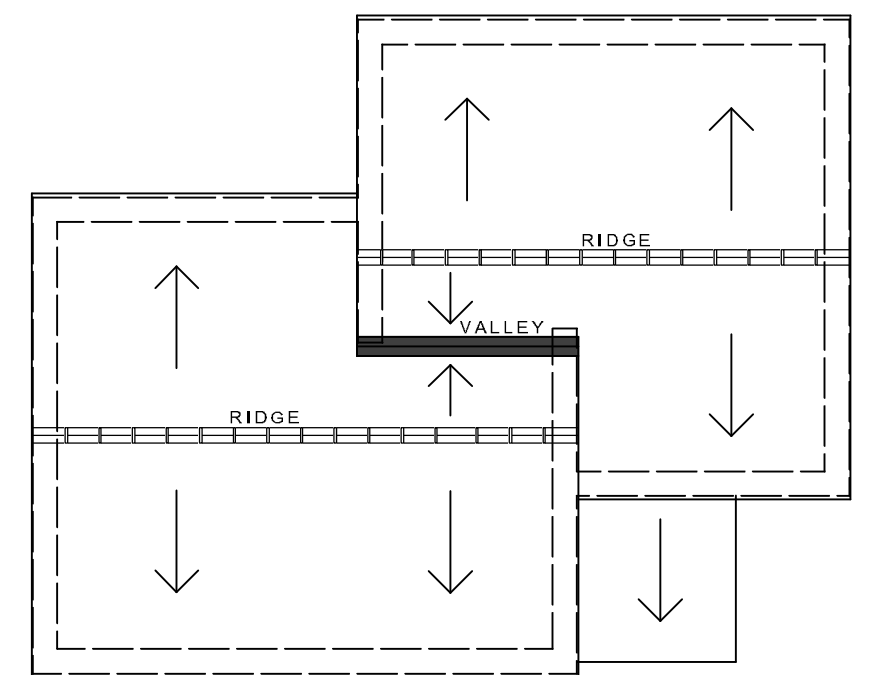
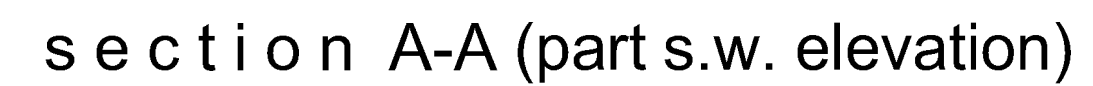
We trust that this information is of interest, clearly Rogers Geotechnical Services Ltd would be happy to offer advice with respect to the above and assist where necessary.

Appendix 1

Plans and Documents



section B-B



roof plan



Scale. 1/50 & 1/100	Drawing Number 2023/001/03	Rev. A	Date Drawn March 2023	Drawn By Andrew Smith
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Suspended Beam & Block Ground Floor: To comprise of suspended precast 175mm deep beam and block floor system details of which are to be provided by manufacturer to Building Control on request. Suspended beam and block floor to be overlaid with 120mm gauged concrete 4 m, lagging with 30 kg of cavity wall mineral wool insulation. Floor slab to be finished with 12mm thick screed. Screed to be finished to achieve a λ -value not exceeding 0.77W/mK, in accordance with SAP calculations provided for project. 65mm standard structural screed to be laid over insulation – suitable for incorporating underfloor heating pipes. Screed to have a smooth finish ready for finisher. Min. 150mm minimum ventilated floor void to be provided between suspended beam and block ground floor. Screed finish to be 120mm of concrete on top of concrete on 120mm gauged concrete on 50 mm thick sand binding over ground (prepared as site preparation).

Floor to be ventilated with 22.5 x 150 air bricks and Rytons Perimeter Under floor ventilators or equal approved. To be installed at a height of minimum 2.0 m centres below floor level around perimeter walls. Mortar to be cement / sand 1 mix six above and

THIS DRAWING TO BE READ IN CONJUNCTION
WITH S&D GARRITT LTD SOUND REPORT &
RECOMMENDATIONS

Steel Beams: Beams to have 1/2-hour fire protection using 12.5mm Gyproc FireLine board on expanded metal lathing. Ensure min. 6mm gap between lathing and flanges of beams to provide adequate mechanical bond for plaster.



