



SOIL IMPORT TESTING STRATEGY AND VERIFICATION PLAN FOR BURY INTERCHANGE – PYRAMID PARK AND UNION SQUARE

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16012-TRE-BRY-XXX-RP-EN-000007 REV P01

27 MAY 2026

FINAL

Prepared for:

Wilmott Dixon on behalf of Transport
for Greater Manchester

Prepared by: Adrian Read

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EXECUTIVE SUMMARY

Introduction	Tier Environmental was commissioned by Wilmott Dixon on behalf of Transport for Greater Manchester to undertake a Soil Import Testing Strategy and Verification Plan of an area of land referred to as Pyramid Park and Union Square, Bury Interchange, located at Bury, BL9 0AY (the “site”).
Proposed land use	The subject site forms the southern access for the wider Bury Interchange development comprising construction of a new pedestrian footbridge with access between Union Square, the existing Metrolink platform and Pyramid Park to enable Bury Tram Stop to continue operating during Phase 2 works. This phase of work also includes refurbishing the existing Metrolink platforms including replacement of the existing platform canopy and enhanced passenger amenities/facilities.
Soil import strategy and verification plan	A Soil Import Testing Strategy and Verification Plan has been prepared to ensure that any imported soils and aggregate materials are suitable for the proposed end use and comply with relevant regulatory guidance and appropriate Generic Assessment Criteria (GACs). The strategy sets out the requirements for source approval, validation testing, placement controls and verification reporting to demonstrate that imported materials do not pose an unacceptable risk to human health or the wider environment. Reference has also been made to the Landscape and Planting Specification produced by Oobe with respect to soil health considerations and landscape specification requirements.



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1. INTRODUCTION

Tier Environmental was commissioned by Wilmott Dixon on behalf of Transport for Greater Manchester, to undertake a Soil Import Testing Strategy and Verification Plan for an area of land referred to as Pyramid Park and Union Square, Bury Interchange, located at Bury, BL9 0AY (the “site”).

1.1. Proposed Development

Under current proposals the development will comprise the construction of a new Transport Interchange in Bury Town Centre. The Bury Interchange project comprises two phases:

1. Southern Access - construction of a new pedestrian footbridge with access between Union Square, the existing Metrolink platform and Pyramid Park to enable Bury Tram Stop to continue operating during Phase 2 works. This phase of work also includes refurbishing the existing Metrolink platforms including replacement of the existing platform canopy and enhanced passenger amenities/facilities.
2. Bury Interchange - demolition and replacement of the existing Interchange Building.

This report pertains to the Southern Access site area.

As such, in accordance with the ‘Updated technical background to the CLEA model’ (Environment Agency, 2009) and ‘Suitable 4 Use Levels’ (LQM / CIEH 2015) the proposed generic land use for this development is commercial, acknowledging the proposed development as a new walkway for station access. In this context, Tier Environmental consider the use of commercial land use GACs to be a reasonable and appropriately conservative default scenario, especially when the actual exposure frequency and duration for public users will be less than that assumed for the default commercial worker.

Given the unknown extent of both proposed earthworks and intended areas of soft landscaping, Tier Environmental will also conduct an additional step of conducting sensitivity analysis by comparing the reported concentrations of imported materials against Public Open Space (POS) Park GACs. We recognise that areas of soft landscaping present a slightly higher potential for soil contact, particularly if members of the public utilise the area as a ‘park’, which may be beyond an exposure frequency of commercial landscapers/maintenance workers. To account for this, a sensitivity analysis shall also be carried out using POS Park GACs for imported soils, which are based on young children playing daily in parks — a highly conservative scenario. This approach is consistent with that previously adopted during the ground investigation risk assessment works.

1.2. Previous Reports

A Detailed UXO Desk Study was completed by EOD Contracts Ltd (Ref: EOD/24/24140/DTS, dated November 2024) for the combined Phase 1 and Phase 2 site boundaries.

The following third party reports were provided for review:

- A Factual Report on Site Investigation for Land at Townside Fields, Bury, by Dunelm Geotechnical and Environmental on behalf of Campbell Reith (Ref: M1062/01, dated April 2022)
- A Geoenvironmental Appraisal of land at Bury Market, for Bury Council, by ID Geoenvironmental Ltd (Ref: 5237-G-R001 Rev A, dated August 2022).
- A Factual Report for Pyramid Park, Bury, by Geotechnics on behalf of Campbell Reith (Ref: PN234595, dated February 2024)



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The above factual reports for Townside Fields/Pyramid Park are collated in the following produced by Campbell Reith, which were available on the Bury Council planning portal:

- A Geotechnical and Geoenvironmental Desk Study Report, by Campbell Reith (Ref: 13819-CRG-XX-XX-RP-LQ-0001, dated March 2022).
- A Phase 2 Interpretive Report (Contamination), by Campbell Reith (Ref: 13819-CRG-XX-XX-RP-LQ-0002, dated July 2022).
- A Land Quality Statement by Campbell Reith (Ref: 14111-CRH-XX-XX-RP-LQ-0001, dated April 2024)
- A Remediation Strategy and Quality Statement by Campbell Reith (Ref: 14111-CRH-XX-XX-RP-LQ-0001-P02, dated November 2024)

Tier Environmental reviewed the above as part of a Preliminary Risk Assessment Report for the Phase 1 Area. Tier Environmental have produced the following reports:

- Preliminary Risk Assessment Report for Bury Interchange Phase 1 (Ref: 16012-TRE-BRY-XXX-RP-EN-000001 Rev. P02, dated April 2025);
- Preliminary Risk Assessment Report for Bury Interchange Phase 2 (Ref: 16012-TRE-BRY-XXX-RP-EN-000002 Rev. P02, dated April 2025);
- Ground Investigation Report for Bury Interchange Trackside Works (Ref: 16012-TRE-BRY-XXX-RP-EN-000003 REV.P02, dated April 2025);
- Ground Investigation Report for Bury Interchange – Pyramid Park and Union Square (Ref: 16012-TRE-BRY-XXX-RP-EN-000004 REV.P03, dated 15th January 2026);
- Asbestos Detailed Quantitative Risk Assessment for Bury Interchange (Ref: 16012-TRE-BRY-XXX-RP-EN-000005, dated 6th June 2025);
- Ground Investigation Report for Bury Interchange – Bus Interchange Concourse (Ref: 16012-TRE-BRY-XXX-RP-EN-000006 REV.P02, dated 10th February 2026)

1.3. Background and Previous Works Summary

Relevant to this subject site, Tier Environmental has previously conducted a ground investigation informed by the Preliminary Conceptual Site Model derived from the Preliminary Risk Assessment. The purpose of the investigation was to determine the nature and extent of soil, bedrock and groundwater beneath the site for the purposes of environmental and geotechnical assessment.

The site was found to be underlain by Made Ground of either a gravelly Clay or clayey sandy Gravel to depths of typically between 1.25m and 2.00m bgl though locally up to 5.70m bgl in BH-P2-104 in the west, and some shallower horizons in the south east of the site to between 0.27m and 0.40m bgl. Natural soils of Till overlying bedrock of the Lower Pennine Coal Measures were recorded where depth was achieved through the Made Ground and predominantly comprised very high strength Clays. BH-P2-106 (trackside) recorded Made Ground comprising railway ballast with varying clay and sand content from the surface to a depth of 1.50m bgl, underlain by further granular Made Ground to 3.00m bgl, and possible cohesive Made Ground to 3.50m bgl. Granular superficial deposits comprising sandy gravel were recorded to 5.00m bgl, underlain by cohesive superficial deposits to 8.00m bgl. Extremely weak to medium strong, thinly laminated mudstone, occasionally interbedded with sandstone, was encountered below to beyond the base of the borehole at 28.50m bgl, with soft bands/coal seams recorded by the drillers between 22.50m to 23.20m bgl, overlying an intact coal seam encountered between 22.85m to 23.22m bgl (0.37m thickness).

Human Health Risk Assessment Conclusions from the Ground Investigation

Localised PAH exceedances were identified during sensitivity analysis when comparing against Generic Assessment Criteria (GACs) protective of a more conservative Public Open Space park land use. Following further qualitative assessment of the provenance of those PAHs it was concluded that as they appeared to be attributable to natural coal that they would be unlikely to represent a potential risk to the end users. Of the 20 No. of Made Ground samples submitted for asbestos screening, 5 No. were reported to contain asbestos in the form of chrysotile and locally amosite fibre bundles, returned with quantification of <0.001% w/w suggesting trace level of asbestos. A total of 3 No. samples of Made Ground from the trackside location BH-P2-106 were screened for asbestos. None recorded asbestos to be present.



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Controlled Waters Risk Assessment Conclusions from the Ground Investigation

Conceptually, superficial deposits (Devensian Till and Glaciofluvial Deposits), and the bedrock (Pennine Lower Coal Measures Formation) are both classified as Secondary A Aquifers. The site is not within a Source Protection Zone and there are no active potable abstraction wells within 2km. The nearest surface water feature is an artificial lake within a park circa 100m east of the site, in land east of Market Street, though this not considered to be in hydraulic conductivity with local groundwater, and the River Irwell located 675m west. Groundwater flow is anticipated to be towards the south in conjunction with the flow of the River Irwell. On this basis the controlled waters sensitivity is regarded as being low/moderate.

Measured leachable concentrations of nickel, iron and anthracene were reported only marginally in excess of the WQS protective of the controlled waters environment by the same order of magnitude or up to 1 order of magnitude. Given the marginal nature of these exceedances, the potential for significant dilution within the groundwater beneath the site, the historical commercial / industrial heritage of the wider area surrounding the site, the absence of a continuous groundwater body beneath the site, the Low/Moderate sensitivity of the controlled waters environment, the localised nature of those soil leachate concentrations in excess of the WQS and the absence of any reported widespread leachable concentrations and the fact that the site will incorporate structures / hardstanding and a dedicated drainage system that shall reduce infiltration rates through the soils, the exceedances were not considered to pose a risks to controlled water receptors.

Measured soil leachate concentrations of fluoranthene and benzo(a)pyrene were reported in excess of the respective WQS protective of the controlled waters environment by between 2 No. orders of magnitude and 3 No. orders of magnitude. Subsequent sensitivity analysis demonstrated that measured soil leachate concentrations of fluoranthene and / or benzo(a)pyrene had been reported only marginally in excess of the respective Maximum Allowable Concentrations (MAC) EQS values for Inland Surface Waters by the same order of magnitude / by up to one order of magnitude. As such, and in the absence of viable 'bioaccumulation in fish and consumption of fish by humans' scenario and given the reasonings outline above, it was therefore considered that the reported soil leachate concentrations of fluoranthene and benzo(a)pyrene were unlikely to present a potential risk to the controlled waters environment.

Asbestos DQRA

Further assessment of the localised asbestos impacts within Made Ground at WS-P2-102 at 0.50-1.00, WS-P2-110 at 0.30-0.50m bgl, WS-P2-106 at 0.70-1.00m bgl, BH-P2-105 at 1.70-2.00 and WS-P2-104 at 1.00-1.50 was undertaken.

A Detailed Quantitative Risk Assessment (DQRA) for asbestos was carried out in accordance with CIRIA C733 focusing on the proposed redevelopment of the site into a new transport interchange, including a pedestrian footbridge and the replacement of the existing interchange building.

The report addresses the primary concern associated with potential health risk posed by asbestos-containing soils identified in the Made Ground. The assessment considered appropriate end-users, with a particular focus on landscape maintenance workers as the most exposed receptor group due to their potential for direct soil disturbance over an extended period.

Comprehensive soil sampling and laboratory analysis during the ground investigation revealed the presence of chrysotile and amosite asbestos fibres at concentrations below 0.001% by weight in five out of twenty samples. Using conservative modelling approaches and published data on fibre release, the report estimated that even under worst-case dry and dusty conditions, airborne asbestos concentrations would remain extremely low. The calculated cumulative lifetime cancer risk for maintenance workers was 0.094 per 100,000, well below the generally accepted minimal risk threshold of 1 per 100,000.

As a result, the report concluded that the identified asbestos poses a minimal risk to future site users, including both workers and the general public, and recommended that asbestos be removed as a significant source from the site's conceptual risk model. The findings support the view that no additional remediation for asbestos is required beyond standard regulatory controls.



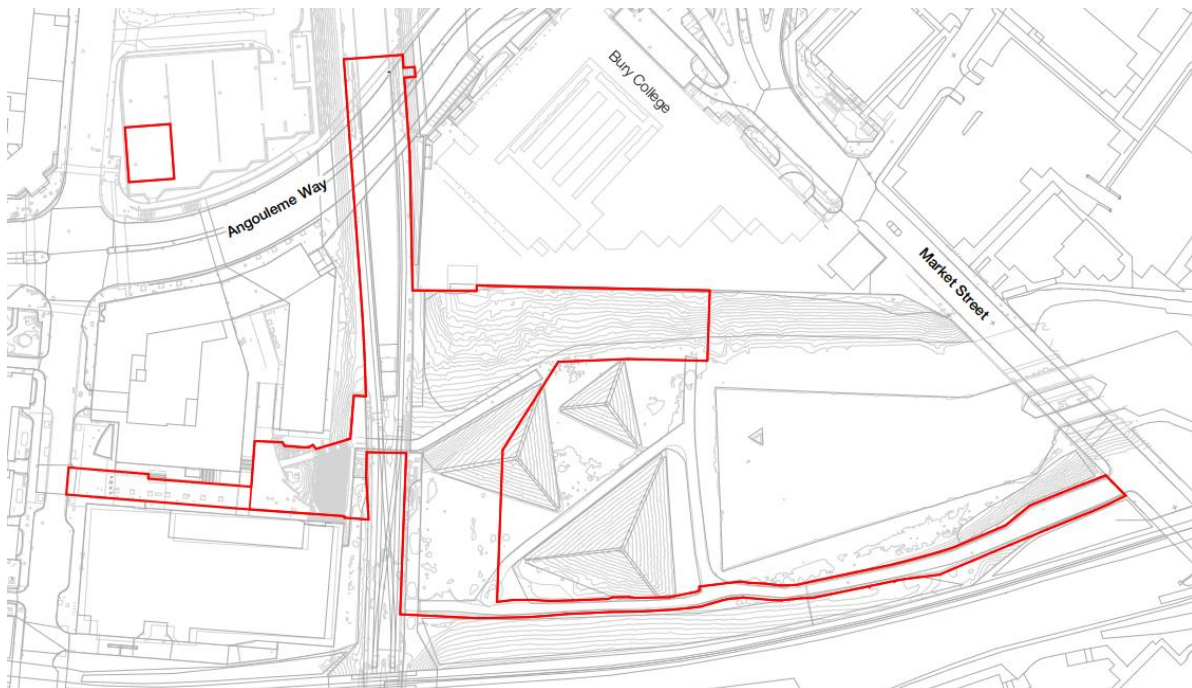
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Overall Conclusions

The conclusions of the risk assessment included within the Ground Investigation Report for Bury Interchange – Pyramid Park And Union Square (report ref: 16012-TRE-BRY-XXX-RP-EN-000005 REV.P03, dated 15th January 2026) combined with the conclusions of the Asbestos DQRA were considered sufficient to demonstrate that there is no chemical or asbestos driver for remediation within the redline boundary area shown below, as communicated / clarified in an email to Sally Shaw (Environmental Protection Officer at Bury Council) in an email dated 2nd July 2026.

Figure 1.1 – Subject Site Boundary (Extracted from Drawing No. 16012-HBA-ZZZ-ZZZ-D-AR-080004 Rev P03, dated February 2025 by Hawkins/Brown)



Planning Context

Discussions with Bury Council, taking into account some wider remediation commitments detailed in a third party Remediation Strategy (Pyramid Park Enabling Works Remediation Strategy prepared by Campbell Reith (report reference 14111-CRH-XX-XX-RPLQ-0001-P02_Rem, dated 11th May 2024) for the wider Pyramid Park area shown below (under separate planning application 70903 relating to Land remediation works, construction of vehicular access road and footway from Market Street with associated infrastructure and structural works), have resulted in the following wording detailed as Condition 5 under planning permission reference 71834 which is relevant to this subject site boundary

“Any soil or soil forming materials to be brought to site for use in soft landscaping, filling and level raising shall be tested for contamination and suitability for use. Proposals for contamination testing including testing schedules, sampling frequencies and allowable contaminant concentrations (as determined by appropriate risk assessment) and source material information shall be submitted to the Local Planning Authority for approval prior to any soil or soil forming materials being brought onto site.

The approved contamination testing shall then be carried out and validity evidence (soil descriptions, laboratory certificates, photographs etc.) submitted to the Local Planning Authority for approval prior to the development being brought into use.

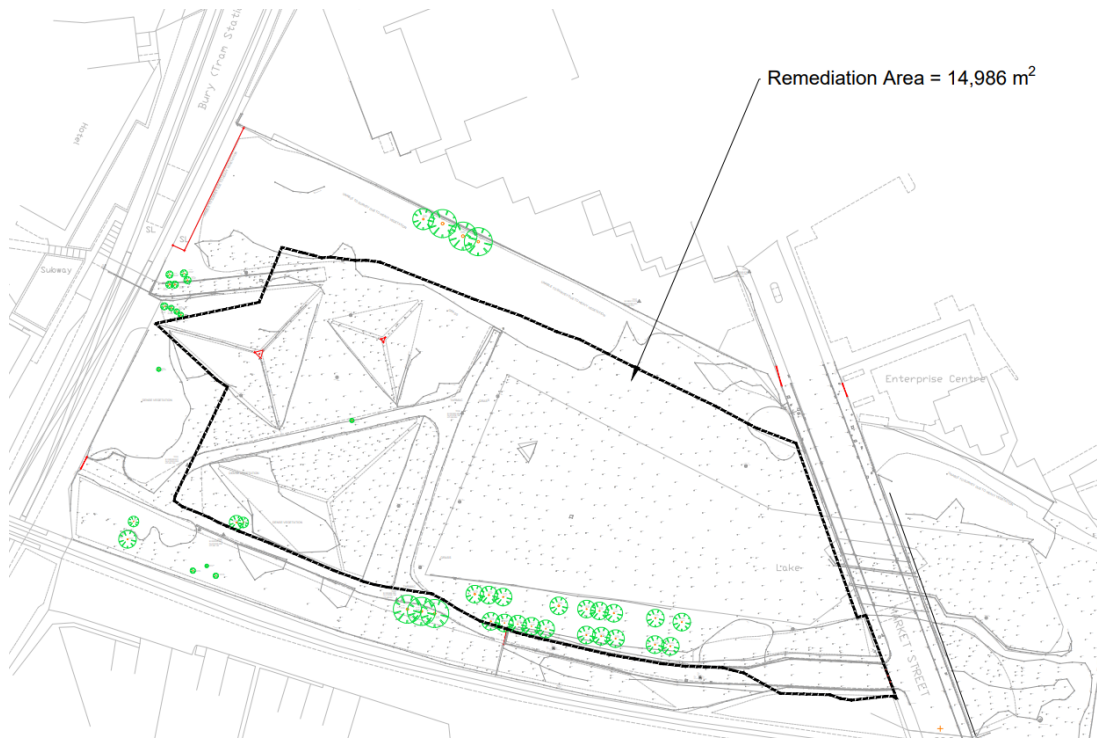


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Reason. To prevent unacceptable risk to Human Health and Controlled Waters and to prevent pollution of the environment in accordance with the aims and Paragraphs 187(f), 196 and 197 of the National Planning Policy Framework (December 2024)."

Figure 1.2 – Extract from Drawing No. 14111 CRH ZZ XX DR Civil 4001 P4 Produced by Campbell Reith (dated 4th March 2024)



1.4. Objectives

On the basis of the above, the objectives of this report are to:

- To summarise the background and context (incusing the planning context) to the production of this report;
- Produce a Soil Import Testing Strategy and Verification Plan sufficient to satisfy the requirements stipulate dunder Condition 5 in the planning permission ref: 71834.

This report, which was designed to meet the requirements of all relevant current guidance including 'Land contamination: risk management' (LC:RM) (which supersedes CLR11) presents the factual information available during previous appraisals, interpretation of the data obtained and recommendations relevant to the defined objectives.

1.5. Assumptions

The following assumptions are made in this report:

- It is assumed that ground levels will not change significantly from those described in this report or a shown on proposed development drawings. If this is not the case, then amendments to the recommendations made in this report may be required.



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- The ground investigations that have informed this remediation strategy were designed with due consideration of known or suspected constraints (including underground services and access constraints).
- Any references to observations of suspected asbestos-containing materials are for information only and should be verified by a suitably qualified asbestos specialist and/or confirmed by laboratory analysis.
- The use of the term 'Topsoil' within this report is based on a visual identification only and that these materials have not been classified in accordance with BS3882:2015.
- The use of the terms 'shallow' and 'deep' within this report (from a geotechnical perspective) assume *typically* between ground level to circa 3.00m below ground level (bgl) for 'shallow' and greater than 3.00m bgl regarded as 'deep';
- The comments and opinions presented in this report are based on the findings of the desk study, review of third party information, ground conditions encountered during intrusive investigation works performed by Tier Environmental and the results of tests carried out within one or more laboratories. There may be other conditions prevailing on the site which have not been revealed by these previous investigations and which have not been taken into account by this report.
- Responsibility cannot be accepted for any conditions not revealed by the previous investigations. Any diagram or opinion on the possible configuration of the findings is conjectural and given for guidance only. Confirmation of intermediate ground conditions should be undertaken if deemed necessary.

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2. SITE DETAILS AND DESCRIPTION

Table 2.1 Current Site Overview.

Site name	Pyramid Park and Union Square, Bury Interchange
Site address	Bury Interchange, Bury, BL9 0AY.
National Grid Reference (NGR)	380399, 410392
Approximate site area	0.92 ha
Site shape	The site is an irregular elongate shape.
Current land use on the site	The site forms part of Bury Interchange station, with station and platform buildings in the north of the site, and railway lines extending south through the beyond site. Underground service drawings have not been provided to Tier Environmental; however, there remains a potential for such features to be present beneath the site.
Surrounding land uses	The site is set within a mixed commercial and residential area with the wider Bury Interchange to the north, car parking and commercial buildings including a hotel to the west and Bury College and a disused park to the east.
General topography and ground levels	The track level of the Phase 1 area is at approximately 86m AOD. The site is within a cutting with levels to the west at 91.4m AOD and to the east circa 94m AOD; the overpass is at circa 95m AOD.



