



COUNTRYSIDE PARTNERSHIPS MERSEYSIDE AND CHESHIRE WEST

HALSNEAD GARDEN VILLAGE

REMEDIATION STRATEGY AND VERIFICATION PLAN

JUNE 2024

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APPENDICES

Appendix A	Proposed Site Layout (Ref: MR-M-DWG-11 Rev H and 33678-MR-M-DWG-03SS)
Appendix B	Cut and Fill Plan (Ref: HGV-AJP-XX-00-DR-C-1411 Rev P03)
Appendix C	Imported Materials Assessment Criteria, Tables 1 and 2

DRAWINGS

DRAWING NO.	TITLE	SCALE
GM13232-001	Site Location Plan	1:2,500 @ A3
GM13232-002	Site Investigation Locations	1:2,500 @ A3

1 INTRODUCTION

1.1 Instruction

- 1.1.1 Wardell Armstrong LLP (WA) were commissioned by Ryan Hayes for Countryside Partnerships Merseyside and Cheshire West of Vistry Group (herein referred to as the 'Client') to prepare a Remediation Strategy and Verification Plan for the development of the Halsnead Garden Village site. The Client intends to develop the Site with low-rise residential dwellings.
- 1.1.2 The location of the Site is shown on Drawing Number GM13232-001, and the current proposed Site Layout is attached as Appendix A. Previous site investigations were carried out at a site off Windy Arbor Road (Area A) and a site off Lickers Lane (Area B). This remediation strategy has been written solely for the site off Lickers Lane (Area B).

1.2 Background

- 1.2.1 This remediation strategy has been prepared to assist the Client in achieving planning permission for a residential development at the Site.
- 1.2.2 The Site and wider development area have previously been subject to previous phases of work including a desk-based study, ground investigations, and mine treatment works, which describe the general site setting and provide background information relating to the Site. In preparing this Remediation Strategy and Verification Plan WA has used the findings of the following Reports which should be read in conjunction with this report:
- 'Desk Study Assessment Report' (Dated July 2017) prepared by Brownfield Solutions Ltd for Stewart Milne Homes (Ref: LC/C3593/7001);
 - 'Coal Mining risk Assessment' (Dated July 2017) prepared by Brownfield Solutions Ltd for Stewart Milne Homes (Ref: LC/C3593/7004);
 - 'Geo-environmental Assessment Report' (dated July 2017) prepared by Brownfield Solutions Ltd for Stewart Milne Homes (Ref: LC/C3593/7018);
 - 'Ground Investigation Report' (Dated August 2023) prepared by Wardell Armstrong for Your Housing Group Limited (Ref: GM11373 RPT-003); and
 - 'Mine Workings and Mine Shaft Treatment Report' (Dated November 2023) prepared by Wardell Armstrong for Your Housing Group Limited (Ref: GM11373 RPT-002).

1.3 Scope

1.3.1 The scope of works is:

- Summarise the site setting and contaminant linkages identified in the previous investigations;
- Establish the remediation objectives;
- Undertake a remediation options appraisal to identify the most appropriate remediation measures;
- Identify the preferred remediation approach; and,
- Provide details of the remediation and verification strategy.

1.4 Limitations

- 1.4.1 This report sets out the remediation measures that will be undertaken during the redevelopment to mitigate the risk identified in the site investigations in the context of the proposed end-use, it does not provide remediation verification or completion statement for the works. This report is a remediation strategy; therefore, the Contractor may need to prepare more detailed remediation method statements.

2 SITE SETTING

2.1 Site Description and Site History

- 2.1.1 The site is located off Lickers Lane approximately 1.0 km to the south of Whiston and approximately 13.0 km east of Liverpool City Centre. The approximate grid reference of the site is SJ 47131 90498. The Site is approximately 11.5 hectares in area and is at an elevation of around 43-48m AOD.
- 2.1.2 The site comprises cropped grassland with sporadic vegetation in the north and bunds present on site to the south with evidence of dirt biking and off road driving taking place. The site is accessed from Lickers Lane to the north. The site is bound by woodland to the north and west and pastoral land to the east and south.
- 2.1.3 The Brownfield Solutions Ltd (BSL) desk study report found that the site has remained undeveloped fields from earliest reviewed mapping dated 1850, however it is known that the site has a history of coal mining prior to this date.
- 2.1.4 The site is proposed for a residential development comprising 239 No. two to three storey properties across the Phase 1 and Phase 2 site areas with landscaping, carriageways, bioretention areas and a pumping station. The proposed site layout and extent of each phase of development are included in Appendix A.

2.2 Planning

- 2.2.1 An outline planning application (reference: 20/OO399/OUT) was approved by Knowsley Council for 'a residential development of up to 239 No. dwellings including associated infrastructure'. Pre-commencement condition 9 of the decision notice related to the production of a remediation strategy. An application for reserved matters (reference: 23/02378/REM) has been granted by Knowsley Council.
- 2.2.2 The remedial works will be undertaken in accordance with a timetable agreed with the Local Planning Authority prior to development to satisfy condition 4 of the reserved matters approval.

2.3 Physical Setting

- 2.3.1 The published British Geological Survey mapping indicates that the site is underlain by made ground and superficial glacial till deposits, underlain by solid deposits of the Pennine Middle Coal Measures. The Ground Investigations undertaken by WA in 2023 encountered the following ground conditions:

- No made ground was recorded across the site.
- Glacial till deposits typically comprising clays, sands and silts were recorded beneath site at depths between 0.10 to 4.20mbgl.
- Rockhead was recorded as weathered mudstone, encountered at depths between 1.90 – 3.60mbgl.
- Coal was encountered at depths between 1.50 – 3.70mbgl.
- Groundwater was encountered during excavation/drilling between 1.20 and 1.40mbgl.

2.3.2 During archaeological trenching carried out in February 2024 to target mining features, made ground deposits comprising clinker, ash and glass were recorded in some of the trenches in isolated pockets across the site.

2.3.3 The Glacial Till is classified as a Secondary Undifferentiated Aquifer and the Pennine Middle coal Measures as a Secondary A Aquifer.

2.3.4 The site is within a Nitrate Vulnerable Zone and the northeastern corner of the site is within a Source Protection Zone III (Total Catchment). There are no groundwater or potable water abstractions within 500m of the site.

2.3.5 The nearest watercourse to the site is an unnamed tertiary river located 47m south of the site. Several ponds and manmade lakes surround the site within 250m. No surface water abstractions are recorded with 1km of the site.

2.4 Human Health Assessment – Soil Contamination

2.4.1 The results of the 2017 desk study were used to identify the potential sources, pathways and receptors that exist on the site and the site investigation works have been used to assess the significance of these potential pollution linkages and identify the necessary remediation/risk management actions to be undertaken the sources, pathways and receptors are summarised in Table 2.1.

2.4.2 The laboratory chemical analysis carried out in 2017 and 2023 recorded low concentrations of contaminants within the near surface deposits. No chemical testing was carried out on made ground deposits identified during the archaeological trenching to confirm the presence of contaminants.

2.5 Controlled Waters Risk Assessment

- 2.5.1 The site is considered to be within a low-moderate sensitive setting for controlled waters on the basis that it is not underlain by a principal aquifer and there are no main rivers in close proximity to the site. However, the northeast corner of the site is located within a Total Catchment Source Protection Zone (Zone III) associated with a potable abstraction over 500m distance from the site.
- 2.5.2 Leachability analysis was undertaken on 12 No. soil samples taken from across the site in 2023 to assess the potential risk to controlled waters.
- 2.5.3 Generally, the majority of leachate concentrations are in accordance with the annual average EQS standards and, where there are leachate exceedances, the solid analysis has proved the reservoir of contaminants within the soils to be low. Given the presence of low permeability clay beneath the site, and the distance to sensitive controlled water receptors, the overall risk to controlled waters is considered low.