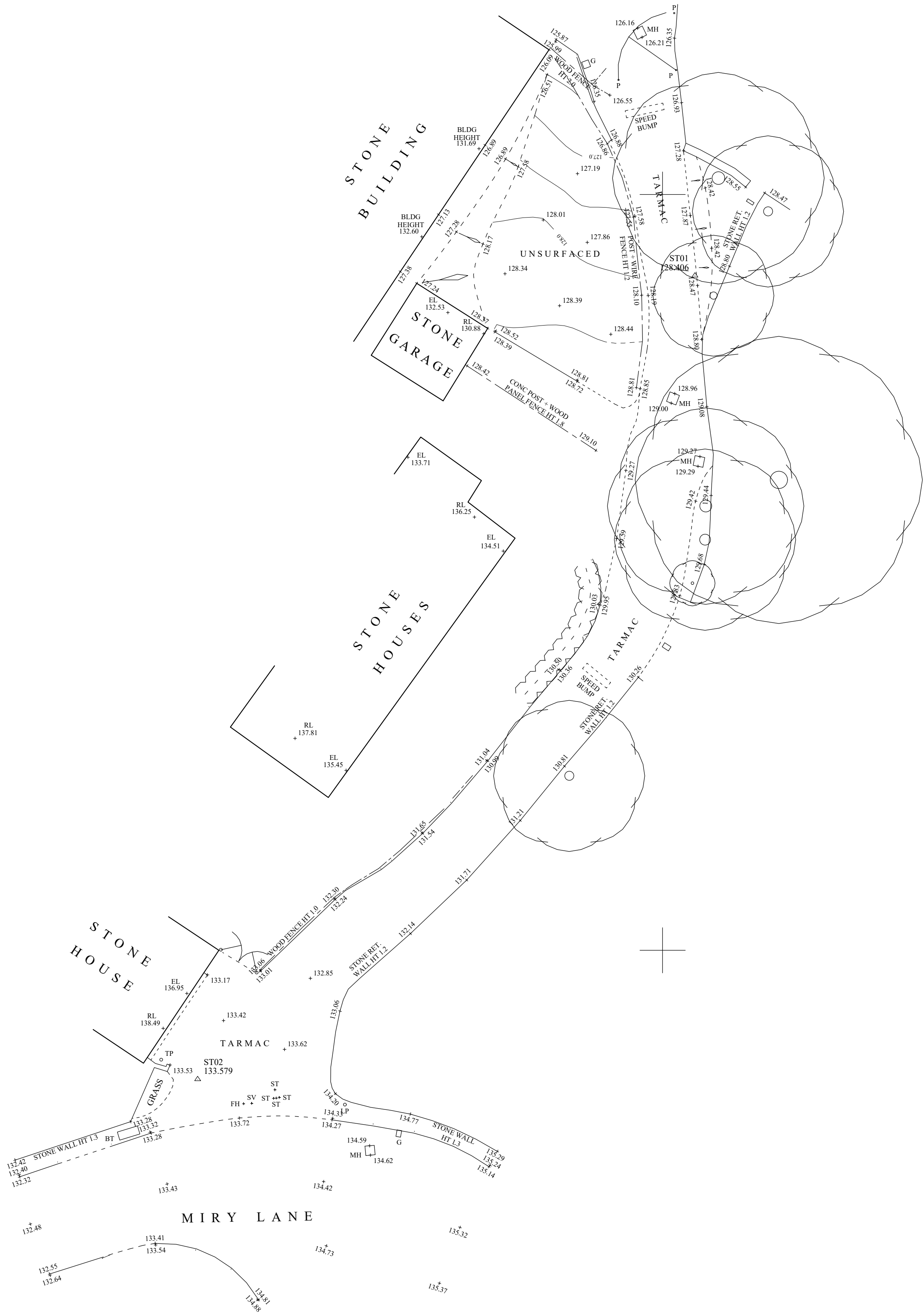
Drawing Status PRELIMINARY				
Scale. 1/50	Drawing Number 2023/001/04	Rev. A	Date Drawn March 2023	Drawn By Andrew Smith

Station
ST01
ST02

Easting
414952.137
414919.249

Northing
409744.638
409691.469

Level
128.406
133.579



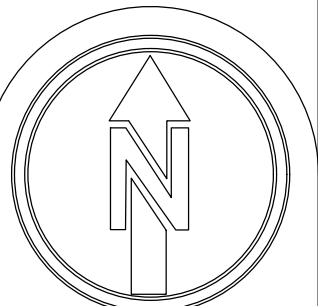
SURVEY NOT TO BE MOVED OR ROTATED
ALL SERVICES TO BE FIELD VERIFIED
All drawings remain the property of Ellam Land Surveys until all payments have been received
Copyright Ellam Land Surveys 2023.
THE COORDINATE SYSTEM USED FOR THE PRIMARY CONTROL IS OSGB36(15)
GRID CENTRE POINT: ST02