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3. IMPORTED SOILS SAMPLING STRATEGY AND VERIFICATION PLAN

The information presented in the previous GIR report summarises the physical conditions of the site, the nature of the soils / materials, the contamination status of the Made Ground soils and presents an overview of the controlled waters regime. For completeness, however, it would be prudent to refer to the previous ground investigation reports, should additional information be required. The following section identifies the imported soils strategy and verification plan that shall be utilised to ensure that all imported materials are chemically suitable for use in such a manner that they will not present a risk to further site users (i.e. human health) and controlled waters receptors.

3.1. Imported Soils Strategy

Volumetric Requirements & Source of Materials Information

Tier Environmental has been provided (by Willmott Dixon) volumetric requirements for a number of populations of materials requiring importation to site, as summarised below:

Table 3.1 Imported Materials Volumetric Requirements & Proposed Source of materials Information

Material Type	Purpose of Material	Volumetric Requirement for Import (m3)	Proposed Source of the Imported Materials
Imported topsoil	Soft landscaping	737	SED Services - Landgate Farm, Land Gate Ln, Ashton-in-Makerfield, Wigan WN4 0EJ
Imported subsoil	Soft landscaping / formation levels	7	SED Services - Landgate Farm, Land Gate Ln, Ashton-in-Makerfield, Wigan WN4 0EJ
Imported MOT Type 1/6F5	Formation levels	1,787	This will be quarried import sourced through a Merchant at the time (product)
Imported 6F5	Piling mat/crane mat/hardstanding compound	1,491	Recycled product from Chartrange Limited, Wharf St, Dukinfield (permit no: EAWML 50052)
Imported 6F2	Capping layer	118	Recycled product from Chartrange Limited, Wharf St, Dukinfield (permit no: EAWML 50052)

The source of the imported materials described above should be inspected and tested **prior to being brought to site** on site to ensure its chemical suitability and absence of any deleterious materials such as glass, metal, roots, invasive weed species and the like.

Verification Testing and Plan

Tier Environmental has taken into due consideration the requirements of the Bury Council produced 'Development of Land Affected by Contamination' technical Guidance for Developers, Landowners, Homeowners and Consultants (reference: 'Developers Guide v1.0 May 2025') in the production of the verification testing requirements below:



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Table 3.2 Imported Materials Verification Requirements

Objective	It will be necessary to ensure that the development of the site does not cause an increased risk to receptors. All imported materials imported to the site will be tested to determine its suitability for use on the site.
Testing frequency	Imported materials will need to be tested before they are imported to site at a rate of: For materials from a proven greenfield source: - Topsoil - 1 sample per 250m³ (with a minimum of 3 No. samples) - Subsoil - 1 sample per 250m³ (with a minimum of 3 No. samples) For materials from a brownfield, manufactured or site-won source - Topsoil - 1 sample per 50m³ (with a minimum of 3 No. samples) - Subsoil - 1 sample per 100m³ (with a minimum of 3 No. samples) Hardcore/crush (e.g. 6F2 / 6F5) from Recycled Aggregate 1 sample per 1000m³ (with a minimum of 3 No. samples) Quarried materials No samples, just evidence it is from a quarried source.
Testing Suite	- Metals; - Speciated PAH; - Total phenol; - pH; - Asbestos Also to include the following if from a brownfield source: - Speciated TPH
Additional information	Soil descriptions to BS 5930:2015+A1:2020. Photographic records of the materials to be obtained.
Screening Criteria	The purpose of the testing is to verify the quality of any materials imported to the site and to determine the contaminant concentrations of materials. The samples will be compared with appropriate LQM / CIEH 2015 S4UL values protective of a commercial/industrial land use to confirm suitability for re-use with additional sensitivity analysis conducted by comparing the reported concentrations of imported materials against Public Open Space (POS) Park GACs. Tier Environmental recognise that areas of soft landscaping present a slightly higher potential for soil contact, particularly if members of the public utilise the area as a 'park', which may be beyond an exposure frequency of commercial landscapers/maintenance workers. To account for this, a sensitivity analysis shall also be carried out using POS Park GACs for imported soils, which are based on young children playing daily in parks — a highly conservative scenario.
Soil Health	Tier Environmental is also aware of considerations of soil health in the Bury Council produced 'Development of Land Affected by Contamination' technical Guidance for Developers, Landowners, Homeowners and Consultants (reference: 'Developers Guide v1.0 May 2025'). It is for that reason that the soils must also meet the requirements stipulated in the Landscape and Planting Specification produced by Oobe (report reference: 16012-OOB--XXX-XXX-L-LA-006001_Landscape and Planting Specification Rev P04, dated 17th November 2025) which is presented in Appendix F.

3.2. Verification Report

The engineer should ensure that the requirements of this strategy are complied with. On satisfactory completion of the soil import testing, a verification report should be produced. This report will comprise all relevant site records and act as certification that the imported materials have been adequately assessed for suitability of use in accordance with this strategy.

The Verification Report shall include the following:

- A description of the works undertaken in accordance with the strategy described above;
- Records of the works;
- Photographic evidence;
- Delivery tickets;



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- Chemical verification test results and assessment.



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4. REGULATORY APPROVALS

The strategy presented above is considered reasonable based on the requirements stipulated under Condition 5. However, these cannot be guaranteed to gain regulatory approval and, therefore, the report should be passed to the appropriate regulatory authorities and/or other organisations for their comment and approval.



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6. GLOSSARY OF TERMS

ACEC	Aggressive Chemical Environment for Concrete (classification)
aOD	Above Ordnance Datum
bgl	Below ground level
BGS	British Geological Survey
BRE	Building Research Establishment
CBR	California Bearing Ratio (test)
COMAH	Control of Major Accident Hazards (regulations)
Designated location	Site (and the ecosystem on that site) protected under national or international legislation. A potential ecological receptor to be considered as part of the assessment of land contamination. Example designated locations include SSSIs (q.v.), SACs (q.v.), national nature reserves, Ramsar sites and bird special protection areas.
DQA	Data Quality Assessment
DQO	Data Quality Objective
DQRA	Detailed Quantitative Risk Assessment
DWS	Drinking Water Standard
EQS	Environmental Quality Standard
GAC	Generic Assessment Criterion
GQA	General Quality Assessment (Environment Agency)
GSV	Gas Screening Value
HCV	Health Criteria Value
IPPC	Integrated Pollution Prevention and Control (regulations)
K _{ow}	Octanol-water partition coefficient
LEL	Lower Explosive Limit
LL	Liquid Limit
LoD	Limit of Detection (analytical)
LoQ	Limit of Quantification (analytical)
Mean Value Test	Statistical test (described in the CIEH Guidance) to estimate the mean value of a normally distributed population of data at a given level of confidence. Normally for contaminated land assessment, the 95th percentile (referred to as the 95%UCL or US95) is applied as a reasonable but conservative estimate of the mean concentration for comparison with the relevant assessment criteria.
Maximum Value Test	Statistical test (described in the CIEH Guidance) to identify whether an elevated concentration within a normally distributed data set forms part of the underlying population from which it has been sampled or whether it is an outlier (such as a localised area of contamination) that merits further consideration.
MC	Moisture Content
NGR	National Grid Reference
NIHHS	Notification of Installations Handling Hazardous Substances (regulations)
OS	Ordnance Survey
PI	Plasticity Index
PID	Photoionisation Detector
PL	Plastic Limit
ppm	Parts per million
ppmv	Parts per million by volume
QA	Quality Assurance
QC	Quality Control
SAC	Special Area of Conservation
SOM	Soil Organic Matter



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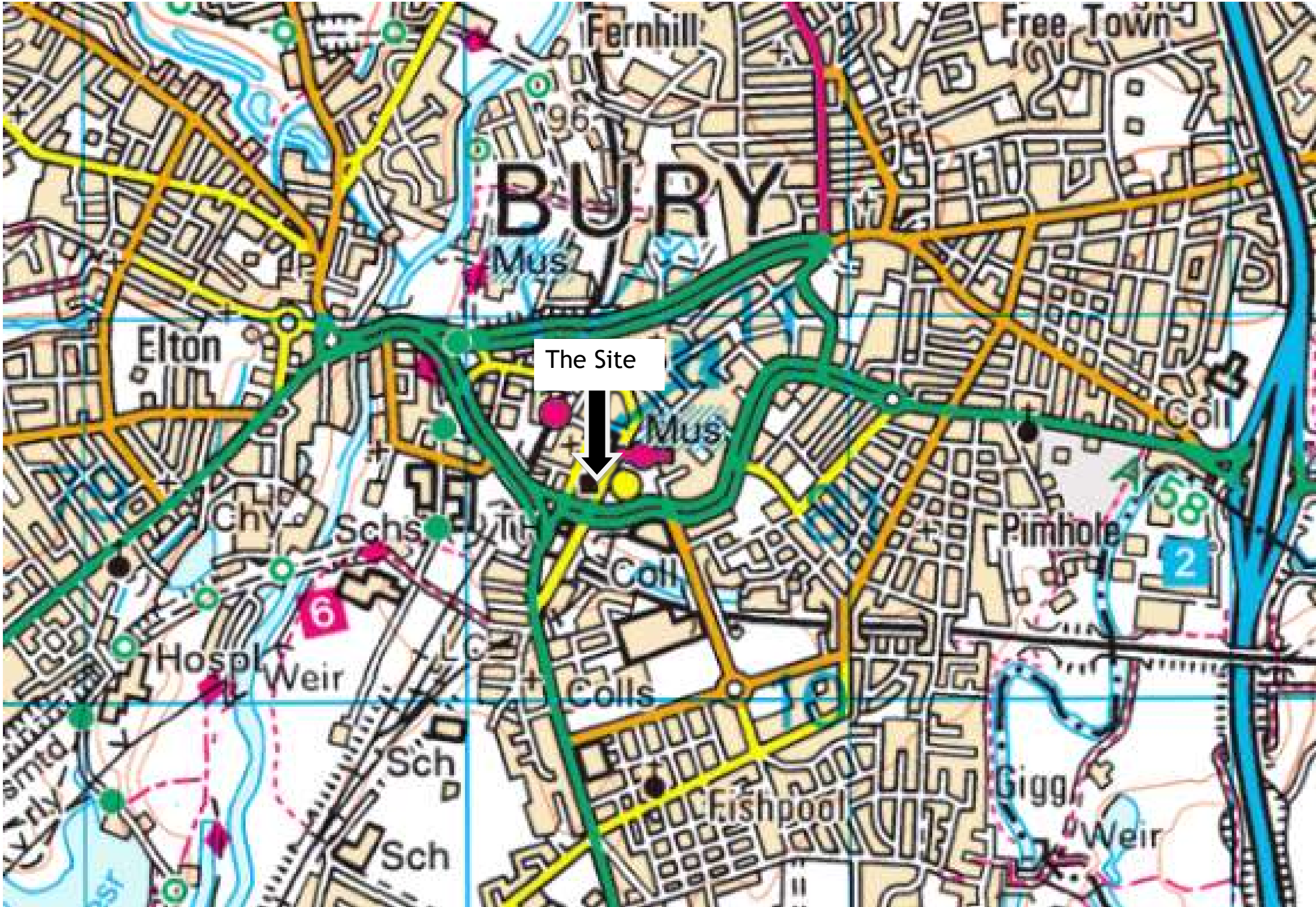
SPT	Standard Penetration Test
SPZ	Source Protection Zone (see Appendix D)
SSAC	Site-Specific Assessment Criterion
SSSI	Site of Special Scientific Interest
SVOC	Semi-Volatile Organic Compound
TEF	Toxicity Equivalent Factor
TPH	Total Petroleum Hydrocarbons
TWA	Time Weighted Average
US95	95 th percentile estimate of the true mean value of a data population (also known as 95%UCL).
VOC	Volatile Organic Compound

APPENDIX A - DRAWINGS



Site Location Plan

Contract Number	TE1885
Contract	Bury Interchange
Client	Wilmott Dixon



Scale	NTS	
Drawn by	SM	Approved AR
Drawing Number	TE1885-TE-00-XX-DR-GE-001-V01 16012-TRE-BRY-XXX-DR-GT-000002	

**APPENDIX B – PREVIOUS REPORTS (AVAILABLE AS A SEPARATE DOCUMENTS,
UPON REQUEST)**

APPENDIX C - HUMAN HEALTH ASSESSMENT CRITERIA

HUMAN HEALTH ASSESSMENT CRITERIA

Context

Contaminated Land is defined under law through Part IIA of the Environmental Protection Act 1990, implemented through Section 57 of the Environment Act 1995 and associated guidance ("Part IIA"). These specify that a "suitable for use" approach is to be applied in the assessment of potentially contaminated land, implemented through a phased programme of site investigation and risk assessment appropriate to the site under consideration.

The assessment of potential risks posed by contaminated land is based upon the assessment of plausible contaminant source - pathway - receptor linkages ("pollutant linkages") for the current and/or proposed future use of the site. The process for the assessment of contaminated land adopted in this report is in line with guidance issued by the Environment Agency Land contamination risk management (LCRM) - GOV.UK (www.gov.uk)

Land contamination can harm:

- human health
- drinking water supplies, groundwater and surface water
- soils
- ecosystems including wildlife, animals and wetlands
- property

It can also affect the current and future land use. Dealing with land contamination helps make the environment clean and safe. Through regeneration it can:

- enhance the health and wellbeing of all
- add to the economic, ecological and amenity value of the area

Use land contamination risk management (LCRM) to:

- identify and assess if there is an unacceptable risk
- assess what remediation options are suitable to manage the risk
- plan and carry out remediation
- verify that remediation has worked

You can use LCRM in a range of regulatory and management contexts. For example, voluntary remediation, planning, assessing liabilities or under the Part 2A contaminated land regime. The Environment Agency expects you to follow LCRM if you are managing the risks from land contamination.

We support the use of the National Quality Mark Scheme (NQMS). You can use it for any type of land contamination report.

Using the NQMS:

- will make sure all legislative requirements and necessary standards related to managing land contamination are met
- can provide increased confidence by submitting reports of the quality we expect
- can result in cost and time savings by 'getting it right first time'

LCRM is made up of 4 guides.

1. LCRM: Before you start.
2. LCRM: Risk assessment.
3. LCRM: Options appraisal.
4. LCRM: Remediation and verification.

We use a staged risk based approach. There are 3 stages, and each stage is broken down into tiers or steps.

Stage 1: Risk assessment

You will use a tiered approach to risk assessment. The 3 tiers are:

1. Preliminary risk assessment.
2. Generic quantitative risk assessment.
3. Detailed quantitative risk assessment.

Stage 1 includes information for intrusive site investigations.

Stage 2: Options appraisal

There are 3 steps to follow.

1. Identify feasible remediation options.
2. Do a detailed evaluation of options.
3. Select the final remediation option.

Stage 3: Remediation and verification

There are 4 steps to follow.

1. Develop a remediation strategy.
2. Remediate.
3. Produce a verification report.
4. Do long term monitoring and maintenance, if required

You must always start with a preliminary risk assessment.

The risk assessment stage is an iterative process. You can do the 3 tiers in order or progress from a preliminary risk assessment to a detailed quantitative risk assessment. As part of a generic or detailed quantitative risk assessment you will need to collect detailed information about the site. This is usually through an intrusive site investigation.

Depending on the level of risk or regulatory requirements, you can proceed from a preliminary risk assessment to the options appraisal stage. If you proceed direct to the options appraisal stage, you still need to collect the detailed site investigation information required by the generic and detailed quantitative risk assessments. This is to confirm that your approach is viable and acceptable.

Following the risk assessment stage, if you conclude that the risks are acceptable, with agreement from the relevant regulator, you can end the process.

If there are unacceptable risks, then remediation or mitigation is required. Follow stages 2 and 3 in order.

In stage 2 options appraisal, you will:

- look at the most feasible options
- produce a shortlist of options
- use evaluation criteria to assess them
- select which ones are the most suitable to take forward to stage 3

In stage 3 remediation and verification, you will produce a remediation strategy, do the remediation and then produce a verification report.

You will decide at the options appraisal stage if long term monitoring and maintenance is the remediation option. You may need to do post-remediation monitoring for further verification.

The risk assessment and subsequent investigation, remediation and verification must address all potential sources of pollutants that may be present on the site (the "hazards"), all receptors that may be harmed by these (e.g., human health, controlled waters, ecological receptors) and the pathways by which the contamination may be transported from the contaminant source(s) to the receptor(s). This is defined within the conceptual model for the site, which represents the characteristics of the site in a form that shows the possible pollutant linkages. As further information becomes available (for example, through site investigation), so the conceptual model will be refined.

Remedial action can be specified at any phase within this assessment process to break the identified pollutant linkage in determining whether or not to undertake further assessment or to undertake remediation, the potential cost-savings arising from a more thorough assessment of the pollutant linkages and more tightly defined remedial strategy must be considered against the direct costs involved in the work and the time that this will take to execute and gain regulatory approval.

A different approach to the statistical appraisal of data is required depending on whether the assessment is being undertaken to assess land as Contaminated Land in accordance with the regulations or whether the assessment is to assess whether the site is suitable for new development in accordance with the Planning regime. The statistical approach to assessment is discussed further in CL:AIRE:2020 "Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration".

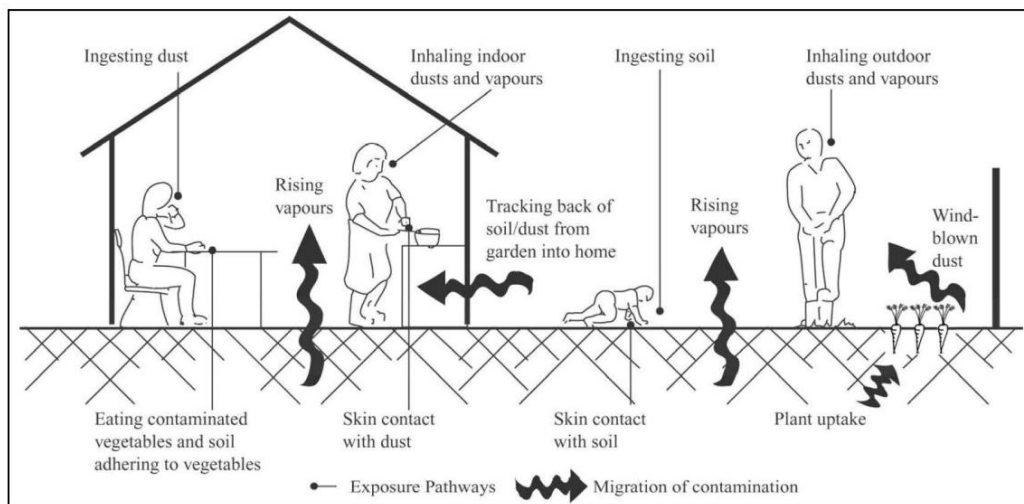
Some form of Detailed Quantitative Risk Assessment (DQRA) will be essential for those cases where appropriate GAC values cannot be established for the contaminant linkages under consideration.

Generic Assessment Criteria for Human Health Risk Assessment

In March 2002, the Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency (EA) published the Contaminated Land Exposure Assessment (CLEA) Model and a series of related reports and guidance. These were designed to provide a scientifically based framework for the assessment of chronic risks to human health from contaminated land. The initial documents (CLR7 – 10) were withdrawn and replaced with revised guidance issued by the Environment Agency including:

- “Using Soil Guideline Values”; EA, 2009; [Land contamination: using soil guideline values \(SGVs\) - GOV.UK \(www.gov.uk\)](http://www.gov.uk/government/publications/using-soil-guideline-values)
- “Human Health toxicology assessment of contaminants in soil” EA, 2009; <https://www.gov.uk/government/publications/human-health-toxicological-assessment-of-contaminants-in-soil>
- “Update technical background to the CLEA model” 2009; <https://www.gov.uk/government/publications/updated-technical-background-to-the-clea-model>
- CLEA Software (Version 1.05) Handbook 2015; <https://www.gov.uk/government/publications/contaminated-land-exposure-assessment-clea-tool>
- Compilation of Data for priority Organic Contaminants for Derivation of Soil Guideline Values; Science Report SC050021/SR7, 2008; and,
- “Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration”. CL:AIRE:2020 <https://www.claire.co.uk/component/phocadownload/category/9-other-cl-aire-documents?download=745:2020-stats-guidance>

The CLEA model and associated guidance was developed to calculate an estimated tolerable daily intake (TDI) of contaminants for site users given a set of ‘typical’ human health exposure pathways which are detailed in “SR3: Updated technical background to the CLEA model”



(Science Report SC050021/SR3, EA, 2009) and reproduced below.

Ingestion

- Outdoor soil;
- Indoor dust;
- Home grown produce;
- Soil attached to home grown produce.

Dermal Contact

- Outdoor soil;
- Indoor dust.

Inhalation

- Outdoor dust;
- Indoor dust;
- Outdoor vapour;
- Indoor vapour.

It should be noted that the CLEA model does not include an exhaustive list of potential exposure pathways, e.g. certain compounds can pass through plastic water pipes into drinking water supply.

The potential significance of each of the exposure pathways is dependent upon the type of land use and the nature of the contaminant being considered. The CLEA model considers principal 'default' land use scenarios and makes a series of assumptions with regards to building type (where applicable), identification of the critical human receptor group, exposure frequency and duration. The definitions of the principal land use types given in SR3 (EA, 2009) are:

Residential land use;

- A typical residential property consisting of a two-storey terraced house built on a ground-bearing slab of 0.15m thickness with a private garden consisting of lawn, flowerbeds, and a small fruit and vegetable patch. The occupants are assumed to be parents with young children, who make regular use of the garden. The critical receptor is a 0 – 6-year-old female.
- Active exposure pathways are ingestion of outdoor soil, ingestion of indoor dust, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and indoor dust and vapour

Allotments

- A plot of open space commonly made available by the Local Authority to tenants to grow fruit and vegetables for their own consumption. There are usually several plots to a site and the overall site area may cover more than one hectare. The tenants are assumed to be the parents or grandparents and that young children make occasional accompanied visits to the plots. The critical receptor is a 0 – 6-year-old female and there is no building present on site.
- Active exposure pathways are ingestion of outdoor soil, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil; inhalation of outdoor vapour.

Commercial and industrial land use.