2.6 Ground Gas Risk Assessment

- 2.6.1 Gas monitoring standpipes were installed in all eight window sample boreholes drilled in 2023 to investigate the ground gas and groundwater regime at the site.
- 2.6.2 Gas monitoring was undertaken on six occasions in 2023 in accordance with BS 8485: 2015+A1:2019 and CIRIA 665 'Assessing Risks Posed By Hazardous Gases to Buildings'.
- 2.6.3 Whilst the natural superficial deposits recorded across the site are generally free from significant volumes of organic type materials (e.g. Peat, Timber etc) laboratory testing did record organic concentrations in isolated samples with a maximum concentration of 16% SOM. Consequently, the decomposition of organic materials within the superficial deposits was considered as a viable source of ground gas.
- 2.6.4 Historical coal workings proven across the site were treated through pressure grouting in 2022; however, open workings may remain outside of these areas and unrecorded and/or untreated mine shafts may still exist across the site. Consequently, the mine workings are considered potential sources of ground gas.
- 2.6.5 Carbon dioxide has been detected during the monitoring regime undertaken to date, with a maximum carbon dioxide concentration of 12.6%v/v. No methane was recorded in the 2023 gas monitoring.

- 2.6.6 Gas flows have been recorded with the maximum steady value of 0.1l/hr being recorded. Methane and Carbon dioxide are asphyxiants and should humans be exposed to elevated concentrations in deep excavations or confined spaces during or after redevelopment works, it could possibly lead to acute health effects.
- 2.6.7 The comparison of the calculated GSV with the classification tables provided in CIRIA C665, shows that the site falls within Characteristic Situation 1 using the modified Wilson and Card system, and Green using the NHBC system, both of which do not require any specialist protection measures. However, given the recorded concentration of carbon dioxide, the presence of viable sources, and the more sensitive nature of the final development it is recommended that the site is classified as Characteristic Situation 2 or Amber 1, where basic gas protection measures are required.
- 2.6.8 All reasonable steps have been taken to locate and treat recorded and unrecorded mine entries. The development layout takes into account the locations of mine entries and properties have been located away from entries. The areas of potential shallow mining are underlain by varying thickness of clay deposits. Where more permeable material was encountered they were not found to be continuous and consequently there does not appear to be any obvious shallow migration pathways. The mining treatment work that have been undertaken and the natural superficial deposits will act as a mitigation factor in the pathway associated with mine gas.
- 2.6.9 Further consideration of the gas risk and appropriate protection measures will need to be made once the final foundation solution is known, particularly if they penetrate the clay deposits.

2.7 Conceptual Site Model

- 2.7.1 The following pollutant linkages have been identified as being relevant to the proposed development and requiring mitigation.

Table 2.1: Summary of pollutant linkages			
Pollutant linkage	Source	Pathway	Receptor
1	Isolated pockets of made ground.	Direct contact, plant uptake and inhalation/ ingestion of soil/dust	1. Future occupiers 2. Future landscaping and garden areas 3. Construction workers
2	Ground gas associated with isolated made ground and historic coal workings immediately on and adjacent to the site.	Accumulation within buildings	1. Future occupiers 2. Buildings

3 MINING

3.1 Coal Mining Legacy

3.1.1 Remedial measures to mitigate the shallow coal mining risk at the site were undertaken between 06 June 2022 and 23 November 2022. These are addressed fully in the WA Mine Workings and Mine Shaft Treatment Report, dated November 2023 (Ref: GM11373 RPT-002) and summarised below.

3.2 Shallow Workings and Shafts

3.2.1 The geology and mine workings beneath the site have been investigated in accordance with accepted practices. Broken ground attributed to legacy coal mining was encountered across the site. The areas of highest grout take correlate with the densest areas of broken ground.

3.2.2 In summary, the works involved the drilling of 2533 boreholes which resulted in 79,516.50 metres of drilling and 1,433.97 tonnes of grout injected. The ground stabilisation works were completed in accordance with the WA Specification entitled 'Coal Workings Stabilisation Works at Lickers Lane, Whiston' and all reasonable steps have been taken to protect and stabilise the ground beneath the site

3.2.3 The locations of two recorded mine shafts (347390-002 and 347390-004) have been proven by probe drilling and were subsequently stabilised by pressure grouting.

3.3 Further Recommendations

3.3.1 A search for shaft 347390-005 was carried out but the shaft was not located as the search area was not accessible due to the presence of overhead cables. If the area beneath the overhead cables is to contain housing development, then it is recommended that the search for shaft 347390-005 is completed under the supervision of an Engineer experienced in shaft location works, followed by drilling and grouting works undertaken at a future date beneath the proposed development. The shaft should be treated by drilling and pressure grouting to the same standard as the other shaft.

3.3.2 Mine shafts and crown holes located under highways and in close proximity to plots are proposed to be capped at a later stage, prior to development. The caps should be designed by a suitably qualified Structural Engineer experienced in the design of mine shaft caps to best practice standards.

- 3.3.3 Further stabilisation works will be carried out at plots identified on the revised housing layout as not covered by the previous drill and grout works. Plots 117-118 in the southeast of the site require stabilisation works as these were not previously covered due to the presence of overhead cables. Plots 30-32 as well as the proposed pumping station will also require stabilisation works. Stabilisation may be required in additional areas if changes are made to the proposed housing layout.
- 3.3.4 If any future development on the site outside the areas investigated and treated are proposed, then advice from an engineer experienced in mining issues should be sought to establish the requirement for additional investigation of the potential shallow mining situation.

4 REMEDIATION OPTIONS

4.1 Introduction

4.1.1 The planning policy states that the site should be suitable for its intended use. The presence of contaminated land is generally considered unacceptable if a risk to either human health, controlled waters (rivers, aquifers etc), property or ecological systems exists. Following remediation, the site should not be capable of being determined contaminated land under Part IIA of the Environmental Protection Act 1990.

4.2 Remediation Options

4.2.1 The remediation options to address the identified linkages have been considered in terms of source remediation, pathway mitigation and receptor management. UK guidance requires consideration of sustainability in the appraisal of remediation options.

Table 4.1: Remedial options				
Pollutant Linkages	Suitability of Remediation Options (yes/no)			Rationale
	Source Remediation	Pathway Mitigation	Receptor Management	
1	No	Yes	No	Source removal of made ground is cost prohibitive and unsustainable due to volumes involved and the variability across the site. It is not considered practical to manage receptors through private homeowners. Pathway mitigation via clean cover systems is considered best option to protect future residents.
2	No	Yes	No	Source removal of made ground is cost prohibitive and unsustainable due to volumes involved and the variability across the site. Open workings may remain outside of treated areas and unrecorded and/or untreated mine shafts may still exist across the site and may act as a source of ground gas. It is not considered practical to manage receptors through private homeowners. Pathway mitigation via gas protection measures is considered best option.

4.3 Stakeholders

4.3.1 The anticipated relevant stakeholders are:

Table 4.2: Summary of stakeholders	
Interest / role	Party
Landowner	Your Housing Group
Construction of development	Countryside Properties (UK) Ltd
Geo-Environmental Consultant	Wardell Armstrong LLP
Regulator – Human Health	Knowsley Council

4.4 Overview

4.4.1 The Remediation Strategy has been developed based on the ground investigation undertaken in 2023 and drill and grout works undertaken in 2024 to mitigate the risk posed by the contaminants of concern and pollutant pathways to the identified receptors and to mitigate the risk of historical mining to the residential development of the site. The key features of the strategy are:

Site Enabling Phase Remediation Works

- Excavation and breaking out of hardstanding compound area;
- Cut and fill to produce development platforms;
- Verification of any imported material for use in the development; and,
- Additional mine stabilisation works.