LEGEND

AV	AIR VALVE	CC	CONCRETE COVER	FWS	FOUL WATER SEWER	LP	LAMP POST	ST	STOP TAP
B	BOLLARD	CM	CABLE MARKER	G	GULLY	MC	METAL COVER	SV	STOP VALVE
BH	BOREHOLE	CP	CATCH PIT	HV	HIGH VOLTAGE	MH	MANHOLE	SWS	SURFACE WATER SEWER
BS	BUS STOP	CTV	CABLE TV I.C	IC	INSPECTION COVER	MV	MEDIUM VOLTAGE	TL	TRAFFIC LIGHTS
BT	BRITISH TELECOM	DP	DOWN PIPE	JB	JUNCTION BOX	P	POST / POLE	TP	TELEGRAPH POLE
		ECP	ELEC. CABLE PIT	KW	KERB WEIR	RE	RODDING EYE	TH	THRESHOLD
		EP	ELEC. POLE/PYLON	LB	LITTER BIN	RS	ROAD SIGN	VP	VENT PIPE
		ER	EARTH ROD	LH	LAMP HOLE	S	STAY	WM	WATER METER
		FH	FIRE HYDRANT			SC	STOP COCK	WO	WASH OUT

SHEET	1 OF 1
SCALE	1 : 200 @ A1
DRAWN	NEIL SYKES
CHECKED BY	SE
DATE	JAN 2023

LEVEL DATUM	GPS
GRID DATUM	GPS
DATUM USED	GPS STN: ST02
	Value 133.579m
DRAWING NO. 8603/1	





Appendix 2

Screening Levels Summary Sheet

Rogers Geotechnical Services Ltd.

Atkins ATRISK Soil Screening Values (SSVs) - Residential With Plant Uptake Landuse

Tox Data Report No.	Compound	Residential with Homegrown Produce Landuse (mg/kg)				Reference
	<i>Metals</i>	SOM: 1%		SOM: 6%		
3	Cadmium	22.1		22.1		C
4	Chromium VI	3.62	20.5	3.62	20.5	B/C
	Copper	4730		4790		A+
7	Mercury	8.81		15.80		A/D
8	Nickel	136		136		A+
	Lead	200		200		C
	Zinc	20000		20300		A+
	Vanadium	136		138		A+
	<i>Semi and Non Metals</i>					
1	Arsenic	37		37		C
10	Selenium	375		375		A
	Free Cyanide	34		34		A
9	Phenols (total)	267		1200		A
	<i>Poly Aromatic Hydrocarbons</i>	Free product	No free product	Free product	No free product	
20	Napthalene	0.829		12.2		A+
	Acenaphthene	157	608	2760		A+
	Fluorene	735		2610		A+
	Anthracene	10200		26200		A+
	Fluoranthene	983		2980		A+
	Pyrene	668		2120		A+
	Benzo(a)anthracene	1.71	4.52	8.54		A
2	Chrysene	0.44	585	2.64	927	A
2	Benzo(b)fluoranthene	1.22	7.72	7.29	9.86	A
2	Benzo(k)fluoranthene	0.686	84.4	4.12	100	A
2	Benzo(a)pyrene	1.51	4.95	0.998	5	B/C
2	Dibenzo(a,h)anthracene	0.00393	0.838	2.05	4.95	A*
2	Indeno(1,2,3-cd)pyrene	0.0614	7.31	0.368	9.75	A
2	Benzo(g,h,i)perylene	0.0187	96.2	0.112	103	A
	<i>Petroleum Hydrocarbons</i>					
	Aliphatic C5-C6	42.7		369		A+
	Aliphatic C6-C8	99.3		768	1240	A+
	Aliphatic C8-C10	13.9		204		A+
	Aliphatic C10-C12	49.9	81.7	297	1180	A+
	Aliphatic C12-C16	20.9	385	125	4130	A+
	Aliphatic C16-C21	210000		210100		A+
	Aliphatic C21-C35	210000		210100		A+
	Aromatic C5-C7 (Benzene)	0.137		0.871		A+
	Aromatic C7-C8 (Toluene)	113		780		A+
	Aromatic C8-C10	20.5		232		A+
	Aromatic C10-C12	70		468		A+
	Aromatic C12-C16	155	165	830		A+
	Aromatic C16-C21	319		1040		A+
	Aromatic C21-C35	1120		1710		A+
A+ = Values update June 2017.						
A* Atrisk's SSV is lower than Chemtest's detectable limit for this compound.						
B = Health Criterion Values (available from toxicological reviews published in the C4SL project methodology report).						
C = Category 4 Screening Levels (C4SLs).						
D = SSV provided is for Methyl Mercury.						