- A typical commercial or light industrial property consisting of a three-story office building (pre-1970) with a ground bearing floor slab at which employees spend most time indoors and are involved in office based or related light physical work. The critical receptor is a working female adult aged 16 – 65 years.
- Active exposure pathway is ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and inhalation of indoor dust and vapour.

Soil Guideline Values

Based on the assumption of each land use type, the EA and DEFRA developed and published Soil Guideline Value (SGV) using the CLEA model for a number of principal contaminants and 'default' end-use scenarios of residential, allotments and commercial/industrial use. The primary purpose of the SGVs is as trigger value for the tolerable daily intake (TDI), below which it can be assumed that the soil does not pose an unacceptable risk to the identified receptor. Where soils contamination is present above this level further assessment may be required. SGVs were developed for the following contaminants:

- Heavy metals and other inorganic compounds: arsenic, cadmium, chromium, cyanide, lead (now withdrawn), mercury, nickel and selenium.
- Benzene, ethylbenzene, toluene and xylenes.
- Phenol.
- Dioxins and dioxin-like polychlorinated biphenyls (PCBs)
- Polycyclic aromatic hydrocarbons (PAHs) – 11 substances

LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment

In addition, in 2009 CIEH through LQM and EIC published generic assessment criteria (GACs) for 82 substances including metals, petroleum hydrocarbons, PAHs and explosive substances for a variety of soil types and the three 'default' land uses – (residential, allotments and commercial end-uses) as described in SR3 (EA, 2009). These have been superseded as described below.

Category 4 Screening Values

In 2013 "SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination" (CL:AIRE 2013) was issued which detailed findings of a research project undertaken by CL:AIRE to set out the framework by which potential Category 4 Screening Levels (pC4SL) may be derived for 6 contaminants of concern, Arsenic, Benzene, Benzo(a)pyrene, Cadmium, Chromium VI and Lead.

This was supplemented in 2014 by "SP1010: Development of Category 4 Screening Levels for the Assessment of Land Affected by Contamination – Policy Companion Document" (DEFRA, 2014). SP1010 proposed several updated toxicology information relating to contaminant behaviour updated assumptions relating to the modelling of human exposure to soil contaminants, derivation of separate C4SLs for residential with the consumption of home grown produce, residential without the consumption of home grown produce, and two new land uses: public open spaces near residential housing (POS resi) and public parks (POS park).

Public Open Space: Residential

- For public open space in close proximity to residential housing and the central green area around which houses are located, as on many housing estates from the 1930s to 1970s. It is also applicable for smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soil with planting. It is considered to be a generally grassed area up to 0.5ha with up to 50% bare soil. The land use is an important resource

for children and the area is near the homes. The critical receptor is a female child age >3 - <9 years old (CLEA age class 4 – 9) as younger children are unlikely to play outdoors unsupervised.

- Active exposure pathways are ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor soil derived dust; inhalation of outdoor and indoor dust and inhalation of outdoor vapour.

Public Open Space: Park

- A public park is defined as an area of open space provided for recreational use and usually owned and maintained by the Local Authority. It is anticipated the park could be used for a wide range of activities, including the following:
 - Family visits and picnics;
 - Children's play area;
 - Sporting activities such as football on an informal basis (i.e. not a dedicated sports pitch); and
 - Dog walking.
- The park is modelled as an area >0.5 ha of predominantly grasses open space with no more than 25% of exposed soil.
- The critical receptor is a female child with CLEA age classes 1 – 6.
- Active exposure pathways are: ingestion of outdoor soil; direct dermal contact with outdoor soil; inhalation of outdoor dust and inhalation of outdoor vapour.

Furthermore, the C4SLs are based on a different toxicological benchmark, the 'low level of toxicological concern' (LLTC). This difference in approach was adopted because the C4SLs were primarily intended for use under Part 2A of the EPA 1990 to quickly screen out Category 4 sites where there is "*no risk or that the level of risk posed is low*". SGVs and LQM GACs are based on the more conservative 'minimal or tolerable level of risk' as defined in SR2 (EA, 2009) and were derived for assessment of contamination for the Planning process.

LQM/CIEH Suitable 4 Use Levels (S4ULs)

The publication of the C4SLs resulted in considerable and inconclusive debate about the applicability of the lower level of protection of the C4SL, which are underlain by the LLTC, outside of the Part 2A context for which they were derived. In 2014 LQM/CIEH presented a Suitable 4 Use Levels (S4ULs), which incorporate the updated assumption exposure derived for the production of the C4SLs but within the context of deriving screening criteria above which further assessment of the risks or remedial action may be needed. The S4ULs replace the 82 substances, species and fractions and congeners contained in the previous LQM/CIEH GACs issued in 2009. Additionally, following changes and new land uses proposed in the C4SL research project, S4ULs have also been derived for the majority of substances for which the EA derived SGVs in 2009 with the exception of lead (see below).

Lead

The C4SL for lead provides a technically robust and conservative assessment tool using significantly updated toxicological modelling than the withdrawn SGV and derived in line with current science of lead toxicology.

EIC/AGS/CL:AIRE Soil Generic Assessment Criteria (2010)

In some instances, EIC/AGS/CL:AIRE GACs for certain VOC / SVOC potential contaminants of concern have been used *in lieu* of available LQM / CIEH S4UL values.

Element	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	1%	2.50%	6%	

mg/kg/metalloids

Arsenic	37			40			43			640			79			170			LQM (2014)
Beryllium	1.7			1.7			35			12			2.2			63			LQM (2014)
Boron	290			11000			45			240000			21000			46000			LQM (2014)
Cadmium	11			85			1.9			190			120			560			LQM (2014 errata)
Chromium III	910			910			18000			8600			1500			33000			LQM (2014)
Chromium VI	6			6			1.8			33			7.7			220			LQM (2014)
Copper	2400			7100			520			68000			12000			44000			LQM (2014)
Lead	200			310			80			2330			630			1300			C4SL
Mercury (elemental)	1.2			1.2			21			58 (25.8)			16			30 (25.8)			LQM (2014)
Mercury (Inorganic)	40			56			19			1100			120			240			LQM (2014)
Methylmercury	11			15			6			320			40			68			LQM (2014)
Nickel	130			180			53			980			230			800			LQM (Revised 2015)
Selenium	250			430			88			12000			1100			1800			LQM (2014)

Vanadium	410	1200	91	9000	2000	5000	LQM (2014)
Zinc	3700	40000	620	730000	81000	170000	LQM (2014)
Other							
Total Sulphate	2,400	2,400	2,400	2,400	2,400	2,400	BRE (2005)

Water Soluble Sulphate (g/l)	0.5			0.5			0.5			0.5			0.5			0.5			BRE (2005)
Acenaphthene	210	510	1100	3000 (57)	4700(141)	6000 (336)	34	85	200	84000 (57)	97000 (141)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Acenaphthylene	170	420	920	2900 (86.1)	4600 (212)	6000 (506)	28	69	160	8300 (86.1)	97000 (212)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Anthracene	2400	5400	11000	31000 (1.17)	35000	37000	380	950	2200	520000	540000	540000	74000	74000	74000	150000	150000	150000	LQM (2014)
Benzo(a)anthracene	7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	LQM (2014)
Benzo(a)pyrene	2.2	2.7	3	3.2	3.2	3.2	0.97	2	3.5	35	35	36	5.7	5.7	5.7	11	12	13	LQM (2014)

Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4	4	0.99	2.1	3.9	44	44	45	7.1	7.1	7.1	13	15	16	LQM (2014)
Benzo(g,h,i)perylene	320	340	350	360	360	360	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600	LQM (2014)
Benzo(k)fluoranthene	77	93	100	110	110	110	37	75	130	1200	1200	1200	190	190	190	370	410	440	LQM (2014)
Chrysene	15	22	27	30	31	32	4.1	9.4	19	350	350	350	57	57	57	93	110	120	LQM (2014)
Dibenz(a,h)anthracene	0.24	0.28	0.3	0.31	0.32	0.32	0.14	0.27	0.61	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4	LQM (2014)
Fluoranthene	280	560	890	1500	1600	1600	52	130	290	23000	23000	23000	3100	3100	3100	63	6300	6400	LQM (2014)
Fluorene	170	400	860	2800 (30.9)	3800 (76.5)	4500 (183)	27	67	160	63000 (30.9)	68000	71000	9900	9900	9900	20000	20000	20000	LQM (2014)
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	9.5	21	39	500	510	510	82	82	82	150	170	180	LQM (2014)
Naphthalene	2.3	5.6	13	2.3	5.6	13	4.1	10	24	190 (76.4)	460 (183)	1100 (432)	4900	4900	4900	1200 (76.4)	1900 (183)	3000	LQM (2014)
Phenanthrene	95	220	440	1300 (36)	1500	1500	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300	LQM (2014)
Pyrene	620	1200	2000	3700	3800	3800	110	270	620	54000	54000	54000	7400	7400	7400	15000	15000	15000	LQM (2014)
Coal Tar (BaP as surrogate marker)	0.79	0.98	1.1	1.2	1.2	1.2	0.32	0.67	1.2	15	15	15	2.2	2.2	2.2	4.4	4.7	4.8	LQM (2014)
Benzene	0.087	0.17	0.37	0.38	0.7	1.4	0.017	0.034	0.075	27	47	90	72	72	73	90	100	110	LQM (2014)
Toluene	130	290	660	880 vap (869)	1900	3900	22	51	120	56000 vap (869)	110000 vap (1920)	180000 vap (4360)	56000	56000	56000	87000 vap (869)	95000 vap (1920)	100000 vap (4360)	LQM (2014)
Ethylbenzene	47	110	260	83	190	440	16	39	91	5700 vap (518)	13000 vap (1220)	27000 vap (2840)	24000	24000	25000	17000 vap (518)	22000 vap (1220)	27000 vap (2840)	LQM (2014)

Xylene - o	60	140	330	88	210	480	28	67	160	6600 (478)	15000 (1120)	33000 (2620)	41000	42000	43000	17000 (478)	24000 (1120)	33000 (2620)	LQM (2014)
Xylene - m	59	140	320	82	190	450	31	74	170	6200 (625)	14000 (1470)	31000 (3460)	41000	42000	43000	17000 (625)	24000 (1470)	32000 (3460)	LQM (2014)
Xylene - p	56	130	310	79	180	430	29	69	160	5900 (576)	14000 (1350)	30000 (3170)	41000	42000	43000	17000 (576)	23000 (1350)	31000 (3170)	LQM (2014)
Aliphatic EC 5-6	42	78	160	42	78	160	730	1700	3900	3200 (304)	5900 (558)	12000 (1150)	570000 (304)	590000	60000 0	95000 (304)	130000 (558)	180000 (1150)	LQM (2014)
Aliphatic EC >6-8	100	230	530	100	230	530	2300	5600	13000	7800 (144)	17000 (322)	40000 (736)	600000	610000	62000 0	150000 (144)	220000 (322)	320000 (736)	LQM (2014)
Aliphatic EC >8-10	27	65	150	27	65	150	320	770	1700	2000 (78)	4800 (190)	11000 (451)	13000	13000	13000	14000 (78)	18000 (190)	21000 (451)	LQM (2014)
Aliphatic EC >10-12	130 (48)	330 (118)	760 (283)	130 (48)	330 (118)	760 (283)	2200	4400	7300	9700 (48)	23000 (118)	47000 (283)	13000	13000	13000	21000 (48)	23000 (118)	24000(283)	LQM (2014)
Aliphatic EC >12-16	1100 (24)	2400 (59)	4300 (142)	1100 (24)	2400 (59)	4300 (142)	11000	13000	13000	59000 (24)	82000 (59)	90000 (142)	13000	13000	13000	25000 (24)	25000 (59)	26000 (142)	LQM (2014)
Aliphatic EC >16-35	65000 (8.48)	92000 (21)	11000 0	65000 (8.48)	92000 (21)	110000	26000 0	270000	27000 0	160000 0	1700000	180000 0	250000	250000	25000 0	450000	480000	490000	LQM (2014)
Aliphatic EC >35-44	65000 (8.48)	92000 (21)	11000 0	65000 (8.48)	92000 (21)	110000	26000 0	270000	27000 0	160000 0	1700000	180000 0	250000	250000	25000 0	450000	480000	490000	LQM (2014)
Aromatic EC 5-7	70	140	300	370	690	1400	13	27	57	26000 (1220)	46000 (2260)	86000 (4710)	56000	56000	56000	76000 (1220)	84000 (2260)	92000 (4710)	LQM (2014)
Aromatic EC >7-8	130	290	660	860	1800	3900	22	51	120	56000 (869)	110000 (1920)	180000 (4360)	56000	56000	56000	87000 (869)	95000 (1920)	100000 (4360)	LQM (2014)
Aromatic EC >8-10	34	83	190	47	110	270	8.6	21	51	3500 (613)	8100 (1500)	17000 (3580)	5000	5000	5000	7200 (613)	8500 (1500)	9300 (3580)	LQM (2014)
Aromatic EC >10-12	74	180	380	250	590	1200	13	31	74	16000 (364)	28000 (899)	34000 (2150)	5000	5000	5000	9200 (364)	9700 (899)	10000	LQM (2014)
Aromatic EC >12-16	140	330	660	1800	2300 (419)	2500	23	27	130	36000 (169)	37000	38000	5100	5100	5000	10000	10000	10000	LQM (2014)
Aromatic EC >16-21	260	540	930	1900	1900	1900	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800	LQM (2014)

Aromatic EC >21-35	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >35-44	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >44-75	1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)

1,2-dichloroethane (1,2-DCA)	0.0071	0.011	0.019	0.0092	0.013	0.023	0.0046	0.0083	0.016	0.67	0.97	1.7	29	29	29	21	24	28	LQM (2014)
1,1,1-trichloroethane	8.8	18	39	9	18	40	48	110	240	660	1300	3000	140000	140000	140000	57000 (1425)	76000 (2915)	100000 (6392)	LQM (2014)
1,1,2,2,tetrachloroethane	1.6	3.4	7.5	3.9	8	17	0.41	0.89	2	270	550	1100	1400	1400	1400	1800	2100	2300	LQM (2014)
tetrachloroethene	0.18	0.39	0.9	0.18	0.4	0.92	0.65	1.5	3.6	19	45	95	1400	1400	1400	810 (424)	1100 (951)	1500	LQM (2014)
tetrachloromethane (Carbon tetrachloride)	0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400	LQM (2014)
Trichloroethene	0.016	0.034	0.075	0.017	0.036	0.08	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	LQM (2014)
Trichloromethane (chloroform)	0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	LQM (2014)
Chloroethene (Vinyl chloride)	0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.00055	0.001	0.0018	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4	LQM (2014)
2,4,6-Trinitrotoluene (TNT)	1.6	3.7	8.1	65	66	66	0.24	0.58	1.4	1000	1000	1000	130	130	130	260	270	270	LQM (2014)
RDX	120	250	540	13000	13000	13000	17	38	85	210000	210000	210000	26000	26000	27000	49000 (18.7)	51000	53000	LQM (2014)
HMX	5.7	13	26	6700	6700	6700	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	23000 (0.35)	23000 (0.39)	24000 (0.48)	LQM (2014)

Aldrin	5.7	6.6	7.1	7.3	7.4	7.5	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31	LQM (2014)
Dieldrin	0.97	2	3.5	7	7.3	7.4	0.17	0.41	0.96	170	170	170	18	18	18	30	30	31	LQM (2014)
Atrazine	3.3	7.6	17.4	610	620	620	0.5	1.2	2.7	9300	9400	9400	1200	1200	1200	2300	2400	2400	LQM (2014)
Dichlovos	0.032	0.066	0.014	6.4	6.5	6.6	0.0049	0.01	0.022	140	140	140	16	16	16	26	26	27	LQM (2014)
Alpha-Endosulfan	7.4	18	41	160 (0.003)	280 (0.007)	410 (0.016)	1.2	2.9	6.8	5600 (0.003)	7400 (0.007)	8400 (0.016)	1200	1200	1200	2400	2400	2500	LQM (2014)
alpha-Hexachlorocyclohexane	0.23	0.55	1.2	6.9	9.2	11	0.035	0.087	0.21	170	180	180	24	24	24	47	48	48	LQM (2014)
beta-hexachlorocyclohexanes	0.085	0.2	0.46	3.7	3.8	3.8	0.013	0.032	0.077	65	65	65	8.1	8.1	8.1	15	15	16	LQM (2014)
gamma-hexachlorocyclohexanes	0.06	0.14	0.33	2.9	3.3	3.5	0.0092	0.023	0.054	67	69	70	8.2	8.2	8.2	14	15	15	LQM (2014)
Chlorobenzene	0.46	1	2.4	0.46	1	2.4	5.9	14	32	56	130	290	11000	13000	14000	1300 (675)	2000 (1520)	2900	LQM (2014)
1,2-Dichlorobenzene	23	55	130	24	57	130	94	230	540	2000 (571)	4800 (1370)	11000 (3240)	90000	95000	98000	24000 (571)	36000 (1370)	51000 (3240)	LQM (2014)
1,3-Dichlorobenzene	0.4	1	2.3	0.44	1.1	2.5	0.25	0.6	1.5	30	73	170	300	300	300	390	440	470	LQM (2014)
1,4-Dichlorobenzene	61	150	350	61	150	350	15	37	88	4400 (224)	10000 (540)	25000 (1280)	17000	17000	17000	36000 (224)	36000 (540)	36000 (1280)	LQM (2014)
1,2,3-Trichlorobenzene	1.5	3.6	8.6	1.5	3.7	8.8	4.7	12	28	102	250	590	1800	1800	1800	770 (134)	1100 (330)	1600 (789)	LQM (2014)
1,2,4-Trichlorobenzene	2.6	6.4	15	2.6	6.4	15	55	140	320	220	530	1300	15000	17000	19000	1700 (318)	2600 (786)	4000 (1880)	LQM (2014)
1,3,5-Trichlorobenzene	0.33	0.81	1.9	0.33	0.81	1.9	4.7	12	28	23	55	130	1700	1700	1800	380 (36.7)	580 (90.8)	860 (217)	LQM (2014)

1,2,3,4-Tetrachlorobenzene	15	36	78	24	56	120	4.4	11	26	1700 (122)	3080 (304)	4400 (728)	830	830	830	1500 (122)	1600	1600	LQM (2014)
1,2,3,5-Tetrachlorobenzene	0.66	1.6	3.7	0.75	1.9	4.3	0.38	0.9	2.2	49 (39.4)	120 (98.1)	240 (235)	78	79	79	110 (39)	120	130	LQM (2014)
1,2,4,5-Tetrachlorobenzene	0.33	0.77	1.6	0.73	1.7	3.5	0.06	0.16	0.37	42 (19.7)	72 (49.1)	96	13	13	13	25	26	26	LQM (2014)
Pentachlorobenzene	5.8	12	22	19	30	38	1.2	3.1	7	640 (43)	770 (107)	830	100	100	100	190	190	190	LQM (2014)
Hexachlorobenzene	1.8 (0.2)	3.3 (0.5)	4.9	4.1 (0.2)	5.7 (0.5)	6.7 (1.2)	0.47	1.1	2.5	110 (0.2)	120	120	16	16	16	30	30	30	LQM (2014)
Phenol	120	200	380	440 ^{dir} (460)	690	1200	23	42	83	440 ^{dir} (26000 ^f)	690 ^{dir} (30000)	1300 ^{dir} (34000)	440 ^{dir} (10000)	690 ^{dir} (10000)	1300 ^{dir} (10000)	440 ^{dir} (7600)	690 ^{dir} (8300)	1300 ^{dir} (9300)	LQM (2014 errata)
Chlorophenols (excluding pentachlorophenol)	0.87 (g)	2	4.5	94	150	210	0.13 (g)	0.3	0.7	3500	4000	4300	620	620	620	1100	1100	1100	LQM (2014)
Pentachlorophenol	0.22	0.52	1.2	27 (16.4)	29	31	0.03	0.08	0.19	400	400	400	60	60	60	110	120	120	LQM (2014)
Carbon Disulphide	0.14	0.29	0.62	0.14	0.29	0.62	4.8	10	23	11	22	47	11000	11000	12000	1300	1900	2700	LQM (2014)
Hexachlorobutadiene	0.29	0.7	1.6	0.32	0.78	1.8	0.25	0.61	1.4	31	66	120	25	25	25	48	50	51	LQM (2014)

(g) derived based on 2,3,4,6-tetrachlorophenol; dir - based on a threshold protective of direct skin contact with phenol (guideline in brackets based on health effects following long term exposure provided for illustration only); (vap) calculated for vapour phase only. SOM – Soil Organic Matter; (4.5) solubility. (f) This value also exceeds the vapour saturation limit of 24,200 mg/kg.

APPENDIX D - CONTROLLED WATERS RISK ASSESSMENT

CURRENT GUIDANCE FOR CONTROLLED WATERS RISK ASSESSMENT

Regulatory Context

Government policy is based upon a “suitable for use approach,” which is relevant to both the current use of land and also to any proposed future use. When considering the current use of land, Part IIA of the Environment Protection Act 1990 (EPA 1990) provides the regulatory regime, which was introduced by Section 57 of the Environment Act 1995, which came into force in England on 1 April 2000. The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health, controlled waters or the wider environment given the current use and circumstances of the land. Part IIA provides a statutory definition of contaminated land under Section 78A(2) as:

“any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that:

(a) Significant harm is being caused or there is a significant possibility of such harm being caused; or

(b) Pollution of controlled waters is being, or is likely to be, caused.”

Part IIA provides a statutory definition of the pollution of controlled waters under Section 78A(9) as:

“the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter”

Controlled Waters are defined Section 104 of the Water Resources Act 1991. In summary, they comprise relevant territorial waters which extend seaward for three miles from the low-tide limit from which the territorial sea adjacent to England and Wales is measured.

The Environment Agency has powers under Part 7 of The Water Resources Act (1991) to take action to prevent or remedy the pollution of controlled waters, including circumstances where the pollution arises from contamination in the land. This is reinforced in The Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, 2012) which came into force in early April 2012.

Part IIA introduces the concept of a contaminant linkage; where for potential harm to exist there must be a connection between the source of the hazard and the receptor via a pathway. Risk assessment in contaminated land is therefore directed towards identifying the contaminants, pathways and receptors that can provide contaminant linkages. This is known as the contaminant-pathway-receptor link (CPR or contaminant linkage).