Build Phase Remediation Works

- Provision of ground gas protection measures within footprint of proposed buildings, in accordance with BS 8585:2015 CS2 with verification by a specialist geo-environmental engineer;
- Installation of clean cover system where made ground deposits are present at the surface;
- Installation of clean service corridors and appropriate water supply pipes; and,
- A verification report to be produced upon completion of the remedial works to confirm that the work was undertaken in accordance with this remediation strategy, relevant legislation and planning conditions.

5 ENABLING PHASE REMEDIAL WORKS

5.1 Introduction

5.1.1 This section of the report outlines the remedial works required prior to commencement of the construction phase of the development. If required, a more detailed Earthworks Specification should be prepared.

5.2 Excavation, Breaking and Processing of Hard Materials

5.2.1 Natural or man-made hard materials including hardstanding associated with the temporary compound are located on site should be broken out from beneath the site. The location and depth of all below ground obstructions remaining during the remedial works / earthworks should be recorded by the Contractor on the final as built drawing.

5.2.2 All hard materials and arisings recovered during the works which are intended for re-use should be processed and stockpiled for chemical testing to demonstrate they are suitable for re-use within the proposed redevelopment.

5.3 Additional Mine Stabalisation Works

5.3.1 As detailed in Section 3 and within the Mine Workings and Treatment Report (Ref: GM11373-0002) further mine treatment works are recommended prior to any development across the site. Any mine stabalisation works will require a Coal Authority Permit to be in place prior to works starting on site.

5.3.2 Seven mine shafts identified in the Drill and Grout Report require capping across Phase 1 area and Phase 2. Additional drilling and grouting works are required in plots 117-118 in the southeast corner of the site not previously treated due to the presence of overhead cables, at the pumping station, and at plots 30-32 surrounding the pumping station. These areas requiring additional mine stabalisation works will be detailed further in the Mine Workings and Treatment Report following the works. Areas requiring further drill and grout works may change should revised housing layouts be issued.

5.3.3 Excavation works are recommended to complete the search of mine shaft 347390-005, which was not completed in the initial phase of treatment works due to the presence of overhead cables.

5.4 Cut and Fill

- 5.4.1 Cut and fill works will be undertaken across the site to form necessary development platforms, the details of which are attached as Appendix B. Topsoil will first be stripped and stockpiled, and any made ground encountered will be excavated separately and tested to determine its suitability for re-use beneath a clean cover.
- 5.4.2 Made ground materials should not be placed in sensitive areas of the site i.e. gardens unless chemical analysis indicates it is suitable to do so beneath a suitable depth of clean cover soils.
- 5.4.3 The re-use of made ground materials under an MMP will need to demonstrate suitability and certainty of use. If any made ground is deemed unsuitable for use on site within the proposed development, then the unsuitable material will be removed from site and disposed of at a suitably licensed facility.
- 5.4.4 There is the potential to encounter coal within made ground across the site that will require separating and disposal of offsite under a Coal Authority 'Incidental Coal Agreement'.

5.5 Disposal Of Water

- 5.5.1 Shallow groundwater was identified during the 2022 ground investigation as fast flowing ingresses into the trial pits. Any waters encountered within the formation of excavations such as for foundations, service corridors etc. should be chemically assessed and disposed of in accordance with legislation either off-Site or through obtaining a discharge consent which should be issued by the appropriate authority.

5.6 Environmental Management

- 5.6.1 During the enabling works, it will be the responsibility of the Contractor to ensure that the works are managed in an appropriate way as not to contaminate the ground and/or watercourses and pose a risk to off-site receptors. Particular attention should be made to the potential for nuisance to be caused to the existing residential development site to the south and mitigation measures provided as appropriate, together with a programme of reassurance monitoring. The Contractor should prepare a Construction Environmental Management Plan (CEMP) which should include measures to prevent the emission of contamination to air and into the wider environment to include (but not limited to):

- Odour suppression as necessary during excavation of contaminated materials – damping down and / or misting as appropriate;
- Use of a wheel wash or road sweeper to address mud on roads;
- Control of water including surface water run-off and water in excavations to prevent escape to adjacent properties and/or watercourses;
- Operation of works only within the times permitted under the planning permission; and,
- Details of incident recording procedures.

5.7 Contamination

5.7.1 As with any ‘Brownfield’ development, there is a possibility that unknown localised areas of soil contamination (a ‘Hotspot’) may be encountered during development works. As such, a ‘hotspot’ protocol is required during the enabling phase of the development. The purpose of the protocol is to provide a ready reference should such an area of contamination be identified by visual or olfactory means during the works.

5.7.2 Should an area of contamination be identified by visual or olfactory means during development works, the following procedure shall be followed:

- Immediately stop all works in the area where soil/groundwater contamination is suspected;
- Immediately inform the Site Manager who should then contact the Environmental Consultant;
- The Environmental Consultant shall provide a verbal response outlining immediate actions with regard to Site Health and Safety and to limit the potential for contaminants to migrate;
- Should it be deemed necessary the Environmental Consultant shall attend Site to oversee the removal of the ‘hotspot’ and collect validation samples;
- Any excavated material should be isolated from all other material at the Site, on plastic sheeting and covered with plastic sheeting until the material can be tested for contamination and an appropriate disposal route can be identified;
- Any ‘hotspot’ stockpiles and excavations should be fenced off, have appropriate signage and their locations recorded on a Site drawing;

- Should any excavated material be required to be disposed of at an off-Site location, the material shall be isolated from all other material at the Site prior to disposal at a suitably licensed facility. All documentation associated with the movement and disposal of any such material shall be supplied to the Environmental Consultant shall, including waste transfer documentation;
- Subject to appropriate Site Health & Safety controls the excavation will remain open until the validation has been completed. Alternatively, for Site Health & Safety reasons, it may be necessary to backfill the excavation with Site derived material. In this case, the location of the excavation will be accurately recorded, and the excavation reopened if required, based on the validation results; and,
- The Regulatory Authorities will be informed by the Environmental Consultant of any remedial activities required and associated validation testing results.

5.7.3 Implementation of appropriate measures to deal with unexpected contamination remains the Contractor's responsibility.

5.8 Material Management

5.8.1 The redevelopment may include earthworks, relating to the excavation and placement of made ground / soils which contain contamination.

5.8.2 It is recommended that any earthworks be undertaken under a Materials Management Plan (MMP) in accordance with the CL:AIRE Code of Practice to facilitate the reuse of these materials. The Contractor shall be responsible for the preparation of a MMP and obtaining appropriate sign off from a Qualified Person prior to the commencement of earthworks.

5.8.3 The assessments undertaken to date has recorded no asbestos containing materials (ACMs) identified on site.

5.8.4 There is the potential for coal to be encountered in the earthworks and drainage excavations. This will require a Coal Authority 'Incidental Coal Agreement' and disposal off site.

5.8.5 The groundworks Contractor should still be made aware of the possibility of encountering potential Asbestos Containing Materials (ACM) within the Made Ground at the Site and an appropriate protocol to mitigate exposure of the workforce and

general public should be in place with due respect to his duties under the Control of Asbestos Regulations 2012.

- 5.8.6 The Contractor will need to prepare a risk assessment which identifies a safe system of work to handle asbestos containing soils (if encountered) which is likely to include asbestos awareness training, a protocol for unexpected finds (should gross asbestos material be identified) as well as safe working procedures such as damping down of excavations and stockpiles in line with general dust generation mitigation.
- 5.8.7 The Contractor shall be responsible for providing appropriate documentation for inclusion within the Verification Report including details of any significant asbestos material encounter.

6 BUILD PHASE REMEDIAL WORK

6.1 Clean Cover System

- 6.1.1 The majority of the site is underlain by natural ground. However, made ground deposits are present in isolated pockets across the site associated with the mining legacy at the site and therefore, it is considered that a clean cover in gardens / soft landscaping is required in areas where made ground is present at the surface.
- 6.1.2 It is anticipated that following a cut and fill across the site, the existing made ground is likely to be at a depth sufficient to mitigate any risk to future site occupiers.
- 6.1.3 Following the earthworks, an Environmental Consultant should re-inspect the area to determine if any plots / soft landscaped areas require clean cover systems. Where made ground has been removed or is at depth beneath raised site levels, no remedial measures are considered necessary aside from the provision of a suitable growing medium in garden or soft landscaped areas. Any placement of made ground materials beneath a clean cover will be subject to confirmation of the suitability of the depth of clean cover to be provided.
- 6.1.4 If made ground is present within the proposed gardens/soft landscaped areas, a clean cover system will be required as shown in Table 6.1 below. It is considered that a 600mm cover thickness within rear garden areas and 450mm cover thickness within front garden and landscaped areas should be sufficient to remove soil exposure pathways and thus mitigate the risk. However, made ground materials proposed to be re-used beneath gardens/soft landscaping will be subject to chemical analysis to confirm that the proposed 600mm is a suitable depth of clean cover to protect the end-user. The depth and/or design of clean cover may need to be revised depending on the contaminants present i.e. asbestos. The Environmental Consultant will advise on any changes to the clean cover system following review of the chemical testing data.

Table 6.1: Proposed Cover System			
Area	Thickness of Clean Imported Subsoil (mm)	Thickness of Clean Imported Topsoil (mm)	Total Cover Thickness (mm)
Back Garden	450	150	600
Front Garden	300	150	450
Landscaped Areas	300	150	450

6.2 Selection of Cover Soils

- 6.2.1 To ensure the clean cover system is suitable for use, chemical analysis of clean cover materials which are site won or imported must be undertaken to confirm suitability for use within gardens and soft landscaped areas.
- 6.2.2 If any topsoil or subsoil is imported onto the Site either for the clean cover or as a growing medium, documentation on its origin should be provided to the Environmental Consultant. Soil materials being considered for importation shall be sampled at their source or manufacture location before import to Site. Chemical laboratory analysis shall be undertaken on the soil materials and written approval from the Environmental Consultant shall be obtained prior to importing the soil to Site. If chemical data for the soil cannot be provided, then the Environmental Consultant should be asked to arrange for sampling and analysis to be undertaken.
- 6.2.3 Imported soils should comply with relevant duty of care and materials management requirements.
- 6.2.4 The following information will need to be provided for all topsoil, subsoil and other materials required for the development prior to importing:
- Details of the locations from which material have been sourced;
 - Records on quantities of materials to be imported to the Site; and,
 - Chemical data for the soil material.
- 6.2.5 The sampling frequencies recommended for imported and site-won soils are shown in Table 6.2 below. The sampling frequencies have been taken from “Land Affected By Contamination: Technical Guidance for Applicants/Developers and Environmental Consultants’ Version No. 4 August 2016 produced by Sefton Council.

Table 6.2: Summary of sampling frequencies			
Source	Frequency of samples	Chemical Analysis suite	Acceptance Criteria
Greenfield / manufactured soil	Minimum 4 samples or 1 per 100m ³	Metals, PAH, asbestos, TPHCWG, pH and SOM	Wardell Armstong adopted assessment criteria contained in Appendix C.
Brownfield / screened and site-won soils	Minimum 4 samples or 1 per 50m ³	Metals, PAH, asbestos, TPHCWG, pH and SOM	
Crushed hardcore, stone and brick (excluding asphalt)	1 per 500m ³	Metals, PAH, asbestos and total TPH	

- 6.2.6 Subsoil and topsoil should be clean and free from foreign debris, invasive plant species, building materials, timber, asbestos and other deleterious matter.
- 6.2.7 Where material is found to be physically or chemically unsuitable for gardens and soft landscaped areas it shall be removed from Site under appropriate duty of care controls and replaced with suitable material approved by the Environmental Consultant.
- 6.2.8 The importation of materials will be managed under the CLAIRE Definition of Waste: Development Industry Code of Practice (DoWCoP) and a Materials Management Plan (MMP) if obtained from a donor site.

6.3 Post-Placement Depth Verification

- 6.3.1 Following the placement of the clean cover system in garden and soft landscaped areas, the depth of cover must be physically inspected to confirm the minimum thicknesses have been achieved.
- 6.3.2 The inspection is to be undertaken by the Environmental Consultant and will comprise:
- The excavation of one inspection pit per three rear garden plot;
 - The excavation of one inspection pit per four front garden areas; and,
 - Inspection pits on a 25m grid in soft landscaped areas.
- 6.3.3 It is anticipated that subsoil and topsoil will have been tested for chemical suitability prior to placement. However, where this is not the case, a sample of topsoil and subsoil shall be obtained from one in three inspection pits and tested to confirm compliance with the criteria in Appendix C. The testing frequency post placement will be subject to meeting the testing frequencies specified in Table 6.2
- 6.3.4 The location of the inspection pits is to be determined by the Environmental Consultant to ensure a good spatial coverage. The Environmental Consultant will record the overall depth of the clean cover along with the thickness of topsoil and subsoil. A photographic record of the excavation, with suitable scale, will be obtained for the verification report.

6.4 Gas Protection Measures

- 6.4.1 The gas risk at the Site has been assessed in accordance with BS 8485: 2015+A1:2019 and CIRIA Report C665 'Assessing risks posed by hazardous ground gases to buildings' 2007.

- 6.4.2 It has been concluded that the Site should be classified as Characteristic Situation 2 in accordance with the CIRIA 665 and Amber 1 in accordance with the NHBC Traffic Light Classification. Installation of a gas resistant membrane, sealing of any service entries, and a ventilated sub floor void should provide sufficient mitigation against ground gases.
- 6.4.3 The gas precautionary measures will need to be designed in accordance with the guidance provided in the following publications:
- BS 8485: 2015+A1:2019 'Code of practice for the characterisation and remediation from ground gas in affected developments', sections 7.1 and 8.3.
 - CIRIA 665 'Assessing risks posed by hazardous ground gases to buildings' 2007.
 - NHBC Report No.: 10627-R01(04).2007 'Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present'.
 - BRE Report 414: 2001 'Protective measures for housing on gas-contaminated land'.
 - The Building Regulations – Approved Document C.
- 6.4.4 Under the NHBC system for a site classified as Amber 1, the required scope of gas protection measures should include:
1. Gas resistant membrane;
 2. Ventilated sub-floor void to create a permeability contrast to limit ingress of gas.
- 6.4.5 For other residential properties not considered under Situation B, the modified Wilson and Card approach classifies the site as Characteristic Situation 2 and the required scope of gas protection measures are:
1. Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with at least 1200g DPM2 and underfloor venting; and,
 2. Beam and block or pre-cast concrete and 2000g DPM/reinforced gas membrane and underfloor venting.
- 6.4.6 The radon risk for the site has been assessed using UK Health Security Agency radon maps. The maximum radon potential across the site is 1-3% of properties above the Action Level for radon which classifies the site as a medium risk for Radon. As per Building Control Regulations, properties within a 1-3% radon potential band do not require any control measures for residential developments in England and Wales.

6.4.7 The design of gas protection measures and any requirements for installation construction quality assurance (CQA) and validation will require the approval of Building Control and Knowsley Council as appropriate. Any gas measure design should be detailed in a Gas Protection Design Report.

6.4.8 Gas protection measures shall be installed by suitably qualified site workers and subject to validation on a plot-by-plot basis. Independent validation will be conducted on the basis of one inspection per five plots by a suitably qualified geo-environmental engineer.