Part IIA places contaminated land responsibility as a part of the planning and redevelopment process, rather than Local Authority or Environment Agency directly, except in cases of very high pollution risk or where harm is occurring. In the planning process, guidance is provided by National Planning Policy Framework (NPPF) of March 2012. The NPPF requires that a site which has been developed shall not be capable of being determined “contaminated land” under Part IIA. Therefore, appropriate risk-based investigation is required to identify the contaminant linkages that can then be assessed and then mitigated using methods that can be agreed with the planners.

Source Protection Zones

Source Protection Zones (SPZs) are defined by the Environment Agency (for England and Wales), SEPA (Scotland) and the Environment and Heritage Service (Northern Ireland) for groundwater sources such as wells, boreholes and springs that are used for public drinking water supply. The zones show the risk of contamination from activities that might cause groundwater pollution in the area. The size and shape of a zone depends upon subsurface conditions, how the groundwater is removed, and other environmental factors.

SPZs are classified into four categories:

- **Zone 1 (Inner protection zone).** Any pollution that can travel to the abstraction point within 50 days from any point within the zone is classified as being inside Zone 1. This applies at and below the groundwater table. This zone also has a minimum 50 m protection radius around the abstraction point. These criteria are designed to protect against the transmission of toxic chemicals and water-borne disease.
- **Zone 2 (Outer protection zone).** The outer zone covers pollution that takes up to 400 days to travel to the abstraction point, or 25% of the total catchment area, whichever area is the largest. This travel time is the minimum period over which the Environment Agency considers that pollutants need to be diluted, reduced in strength or delayed by the time they reach the abstraction point.
- **Zone 3 (Total catchment).** This is the total area needed to support removal of water from the abstraction point, and to support any discharge from this.
- **Zone of special interest.** This may occasionally be defined as a special case. This is usually where local conditions mean that industrial sites and other potential sources of contamination could affect the groundwater source, even though they are outside the normal catchment area.

Groundwater Vulnerability Assessments

From 1 April 2010 The Environment Agency Groundwater Protection Policy began to use aquifer designations which are consistent with the Water Framework Directive. These designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems.

The aquifer designation data is based on geological mapping provided by the British Geological Survey. It is updated regularly to reflect their ongoing programme of improvements to these maps. The maps are split into two different types of aquifer designation:

- Superficial (Drift) - permeable unconsolidated (loose) deposits. For example, sands and gravels.
- Bedrock - solid permeable formations e.g. sandstone, chalk, and limestone.

The maps display the following aquifer designations:

Table 1. Aquifer Classification ("Geological Classification").

Classification	Definition
Principal Aquifers (Highly Permeable)	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.
Secondary A Aquifers	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
Secondary B Aquifers	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
Secondary Undifferentiated Aquifers	This has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
Unproductive Strata	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Environment Agency Guidance

The Environment Agency's stance on groundwater resources is:

"to protect and manage groundwater resources for present and future generations in ways that are appropriate for the risks we identify"
(Groundwater Protection: Policy and Practice GP3, 2012).

At present, the legislation and guidance pertaining to the protection of controlled waters in the UK is complex; however, the core objectives seek to enforce the position given above.

In 1992, the National Rivers Authority published their Policy and Practice for the Protection of Groundwater (PPPG), this document introduced areas of focus for developments such as Source Protection Zones (SPZs) and Groundwater Vulnerability Maps. The Policy was revised in 1998, since which there have been substantial changes in legislation, driven by key European Directives relating to groundwater include the Groundwater Directive (80/68/EEC) and the Water Framework Directive (2000/60/EC). Aspects of these directives are controlled by primary UK legislation such as the Water Resources Act 1991 as amended by the Water Act 2003. Gaps in the 1998 PPPG that emerged as the result of further legislative changes were addressed in the Environment Agency Policy document Groundwater Protection: Policy and Practice (GP3), Version 1 of November 2012. The three main parts of GP3 were:

- Groundwater principals;
- Position statements and legislation; and
- Technical information.

The Environment Agency has a tiered risk based approach to drinking water protection as summarised below:



Controlled Waters Risk Assessment

A number of tools are available (as detailed in GP3) in order for a developer of a potentially contaminated site to fulfil their obligations under the legislation. A site assessment would be required in order to identify any potential risks to controlled waters and to derive suitable clean up criteria, if required, to ensure the protection of controlled waters.

There are three main stages to any risk assessment of controlled waters:

1. Risk Screening (devise Conceptual Site Model, making reference to groundwater vulnerability maps, site setting, controlled waters context etc)
2. Generic Risk Assessment (EA Remedial Targets Methodology Tier 1 / Comparison of groundwater data with relevant standards)
3. Detailed Quantitative Risk Assessment (Consideration of aquifer properties and site specific parameters, EA Remedial Targets Methodology Tiers 2 & 3)

Risk Screening

Here, the Conceptual Site Model (CSM) is a critical tool to assessing any potentially contaminated site. The information from a robust CSM can be used to establish any pathways or receptors that do not require further assessment at an early stage. For example, it may be possible to confirm the absence of a particular sensitive controlled water receptor (such as a surface water feature) within the vicinity of the site thereby breaking the associated source-pathway-receptor pollutant linkage. Information from subsequent tiers of risk assessment, such as following intrusive investigations, are used to update the CSM accordingly.

Generic Risk Assessment - England and Wales

When undertaking the Generic Hydrogeological Risk Assessment (EA Remedial Targets Methodology Tier 1), comparison of chemical analytical results is made with those screening criteria.

In accordance with Part 2A of the Environmental Protection Act 1990, Tier Environmental has made regard to all of the Water Quality Standards (WQS) that are relevant to the specific site and a judgment has been made against the most stringent of those relevant standards:

- EQS Directive 2008/105/EC
- Priority Substances Directive 2013/39/EU
- Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015
- UK Drinking Water Standards (UK DWS)
- World Health Organisation (WHO Guidelines) for Drinking Water Quality
- Council Directive 98/83/EC on the quality of water intended for human consumption (Drinking water directive)

In some instances, the laboratory method detection limit is greater than the appropriate EQS/UKDWS value. In these instances, only measured concentrations in excess of the laboratory method detection limit have been considered likely to potentially represent a possible significant risk to controlled waters.

Please note that there is no quantitative criterion for total petroleum hydrocarbons (TPH), or speciated TPH fractions. Historically, standards provided for petroleum hydrocarbons ranges from 10µg/l (Private Water Supply Regulations 1991, removed from the 2009 regulations) to 50µg/l-1000µg/l (Surface Waters (Abstraction for Drinking Water) Regulations 1989) which related to the degree of treatment of water prior to use as drinking water. Over time, the legislative standards have been rescinded and no alternative standard provided, although the Environment Agency planned to release speciated TPH criteria (Fretwell et al., 2009).

In order to assess whether there is a potentially unacceptable risk of pollution of controlled waters, the results of the groundwater chemical analysis for TPH and BTEX were evaluated against Water Quality Standards (WQS) appropriate to the conceptual model for the site:

Table 2. Summary of Selected TPH and BTEX Water Quality Standards Selected for Tier 1 Screening

Determinand	Units	WQS Selected	Source of WQS
Aliphatics >C5-C6	µg/l	15000	Table 5.4 of CL:AIRE 2017#
Aliphatics >C6-C8	µg/l	15000	Table 5.4 of CL:AIRE 2017#
Aliphatics >C8-C10	µg/l	300	Table 5.4 of CL:AIRE 2017#
Aliphatics >C10-C12	µg/l	300	Table 5.4 of CL:AIRE 2017#
Aliphatics >C12-C16	µg/l	300	Table 5.4 of CL:AIRE 2017#
Aliphatics >C16-C21	µg/l	-	Table 5.4 of CL:AIRE 2017#
Aliphatics >C21-C35	µg/l	-	Table 5.4 of CL:AIRE 2017#
Aromatics >C5-EC7	µg/l	10	Table 5.4 of CL:AIRE 2017#
Aromatics >EC7-EC8	µg/l	700	Table 5.4 of CL:AIRE 2017#
Aromatics >EC8-EC10	µg/l	300	Table 5.4 of CL:AIRE 2017#
Aromatics >EC10-EC12	µg/l	100	Table 5.4 of CL:AIRE 2017#

Aromatics >EC12-EC16	µg/l	100	Table 5.4 of CL:AIRE 2017#
Aromatics >EC16-EC21	µg/l	90	Table 5.4 of CL:AIRE 2017#
Aromatics >EC21-EC35	µg/l	90	Table 5.4 of CL:AIRE 2017#
Benzene	µg/l	10	Priority Substance Water Framework Directive 2015 and Table 5.3 of CL:AIRE 2017#
Toluene	µg/l	74	Table 1 Water Framework Directive 2015 and Table 5.3 of CL:AIRE 2017#
Ethylbenzene	µg/l	20	R&D Technical Report P2-115/TR4, 2002
Total xylenes	µg/l	30	DoE (1997c) Hedgecott S. and Lewis S, An update on proposed environmental quality standards for xylenes in water, final report to the Department of the Environment. Report No. DoE 4273/1. Medmenham: WRc; and; Table 5.3 of CL:AIRE 2017#

Notes - # = CL:AIRE document 'Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies' (ISBN 978-1-905046-31-7, dated 2017),

Table 5.3 was referenced in the first instance from the CL:AIRE document 'Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies' (ISBN 978-1-905046-31-7, dated 2017), the to select appropriate Freshwater EQS values for benzene, toluene and total xylenes. The selected value for Ethylbenzene was derived from the proposed EQS value of 20µg/l from the Environment Agency R&D Technical Report P2-115/TR4, 2002. This represents a more conservative value than the 300µg/l value in Table 5.3.

With respect to speciated TPH CWG fractions, Table 5.3 states and refers the reader to 'See Table 5.4'. On this basis, Tier Environmental selected the World Health Organization (WHO) guide values for TPHCWG fractions in drinking water that are presented in Table 5.4 which may be considered appropriately protective of the controlled waters environment based on the conceptual site model.

Generic Risk Assessment is generally undertaken via comparison of reported leachate and/or groundwater concentrations against selected assessment criteria for the potential contaminants of concern identified for the site from a preliminary desk based assessment.

The selected Generic Assessment Criteria (GAC) derived from a Water Quality Standard (WQS) for any specific substance may not necessarily be a simple number and can often be found to be expressed as:

- Annual mean concentration;
- Maximum allowable concentration;
- 95th percentile concentration for *n* samples;
- Total concentration;
- Dissolved concentration (applicable to filtered samples)

The values may sometimes be expressed for individual substances (e.g. arsenic or for groups of substances e.g. total xylenes or sums of certain PAHs).

Environmental Quality Standards (EQS) have been used where available for Priority Substances and Priority Hazardous Substances set at a European level:

- Priority Substances Directive 2013/39/EU;
- Amending 2008/105 and 2000/118/EC

In addition, EQS values derived for Specific Pollutants have been used as presented in The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

For assessing risks to potable water abstraction supplies, UK Drinking Water Standards presented in the Water Supply (Water Quality) Regulations 2000 (SI/2000/3184) (as amended) have been applied.

In selecting a GAC for a particular site, Tier Environmental considers the following factors:

- Current use/function of the groundwater (e.g. drinking water, irrigation water, industrial use, base-flow to rivers and streams);
- Plausible, proposed or planned future uses of the water and nearby waters;
- Sensitivity of the critical receptor (e.g. human health, aquatic life); and,
- Requirements to trigger action under the legal context

In accordance with Part 2A:

"in deciding whether pollution of controlled waters is occurring, the assessor will have regard to all of the water quality standards that are relevant to the specific site and make a judgment against the most stringent of those relevant standards"

Should the Level 1 or 2 assessments indicate threshold levels to be exceeded, then there are three alternative ways in which to proceed:

- To devise suitable remedial solutions;
- To carry out more investigation, sampling, and analysis;
- To conduct a site-specific Detailed Quantitative Risk Assessment (DQRA) to whether or not the soil materials are suitable for their site-specific intended use or to devise a site-specific clean-up level.

Detailed Quantitative Risk Assessment (DQRA)

The decision to carry out a DQRA will be informed by the initial qualitative and generic assessment. The scope of any such assessment will be accurately defined by the outcomes of the former two stages. The robust CSM will be sufficiently refined by this stage that only certain contaminants of concern, certain pathways and certain receptors will require further assessment.

Additional site specific data is normally required for this stage of assessment, as explained above, more processes that are capable of affecting contaminant concentrations are considered (such as dilution and attenuation).

Remediation criteria derived will therefore be specific to each site and will be based on a detailed assessment of the potential impact at the identified receptor or compliance point. A greater level of confidence can be placed on the predicted impact on the compliance point following a DQRA.

Hazardous and Non Hazardous Substances

The Groundwater (England and Wales) Regulations 2009 control the disposal to the hydrogeological environment of potentially polluting substances which are divided into Hazardous Substances and Non-hazardous Contaminants (this roughly approximates to the former List 1 and List 2 substances).

Hazardous Substances are the most damaging and toxic and must be prevented from directly or indirectly entering the groundwater environment. Hazardous Substances include mineral oils and hydrocarbons, pesticides, biocides, herbicides, solvents and some metals. Discharge of Hazardous Substances to Controlled Waters must be prevented.

Non-hazardous Pollutants are any contaminants other than Hazardous Substances. Non-hazardous Pollutants are potentially toxic but are less harmful than Hazardous Substances, but their direct discharge to groundwater is generally not permitted and any indirect discharge to groundwater must be limited and be controlled by technical precautions in order to prevent pollution. Non-hazardous Pollutants include ammonia and nitrites, many metals and fluorides.

APPENDIX E - CHEMICAL TEST SAMPLING

Samples were selected by a representative of Tier Environmental during the site investigation works in accordance with the sampling approach described elsewhere in this report.

Samples for chemical analysis

All samples for chemical analysis were placed into clean new containers as summarised in Table 1. Unless explicitly stated elsewhere in this report, no preservatives were used to eliminate the risk that preservatives cause contaminant dissolution or analytical interference. Containers for VOC analysis were fully filled to exclude headspace.

Soil samples were dispensed as soon as possible after collection using reusable stainless steel spatulas, trowels, or similar implements.

Ground water samples were collected from boreholes using single-use Teflon bailers or dedicated Waterra tubing with foot valves, except as otherwise noted within this report. Caution was taken to avoid excessive agitation during collection

New disposable gloves were used by the engineer for the collection of each sample.

Reusable equipment was washed down with distilled or deionised water between samples, except where tarry or similarly sticky materials were present. In such cases specific cleaning procedures were adopted as specifically described elsewhere in this report.

All sub-samples taken for chemical analysis were placed into refrigerators or cool boxes containing frozen ice packs immediately after aliquoting. All samples were transferred in cool boxes containing frozen ice packs to the relevant UKAS/MCERTS accredited laboratory as soon as possible. Recommended maximum holding times before analysis are summarised in Table 1.

Table 1. Sample containers and holding times.

Analysis	Container/special requirements	Max. holding time at 4°C before analysis
Soil and sediment samples		
VOCs	30-60 g brown or green glass jar with VOC-resistant cap and inert cap liner. Must be fully filled.	14 days
TPHCWG	30-60 g brown or green glass jar with VOC-resistant cap and inert cap liner PLUS 250-500 g brown or green glass jar with unwaxed cap liner. ¹ The former must be fully filled.	14 days
All other organics	250-500 g brown or green glass jar with unwaxed cap liner.	7 days
Inorganics	Air-tight 0.5-2.0 kg plastic container (250-500 g brown or green glass jar may also be used).	14 days ²
Water samples		
VOCs	40-50 ml glass vial with VOC resistant screw cap and inert liner. Must be fully filled.	14 days
TPHCWG	40-50 ml glass vial with VOC resistant screw cap and inert liner PLUS 500-1000 ml brown or green glass bottle with screw cap and unwaxed liner. ¹ The former must be fully filled; the latter should be filled if possible.	14 days
All other organics	500-1000 ml brown or green glass bottle with screw cap. Fill if possible.	7 days
Inorganics	500-1000 ml translucent or opaque screw cap plastic <i>or</i> brown or green glass bottles. Fill if possible.	14 days ³

¹ The smaller vessel is used for analysis of the volatile components within the TPH mixture and the larger one is for the non-volatile components.

² 14 days is set as a reasonable limit for all routine analyses of soil for those inorganic components vulnerable to chemical and/or biological breakdown. Samples for sulphate analysis are vulnerable to biological sulphate-reduction but can be held for up to 28 days. For total metals, a holding period of up to 6 months is acceptable.

³ 14 days applies for all routine analyses of most inorganic components that may be vulnerable to chemical and/or biological reactions. In the specific cases of sulphide, nitrite, nitrate and phosphate analyses, storage time must not exceed 48 hours. For total metals, a holding time of up to 6 months is acceptable.

Tier Environmental standard analytical suites

The analyses included with Tier Environmental's standard analytical suites for soil, soil leachate and water samples are presented in Table 2. Other individual analyses were specified as described within this report.

Table 2. Tier Environmental Standard Analytical Suites.

Parameter	Sample type					
	Soil		Leachate ¹		Water	
		LoD ² (mg/kg or as stated)		LoD (µg/l or as stated)		LoD (µg/l or as stated)
Metals and metalloids						
Arsenic	✓	1	✓	10	✓	10
Cadmium	✓	1	✓	5	✓	5
Chromium	✓	1	✓	5	✓	5
Mercury	✓	1	✓	1	✓	1
Lead	✓	1	✓	4	✓	4
Selenium	✓	2	✓	10	✓	10
Copper	✓	1	✓	1	✓	1
Nickel	✓	1	✓	50	✓	50
Zinc	✓	1	✓	8	✓	8
Other inorganics						
Ammonia (as NH ₄ -N)					✓	15
Total sulphate	✓	100			✓	50 mg/l
Water-soluble sulphate	✓	0.1 g/l				
Hardness (as CaCO ₃)					✓	1 mg/l
Organics						
Monohydric phenol	✓	1	✓	0.5	✓	0.5
Speciated PAHs (USEPA 16)	✓	0.1	✓	0.01	✓	0.01
Total Organic Carbon	✓	0.1 wt%				
Others						
Electrical conductivity					✓	NA
pH	✓	NA	✓	NA	✓	NA

NA - Not applicable

1 Leachate preparation according to NRA (1994), 10:1 liquid to solid ratio.

2 The table presents the desired limit of detection for the analysis. Higher LoDs may be reported on analytical data sheets due to interference between analytes within specific samples or if the laboratory needed to dilute samples to achieve results within the calibrated range for that instrument.

Analytical QA procedures

Introduction

Quality Assurance (QA) is a system of review and audit that assesses the effectiveness of that product and assures the producer and user that defined standards of quality have been met. If we consider site investigation and chemical analysis, QA is the management system that ensures these measures are in place and working as intended.

QA within the laboratory form part of relevant certification programmes (such as UKAS and MCERTS) and, indeed, will be undertaken in some form by any reputable analyst, whether for a certified technique or not. Laboratory QA/QC is beyond the control of Tier Environmental and will not be considered further in this document, although the relevant laboratory documentation can be obtained upon request. QA must also form part of the design and execution of a site investigation.

Two parameters often used to assess measurement quality objectives are bias and precision. Bias is a systematic deviation in the data. For example, a positive bias (concentrations higher than in reality) would be introduced if sampling bottles were a source of the analyte and this fact was unknown. Precision is the variation in the measurements around a central 'expected' value. This could be due both to real variability in the environmental medium being measured and random errors in the analytical process. Both precision and bias can be assessed by the use of appropriate blanks and replicates within the site investigation programme.

The objectives of the QA activities undertaken in this present site investigation were to recognise and quantify systematic bias within the analytical dataset and to obtain an indication of precision. In environmental samples, much of the observed variability is likely to result from heterogeneity in the sampled medium, particularly for soil and sediment samples.

Such QA practice within the sampling programme is required by current guidance (e.g., Environment Agency report P5-065/TR (2000); Environment Agency LFTGN02 (2002); BS 10175:2026).

Alternative QA procedures to the generic approach presented in this appendix may be specified for a project, provided case-specific justification is given.

QA checking procedure (data validation)

The responsible Engineer and Project Reviewer are required to undertake data validation and provide comment on data quality within the main body of the report(s) issued, when noteworthy matters arise. This QA checking should involve:

Confirming that data reported by the laboratory have achieved the standards specified by the certification scheme (MCERTS or UKAS). This will be indicated on the analytical certificates issued by the laboratory.

Checking that the limit of detection (LoD) and limit of quantification (LoQ) achieved by the laboratory for an individual analyte is appropriate for the purposes of the report. LoD and LoQ will vary dependent upon analyte concentrations, sample matrix properties and interference from co-contaminants.

A check that the reported range of concentrations are reasonable for the analyte. For example, the dissolved concentration of an analyte in a water sample should not exceed saturation. If it does, then this merits further consideration (e.g., was colloidal organic matter or other solid-phase material present or could there have been unobserved free-phase organic liquid?) and explicit comment. At its simplest, there may be a unit error.

Where analysis involves reporting of Tentatively Identified Compounds (TICs; normally by mass spectrometry), the reviewers should check that these might reasonably be expected at the site under consideration. The uncertainties in identification by MS mean that it is not uncommon that TICs are incorrectly assigned. In cases of doubt, the analytical laboratory can re-check the raw data and confirm.

A review of the analytical precision by comparing data obtained for duplicate samples. There is no absolute threshold - variability is entirely dependent upon the sample matrix and manner in which the contaminant has entered the sample. Variability that cannot reasonably be assigned to such factors (for example a very high apparent variability in data for sediment-free water samples) should be reviewed with the laboratory. Variability that is attributable to the sample matrix can nevertheless provide important pointers to improve understanding of contaminant transport pathways and the risks posed by pollutant linkages (e.g., soil heterogeneity, the association of contamination with particular soil fractions, the presence of residual NAPL within soil pores or the role of suspended sediments in contaminant transport).

Confirmation that no errors have been introduced by data transcription, unit conversion or corrections between preliminary and certificates issued by the laboratory. The reviewer should audit a proportion (typically 5-10%) of all data from the original (final) certificates of analysis through to the equivalent values in the report for those specific samples.

It is important to consult the analytical laboratory if apparent QA issues arise. Many apparent concerns can be adequately resolved on the basis of revisiting the raw analytical data or by obtaining a better understanding of the inherent limitations of the analysis for a particular matrix or sample type.

APPENDIX F – LANDSCAPE AND PLANTING SPECIFICATION PRODUCED BY OOB



Client: TfGM

16012-OOB--XXX-XXX-L-LA-006001_Landscape and Planting Specification

P04

6001 - Bury Interchange - Phase 1

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A

Revision Table

Clauses

1.0 Revisions

1.