6.5 Underground utilities and sub-structures

6.5.1 A specific investigation in compliance with the requirements of UKWIR 2010 and / or the local water supplier has not been undertaken; however, no significant contamination has been identified during the site investigations. A United Utilities Risk Assessment is required to confirm the most appropriate water pipeline material for the site.

6.5.2 Services and utility trenches should be backfilled with chemically clean materials. Appropriate chemical testing should be undertaken on any imported material used to backfill utility trenches.

6.5.3 Based upon the use of the BRE methodology, the design Sulphate class for this site is DS-1 and the aggressive chemical environment for concrete (ACEC) classification for the site is AC-2z.

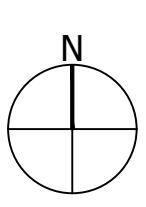
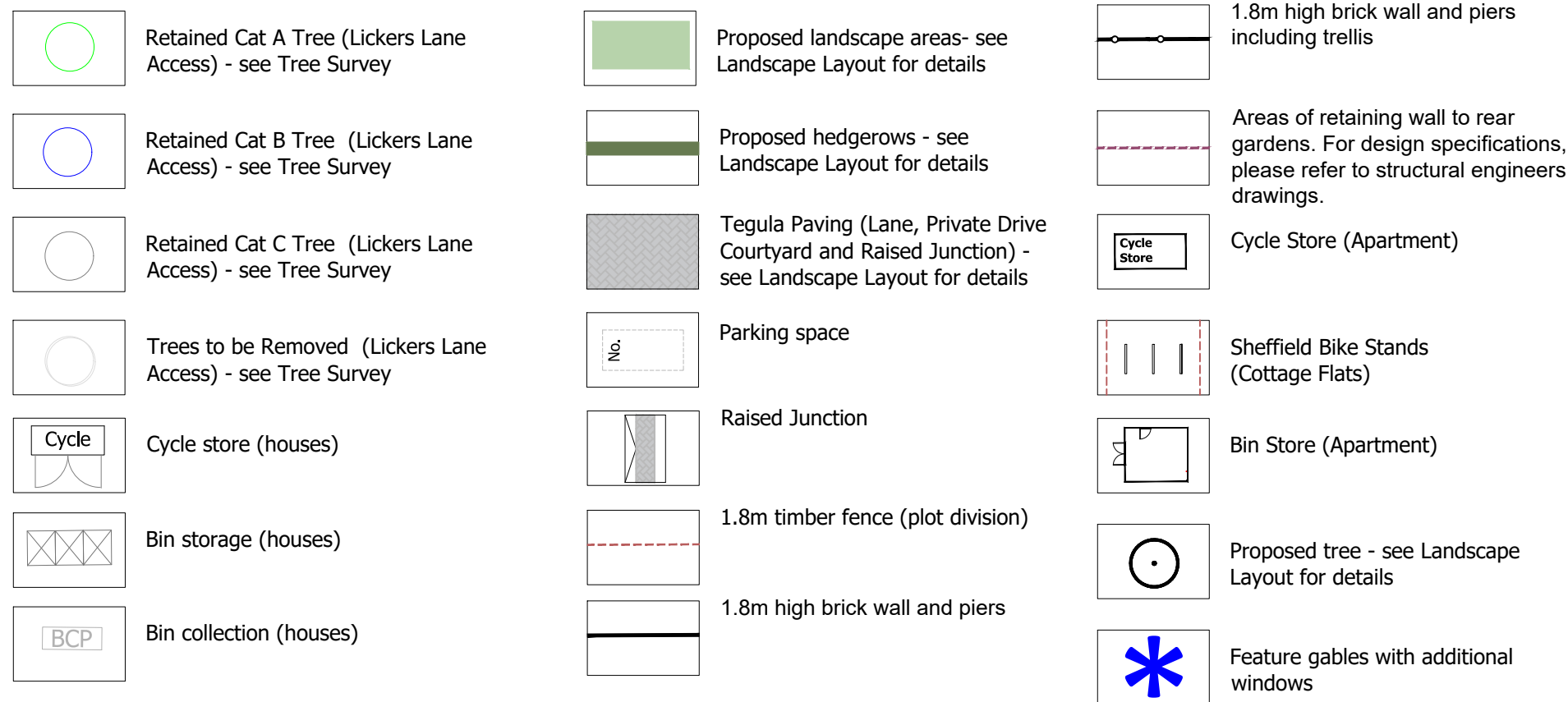
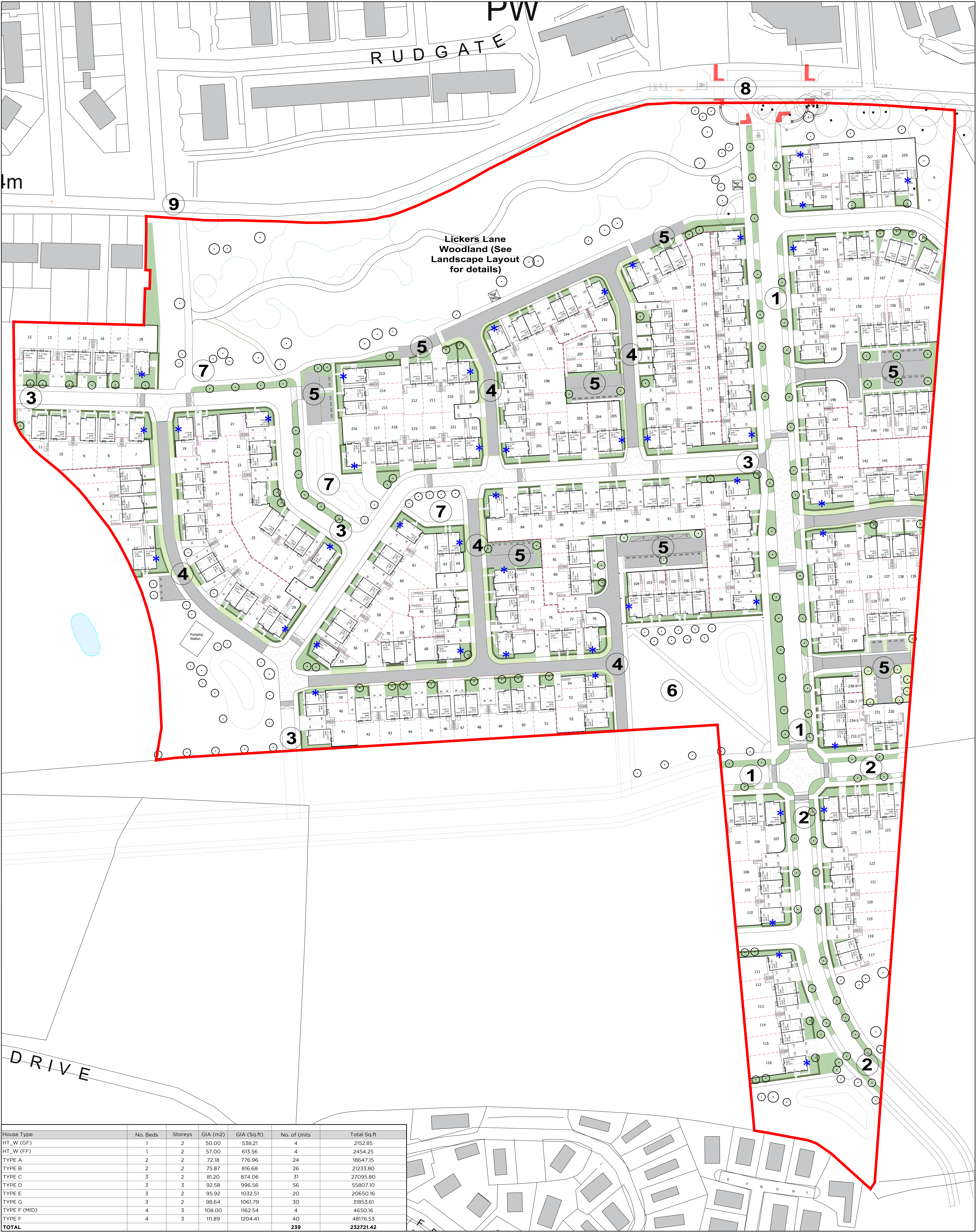
7 VERIFICATION REPORTING