Date	Revision Number	Changes	Updates made by	Approved by
13/10/2025	P01	Issued for Information	JPO	MG
17/11/2025	P02	Issued for Information	JPO	MG

2.0 OOB

1. Address:
Newcastle: Door 19, Teapots 1 & 2, Hoult's Yard, Walker Road, Newcastle upon Tyne, NE6 2HL
Edinburgh: 91 George Street, Edinburgh EH2 3ES
Glasgow: 177 West George Street, Glasgow Metropolitan Area, Glasgow, G2 2LB

PREAMBLE

For the purposes of describing design intent, this specification gives reference to specific product suppliers and manufacturers.

Prepared on behalf of **Wilmot Dixon OOB** Ltd certify that they have carried out the work with due care and diligence to their best belief and knowledge based on the information available. Thus, any reliance placed on the advice and/or information given in the specification should be considered in the light of the information available and/or accessible at the time of preparation.

To be read in conjunction with Engineer's specification for all Civil and Structural works including bedding, jointing and groundwork.

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Ω End of Section

D41

Crib walls, gabions and other gravity retaining walls

To be read with preliminaries/ general conditions.

105 W02 - Proposed HVM Dwarf Wall To Union Square Access

1. Requirement: Granite Cladded Concrete Wall
2. Structural requirements
 - 2.1. Generally: HVM rated
 - 2.2. Modifications: To Engineer's specification
 - 2.3. Design: To Engineer's specification
3. Other requirements: To Engineer's specification
4. Concrete for foundations: To Engineer's specification

106 W03 - Proposed Retaining Wall To Maintenance Paths and External Steps

1. Requirement: Concrete Wall
2. Structural requirements
 - 2.1. Generally: To Engineer's specification
 - 2.2. Modifications: To Engineer's specification
 - 2.3. Design: To Engineer's specification
3. Other requirements: To Engineer's specification

Ω End of Section

F10

Brick/ block walling

Types of walling - Not Used

Testing - Not Used

Workmanship generally

430 Conditioning of clay bricks and blocks

1. Bricks and blocks delivered warm from manufacturing process: Do not use until cold.
2. Absorbent bricks in warm weather: Wet to reduce suction. Do not soak.

500 Laying generally

1. Mortar joints: Fill vertical joints. Lay bricks, solid and cellular blocks on a full bed.
2. AAC block thin mortar adhesive and gypsum block adhesive joints: Fill vertical joints. Lay blocks on a full bed.
3. Clay block joints
 - 3.1. Thin-layer mortar: Lay blocks on a full bed.
 - 3.2. Interlocking perpends: Butted.
4. Bond where not specified: Half-lap stretcher.
5. Vertical joints in brick and concrete block facework: Even widths. Plumb at every fifth cross joint.

520 Accuracy

1. Courses: Level and true to line.
2. Faces, angles and features: Plumb.
3. Permissible deviations
 - 3.1. Position in plan of any point in relation to the specified building reference line and/ or point at the same level: ± 10 mm.
 - 3.2. Straightness in any 5 m length: ± 5 mm.
 - 3.3. Verticality up to 3 m height: ± 10 mm.
 - 3.4. Verticality up to 7 m height: ± 14 mm.
 - 3.5. Overall thickness of walls: ± 10 mm.
 - 3.6. Level of bed joints up to 5 m (brick masonry): ± 11 mm.
 - 3.7. Level of bed joints up to 5 m (block masonry): ± 13 mm.

560 Coursing brickwork

1. Gauge: Four brick courses including bed joints to 300 mm.

561 Coursing brickwork with existing

1. Gauge: Line up with existing brick courses.

690 Adverse weather

1. General: Do not use frozen materials or lay on frozen surfaces.
2. Air temperature requirements: Do not lay bricks/ blocks:
 - 2.1. In cement-gauged mortars when at or below 3°C and falling or unless it is at least 1°C and rising.

- 2.2. In hydraulic lime:sand mortars when at or below 5°C and falling or below 3°C and rising, or as manufacturer's/ supplier's recommendations.
- 2.3. In thin-layer mortars when outside the limits set by the mortar manufacturer.
3. Temperature of walling during curing: Above freezing until hardened.
4. Newly erected walling: Protect at all times from:
 - 4.1. Rain and snow.
 - 4.2. Drying out too rapidly in hot conditions and in drying winds.

Additional requirements for facework

750 Colour consistency of masonry units

1. **Colour range:** Submit proposals of methods taken to ensure that units are of consistent and even appearance within deliveries.
2. **Conformity:** Check each delivery for consistency of appearance with previous deliveries and with approved reference panels; do not use if variation is excessive.
3. Facing bricks should be blended on site from a minimum of three packs to ensure an even distribution of colour and texture variation.
4. **Finished work:** Free from patches, horizontal stripes and racking back marks.

760 Appearance

1. **Brick/ block selection:** Do not use units with damaged faces or arrises.
2. **Cut masonry units:** Where cut faces or edges are exposed cut with table masonry saw.
3. **Quality control:** Lay masonry units to match relevant reference panels.
 - 3.1. **Setting out:** To produce satisfactory junctions and joints with built-in features and components.
 - 3.2. **Coursing:** Evenly spaced using gauge rods.
4. **Lifts:** Complete in one operation.
5. **Methods of protecting facework:** Submit proposals.

780 Ground level

1. **Commencement of facework:** Not less than 150 mm below finished level of adjoining ground or external works level.

830 Cleanliness

1. **Facework:** Keep clean.
2. **Mortar on facework:** Allow to dry before removing with stiff bristled brush.
3. **Removal of marks and stains:** Rubbing not permitted.

Ω End of Section

L37

External stair, ramps, handrail and balustrades systems

General

160 R01 - Proposed Guardrail to Union Square

1. Reference:: GRP Palisade Fencing
2. System manufacturer: Evergrip [or similar approved]
3. Material: GRP
 - 3.1. Finish: To match Bridge
4. Accessories: To Metrolink's specification.

240 H01 - Proposed Handrail

1. Description: To steps, sloped path and maintenance access
2. Reference:: GRP Handrail System
3. System manufacturer: Evergrip [or similar approved]
4. Material: GRP
 - 4.1. Finish: Standard
 - 4.1.1. Colour:: RAL 1013
5. Height above ground surface (to upper surface of handrail)
 - 5.1. Upper handrail: 900~1100mmmm
 - 5.2. Lower handrail: 600mm
6. Fixing:: Wall mounted when presented with wall upstand, ground fixing where no wall is available to Engineer's specification.
7. Loading:: BS EN ISO 14122-3:2001 & BS 6399-1:1996
8. Accessories: All handrails shall extend 300 mm past the nosing of the top and bottom step, with the extending section being horizontal. With mid-rail and tapping rail.
9. Notes:: To BS 8300 - Metrolink's specification.

241 H02 - Proposed Illuminated Handrail

1. Description: To Union Square Steps
2. System manufacturer: Specialist's choice [FutureServ]
3. Product Reference:: DW Windsor Garda Pro
4. Accessories: To BS 8300 - Metrolink's specification.

System performance - Not Used

Products

315 ST01 - Proposed Steps

1. Manufacturer: Marshalls Plc [or similar approved]
 - 1.1. Product reference: Conservation X Step Units
2. Standard: To BS EN 771-5.
3. Size
 - 3.1. Surface width: As per drawing

- 3.2. Going: 300 mm, top step 400mm
- 3.3. Rise: 150 mm
- 4. Colour: Silver Grey
- 5. Finish: Smooth / acid etched
 - 5.1. Slip resistance value of integral tread - water wet (minimum): per manufacturers standard
 - 5.2. Slip resistance value of integral nosing - water wet (minimum): per manufacturers standard
 - 5.2.1. Colour of integral nosing: Black
- 6. Accessories: Visibility strips to corners as per Building Regulations Part M, BS 8300 and Metrolink regulation compatibility requirements.
The contrasting material should extend 55mm in width from the front and top edge of the tread.

Fabrication

510 Fabrication generally

- 1. Design: Complete the detailed design and obtain approval prior to commencing fabrication.
- 2. Shop drawings: Submit.
- 3. Structural calculations: Submit.
- 4. Frameworks: Assemble and brace, including temporary members required for installation.
- 5. Contact between dissimilar metals: Avoid.
- 6. Fixings: Fully bolt together. Tighten bolts.
- 7. Temporary support: Do not subject members to non-design loadings.

Execution

610 Loading

- 1. Site activities: Restrict, to ensure that design loads are not exceeded, or submit proposals for temporary supports.

620 Concrete foundations generally

- 1. Standard: To BS 8500-2.
- 2. Concrete: Designated not less than GEN 1 or standard prescribed not less than ST2.
- 3. Admixtures: Do not use.
- 4. Foundation holes: Neat vertical sides.
- 5. Depth of foundations, bedding, haunching: Appropriate to provide adequate support and to receive overlying soft landscape or paving finishes.

630 Setting components in concrete

- 1. Holes:
- 2. Components: Accurately positioned and securely supported.
- 3. Concrete fill: Compact as filling proceeds.
- 4. Concrete foundations exposed to view: Finished to weathering profile to shed water and trowel smooth.
- 5. Temporary component support: Maintain undisturbed for minimum 48 hours.

650 Installation generally

- 1. Fasteners: To section Z20.

2. **Structural members:** Do not modify, cut, notch or make holes in structural members, except as indicated on drawings.
3. **Temporary support:** Do not use finished work as temporary support or strutting for other work.
4. **Applied finishes:** Substrates to be even, dry, sound and free from contaminants. Make good substrate surfaces and prepare/ prime as finish manufacturer's recommendation before application.

660 Installation of manufactured stone elements

1. **Selection:** Do not use damaged units.
2. **Accuracy**
 - 2.1. **Courses:** Level and true to line.
 - 2.2. **Faces, angles and features:** Plumb.
 - 2.3. **Setting out:** Achieve satisfactory junctions and joints with adjoining or built-in elements and components.
3. **Absorbent units:** Dampen in warm weather to reduce suction.
4. **Dowels:**
5. **Mortar joints:**
 - 5.1. **Laying:** Full bed of mortar with all joints and voids filled.
 - 5.2. **Temporary distance pieces:** Lead or stainless steel. Remove when mortar is sufficiently strong.
 - 5.3. **Appearance:** Neat and consistent.
6. **Cleanliness:** Keep facework clean. Rubbing and other abrasive or chemical cleaning methods to remove marks and stains, not permitted.
7. **Cutting of reinforced units:** Not permitted.

662 Adverse weather

1. **General:** Do not use frozen materials and do not lay on frozen surfaces.
2. **Working limits:** Do not lay blocks/ dressings:
 - 2.1. **Cement gauged mortars:** When the air temperature is at or below 3°C and falling or below 1°C and rising (unless mortar has a temperature of not less than 4°C when laid and work is thoroughly protected).
 - 2.2. **Hydraulic lime:sand mortars:** When the air temperature is at or below 5°C and falling or below 3°C and rising.
3. **Temperature of the work:** Maintain above freezing until mortar has fully set.
4. **Newly erected work:** Protect from precipitation; Prevent rapid drying in hot conditions.
5. **Remedial work:** Rake out and replace mortar damaged by frost.
 - 5.1. **Damaged work:** Rebuild.

Completion

910 Inspection

1. **Timing:** Give reasonable notice before covering up
2. **Period of notice (minimum):** 3 working days.

Ω End of Section

Q10

Kerbs/ edgings/ channels/ paving accessories

Types of kerbs/edgings and channels

110A K01 - Kerb Type 1

1. **Description:** Natural Stone - Granite
2. **Manufacturer:** Marshalls plc
 - 2.1. **Contact details**
 - 2.1.1. **Address:** Landscape House
Lowfields Business Park
Elland
West Yorkshire
HX5 9HT
 - 2.1.2. **Telephone:** +44 (0)330 0574472
 - 2.1.3. **Web:** www.marshalls.co.uk
 - 2.1.4. **Email:** info@marshalls.co.uk
 - 2.2. **Product reference:** Tarvos
3. **Standard:** To BS 7533-6:1999.
4. **Physical properties**
 - 4.1. **Finish:** Flamed
 - 4.2. **Dimensions:** 300 x 125 mm x 915 mm.
 - 4.3. **Weathering resistance:** $\leq 1.0 \text{ kg/m}^2$ as a mean with no individual value $> 1.5 \text{ kg/m}^2$ (freeze thaw durability).
 - 4.4. **Abrasion resistance:** $\leq 23 \text{ mm}$ (Wide Wheel Abrasion Test).
 - 4.5. **Bending strength:** Characteristic bending strength of 3.5 MPa with no individual result less than 2.8 MPa
 - 4.6. **Unpolished Slip Resistance Value (USRV) (minimum):** > 45 .

110B K02 - Kerb Type 2

1. **Description:** British Standard Road Kerb
2. **Standard:** To BS EN 1340.
3. **Manufacturer:** Marshalls (or similar approved)

Marshalls PLC
Landscape House
Lowfield Business Park
Elland
HX5 9HT

Phone: 0370 218 5601
Email: info@marshalls.co.uk
4. **Manufacturer:** Marshalls plc.
5. **Web:** www.marshalls.co.uk.
6. **Tel:** +44 (0)330 0574472.) .
7. **- Product reference:** 125 x 150 Half Battered Kerb
8. **Size (width x height x length):** 125 x 255 x 915 mm with 100mm upstand

9. **Special shapes:** External radius kerbs as shown on landscape drawings
10. **Finish:** Standard aggregate
11. **Colour:** Standard grey
12. **Bedding:** To Engineers specification
13. **Joints generally:** Narrow mortar

110C K03 - Kerb Type 3

1. **Description:** Concrete Pin Kerb
2. **Standard:** To BS EN 1340.
3. **Manufacturer:** Marshalls (or similar approved)

Marshalls PLC
Landscape House
Lowfield Business Park
Elland
HX5 9HT

Phone: 0370 218 5601
Email: info@marshalls.co.uk

4. **Manufacturer:** Marshalls plc.
5. **Web:** www.marshalls.co.uk.
6. **Tel:** +44 (0)330 0574472.) .
7. **- Product reference:** Standard Concrete Pin Kerb
8. **Size (width x height x length):** 50 x 150 x 915 mm
9. **Special shapes:** External radius kerbs as shown on landscape drawings
10. **Colour:** Standard grey
11. **Bedding:** To Engineers specification
12. **Joints generally:** Narrow mortar

250 Material samples

1. **Samples representative of colour and appearance of designated materials:** Submit before placing orders.
 - 1.1. **Designated materials:** Stone kerbs

Roads/paving accessories/ marking/ demarcation - Not Used

Laying

510 Laying kerbs, edgings and channels

1. **Cutting:** Neat, accurate and without spalling. Form neat junctions.
 - 1.1. **Long units (450 mm and over) minimum length after cutting:** 300 mm.
 - 1.2. **Short units minimum length after cutting:** The lower of one third of their original length or 50 mm.
2. **Bedding of units:** Positioned true to line and levelled along top and front faces, in a mortar bed on accurately cast foundations or on a race of fresh concrete.
3. **Securing of units:** After bedding has set, secured with a continuous haunching of concrete or on a race of fresh concrete with backing concrete cast monolithically.

520 Adverse weather

1. **Conditions:** Do not construct if the temperature is below 3°C on a falling thermometer or 1°C on a rising thermometer. Adequately protect foundations, bedding and haunching against frost and rapid drying by sun and wind.

530 Concrete for foundations, races and haunching

1. **Standard:** To BS 8500-2.
2. **Designated mix:** Not less than GEN0 or Standard mix ST1.
3. **Workability:** Very low.

540 Cement mortar bedding

1. **General:** To section Z21.
2. **Mix (Portland cement:sand):** 1:3.
 - 2.1. **Portland cement:** Class CEM I 42.5 to BS EN 197-1.
 - 2.2. **Sand:** to BS EN 12620, grade 0/4 or 0/2 (MP).
3. **Bed thickness:** 12-40 mm.

580 Drainage channel systems

1. **Installation:** To an even gradient, without ponding or backfall. Commence laying from outlets.
2. **Silt and debris:** Removed from entire system immediately before handover.
3. **Washing and detritus:** Safely disposed without discharging into sewers or watercourses.

620 Accuracy

1. **Deviations (maximum)**
 - 1.1. **Level:** ± 6 mm.
 - 1.2. **Horizontal and vertical alignment:** 3 mm in 3 m.

625 Regularity of paved surfaces

1. **Maximum undulation of (non-tactile) paving surface:** 3 mm.
 - 1.1. **Method of measurement:** Under a 1 m straight edge placed anywhere on the surface (where appropriate in relation to the geometry of the surface).
2. **Difference in level between adjacent units (maximum)**
 - 2.1. **Joints flush with the surface:** Twice the joint width (with 5 mm max difference in level).
 - 2.2. **Recessed, filled joints:** 2 mm.
 - 2.2.1. **Recess depth (maximum):** 5 mm.
 - 2.3. **Unfilled joints:** 2 mm.
3. **Sudden irregularities:** Not permitted.

640 Tooled mortar joints

1. **Jointing:** Ends of units buttered with bedding mortar as laying proceeds. Joints completely filled and tooled to a neat flush profile.
 - 1.1. **Joint width:** 6 mm.

Ω End of Section

Q22

Asphalt roads/ pavings

Types of paving

115 Tarmac

1. **Description:** Proposed Tarmac to external ramp
2. **Supplier:** : Contractors selection
3. **Details::** Refer to Engineer's specification

Preparatory work/ requirements

195 Hard landscaping materials specification

1. Minimum 'BRE Green Guide to Specification' online rating:

240 Acceptance of surfaces

1. **Surface:** Sound, clean and suitably close textured.
2. **Level tolerances:** To BS 594987.
3. **Kerbs and edgings:** Complete, adequately bedded and haunched and to the required levels.

Laying

310 Laying generally

1. **Preparation:** Remove all loose material, rubbish and standing water.
2. **Adjacent work:** Form neat junctions. Do not damage.
3. **Channels, kerbs, inspection covers etc:** Keep clean.
4. **New paving**
 - 4.1. Keep traffic free until it has cooled to prevailing atmospheric temperature.
 - 4.2. Do not allow rollers to stand at any time.
 - 4.3. Prevent damage.
 - 4.4. **Lines and levels:** With regular falls to prevent ponding.
 - 4.5. **Overall texture:** Smooth, even and free from dragging, tearing or segregation.
 - 4.6. **State on completion:** Clean.

320 Adverse weather

1. **Frozen materials:** Do not use.
2. **Suspend laying**
 - 2.1. During freezing conditions
 - 2.2. If the air temperature reaches 0°C, or in calm dry conditions -3°C, on a falling thermometer.
 - 2.3. **Hot rolled asphalt:** During periods of continuous or heavy rain or if there is standing water on the base.

330 Levels

1. **Permissible deviation from the required levels, falls and cambers (maximum):** In accordance with BS 594987, clause 5.2.

340 Flatness/ Surface regularity

1. **Deviation of surface:** Where appropriate in relation to the geometry of the surface, the variation in gap under a 3 m straightedge placed anywhere on the surface to be not more than:

350 Contractor's use of pavements

1. **Before use**
 - 1.1. **Timing:** allow newly laid sections to cool before trafficking.
 - 1.2. **Open-grained surface:** Fill with 0/4 mm size coated grit. Remove surplus.
 - 1.3. **Finish:** Uncoated chipping and binder surface treatment.
2. **Preparation for final surfacing**
 - 2.1. **Timing:** Defer laying until as late as practicable.
 - 2.2. **Immediately before laying final surfacing:** Clean and make good the base/ binder course. Allow to dry.
 - 2.3. **Adhesion:**
 - 2.3.1. **Application rate:**
 - 2.3.2. **Accuracy:** Uniform, without puddles.
 - 2.4. **Finishing:** Allow emulsion to break completely before applying surface.

Completion

390 Documentation

1. **Standard:**
 - 1.1. **Declaration of conformity:** Submit.
2. **Number of copies:**
3. **Submission:**

Ω End of Section

Q23

Gravel/ hoggin/ woodchip/ resin bound roads/ pavings/ overlays

Types of surfacing

160 Gravel

1. Description: Proposed Gravel to Maintenance Area
2. Supplier:: Contractor's choice
3. Gravel: Loose laid and raked to uniform thickness.
 - 3.1. Colour: Silver

Laying

315 Materials

1. Compatibility: Chippings suitable for use with respective binders/ emulsions/ resin/ epoxy.

340 Laying generally

1. Channels, gullies, etc: Keep clear.
2. Finished surfaces
 - 2.1. Lines and levels: To prevent ponding.
 - 2.2. Overall texture: Even.
 - 2.3. State at completion: Clean.

350 Cold weather working

1. Frozen materials: Do not use.
2. Freezing conditions: Do not lay pavings.
3. Cold bituminous surface dressings: Do not apply when ambient temperature is below 10°C.
4. Other dressings or overlays: As manufacturers' recommendations.

360 Drainage falls

1. Sealed surfaces
 - 1.1. Falls and cross falls (minimum): 1:40.
 - 1.2. Camber (minimum): 1:50.
2. Unsealed surfaces (minimum): 1:30.

380 Laying granular surfaces in pedestrian areas and cycle tracks

1. Permissible deviation from required levels, falls and cambers (maximum): ± 12 mm.
2. General: Spread and level in 100 mm maximum layers. As soon as possible, compact each layer.
3. Dry weather: Lightly water layers during compaction.

Completion - Not Used

Ω End of Section

Q24

Interlocking brick/ block roads/ pavings

Types of paving

110 P06 - Paving Type 6 - Maintenance Path

1. **Description:** Concrete Flags to Maintenance paths
2. **Laying course**
 - 2.1. **Material:** In accordance with BS 7533-3.
3. **Blocks:** To BS EN 1338.
 - 3.1. **Manufacturer:** Marshalls Plc [or similar approved]
 - 3.1.1. **Product reference:** Saxon
 - 3.2. **Sizes:** 600mm x 600mm x 65mm
 - 3.3. **Colour/ Finish:** Natural
4. **Jointing**
 - 4.1. **Material:** In accordance with BS 7533-3.
 - 4.2. **Joint width:** 2-5 mm.
5. **Setting out**
 - 5.1. **Bond:** 90° herringbone

Execution

200 Execution generally – concrete block and clay paver paving

1. **Standard:** In accordance with BS 7533-3.