- 7.1.1 The remediation works will be carried out under an appropriate level of observation by a suitably qualified person to ensure that the appropriate methods of working are applied and adhered to. Appropriately detailed records of the remediation works will be maintained, including records of all operations undertaken on Site and details of samples and tests undertaken to validate the success of work (if required). The suitably qualified person who may be appointed, will undertake any necessary monitoring, sampling and testing to facilitate the validation of the works.
- 7.1.2 Following completion of the remedial works, a verification completion report will be prepared for submission to Knowsley Council to satisfy relevant planning conditions.
- 7.1.3 The Verification Report will include as a minimum:
- Description of the remedial works undertaken including an outline of the methodology;
 - Description of the mine workings treatment and shaft treatment;
 - Details of the placement of clean cover layer in gardens and soft landscaping;
 - Details of gas protection measures verification in each plot;
 - Confirmation of the chemical results, and transfer notes detailing the place of origin of any imported topsoil/ subsoil;
 - Results of any relevant testing carried out, e.g., chemical test results.
 - Details of the final water pipe material utilised within the development;
 - A record of any 'hotspots' found during construction and groundworks, and the associated actions taken to assess/mitigate the risk; and,
 - Description of final site conditions.

APPENDICES

APPENDIX A

Proposed Site Layout
(Ref: MR-M-DWG-11 Rev H
and 33678-MR-M-DWG-03SS)

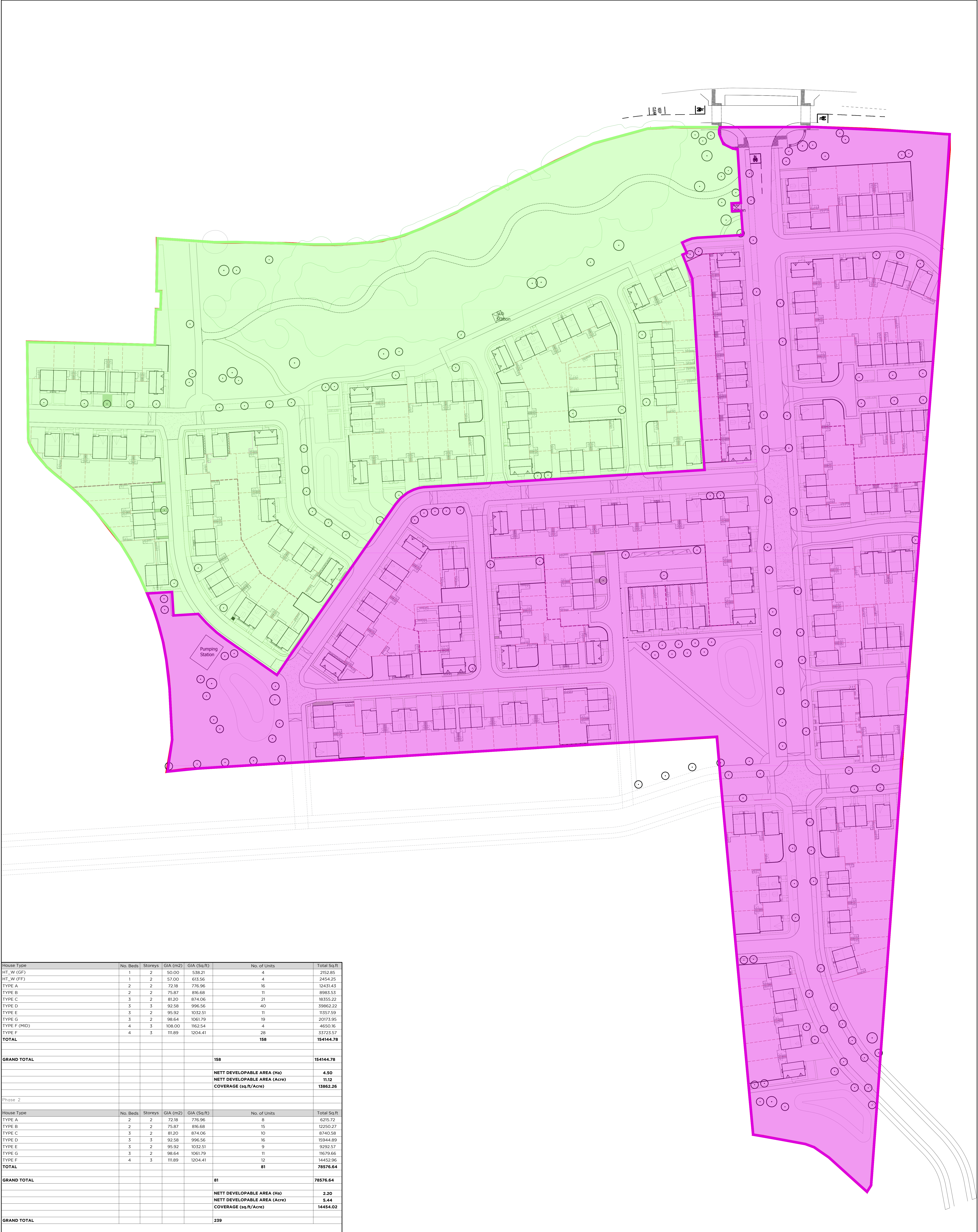


Project
Halshead Garden Village
Your Housing
Drawing Title
Site Layout

Date
14.08.23
Scale
1:500@A0
Project No
33678
Drawing No
MR-H-DWG-03
Drawn by
SW
Check by
-
Revision
SS



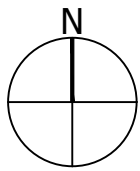
Stantec UK Limited
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The Creative Quarter
8th Floor
Cardiff
CF10 1NF
T: 02920 660 510
stantec.com/uk



House Type	No. Beds	Storeys	GIA (m2)	GIA (Sq.ft)	No. of Units	Total Sq.ft
HT_W (GF)	1	2	50.00	538.21	4	2152.85
HT_W (FF)	1	2	57.00	615.56	4	2454.25
TYPE A	2	2	72.18	776.96	16	12431.43
TYPE B	2	2	75.87	816.68	11	8983.53
TYPE C	3	2	81.20	874.06	21	18355.22
TYPE D	3	3	92.58	996.56	40	39862.22
TYPE E	3	2	95.92	1032.51	11	11357.59
TYPE G	3	2	98.64	1061.79	19	20173.95
TYPE F (MID)	4	3	108.00	1162.54	4	4650.16
TYPE F	4	3	111.89	1204.41	28	33723.57
TOTAL					158	154144.78
GRAND TOTAL					158	154144.78
					NETT DEVELOPABLE AREA (Ha)	4.50
					NETT DEVELOPABLE AREA (Acre)	11.12
					COVERAGE (sq.ft/Acre)	13862.26
Phase 2						
House Type	No. Beds	Storeys	GIA (m2)	GIA (Sq.ft)	No. of Units	Total Sq.ft
TYPE A	2	2	72.18	776.96	8	6215.72
TYPE B	2	2	75.87	816.68	15	12250.27
TYPE C	3	2	81.20	874.06	10	8740.58
TYPE D	3	3	92.58	996.56	16	15944.89
TYPE E	3	2	95.92	1032.51	9	9293.57
TYPE G	3	2	98.64	1061.79	11	11679.66
TYPE F	4	3	111.89	1204.41	12	14452.96
TOTAL					81	78576.64
GRAND TOTAL					81	78576.64
					NETT DEVELOPABLE AREA (Ha)	2.20
					NETT DEVELOPABLE AREA (Acre)	5.44
					COVERAGE (sq.ft/Acre)	14454.02
GRAND TOTAL					239	

LEGEND

- Phase 1
- Phase 2



Project
Halsnead Garden Village
Your Housing
Drawing Title
Servicing Plans
Phasing
Date
07.08.23
Scale
1:500
Project No
33678
Drawing No
MR-H-DWG-11

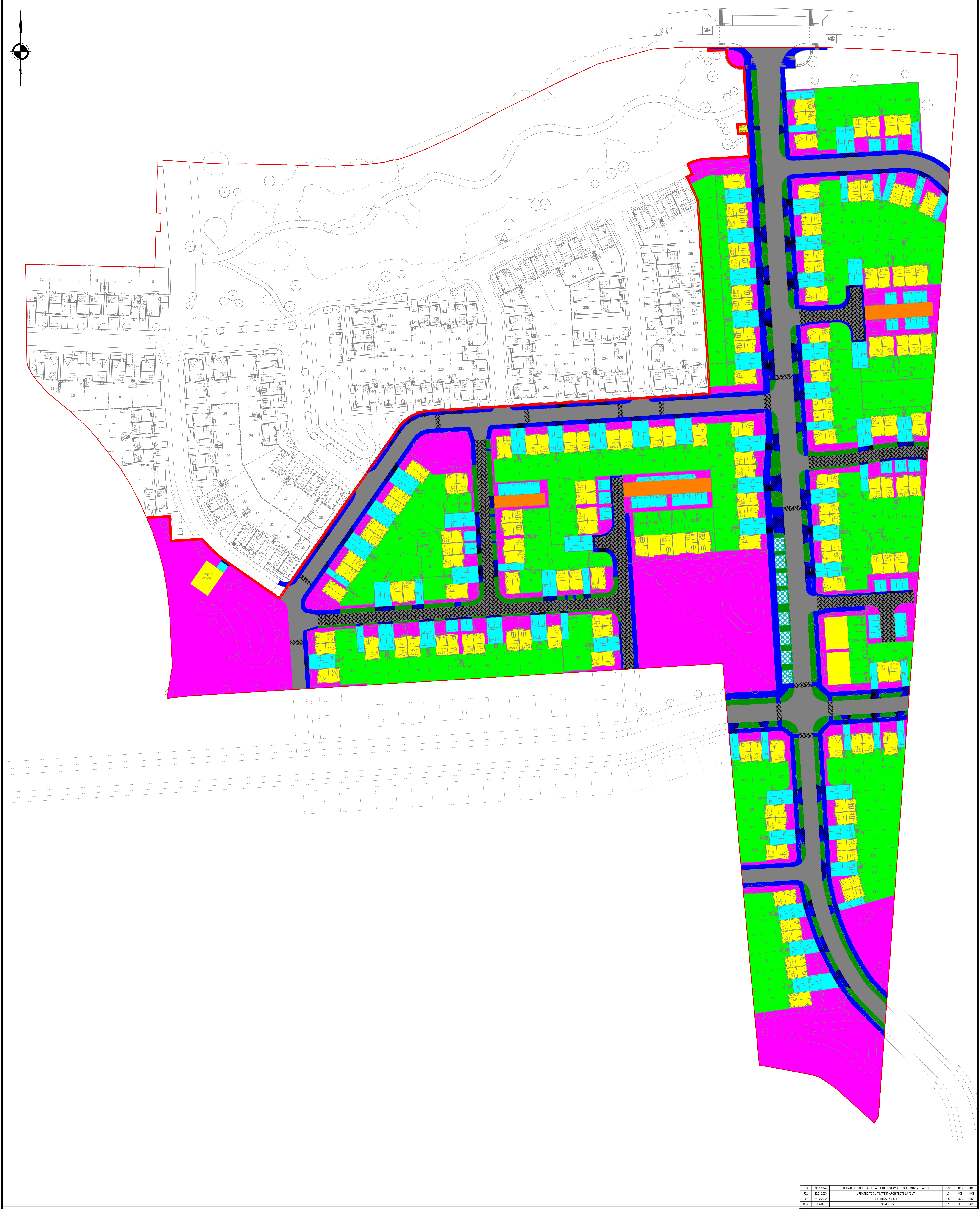
Drawn by
LC
Check by
SW
Revision
H



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APPENDIX B

Cut and Fill Plan (Ref: HGV-AJP-XX-00-DR-C-1411 Rev P03)



KEY	
—	PHASE SPLIT
 	PLOTS
 	ADOPTABLE CARRIAGEWAY TARMAC
 	ADOPTABLE CARRIAGEWAY BLOCK PAVING
 	ADOPTABLE FOOTWAY
 	ADOPTABLE VEHICLE CROSSING
 	ADOPTABLE BIORETENTION AREA
 	ADOPTABLE VERGE
 	REAR GARDENS
 	SOFT LANDSCAPING AND HARDSTANDING
 	PRIVATE PARKING BAYS
 	SHARED DRIVEWAYS AND CAR PARKS

PHASE 1 VOLUMES

FILL VOLUME REQUIRED FROM EXISTING SITE LEVELS TO PROPOSED = **11,844m³**

CUT ESTIMATIONS BASED ON TOTAL AREAS v THE DEPTH OF CONSTRUCTION

- 450mm FROM FFL TO REDUCED LEVEL - **3,392m³** (TOTAL AREA: 7,537m²)
- 750mm ADOPTABLE CARRIAGEWAY TARMAC - **4,241m³** (TOTAL AREA: 5,654m²)
- 750mm ADOPTABLE CARRIAGEWAY BLOCK PAVING - **1,678m³** (TOTAL AREA: 2,237m²)
- 280mm ADOPTABLE FOOTWAY - **876m³** (TOTAL AREA: 3,130m²)
- 280mm ADOPTABLE VEHICLE CROSSING - **475m³** (TOTAL AREA: 1,697m²)
- 1,150mm ADOPTABLE BIORETENTION AREA - **221m³** (TOTAL AREA: 192m²)
- 300mm ADOPTABLE VERGE - **570m³** (TOTAL AREA: 1,901m²)
- 600mm REAR GARDENS - **8,627m³** (TOTAL AREA: 14,379m²)
- 450mm SOFT LANDSCAPING & HARDSTANDING - **5,873m³** (TOTAL AREA: 13,052m²)
- 330mm PRIVATE DRIVEWAYS - **1,725m³** (TOTAL AREA: 5,226m²)
- 420mm SHARED DRIVEWAYS AND CAR PARKING - **211m³** (TOTAL AREA: 502m²)

TOTAL 'CUT' FROM PROPOSED FINISHED LEVELS = **27,889m³**

THEREFORE AN OVERALL NET CUT OF **16,045m³** IS REQUIRED FOR THE SITE

ESTIMATED VOLUMES ABOVE **DO NOT** ACCOUNT FOR THE FOLLOWING ITEMS:

- TOP SOIL STRIP TO SITE PRIOR TO REDUCED LEVEL DIG - **APPROX. 15,242m³** ALLOWING FOR AN AVERAGE DEPTH OF 300mm ACROSS THE WHOLE SITE AREA TO BE REMOVED FROM SITE.
- ARISINGS FROM PLOT DRAINAGE - **APPROX. 750m³** - ASSUMING AN AVERAGE OF 5.0m³ PER PLOT
- ARISINGS FROM PLOT SERVICES - **APPROX. 316m³** - ASSUMING AN AVERAGE OF 2.0m³ PER PLOT
- ADOPTABLE SEWERS AND MANHOLES
- STRIP FOUNDATIONS TO PLOTS
- RETAINING WALL CONSTRUCTION AND FOUNDATIONS IF REQUIRED
- ADDITIONAL CAPPING STONE TO HIGHWAY CORRIDOR IF REQUIRED FOR HAUL ROAD OR WEAKER CBR VALUES
- PILING MAT TO PLOTS REQUIRING VIBRO STONE REINFORCED COLUMNS OR DRIVEN PILES.
- NO ALLOWANCE FOR BULKING