211 Colour banding

1. **General:** Unless premixed by manufacturer, select blocks/ pavers/ setts from at least 3 3-5 separate packs in rotation, to avoid colour banding.

220 Samples

1. **General:** Before ordering, submit samples of all blocks/ pavers/ setts that are representative of colour and appearance.

240 Adverse weather

1. **General:** Do not use frozen materials or lay bedding on frozen or frost covered sub-bases.

485 Laying blocks/ pavers/ setts

1. **Setting out:** Start from an edge restraint.
2. **Cutting:** Cleanly, accurately and vertically, without spalling. Do not mark or damage visible surfaces.
3. **Cut edges:** Turn inwards where possible; do not position against edge restraints or other features.
4. **Compaction:** Vibrate to produce thoroughly interlocked paving of even overall appearance with regular joints and accurate to line, level and profile. Do not mark or damage paving units, kerbs and adjacent work.
 - 4.1. **Concrete blocks and clay pavers:** In accordance with BS 7533-3, Annex F, to site category required for laying course material.

500 Regularity of paved surfaces

1. Maximum variation in gap under a 3 m straight edge placed anywhere on the surface (where appropriate in relation to the geometry of the surface)
 - 1.1. Precast concrete paving blocks and clay pavers for flexible pavements: 10 mm.
2. Difference in level between adjacent paving units (maximum): 2 mm.
3. Sudden irregularities: Not permitted.

Completion

615 Completion of paving

1. Final compaction of the surface course: In accordance with BS 7533-3.
2. Vacuum cleaning machines: Not allowed.

Ω End of Section

Q25

Slab/ brick/ sett/ cobble pavings

General - Not Used

System performance - Not Used

Products

151 P04 - Paving Type 4

1. **Description:** Union Square granite paving to be retained / reinstated - Natural Stone Flags should new be required
2. **Standard:** To BS EN 1341.
3. **Supplier:** Marshalls Plc
 - 3.1. **Product reference:** Rosalind Granite
4. **Finish:** Flamed
5. **Sizes:** To match existing

310 P01 - Paving Type 1

1. **Description:** Natural Stone Flags
2. **Standard:** To BS EN 1341.
3. **Supplier:** Marshalls Plc
 - 3.1. **Product reference:** Brackendale Sandstone
 - 3.2. **Quarry:** India
4. **Finish:** Flamed
5. **Sizes:** 600mm wide gauge x 50mm thick x random lengths [400mm – 750mm]

320 TP01 - Tactile Paving Corduroy

1. **Description:** Tactile paving to top and bottom of steps
2. **Standard:** To DD CEN/TS 15209.
3. **Material:** Concrete
 - 3.1. **Manufacturer:** Marshalls Plc
 - 3.1.1. **Product reference:** Tactile Hazard Warning
4. **Nominal sizes:** 400x400x50mm
5. **Colour:** Buff
6. **Type of surface:** Corduroy

370 Concrete for site mixed mortar

1. **Description:** Fine Bedding Concrete
2. **Manufacturer:** Marshalls PLC
 - 2.1. **Product Reference:** Pavebed

435 Primer for underside of flags and slabs

1. **Description:** High Strength Slurry Primer and Cladding adhesive
2. **Manufacturer:** Marshalls PLC

- 2.1. Product reference: Pavebond

Execution

610 Material samples

1. Samples representative of colour and appearance of designated materials: Submit before placing orders.
 - 1.1. Designated materials: All pavings

620 Adverse weather

1. General
 - 1.1. Temperature: Do not lay or joint paving if the temperature is below 3°C on a falling thermometer or below 1°C on a rising thermometer.
 - 1.2. Frozen materials: Do not use. Do not lay bedding on frozen or frost covered bases.
2. Paving with mortar joints and/ or bedding
 - 2.1. Protect from frost damage, rapid drying out and saturation until mortar has hardened.
3. Paving laid and jointed in sand/ fine aggregate
 - 3.1. Stockpiled laying course sand/ fine aggregate: Protect from saturation.
 - 3.2. Exposed areas of unbound laying course and uncompacted areas of unbound paving: Protect from heavy rainfall.
 - 3.3. Saturated unbound laying course: Remove and replace, or allow to dry before proceeding.
 - 3.4. Laying dry sand/ fine aggregate jointed paving in damp conditions: Brush in as much jointing sand as possible. Minimize site traffic over paving. As soon as paving is dry, top up joints and complete compaction.

625 Laying pavings – general

1. Appearance: Smooth and even with regular joints and accurate to line, level and profile.
2. Falls: To prevent ponding.
3. Bedding of paving units: Firm so that rocking or subsidence does not occur or develop.
 - 3.1. Bedding/ Laying course: Consistently and accurately graded, spread and compacted to produce uniform thickness and support for paving units.
4. Slopes: Lay paving units upwards from the bottom of slopes.
5. Paving units: Free of mortar and sand stains.
6. Cutting: Cut units cleanly and accurately, without spalling, to give neat junctions with edgings and adjoining finishes.

630 Levels of paving

1. Permissible deviation from specified levels
 - 1.1. Generally: ± 6 mm.
2. Height of finished paving above features
 - 2.1. At gullies: +6 to +10 mm.
 - 2.2. At drainage channels and kerbs: +3 to +6 mm.

635 Regularity of paved surfaces

1. Maximum variation in gap under a 3 m straight edge placed anywhere on the surface (where appropriate in relation to the geometry of the surface)
 - 1.1. Precast concrete paving blocks and clay pavers for flexible pavements: 10 mm.

- 1.2. Precast concrete flags or natural stone slabs: 3 mm.
2. Difference in level between adjacent paving units (maximum): 2 mm.
3. Sudden irregularities: Not permitted.

645 Protection

1. **Cleanliness:** Keep paving clean and free from mortar droppings, oil and other materials likely to cause staining.
2. **Materials storage:** Do not overload pavings with stacks of materials.
3. **Handling:** Do not damage paving unit corners, arrises, or previously laid paving.
4. **Mortar bedded pavings:** Keep free from traffic after laying:
5. **Access:** Restrict access to paved areas to prevent damage from site traffic and plant.

690 Reclaimed natural stone

1. **Description:** Union Square granite paving to be reclaimed / reinstated
2. **Location/ Access:**
3. **Lifting/ Storage/ Protection:**
4. **Preparation:**

715 Laying flag and slab paving – mortar laying course and jointing

1. **Standard generally:** In accordance with BS 7533-4.
2. **Flag installation and cutting:** To Interpave 'Concrete flag paving'.
3. **Laying course**
 - 3.1. **Nominal thickness:** 40 mm before laying paving slabs
4. **Laying and jointing:** Marshalls PLC Pavement
5. **Joint width (nominal):** 6-10 mm

730 Laying natural stone sett paving

1. **Standard generally:** In accordance with BS 7533-7.
2. **Laying type:** Rigid.
 - 2.1. **Laying and jointing method:** Marshalls PLC Pavement
3. **Laying course**
 - 3.1. **Target thickness after compaction:** 40 mm
4. **Joint width (nominal):** 12 mm

Completion

915 Completion of paving with dry sand or fine aggregate filled joints

1. **Sand dressing:** Leave a thin layer of dry jointing sand/ fine aggregate over the paving until opened to public access
2. **Final compaction of the surface course:** In accordance with BS 7533-3.
3. **Vacuum cleaning machines:** Not allowed.

Ω End of Section

Q28

Topsoil and soil ameliorants

Clauses - Not Used

System outline

135 Planting bed topsoil system

1. **Description:** For all planted areas
2. **Composition**
 - 2.1. **Topsoil:** Imported topsoil to BS 3882
 - 2.2. **Ameliorants:** sanitized and stabilized compost to PAS 100
 - 2.3. **Accessories:** Mycorrhizal inoculant.

155 Mulching and top dressing system

1. **Description:** For all planted areas
2. **Composition**
 - 2.1. **Material:** Organic materials - bark mulch

Products

300 Preparation materials generally

1. **Purity:** Free of pests and disease.
2. **Foreign matter:** On visual inspection, free of fragments and roots of aggressive weeds, sticks, straw, subsoil, pieces of brick, concrete, glass, wire, large lumps of clay or vegetation, and the like.
3. **Contamination:** Do not use topsoil contaminated with subsoil, rubbish or other materials that are:
 - 3.1. Corrosive, explosive or flammable.
 - 3.2. Hazardous to human or animal life.
 - 3.3. Detrimental to healthy plant growth.
4. **Subsoil:** In areas to receive topsoil or planting media, do not use subsoil contaminated with the above materials.
5. **Objectionable odour:** None.
6. **Give notice:** If any evidence or symptoms of soil contamination are discovered on the site or in topsoil or planting media to be imported.

310 Materials not permitted

1. **Materials:** - Peat;- Products containing peat; and- River and canal dredgings

315 Imported topsoil to BS 3882

1. **Description:** For planted areas
2. **Quantity:** Provide as necessary to make up any deficiency of topsoil existing on site and to complete the work.
3. **Standard:** To BS 3882.
4. **Classification:** Multipurpose
 - 4.1. **Soil textural class** to BS 3882, Figure 1: Sandy loam
5. **Source:** Greenblue Urban or similar approved

5.1. Product reference: Rootsoil 20

345 Aggregates Gravel for mulch layer to rain gardens

1. Description: Pea Gravel or Pea Shingle for drainage layer to planters
2. Source: Contractor's choice
 - 2.1. Product reference: Quarried, washed, non-calcareous, sub-rounded to rounded gravel
3. Reference, description and grading
 - 3.1. Grit: 5-10mm pea shingle

355 Organic materials

1. Description: FOR CONTAINER PLANTING
2. Type: Bark mulch
3. Source: Row lawn [or similar approved]
 - 3.1. Product reference: Promulch

360 Sanitized and stabilized composted materials certified to PAS 100

1. Description: For all planted areas
2. Standard: In accordance with PAS 100.
3. Source: Submit proposals
 - 3.1. Product reference: Submit proposals
4. Horticultural parameters
 - 4.1. pH (1:5 water extract): 7.0-8.7.
 - 4.2. Electrical conductivity (maximum, 1:5 water extract): 200 mS/m.
 - 4.3. Moisture content (m/m of fresh weight): 35-55%.
 - 4.4. Organic matter content (minimum): 25%.
 - 4.5. Grading (air dried samples): 99% passing 25 mm screen, and 90% passing: 10 mm screen mesh aperture
 - 4.6. Carbon:Nitrogen ratio (maximum): 20:1.
5. Texture: Friable.
6. Objectionable odour: None.
7. Compost Certification Scheme certification: Required
8. Declaration of analysis: Submit.
9. Additional analyses: Not required
10. Samples: Not required

380 Mycorrhizal inoculant

1. Description: Apply to shrub beds at time of planting in accordance with manufacturers instructions
2. Manufacturer: Greenblue Urban [Or similar approved]
 - 2.1. Product reference: RootStart Mycorrhiza

385 Water retention gels

1. Description: FOR CONTAINER PLANTING
2. Type: Agri-polymer gel
3. Manufacturer: Green-tech or similar

- 3.1. Product reference: Broadleaf P4

401 Organic fertilizers

1. Description: FOR CONTAINER PLANTING
2. Manufacturer/ source: Contractor's choice
 - 2.1. Product reference: Submit proposals
3. Standard: In accordance with The EC Fertilizers (England and Wales) Regulations 2006
4. Purpose: General purpose fertilizer Maintenance fertilizer - March application (15:10:10 spring turf fertilizer)
5. Type: Sanitized and stabilized compost
6. Availability to plants: Slow-release

Execution

610 Topsoil analysis

1. Soil to be analysed: Imported topsoil
2. Soil analyst: submit proposals
3. Samples: Collect in accordance with BS 3882.
4. Submit
 - 4.1. Declaration of analysis: In accordance with BS 3882, clause 6 and Table 1.
 - 4.2. Additional analysis: Not required
 - 4.3. Report detailing soil analyst's recommendations.

620 Importing topsoil

1. Give notice: Before stripping topsoil for transfer to site.
 - 1.1. Notice period: 5 days

625 Sample loads

1. Description: For imported topsoil
2. Deliver to site a sample load: of 5 kg
3. Give notice: Allow inspection before making further deliveries to site. Retain for comparison with subsequent loads.
 - 3.1. Notice period: 5 days

630 Documentation for imported topsoil

1. Description: To all planted areas
2. Timing: Submit at handover.
3. Contents
 - 3.1. Full description of all soil components.
 - 3.2. Record of source for all soil components.
 - 3.3. Record drawings showing the location and depth of all soils by type and grade.
 - 3.4. Declaration of analysis: in accordance with BS 3882, clause 6 and Table 1.
4. Number of copies: 3

650 Notice

1. Give notice before
 - 1.1. Setting out.
 - 1.2. Spreading topsoil.
 - 1.3. Applying herbicide.
 - 1.4. Applying fertilizer.
 - 1.5. Visiting site during maintenance period.
2. Period of notice: 1 week

655 Mechanical tools

1. Restrictions: Do not use within 100 mm of tree and plant stems.

660 Grading subsoil for:

1. Description: All planted areas
2. Standard: In accordance with BS 8601.
3. General: Grade to smooth flowing contours to achieve specified finished levels of topsoil.
4. Areas of thicker topsoil: Excavate locally.
5. Avoid compaction.
6. Excess subsoil: Remove.
7. Imported subsoil: Greenblue Urban [Or similar approved], Rootsoil subsoil

665 Subsoil surface preparation for:

1. Description: All planted areas
2. Standard: In accordance with BS 3882.
3. General: Excavate and/ or place fill to required profiles and levels, as section D20.
4. Loosening
 - 4.1. When ground conditions are sufficiently dry to allow breaking up of soils, loosen thoroughly to specified depth
 - 4.1.1. Light and noncohesive subsoils: when dry conditions are reasonably dry, loose thoroughly to a depth of 300mm
 - 4.1.2. Stiff clay and cohesive subsoils: when dry conditions are reasonably dry, loose thoroughly to a depth of 450mm
 - 4.1.3. Rock and chalk subgrades: Lightly scarify to promote free drainage.
 - 4.2. Wet conditions: Do not loosen subsoils.
5. Stones: Immediately before spreading topsoil, remove stones larger than 50 mm.
6. Remove from site: Arisings, contaminants and debris and Builders rubble

670 Inspecting formations

1. Give notice: Before spreading topsoil for planting beds.
2. Notice period: 7 days

690 Topsoil storage heaps

1. Location: Submit proposals
2. Height (maximum): 1.0 m

3. **Width (maximum):** 4.0 m
 - 3.1. **Formation:** Loose tip and shape from the side only, without running machinery on the heap at any time.
4. **Protection**
 - 4.1. Do not place any other material on top of storage heaps.
 - 4.2. Do not allow construction plant to pass over storage heaps.
 - 4.3. Prevent compaction and contamination, by fencing and covering as appropriate.

700 Grading of topsoil

1. **Topsoil condition:** Reasonably dry and workable.
2. **Contours:** Smooth and flowing, with falls for adequate drainage.
 - 2.1. **Hollows and ridges:** Not permitted.
3. **Give notice:** If required levels cannot be achieved by movement of existing soil.

705 Handling topsoil

1. **Standard:** In accordance with BS 3882.
2. **Aggressive weeds:** Give notice and obtain instructions before moving topsoil.
3. **Plant:** Select and use plant to minimize disturbance, trafficking and compaction.
4. **Contamination:** Do not mix topsoil with:
 - 4.1. Subsoil, stone, hardcore, rubbish or material from demolition work.
 - 4.2. Other grades of topsoil.
5. **Multiple handling:** Keep to a minimum. Use or stockpile topsoil immediately after stripping.
6. **Wet conditions:** Handle topsoil in the driest condition possible. Do not handle during or after heavy rainfall or when it is wetter than the plastic limit: less 3%, to BS 1377-2

710 Spreading topsoil on:

1. **Description:** ORNAMENTAL PLANTING BEDS / PLANTERS
2. **Standard:** In accordance with BS 3882.
3. **Layers**
 - 3.1. **Depth (maximum):** 150 mm.
 - 3.2. Gently firm each layer before spreading the next.
4. **Depth after firming and settlement:** 300 mm for all shrub, perennials and ornamental grasses, subsoil to be used below
5. **Crumb structure:** Do not compact topsoil. Preserve a friable texture of separate visible crumbs wherever possible.

715 Loose tipping of topsoil

1. **Standard:** In accordance with BS 3882.
2. **General:** Do not firm, consolidate or compact topsoil when laying. Tip and grade to approximate levels in one operation with minimum of trafficking by plant.

845 Applying loose mulch

1. **Description:** For all planted areas
2. **Timing:** Immediately after planting
3. **Preparation:** Clear all weeds

4. Coverage of mulch (minimum)
 - 4.1. Container planting: 50 mm - 75mm depth [refer to details]
5. Finished level of mulch: Level with lip of planter

Completion

920 Applying mulch

1. Timing: At end of the maintenance period
2. Watering: Ensure that soil is thoroughly moistened prior to mulching, applying water where necessary.
3. Container planting: Remulch.
 - 3.1. Depth (minimum): 50-75mm deep [refer to detail drawings]

Ω End of Section

Q30

Seeding/ turfing

General information/requirements

115 Seeded and turfed areas

1. **Growth and development:** Healthy, vigorous grass sward, free from the visible effects of pests, weeds and disease.
2. **Appearance:** A closely knit, continuous ground cover of even density, height and colour.

120 Climatic conditions

1. **General:** Carry out the work while soil and weather conditions are suitable.

145 Watering

1. **Quantity:** Wet full depth of topsoil.
2. **Application:** Even and without displacing seed, seedlings or soil.
3. **Frequency:** As necessary to ensure the establishment and continued thriving of all seeding/turfing.

150 Water restrictions

1. **Timing:** If water supply is or is likely to be restricted by emergency legislation do not carry out seeding/turfing until instructed. If seeding/turfing has been carried out, obtain instructions on watering.

170 Setting out

1. **Boundaries:** Mark clearly.
2. **Delineation:** In straight lines or smoothly flowing curves as shown on drawings.

Preparation

250 Soil requirements

1. **Type**
 - 1.1. **Seeded areas:** Soil for grass swards as Section 28
 - 1.2. **Turfed areas:** Soil for grass swards as Section 28
 - 1.3. **Reinforced grass areas:** NA

Seeding

310 Proposed Grassland

1. **Description:** Seeded grassland to match Pyramid Park remediation works

311 Proposed Species Rich Lawn

1. **Supplier:** Emorsgate [or similar approved]
 - 1.1. **Mixture reference:** EL1 Flowering Lawn Mix
2. **Application rate:** 4 g/m²

312 Proposed Wildflower & Grass Meadow

1. **Supplier:** Emorsgate [or similar approved]

- 1.1. Mixture reference: EM34 Diverse Meadow Mix
2. Application rate: 4 g/m²

313 Proposed Woodland Planting

1. Supplier: Emorsgate [or similar approved]
 - 1.1. Mixture reference: EW1 Woodland Seed Mix
2. Application rate: 4 g/m²
3. Density:: Tree whips to be added creating denser areas and gaps. Average density: 1 whip / 2m²

319 Quality of seed

1. Description: for grassed and meadow areas
2. Freshness: Produced for the current growing season.
3. Certification: Blue label certified varieties.
 - 3.1. Standard: EC purity and germination regulations.
 - 3.2. Official Seed Testing Station certificate of germination, purity and composition: Submit when requested.
4. Samples of mixtures: Submit when requested.

330 Sowing

1. General: Establish good seed contact with the root zone.
2. Method: To suit soil type, proposed usage, location and weather conditions during and after sowing
 - 2.1. Distribution: 2 equal sowings at right angles to each other and diagonally to main axis

335 Grass sowing season

1. Grass seed generally: April to October

336 Wildflower sowing season

1. Wildflower seed generally: March to May or August to October

352 Edges to seeded areas

1. Description: To all grassed areas
2. Timing: After seeded areas are well established.
3. Edges: Clean straight lines or smooth curves.
 - 3.1. Mulch and soil: Draw back to permit edging.
4. Arisings: Remove.
5. Completion: Respread soil and mulch.

Turfing - Not Used

Protecting/cutting

530 First cut of grassed areas

1. Timing: When grass is reasonably dry.
 - 1.1. Height of initial growth: 40-75 mm
2. Preparation
 - 2.1. Debris and litter: Remove.

- 2.2. Stones and earth clods larger than 25 mm in any dimension: Remove
3. Height of first cut: down to 10 mm
4. Mower type: Contractor's choice
5. Arisings: Remove from site

540 First cut of meadow mix

1. Description: Wildflower Meadows
2. Preparation:
3. Debris and litter: Remove.
 - 3.1. Stones and earth clods larger than 25 mm in any dimension: Remove
4. Height of first cut: 70-100mm
5. Mower type: Contractor's choice
6. Arisings: Remove from site

590 Cleanliness

1. Soil and arisings: Remove from hard surfaces.
2. General: Leave the works in a clean, tidy condition at Completion and after any maintenance operations.

Maintenance

610 Failures of seeding/ turfing

1. Duration: Carry out the following operations from completion of seeding/ turfing until: the end of the rectification period.
2. Defective materials or workmanship: Areas that have failed to thrive.
 - 2.1. Exclusions: Theft or malicious damage.
3. Method of making good: Recultivation and reseeding/ returfing.
4. Timing of making good: The next suitable planting season

620 Maintaining

1. Description: All Grassed areas
2. Duration: Carry out the following operations from completion of seeding/ turfing until: the end of the rectification period.
3. Maximum height of growth at any time: 75 mm
4. Preparation: Before each cut remove all litter and debris.
5. Cutting: As and when necessary to a height of 10 mm.
 - 5.1. Arisings: Remove
6. Bulb planting areas: Do not cut until bulb foliage has died down.
7. Trimming: All edges.
 - 7.1. Arisings: Remove.
8. Weed control: Substantially free of broad leaved weeds.
9. Stones brought to the surface: Remove regularly.
 - 9.1. Size: Exceeding 25 mm in any dimension.
10. Areas of settlement: Make good.
11. Watering: As instructed in line with maintenance schedule

650 Maintaining grassed areas with perennial wildflowers

1. Duration: Carry out the following operations from completion of seeding/ turfing until: the end of the rectification period.
2. Preparation: Before each cut remove all litter and debris.
3. Height and frequency of cut in first growing season
 - 3.1. Time of first cut: mid-September - early October
 - 3.2. Height of first cut: 70-100mm
 - 3.3. Frequency of subsequent cutting (minimum): 2
 - 3.4. Height of growth permitted (maximum): To allow flowering of species mix
4. Height and frequency of cut in second growing season
 - 4.1. Time of cut: mid- august - early October and March
 - 4.2. Height of cut: 70-100mm
5. Trimming: All edges.
 - 5.1. Arisings: Remove.