PRELIMINARY	LS	KOB	KOB
PRELIMINARY ISSUE	LS	KOB	KOB
DESCRIPTION	BF	CHK	APP
DRAWING STATUS:			
PRELIMINARY			
CLIENT:	YOUR HOUSING GROUP		
ARCHITECT:	BARTON WILLMORE		
PROJECT:	HALSNEAD GARDEN VILLAGE LICKERS LANE WHISTON		
TITLE:	CUT AND FILL TOTAL AREAS PLAN PHASE 1		
STATUS:	PROJECT NO:	PROJECT:	COORDINATOR:
S2	220-275	HGV - AJP - XX - 00 - DR - C - 1411	P03
SCALE @ A4:	DESIGNED:	DRAWN:	CHECKED:
1:500	LS	LS	KOB
			APPROVED:
			KOB
			DATE:
			DEC 2022
AJPE consulting engineers			
t:0151 227 1462 e:info@ajpe.co.uk 9 Dale Street, Liverpool, L2 2ET			

APPENDIX C

Imported Materials Assessment Criteria, Tables 1 and 2

Table 1: First Generation (Greenfield) Imported Soils Chemical Acceptance Criteria

Contaminant	Acceptance Criteria (mg/kg)	Source
Arsenic	37	C4SL Residential with Plant Uptake
Cadmium	22	C4SL Residential with Plant Uptake
Chromium Total	910	S4UL Residential with Plant Uptake
Chromium VI (Hexavalent)	21	C4SL Residential with Plant Uptake
Copper	2400	S4UL Residential with Plant Uptake
Lead	200	C4SL Residential with Plant Uptake
Mercury	40	S4UL Residential with Plant Uptake
Nickel	180	S4UL Residential with Plant Uptake
Selenium	250	S4UL Residential with Plant Uptake
Zinc	3700	S4UL Residential with Plant Uptake
Asbestos Screen and Quantification	***	***
pH	***	***
FOC	***	***
<i>Polycyclic Aromatic Hydrocarbons</i>		
naphthalene	2.3	S4UL*
acenaphthylene	170	S4UL*
acenaphthene	210	S4UL*
fluorine	170	S4UL*
phenanthrene	95	S4UL*
anthracene	2400	S4UL*
fluoranthene	280	S4UL*
pyrene	620	S4UL*
benz[a]anthracene	7.2	S4UL*
chrysene	15	S4UL*
benzo[b]fluoranthene	2.6	S4UL*
benzo[k]fluoranthene	77	S4UL*
benzo[a]pyrene	2.2	C4SL*
indeno[1,2,3-cd]pyrene	27	S4UL*
dibenz[a,h]anthracene	0.24	S4UL*
benzo[ghi]perylene	320	S4UL*

*(assumes 1% SOM)

*** No acceptance Criteria Available

Table 2: Second Generation (Recycled/Brownfield) Imported Soils Chemical Acceptance Criteria

Contaminant	Acceptance Criteria (mg/kg)	Source
Arsenic	37	C4SL Residential with Plant Uptake
Cadmium	22	C4SL Residential with Plant Uptake
Chromium Total	910	S4UL Residential with Plant Uptake
Chromium VI (Hexavalent)	21	C4SL Residential with Plant Uptake
Copper	2400	S4UL Residential with Plant Uptake
Lead	200	S4UL Residential with Plant Uptake
Mercury	40	S4UL Residential with Plant Uptake
Nickel	180	S4UL Residential with Plant Uptake
Selenium	250	S4UL Residential with Plant Uptake
Zinc	3700	S4UL Residential with Plant Uptake
Asbestos Screen and Quantification	***	***
pH	***	***
FOC	***	***
Total Petroleum Hydrocarbons (TPH)		
Aliphatic EC 5-6	42	S4UL*
Aliphatic EC >6-8	100	S4UL*
Aliphatic EC > 8-1	27	S4UL*
Aliphatic EC > 10-12	130 (48)v	S4UL*
Aliphatic EC > 12-16	1100 (24)s	S4UL*
Aliphatic EC > 16-35	65000 (8.48)s	S4UL*
Aromatic EC 5-7 (benzene)	70	S4UL*
Aromatic EC > 7-8 (toluene)	130	S4UL*
Aromatic EC > 8-10	34	S4UL*
Aromatic EC > 10-12	74	S4UL*
Aromatic EC > 12-16	140	S4UL*
Aromatic EC > 16-21	26	S4UL*
Aromatic EC >21-35	1100	S4UL*
Benzene	0.087	C4SL*
Toluene	130	S4UL*
Ethyl benzene	47	S4UL*

Contaminant	Acceptance Criteria (mg/kg)	Source
O-Xylene	60	S4UL*
M-Xylene	56	S4UL*
P-Xylene	56	S4UL*
<i>Polycyclic Aromatic Hydrocarbons</i>		
naphthalene	2.3	S4UL*
acenaphthylene	170	S4UL*
acenaphthene	210	S4UL*
fluorene	170	S4UL*
phenanthrene	95	S4UL*
anthracene	2400	S4UL*
fluoranthene	280	S4UL*
pyrene	620	S4UL*
benz[a]anthracene	7.2	S4UL*
chrysene	15	S4UL*
benzo[b]fluoranthene	2.6	S4UL*
benzo[k]fluoranthene	77	S4UL*
benzo[a]pyrene	2.2	C4SL*
indeno[1,2,3-cd]pyrene	27	S4UL*
dibenz[a,h]anthracene	0.24	S4UL*
benzo[ghi]perylene	320	S4UL*

*(assumes 1% SOM)

** Please note that this assessment criteria exceeds its lower saturation limit (indicated in brackets). The largest value should be used as a screening value, however, if the contamination is free phase, i.e. the oil contamination is visible and discernable from the soil matrix, then the lower value should be used and further assessment will be required.

*** No Acceptance Criteria Available

DRAWINGS



KEY

Site Boundary

Inset Plan

Scale: 1:200000

Notes:

Boundaries are indicative. Aerial imagery shown for context purposes only.

REVISION	DETAILS	DATE	DRAWN	CHKD	APPD
CLIENT					
COUNTRYSIDE PARTNERSHIPS MERSEYSIDE AND CHESHIRE WEST					
PROJECT					
HALSNEAD GARDEN VILLAGE					
DRAWING TITLE					
SITE LOCATION PLAN					
DRG No.		GM13232-001		REV	A
DRG SIZE		A3		SUIT. CODE	--
SCALE		1:2,500		DATE	04/04/2024
DRAWN BY		CT		APPROVED BY	DB



KEY

Site Boundary

Light Cable Percussive Boreholes

Trial Pits

Windowless Sample Boreholes

Notes:

Boundaries are indicative. Aerial imagery shown for context purposes only.

REVISION	DETAILS	DATE	DRAWN	CHKD	APPD
CLIENT					
COUNTRYSIDE PARTNERSHIPS MERSEYSIDE AND CHESHIRE WEST					
PROJECT					
HALSNEAD GARDEN VILLAGE					
DRAWING TITLE					
GROUND INVESTIGATION LOCATION PLAN					
DRG No.		GM13232-002		REV	A
				SUIT. CODE	--
DRG SIZE	A3	SCALE	1:2,000	DATE	04/04/2024
DRAWN BY	EK	CHECKED BY	SS	APPROVED BY	DB

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Temple Gate
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