Ω End of Section

Q31

External planting

General information/ requirements

112 Site clearance generally

1. **General:** Remove rubbish, concrete, metal, glass, decayed vegetation and contaminated topsoil.
2. **Stones:** Remove those with any dimension exceeding 50 mm.
3. **Contamination:** Remove material containing toxins, pathogens or other extraneous substances harmful to plant, animal or human life.
4. **Vegetation:** Clear scrub to ground level by flail mowing and remove arisings; retain and protect trees indicated on drawings
5. **Large roots:** Grub up and dispose of without undue disturbance of soil and adjacent areas.

118 Soil conditions

1. **Soil for cultivating and planting:** Moist, friable and (except in aquatic/ marginal planting) not waterlogged.
2. **Frozen or snow covered soil:** Give notice before planting. Provide additional root protection. Prevent planting pit sides and bases and backfill materials from freezing.

120 Climatic conditions

1. **General:** Carry out the work while soil and weather conditions are suitable.
 - 1.1. **Strong winds:** Do not plant.

125 Times of year for planting

1. **Deciduous trees and shrubs:** Late October to late March.
2. **Conifers and evergreens:** September/ October or April/ May.
3. **Herbaceous plants (including marginal):** September/ October or March/ April.
4. **Container grown plants:** At any time if ground and weather conditions are favourable.
 - 4.1. **Watering and weed control:** Provide as necessary.
5. **Dried bulbs, corms and tubers:** September/ October.
6. **Colchicum (crocus):** July/ August.
7. **Green bulbs:** After flowering in spring.
8. **Wildflower plugs:** Late August to mid November or March/ April.
9. **Aquatic plants:** May/ June or September/ October.

130 Mechanical tools

1. **Restrictions:** Do not use within 100 mm of tree and plant stems.

145 Watering

1. **Quantity:** Wet full depth of topsoil.
2. **Application:** Even and without damaging or displacing plants or soil.
3. **Frequency:** As necessary to ensure establishment and continued thriving of planting.

150 Water restrictions

1. **General:** If water supply is or is likely to be restricted by emergency legislation, do not carry out planting until instructed. If planting has been carried out, obtain instructions on watering.

160 Notice

1. Give notice before
 - 1.1. Setting out.
 - 1.2. Applying herbicide.
 - 1.3. Applying fertilizer.
 - 1.4. Delivery of plants/ trees.
 - 1.5. Planting shrubs.
 - 1.6. Planting trees into previously dug pits.
 - 1.7. Watering.
 - 1.8. Visiting site during maintenance period.
2. Period of notice: One week

170 Soil requirements

1. Type
 - 1.1. **Planted beds:** Planting bed soil system, as section Q28
 - 1.2. **Tree pits, shrub pits and other backfilling:** Plant pit backfilling soil system, as section Q28
 - 1.3. **External container planting:** Container planting growing media system, as section Q28
 - 1.4. **Mulch applied after planting:** Mulching and top dressing system, as section Q28

200 Plants/ Trees – general

1. **Condition:** Materially undamaged, sturdy, healthy and vigorous.
2. **Appearance:** Of good shape and without elongated shoots.
3. **Hardiness:** Grown in a suitable environment and hardened off.
4. **Health:** Free from pests, diseases, discoloration, weeds and physiological disorders.
5. **Budded or grafted plants:** Bottom worked.
6. **Root system and condition:** Balanced with branch system.
 - 6.1. **Standard:** The National Plant Specification
7. **Species:** True to name.
8. **Origin/ Provenance:** Grown in the United Kingdom for at least one growing season, unless otherwise approved
9. **Definition:** Origin and Provenance have the meaning given in the National Plant Specification.

215 Plants/ Trees – specification criteria

1. **Name, forms, dimensions, provenance and other criteria:** As scheduled and defined in the National Plant Specification (available on CS Design Software Limited's website).

225 Bulbs/ Corms/ Tubers

1. **Condition:** Firm, entire, not dried out or shrivelled.
2. **Health:** Free from pests, diseases and fungus.
3. **Handling:** Remove from packaging immediately.

4. **Storage:** Permitted only when necessary.
 - 4.1. **Location:** Well ventilated, dark, covered, rodent proof container, away from exhausts and fruit.
 - 4.2. **Duration:** Minimum period.
 - 4.3. **Temperature:** 18-21°C.

235 Container grown plants/ Trees

1. **Growing medium:** With adequate nutrients for plants to thrive until permanently planted.
2. **Plants:** Centred in containers, firmed and well watered.
3. **Root growth:** Substantially filling containers, but not root bound, and in a condition conducive to successful transplanting.
4. **Hardiness:** Grown in the open for at least two months before being supplied.
5. **Containers:** With holes adequate for drainage when placed on any substrate commonly used under irrigation systems.

245 Labelling and information

1. **General:** Provide each plant/ tree or group of plants/ trees of a single species or cultivar with supplier's labelling for delivery to site, showing:
 - 1.1. Full botanical name.
 - 1.2. Total number.
 - 1.3. Number of bundles.
 - 1.4. Part bundles.
 - 1.5. Supplier's name.
 - 1.6. Employer's name and project reference.
 - 1.7. Plant specification, in accordance with scheduled National Plant Specification categories.
2. **Additional information:** Submit on request: Date supplied and consignment details or reference.

246 Labelling and information

1. **Standard:** To BS 3936.

260 Plant/ Tree substitution

1. **Plants/ trees unobtainable or known to be likely to be unobtainable at time of ordering:** Submit alternatives, stating:
 - 1.1. Price.
 - 1.2. Difference from specified plants/ trees.
2. **Approval:** Obtain before making any substitution.

265 Plant handling, storage transport and planting

1. **Standard:** To CPSE 'Handling and establishing landscape plants'.
2. **Frost:** Protect plants from frost.
3. **Handling:** Handle plants with care. Protect from mechanical damage and do not subject to shock, e.g. by dropping from a vehicle.
4. **Planting:** Upright or well balanced with best side to front.

280 Treatment of tree wounds

1. **Cutting:** Keep wounds as small as possible.
 - 1.1. Cut cleanly back to sound wood using sharp, clean tools.

- 1.2. Leave branch collars. Do not cut flush with stem or trunk.
- 1.3. Set cuts so that water will not collect on cut area.
2. Fungicide/ Sealant: Do not apply unless instructed.

290 Surplus material

1. Subsoil, stones, debris, wrapping material, canes, ties, temporary labelling, rubbish, prunings and other arisings: Remove.

Plant containers - Not Used

Preparation of planting beds/ planting materials

305 Weed control

1. Locations: All planting areas
2. General: Prevent weeds from seeding and perennial weeds from becoming established, by hand weeding.

Planting shrubs/ herbaceous plants/ bulbs

400 Proposed Ornamental Planting

1. Topsoil Depth:: 450mm
2. Notes: Low maintenance ornamental mix to Union Square

401 Proposed Scrub Planting

1. Notes: Average density 2no / m² - unevenly planted to create denser areas and gaps

402 Random plant layout

1. Description: to all beds
2. Spacing: Evenly, avoiding straight lines
3. Density: As indicated on detailed planting plans

405 Shrub planting pits

1. Timing: Excavate 1-2 days (maximum) before planting.
2. Sizes: Wide enough to accommodate roots when fully spread and 75 mm deeper than root system
3. Pit bottom improvement Break up to a depth of 150 mm, incorporating 25 g of slow release fertilizer per planting pit.

480 After planting

1. Watering: Immediately after planting, thoroughly and without damaging or displacing plants or soil.
2. Firming: Lightly firm soil around plants and fork and/ or rake soil, without damaging roots, to a fine tilth with gentle cambers and no hollows.
3. Top dressing: Mulching and top dressing system, as section Q28
 - 3.1. Depth: 75mm

Planting trees

500 Proposed Tree

1. Standard: Prepare trees and transplant in accordance with BS 8545

501 Proposed Sapling

1. **New Item:** Tree whips to be added creating denser areas and gaps. Average density: 1 whip / 2m²
2. **Standard:** Prepare trees and transplant in accordance with BS 8545

510 Tree Root Barriers

1. **Manufacturer:** GreenBlue Urban Ltd
 - 1.1. **Contact details**
 - 1.1.1. **Address:** Northpoint
Compass Park
Junction Road
Bodiam
East Sussex
TN32 5BS
 - 1.1.2. **Telephone:** +44 (0)1580 830800
 - 1.1.3. **Web:** www.greenblue.com
 - 1.1.4. **Email:** hello@greenblueurban.com
 - 1.2. **Product reference:** ReRoot Root Barriers (RER1000A)
2. **Roll depth:** 1000 mm. 1000 mm.
3. **Profile:** Ribbed.

535 Tree stakes

1. **Stakes:** 3no. Softwood, peeled chestnut, larch or oak, straight, free from projections and large or edge knots and with pointed lower end.
2. **Stake size (minimum):** 75mm dia
3. **Stake length (minimum):** 600mm

576 Tree pit surfacing – loose fill

1. **Surfacing material:** Mulch, as section Q28
2. **Area:** Full extent of tree pit surface
3. **Depth:** 75 mm 75 mm
4. **Watering:** Water soil thoroughly before laying.
5. **Installation:** Ensure the base of the tree stem is kept free from loose filled material.

Woodland/ matrix/ buffer zone planting

600 Woodland work generally

1. **Services:** Check for below and above ground services, including land drainage, in the vicinity. Give notice if they may be affected and obtain instructions before proceeding.
2. **Safety:** Comply with Arboriculture and Forestry Advisory Group Safety leaflets.

605 Existing vegetation/ Weed clearance

1. **Arisings:** Remove.

680 Setting out

1. **Planting density:** Refer to detailed planting plan

2. **Layout:** Random groups of no less than 3 or more than 7 of the same species, ensuring that no three plants are aligned in any one direction.

Protecting/ maintaining/ making good defects

720 Failures of planting

1. **Defects due to materials or workmanship not in accordance with the Contract:** Plants/ trees/ shrubs that have failed to thrive.
 - 1.1. **Exclusions:** Theft or malicious damage after completion.
 - 1.2. **Rectification:** Replace with equivalent plants/ trees/ shrubs.
2. **Replacements:** To match size of adjacent or nearby plants of same species or match original specification, whichever is the greater.
3. **Timing of making good:** During the next suitable planting season In accordance with an agreed defects rectification programme

740 Cleanliness

1. **Soil and arisings:** Remove from hard surfaces and grassed areas.
2. **General:** Leave the works in a clean tidy condition at completion and after any maintenance operations.

750 Planting maintenance generally

1. **Weed control:** Maintain weed free area around each tree and shrub.
 - 1.1. **Diameter (minimum):** The larger of 1 m or the surface of original planting pit.
 - 1.2. **Keep planting beds clear of weeds:** By hoeing By maintaining full thickness of mulch
2. **Planted areas:** Fork over beds as necessary to keep soil loose, with gentle cambers and no hollows. Take care not to reduce depth or effect of mulch.
3. **Precautions:** Ensure that trees and shrubs are not damaged by use of mowers, nylon filament rotary cutters and similar powered tools.
4. **Firming up:** Gently firm loosened soil around trees/ shrubs. Straighten leaning trees/ shrubs.
5. **Trees:** Spray crown when in leaf during warm weather.
 - 5.1. **Timing:** After dusk.
6. **Tree accessories:** Check condition of stakes, ties, guys, guards and irrigation and ventilation systems.
 - 6.1. **Broken or missing items:** Replace.
 - 6.2. **Loose stakes:** Re-firm in the ground or replace as necessary to provide support to the tree.
 - 6.3. **Loose guys:** Re-firm anchor points and adjust as necessary to provide support to the tree.
 - 6.4. **Ties:** Adjust to accommodate growth and prevent constriction or abrasion.
 - 6.5. **Damage to bark:** Cut back neatly with sharp knife. Prevent further damage.
 - 6.6. **Frequency of checks:** Every two weeks
7. **Watering:** As required for healthy establishment, depending on weather conditions

780 Maintenance instructions

1. **General:** Before end of the maintenance period, submit printed instructions recommending procedures to be established by the Employer for maintenance of the planting work for one full year: Provide a schedule of any ongoing maintenance problems experienced during the rectification period.

790 Final mulching

1. **Timing:** At end of the maintenance period.
2. **Watering:** Ensure that soil is thoroughly moistened prior to remulching, applying water where necessary.

3. Planting beds: Remulch.
4. Depth (minimum): 75 mm

Ω End of Section

Q35

Landscape maintenance

Generally

110 Notice

1. Give notice before
 - 1.1. Application of herbicide.
 - 1.2. Application of fertilizer.
 - 1.3. Watering.
 - 1.4. Each site maintenance visit.
2. Period of notice: 7 Days

130 Reinstatement

1. Damage or disturbance to soil structure, planting, grass, fencing, hard landscaping, structures or buildings: Reinstatement to original condition.

155 Watering

1. Supply: Potable mains water
2. Quantity: Wet full depth of topsoil
3. Application: Do not damage or loosen plants.
4. Compacted soil: Loosen or scoop out, to direct water to rootzone.
5. Frequency: As necessary for the continued thriving of all planting. When the soil is dry in winter and frost-free, it is advisable to water regularly.

160 Water restrictions

1. General: If water supply is, or is likely to be, restricted by emergency legislation, submit proposals for an alternative suitable source of water. Obtain instructions before proceeding.

170 Disposal of arisings

1. General: Unless specified otherwise, dispose of arisings as follows:
 - 1.1. Biodegradable arisings: Remove to recycling facility
 - 1.2. Tree roots and stumps: Remove from site
 - 1.3. Shrub and tree prunings: Remove to recycling facility
 - 1.4. Litter and nonbiodegradable arisings: Remove from site

181 Mechanical equipment

1. General: Minimize.
2. Prohibited equipment: To be confirmed with CA
3. Timing: Use of mechanical equipment allowed between the hours of 10:00 am and 4:00 pm only

190 Litter

1. Extraneous rubbish not arising from the contract work: Collect and remove from site.

197 Cleanliness

1. **Soil and arisings:** Remove from hard surfaces.
2. **General:** Leave the works in a clean, tidy condition at completion and after any maintenance operations.

Grassed areas

226 Tree stems

1. **Precautions:** Do not allow nylon filament rotary cutters and other mechanical tools closer than 100 mm to the stem of any tree.
 - 1.1. **Operations close to stems:** Complete using hand tools.

250 Leaf removal

1. **Operations:** Collect fallen leaves.
2. **Special requirements:** None
3. **Disposal:** Remove from site for recycling

350 Fertilizer – spring application

1. **Type:** Organic
2. **Application rate:** 60 g/m²

360 Fertilizer – autumn application

1. **Type:** Organic
2. **Application rate:** 60 g/m²

Flower beds/ seasonal beddings

460 Beds of perennials or perennials and annuals

1. **Plant supports:** Stake and tie plants using Upright, tall, clump-forming perennial can be supported with canes or rods and twine. Use single stem ring supports to support stems of plants with large single blooms. Use grow-through circular grid support frames for bushy clump-forming perennials. Pea-sticks can also be used for both short front-of-the-border as well as taller back-of the border plants.
 - 1.1. **Length:** Support type and length to suit vigour of plant and be installed in spring, before plants have made too much growth
 - 1.2. **Maintain** throughout the growing season.
2. **Gaps in planting:** Refill by replanting.
3. **Watering**
 - 3.1. **New plants:** Before and after planting out.
 - 3.2. **Ongoing:** As necessary for the continued thriving of all planting.
4. **Operations at end of growing season**
 - 4.1. **Trim:** Older flowering stems of herbaceous perennials.
 - 4.2. **Remove:** Redundant plant supports, litter, debris and arisings.
 - 4.3. **Cultivate:** Fork over the soil, taking care not to cause undue disturbance to plants.

470 Flower beds generally

1. **Operations**
 - 1.1. **Remove:** Dead flower heads, fallen leaves, litter and debris.

- 1.2. Weeds: Thoroughly hand weed.
- 1.3. Cultivate: Lightly hoe.
- 1.4. Trim: Clip grass edges.

490 Thinning by removal of surplus plants

1. Plants to be thinned: Perennials and grasses if overcrowded
2. Standard: BS 7370-4, clause 3.5.17.1.
3. Timing: Thin when foliage of adjacent plants has begun to touch.
4. Roots
 - 4.1. Disturbance to adjacent plants: Minimize.
 - 4.2. Soil: Refill holes with topsoil to leave an even graded surface.
 - 4.3. Mulch: Maintain mulch as original specification.
5. Adjacent plants: Make good any minor damage immediately.
6. Plants for retention: Select plants with a strong healthy habit.
7. Mature planting density: To provide lush non-gappy planting without overcrowding.

Shrubs/trees/hedges

500 Establishment of new planting

1. Duration: 12 months
2. Weed control
 - 2.1. Method: Keep planting beds clear of weeds by hand weeding.
3. Soil condition: Fork over beds to keep soil loose, with gentle cambers and no hollows. Do not reduce depth or effect of mulch.
4. Watering: As necessary for the continued thriving of all planting.

502 Establishment of new planting – fertilizer

1. Time of year: March or April.
2. Type: Slow release
3. Spreading: Spread evenly.
 - 3.1. Application rate: As Manufacturer's recommendations

520 Refirming of trees and shrubs

1. Timing: After strong winds, frost heave and other disturbances.
2. Refirming: Tread around the base until firmly bedded.
3. Collars in soil at base of tree stems, created by tree movement: Break up by fork, avoiding damage to roots. Backfill with topsoil and refirm.

540 Pruning generally

1. Pruning: In accordance with good horticultural and arboricultural practice.
 - 1.1. Removing branches: Do not damage or tear the stem or bark.
 - 1.2. Wounds: Keep as small as possible and cut cleanly back to sound wood.
 - 1.3. Cutting: Make cuts above and sloping away from an outward facing healthy bud, angled so that water will not collect on cut area.
 - 1.4. Larger branches: Prune neither flush nor leaving a stub, but using the branch bark ridge or branch collar as a pruning guide.

2. **Appearance:** Thin, trim and shape each specimen appropriately to species, location, season, and stage of growth, leaving a well-balanced natural appearance.
3. **Tools:** Use clean sharp secateurs, hand saws or other approved tools. Trim off ragged edges of bark or wood with a sharp knife.
4. **Disease or infection:** Give notice if detected.
5. **Growth retardants, fungicide or pruning sealant:** Do not use unless instructed.

545 Pruning of excessive overhang

1. **Timing:** Annually
2. **Operations:** Remove growth encroaching onto grassed areas, paths, roads, signs, sightlines and road lighting luminaires.
3. **Special requirements:** None

550 Pruning of excessive height

1. **Timing:** Annually
2. **Operations:** Remove excessive height Remove excessive height As instructed.

555 Pruning trees and shrubs

1. **Standard:** To BS 7370-4.
2. **Special requirements:** None

575 Pruning ornamental shrubs

1. **General:** Prune to encourage healthy and bushy growth and desirable ornamental features, e.g. flowers, fruit, autumn colour, stem colour.
2. **Suckers:** Remove by cutting back level with the source stem or root.

605 Trimming slowly establishing hedges

1. **Operations**
 - 1.1. **Timing:** Cut back hard in June and September to encourage bushy growth down to ground level.
 - 1.2. **Form:** Allow to reach planned dimensions only by gradual degrees, depending on growth rate and habit.

620 Removal of dead plant material

1. **Operations:** At the end of the growing season, check all shrubs and remove all dead foliage, dead wood, and broken or damaged branches and stems.

625 Climbing plants

1. **Pruning:** Remove excess growth, to ensure that signs, light fittings, doors and windows are kept clear at all times.
2. **Insecure growth:** Attach to supporting wires or structures using 5-ply soft twine.
3. **Supporting structures:** Check and repair as necessary.

635 Reinstatement of shrub/ herbaceous areas

1. **Dead and damaged plants:** Remove.
2. **Mulch/ matting materials**
 - 2.1. Carefully move to one side and dig over the soil, leaving it fit for replanting.
3. Do not disturb roots of adjacent plants.

4. Replacement plants
 - 4.1. Use pits and plants: To original specification or to match the size of adjacent or nearby plants of the same species, whichever is the greater.
5. Dressing: Slow release fertilizer:
 - 5.1. Type: Landscape contractors choice
 - 5.2. Application rate: As manufacturers guidance for planting type

645 Weed control generally

1. Weed tolerance: Weed to clear ground every two weeks
2. Adjacent plants, trees and grass: Do not damage.

650 Hand weeding

1. General: Remove weeds entirely, including roots.
2. Disturbance: Remove the minimum quantity of soil, and disturb plants, bulbs and mulched surfaces as little as possible.
3. Completion: Rake area to a neat, clean condition.
4. Mulch: Reinstate to original depth.

680 Soil aeration

1. Compacted soil surfaces
 - 1.1. Prick up: To aerate the soil of root areas and break surface crust.
 - 1.2. Size of lumps: Reduce to crumb and level off.
 - 1.3. Damage: Do not damage plants and their roots.

690 Maintenance of loose mulch

1. Thickness (minimum): 75 mm
 - 1.1. Top up: Twice per year
2. Mulch spill on adjacent areas: Remove weeds and rubbish and return to planted area.
3. Weeding: Remove weeds growing on or in mulch by hand weeding.

Tree work

810 Tree work generally

1. Identification: Before starting work agree which trees, shrubs and hedges are to be removed or pruned.
2. Protection: Avoid damage to neighbouring trees, plants and property
3. Standard: To BS 3998.
4. Removing branches: Cut vertical branches similarly, with no more slope on the cut surface than is necessary to shed rainwater.
5. Appearance: Leave trees with a well-balanced natural appearance.
6. Chain saw work: Operatives must hold a Certificate of Competence.
7. Tree work: To be carried out by an approved member of the Arboricultural Association.

820 Prevention of wound bleeding

1. Standard: To BS 3998.

825 Prevention of disease transmission

1. **Standard:** To BS 3998.

835 Cutting and pruning generally

1. **Tools:** Appropriate, well maintained and sharp.
2. **Final pruning cuts**
 - 2.1. **Chainsaws:** Do not use on branches of less than 50 mm diameter.
 - 2.2. **Hand saws:** Form a smooth cut surface.
 - 2.3. **Anvil type secateurs:** Do not use.
3. **Removing branches:** Do not damage or tear the stem.
4. **Wounds:** Keep as small as possible, cut cleanly back to sound wood leaving a smooth surface, and angled so that water will not collect on the cut area.
5. **Cutting:** Cut at a fork or at the main stem to avoid stumps wherever possible.
6. **Large branches:**
 - 6.1. Remove in small sections and lower to ground with ropes and slings.
7. **Dead branches and stubs:** When removing, do not cut into live wood.
8. **Unsafe branches:** Remove epicormic shoots and potentially weak forks that could fail in adverse weather conditions.
9. **Disease or fungus:** Give notice if detected. Do not apply fungicide or sealant unless instructed.

840 Crown reduction/ shaping

1. **General:** Cut back selectively to lateral or sublateral buds or branches to retain flowing branch lines without leaving stumps.

845 Crown lifting

1. **Clearances:** Remove branch systems to give clearance.
 - 1.1. **Height:** 2.5 m above footpaths
2. **Removing branches:** Remove whole branches back to the stem, or cut lower portions of branches back to lateral or sublateral buds or branches. Do not leave stumps.

865 Bark damage

1. **Wounds**
 - 1.1. Do not attempt to stop sap bleeding.
 - 1.2. **Bark:** Remove ragged edges using a sharp knife.
 - 1.3. **Wood:** Remove splintered wood from deep wounds.
 - 1.4. **Size:** Keep wounds as small as possible.
2. **Liquid or flux oozing from apparently healthy bark:** Give notice.

Water areas - Not Used

Hard landscape areas/fencing

900 Snow clearance

1. **Clearance:** When instructed
2. **De-icing:** To roads, footpaths
 - 2.1. **Material:** Rock salt to BS 3247

- 2.2. **Timing:** When the road surface temperature falls to +1°C with forecast of freezing conditions and ice forming
When the road surface temperature falls to +1°C with forecast of freezing conditions and ice forming

910 Hard surfaces and gravel areas

1. **Hard surfaces:** Remove litter, leaves and other debris.
2. **Surface gutters and channels:** Remove mud, silt and debris.
3. **Drainage gullies:** Empty traps and flush clean.
4. **Gravel areas:** Rake over. Remove weeds, litter, leaves and debris, and level off.
5. **Repairs to flexible bituminous pavings:** In accordance with the original paving specification or BS 7370-2, clause 4.12.

920 Logic Manufactured Bespoke Timber integrated seating

1. Inspection & Cleaning

To maximise life expectancy, all products should be visually inspected on a regular basis for any signs of damage, vandalism, breakdown of surface finish, build-up of salt, dirt or atmospheric residue, and fixings are in place and tightened.

During these inspections, should any concerns be noted, then the Customer's attention is brought to the following pages whereby suitable maintenance and repair methods are described for the various materials used.

In the event of serious damage to any main component then LOGIC should be contacted immediately for detailed advice.

In addition to the visual inspection, a regular cleaning programme is also required.

The frequency of visual inspection and cleaning will be dependent on the environment in which the product is situated.

NB. This document is not designed to be exhaustive and extensive in the exacting requirements of every case. If you consider your cleaning or repair circumstances to be outside of the scope of this document, then please contact LOGIC and we will be happy to advise.

All cleaning and maintenance should be recorded, detailing the method of cleaning, what products have been used, and what repair work has been undertaken, if any.

LOGIC will require this information if any defects occur.

2. Powder Coating

This type of coating is applied electrostatically to the surface as a free-floating, dry powder before heat is used to seal the coating. The powder can be made of any number of products: polyester, polyurethane, polyester-epoxy, and acrylics. The final finish is a thick, hard wearing coating that is tougher than conventional paints. Typically, powder coat has an expected life span of 20 years depending upon the product design and geographic location.

Maintenance:

Visual inspection is required to ensure the protective coating has not been 'punctured' in any way. If this has happened, then the underlying steel will be exposed and will potentially oxidise unless there are other protective layers beneath. If the coating has been damaged, then this requires sealing straight away.

For light scratches / chips where the base material is exposed then a suitable primer should be carefully applied to the defect, followed by a topcoat finish of a matching paint or touch up.

For larger damages, the area may require 'filling' to bring it back up to the same level. A suitable epoxy car-body filler can be used and can easily be sanded back. This should then be followed by a topcoat finish of a matching paint or touch up.

Cleaning:

This finish can simply be cleaned with using a solution of warm water and non-abrasive, pH neutral detergent solution. You can use a soft cloth, sponge or a soft natural bristle brush. Make sure you thoroughly rinse the surfaces after cleaning to remove all residues.

At no time during the cleaning process is it advisable for any abrasive cleaners, solvents, or any other chemicals, to be used.

3. Stainless Steel

Stainless steel, as the name indicates, is stain-less meaning it has a high resistance to corrosion. This is due to the various alloys contained within the steel, one of which is Chromium which produces a thin layer of oxide on the surface of the steel. This prevents any further corrosion of the surface. There are various grades of Stainless which come from the differing alloy content; depending on the environment in which they are going, a suitable grade would be selected.

The steel is available in a variety of finishes; polished, brushed, matt, bead-blasted, and can also be powder coated if required. Typically, stainless steel has an expected life span of 40 years depending upon the stainless grade, product design and geographic location.

Maintenance:

Some grades of stainless steel will stain and discolour in certain conditions due to surface deposits and cannot be considered completely maintenance-free. In order to retain maximum corrosion resistance and aesthetic appeal, the surface of stainless steel must be kept clean. Provided the grade of stainless steel and the surface finish are correctly selected, and cleaning schedules carried out on a regular basis then good performance and long service life is assured.

Cleaning:

Cleaning of this finish can simply be carried out with using a solution of warm water and non-abrasive, detergent solution. Alternatively, a mild solution of white vinegar and water can be used. Use a soft cloth, sponge or a soft natural bristle brush. Make sure you thoroughly rinse the surfaces after cleaning to remove all residues and drying the steel will further enhance its appearance.

If the steel becomes extremely dirty due to long periods of neglect, or subject to an aggressive environment, mild abrasion may be required. Nylon scourers, or Stainless-Steel soap pads, can be used carefully. Ordinary steel scourers should not be used.

On brushed finishes, nylon abrasive blocks may be used to remove minor surface imperfections, ground in dirt and scratches. These blocks are flexible and are impregnated with grit. NB they must always be used in the same direction as the original polishing marks.

4. Timber

Douglas Fir – Class 3

Sometimes known as Oregon pine or Columbian pine and is a native species of North America. This timber can be successfully used in the outside environment and has a high strength / weight ratio and is subject to low shrinkage and good stability. Douglas Fir also scores particularly high regarding suitability / green credentials thanks to the speed & location of growth (UK).

Left in its natural state, Douglas Fir will turn silvery grey in time. This can be delayed / stopped by application of surface treatments. During the interim period, the surface of the timber may show signs of discolouration and/or surface mildew which is part of the natural weathering process. This is something that will have been covered in the design stage of the product and is mentioned in the Maintenance section below. Typically, Douglas Fir has an expected life span of 15 years depending upon the product design and geographic location.

Maintenance:

A visual check should be completed at least annually, whereby any splinters or sharp edges of the timber should be lightly sanded to remove them. Also, check for any unwanted surface build up and/or surface mold.

If the timber has had any surface treatment applied, then this should be inspected and re-applied as necessary. The frequency of this treatment will depend on location of the timber. Areas subject to severe environmental impact will require more frequent maintenance.

Cleaning:

Surface dust and debris can be removed with a soft brush, whereas more engrained dirt, guano, or surface mold will require greater agitation with a stiff brush. Care should be taken not to damage the surface of the timber.

925 Tobermore Concrete block paving

1. Product Maintenance

Routine cleaning and maintenance is required to keep the overall appearance of products in pristine condition.

All concrete products can develop algae, lichen, and moss growths due to environmental conditions and

may require cleaning. Areas adjacent to plant borders and trees may discolour from transfer of plant-life. Tobermore cannot accept responsibility for any of these conditions.

2. Light coloured paving Blocks
Light coloured paving blocks and flags emphasise tyre marks and oil spills on the driveway. Please note that these products will need more maintenance if overall appearance is to be maintained.
3. Initial Cleaning
When an area has just been paved, allow it to settle for a few days. After this, you may wish to lightly hose down the paving to remove any excess sand or dirt. The area should then be treated with a weed killer suppressant two – three times per year as required.
4. General Cleaning
Paving requires regular maintenance, including regular sweeping to prevent the build up of detritus. Tobermore recommends that paving is cleaned two – three times per year.
For general cleaning of dirt and algae, vigorous brushing with a stiff yard brush with plenty of hot detergent solution (washing up liquid or non-bio washing powder), thoroughly rinsed with clean water, should suffice. Repeated treatment may be required for paved areas sited beneath trees or in permanent/near permanent shade.
A light power hose at medium pressure is generally all that is required to clean general dirt and grime. Any jointing material which is removed must be replaced. Do not use high pressure powerwashers as aggressive power-washing can damage the product surface. A trial area should be tested before large scale powerwashing takes place. (Important: EasyClean products should not be pressure washed. Please refer to specific EasyClean information)
5. Moss, Lichen and Algae
Thick growths of moss or lichen must be removed first by scraping out the joints and then treating the area with a moss killer such as anti-moss paving cleaner. Anti-moss is designed to remove moss, lichens and algae. It is best applied in dry weather. After being applied it will take a few days to be fully effective. Once the moss and lichens have been killed, they can easily be brushed off. Anti-moss also leaves a residue in the sand joint which will help reduce the likelihood of re-growth. The manufacturer's instructions should always be followed when using any cleaning agent.
6. Weeds
Large weeds should be removed by hand and then the area treated with a weed killer (available from any good garden centre). Smaller weeds can then be treated directly with weed killer and these weeds should start to die within days. The manufacturer's instructions should always be followed when using any weed killing agent.
7. Block Paving Sealer
It is possible to seal block paving with a resin material which combats staining and weed growth and which also enhances colour and appearance. The acrylic sealer is sprayed onto the block paving and forms a 'skin' on top of the paving and the jointing material giving an easily maintained finish. The manufacturer's instructions should always be followed when using any sealing agent. (Important: Do not use sealers on EasyClean products)

930 Marshalls PLC Commercial cleaning for concrete block paving, natural stone and Pavé drain

1. Commercial Cleaning and Maintenance Manual [see attachment]
2. Cleaning and Maintenance Guidelines - Commercial Natural Stone [See attachment]
3. Pavé Drain Maintenance [See attachment]

Ω End of Section

Q38

Green walls

General - Not Used

Performance - Not Used

Products

305 W01 - Proposed Vegetated Retaining Wall

1. **Manufacturer:** Flex MSE [or similar approved]
 - 1.1. **Product reference:** Vegetated Retaining Wall
2. **Purpose:** to ramp area
3. **Note::** To Manufacturer's detail and specification

Execution

602 Climatic conditions

1. **Generally:** Prevent frost damage or drying-out of plants. Do not work with frozen materials.
2. **Adverse weather:** Secure unfinished work from damage and wind uplift.

604 Substrate preparation

1. **Preparation:** Clear wall surface of debris and existing coverings. Make good.
2. **Additional work required:** Give notice.

605 Installation generally

1. **Component assembly:** Carry out as much assembly as possible in the workshop prior to installation on site.
2. **Joints:** Secure rigidly, reinforce where necessary and fix with hairline abutments.
3. **Electrolytic corrosion:** Prevent. Submit proposed methods.
4. **Identification of products:** When marking or tagging products to facilitate identification during assembly, handling, storage and installation, do not mark surfaces visible in completed system.
5. **Contamination:** Do not use materials detrimental to healthy plant growth.
6. **Tolerances**
 - 6.1. **Width:**
 - 6.2. **Height:**
7. **In situ welding:**
8. **Temporary protective coverings:** Remove at completion.

610 Pre-installation survey

1. **Primary support structure (substrate):** Carry out a sufficiently detailed survey to verify that required accuracy of erection can be achieved.
2. **Survey results:** Submit. Confirm that the structure will allow the accuracy and security or erection required by specification. Give notice of all areas of structure that do not meet the requirements.
3. **Timing:** Before commencement of installation on site.

620 Installing waterproof membranes

1. **General requirements:** Visually inspect waterproof membrane prior to installation. Report any damage.
2. **Continuity:** No breaks in waterproof layer. Minimize joints.
3. **Sheet laps**
 - 3.1. **Overlap (minimum):** 150 mm.
 - 3.2. **Sealing:**
4. **Sheet repairs and punctures:** Seal with lapped patch of waterproof membrane and continuous band of sealant tape along edges.

655 Installing divided modular units

1. **Alignment:** Ensure correct alignment with support structure placement. Vertically and horizontally square.
2. **Fixing:**
3. **Joints**
 - 3.1. **Type:**
 - 3.2. **Gaps:**
4. **Irrigation system:** Install header pipe as work progresses.

Completion - Not Used

Ω End of Section

Q40

Fencing

Fencing systems - Not Used

Gates, posts and stiles

570 G01 - Proposed GRP Maintenance Gate

1. **Manufacturer:** Evergrip [or similar approved]
 - 1.1. **Product reference:** Gates to match adjoining fence type and height
2. **Locking Mechanism::** KABA Keys - Mechanical Locking System
3. **Accessories:** To BS 8300 / BS 9999 - Metrolink's specification.

571 G02 - Proposed Handrail Gate

1. **Manufacturer:** Evergrip [or similar approved]
 - 1.1. **Product reference:** Gates to match existing handrail type and height
2. **Locking Mechanism::** KABA Keys - Mechanical Locking System
3. **Accessories:** To BS 8300 / BS 9999 - Metrolink's specification.

Accessories - Not Used

Execution

710 Installation generally

1. **Set out and erect**
 - 1.1. **Alignment:** Straight lines or smoothly flowing curves.
 - 1.2. **Tops of posts:** Following profile of the ground.
 - 1.3. **Setting posts:** Rigid, plumb and to specified depth, or greater where necessary to ensure adequate support.
 - 1.4. **Fixings:** All components securely fixed.

720 Setting posts in concrete

1. **Standard:** To BS 8500-2.
2. **Mix:** Designated concrete not less than GEN1 or Standard prescribed concrete not less than ST2.
3. **Alternative mix for small quantities:** 50 kg Portland cement to 150 kg fine aggregate to 250 kg 20 mm nominal maximum size coarse aggregate, medium workability.
4. **Admixtures:** Do not use.
5. **Holes:** Excavate neatly and with vertical sides.
6. **Filling:** Position post/ strut and fill hole with concrete to not less than the specified depth, well rammed as filling proceeds and consolidated.
7. **Backfilling of holes not completely filled with concrete:** Excavated material, well rammed and consolidated.

760 Nailed wood rails

1. **Length (minimum):** Two bays, with joints in adjacent rails staggered.
2. **Fixing:** Nail each length of rail to each post with two 100 mm galvanized nails.

3. Rails with split ends: Replace.

770 Site cutting of wood

1. General: Kept to a minimum.
2. Below or near ground level: Cutting prohibited.
3. Treatment of surfaces exposed by minor cutting and drilling: Two flood coats of solution recommended for the purpose by main treatment solution manufacturer.

780 Making good galvanized surfaces

1. Treatment of minor damage (including on fasteners and fittings): Low melting point zinc alloy repair rods or powders made for this purpose, or at least two coats of zinc-rich paint to BS 4652.
2. Thickness: Apply sufficient material to provide a zinc coating at least equal in thickness to the original layer.

Completion

910 Cleaning

1. General: Leave the works in a clean, tidy condition.
2. Surfaces: Clean immediately before handover.

920 Fixings

1. All components: Tighten.
 - 1.1. Timing: Before handover.

930 Gates

1. Hinges, latches and closers: Adjust to provide smooth operation. Lubricate where necessary.
 - 1.1. Timing: Before handover.

Ω End of Section

Q41

Barriers/ guardrails

Types of barriers/ guardrails - Not Used

Performance/ inspection/ testing - Not Used

Installation

405 Competence

1. **Operatives:** Contractors must employ competent operatives.
2. **Qualifications:** Submit certification of training.

420 Alignment

1. **Erection:** Fences/ barriers to present a flowing alignment. Tops of posts to follow ground profile.
2. **Tolerance:** ± 30 mm of prescribed alignment and, within any 10 m length, ± 15 mm from the straight or required radius.

430 Erection generally

1. **Protection:** Coat all internal and external surfaces of aluminium and steel posts below and up to 150 mm above ground level, with two coats of bituminous paint to BS 6949 type 2, unless other applied surface finish is specified.
2. **Prevention of electrolytic corrosion:** Isolate dissimilar metals.
3. **Steel components:** Do not drill, cut or weld after galvanizing.

480 Concrete foundations for posts

1. **Excavations:** To have vertical sides. Dispose of all arisings. Blind excavation bottoms with a 50 mm layer of concrete.
2. **Concrete mix:** To BS 8500-2, Designated mix not less than GEN 4 or Standard mix not less than ST5. Do not use admixtures.
3. **Placing concrete:** Fill holes to the specified depth and fully compact. Do not backfill for at least four days.
4. **Temporary support to posts:** Provide for a at least four days after placing concrete.

510 Preparation for site painting

1. **Preparation and application:** As soon as possible after installation of barriers/ guardrails.

Completion - Not Used

Ω End of Section

Q50

Site/ street furniture/ equipment

Gates, barriers and parking controls

192 F03 - Proposed HVM Bollard To Union Square Access

1. Manufacturer: Marshalls [or similar approved]
 - 1.1. Product reference: Rhinoguard Geo 75 40 Protective Bollard
2. Material: Stainless Steel
3. Dimensions
 - 3.1. Height: 1100mm
 - 3.2. Length below ground: 600mm.
4. Accessories: include sleeve
5. OverallDiameter: 204 mm.
6. Method of fixing: To Manufacturer's detail and specification

Site and street furniture

220A F01 - Proposed Bench

1. Description: Steel and Timber Bench - no Armrest and no Backrest
2. Manufacturer: Marshalls [or similar approved]
 - 2.1. Product reference: Geo Bench
3. Features : At Union Square, to be provided without armrests and backrest
4. Length: 1800mm
5. Material: 316 Grade Stainless Steel and Iroko hardwood
 - 5.1. Finish: Standard
6. Method of fixing: Refer to Manufacturer's specification

220B F02 - Proposed Seat

1. Description: Steel and Timber Seat
2. Manufacturer: Marshalls [or similar approved]
 - 2.1. Product reference: Geo Seat
3. Length: 1800mm
4. Material: 316 Grade Stainless Steel and Iroko hardwood
 - 4.1. Finish: Standard
5. Method of fixing: Refer to Manufacturer's specification

250 S01 - Metrolink Flag Sign

1. Description: Standard Metrolink "Flag" Stop Sign
2. Manufacturer: TfGM / Metrolink approved signage manufacturer, or similar approved
3. Material: Aluminium panel with high-performance retro-reflective sheeting. Sign support post: brushed or satin-polished stainless steel, grade 316 for external use
 - 3.1. Finish: All exposed metalwork in satin-polished stainless steel or PPC finish in Metrolink standard colour, with contrasting background to ensure legibility and visual contrast for partially sighted users
4. Size: Final dimensions to Metrolink standard detail for stop name flag signs

5. **Method of fixing:** Post base fixed to platform structure to manufacturer's detail and specification, coordinated with Metrolink ITS

251 S02 - Cyclist Dismount Sign

1. **Description:** Standard "Cyclists Dismount" regulatory Sign
2. **Manufacturer:** TfGM / Metrolink approved signage manufacturer, or similar approved
3. **Features :** Mounted to existing lamp post on pedestrian / cycle approach to the Metrolink bridge stop, positioned to maintain minimum 2.3 m clearance above footway
4. **Material:** Sign face: Aluminium substrate with Class RA2 (or better) retro-reflective sheeting
5. **Method of fixing:** Fixing brackets and clips: Stainless steel to suit host lighting column diameter, designed to avoid drilling of column.

350 E01 - Proposed Nest Box - Closed fronted

1. **Manufacturer:** Schwegler [or similar approved]
 - 1.1. **Product reference:** Nest Box 1B
2. **Material:** Woodcrete
3. **Method of fixing:** Galvanised steel hanger and aluminium nail

351 E02 - Proposed Bat Box

1. **Manufacturer:** Schwegler [or similar approved]
 - 1.1. **Product reference:** Bat Box 2F universal
2. **Material:** Woodcrete
3. **Method of fixing:** Galvanised steel hanger and aluminium nail

352 E03 - Proposed Bug Hotel

1. **Manufacturer:** NHBS [or similar approved]
 - 1.1. **Product reference:** Bug Hotel
2. **Material:** FSC Certified Exterior Grade Plywood
3. **Method of fixing:** 2 mounting holes in top of back panel

353 E04 - Proposed Deadwood Log Piles

1. **Material:** Using felled trees on site

Installation

510 Concrete foundations generally

1. **Standard:** To BS 8500-2.
2. **Concrete:** Refer to engineers spec
3. **Admixtures:** Do not use.
4. **Foundation holes:** Neat vertical sides.
5. **Depth of foundations, bedding, haunching:** Appropriate to provide adequate support and to receive overlying soft landscape or paving finishes.

515 Setting components in concrete

1. **Holes:** To suit furniture requirement
2. **Components:** Accurately positioned and securely supported.

3. **Concrete fill:** Fully compacted as filling proceeds.
4. **Concrete foundations exposed to view:** Compacted until air bubbles cease to appear on the upper surface, then weathered to shed water and trowelled smooth.
5. **Temporary component support:** Maintain undisturbed for minimum 48 hours.

550 Damage to galvanized surfaces

1. **Minor damage in areas up to 40 mm² (including on fixings and fittings):** Make good.
 - 1.1. **Material:** Low melting point zinc alloy repair rods or powders made for this purpose or at least two coats of zinc-rich paint to BS 4652.
 - 1.2. **Thickness:** Sufficient to provide a zinc coating at least equal to the original layer.

560 Site painting

1. **Timing:** Prepare surfaces and apply finishes as soon as possible after fixing.

Ω End of Section

