

BAE SYSTEMS Environmental Detailed Verification Plan to Discharge Planning Condition 23g of Consent 09/0527/PP

Remediation and Bulk Earthworks, Bishopton
BAE Systems Property Investments Ltd


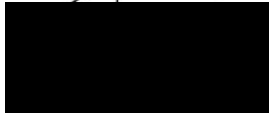



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DOCUMENT CONTROL

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1. INTRODUCTION

1.1. Background

Under a Notification of Consent for engineering operations comprising remediation and earthworks at Station Road Bishopton, dated 23 March 2010 (Application Number 09/0527/PP), 39 planning conditions were attached to the Decision Notice. A number of these are pre-commencement conditions that require discharging before the engineering works can commence.

One of the pre-commencement conditions, Condition 23, requires the submission of further documents for the written approval of the Planning Authority. Condition 23 states:

'Prior to any demolition, clearance, enabling, building or other works commencing on the site, the following documents, as listed within supporting documents supplied by BAE, shall be submitted for the written approval of the Planning Authority. The proposed content of each plan shall be approved in writing with the Planning Authority in consultation with SEPA. Thereafter all works shall be undertaken in accordance with the approved documents:

- (a) Water Management Plan (including impact of remediation);*
- (b) Logistics Management Plan;*
- (c) Material Handling and Storage Plan;*
- (d) Site Clearance Method Statement;*
- (e) Building Decontamination Method Statement;*
- (f) Asbestos Monitoring Plan;*
- (g) Detailed Verification Plan;*
- (h) Detailed Monitoring Plan;*
- (i) Remediation & Construction Traffic Management Plan (possibly incorporated into the overall Traffic Management Plan); and*
- (j) A phased Submission of Information Statement"*

This Detailed Verification Plan is submitted to allow the discharge of Condition 23(g) of Consent reference 09/0527/PP.

This report draws on the information already presented to Renfrewshire Council in support of Consent reference 09/0527/PP (documents pre March 2010) and those presented post March 2010 to discharge particular planning conditions associated with Consent reference 09/527/PP.

These documents are:

- Preliminary Risk Assessment for Land Contamination, Desk Study, Bishopton, ref A0138-00-R1-1 (BAE Systems Environmental 2005)

- Stage 1 Site Investigation Outline Strategy, Bishopton ref. A385-00-R1-1 (BAE Systems Environmental, 2005)
- Stage 1 Factual Report, Bishopton, ref A0385-00-R4-1 (BAE Systems Environmental, 2006)
- Generic Quantitative Risk Assessment Report (GQRA), Bishopton, ref A385-00-R5-1 (BAE Systems Environmental, 2006)
- Stage 2 Site Investigation Strategy, ref. B0014-0G-R4-2, (BAE Systems Environmental, 2008)
- Stage 2 Site Investigation Factual Report, ref B0060-00-R1-1 (BAE Systems Environmental, July 2009)
- Stage 2 Site Investigation Interpretative Report, ref B0060-00-R2-1 (BAE Systems Environmental, July 2009)
- Remediation Strategy, Remediation and Bulk Earthworks, Bishopton, ref B0064-OC-R1-1 (BAE Systems Environmental, July 2009)
- Verification Strategy, Bishopton, ref B0064-OC-R2-1 (BAE Systems Environmental, July 2009)
- Monitoring Plan, Bishopton, ref B0064-OC-R3-1 (BAE Systems Environmental, July 2009)
- Justification Document Recreational Landscape Mounds Bishopton (BAE Systems Environmental, February 2010)
- Land Quality Management Areas Justification Document, Bishopton, ref B0091-OC-R1-1 (BAE Systems Environmental, June 2010)

As such, this document provides a detailed verification plan at the site-wide scale and a framework on which a detailed verification plan for each Land Quality Management Area (LQMA) can be developed as part of the Remediation Method Statement for each LQMA as required. Notwithstanding this a detailed scope for verification is included in this document and this will be used and reflected as the basis for verifying each LQMA. There may be LQMA specific needs that will not have been captured in this document and would therefore be further described and detailed in the LQMA's Remediation Method Statement.

1.2. Definitions

The term 'Site' refers to land owned by BAE Systems to the south-west of Bishopton village encompassing the former Royal Ordnance factory, as shown in Figures 1.

Figure 2 shows the proposed land uses of the Site, whilst Figure 3 shows the location of each of the 34 Land Quality Management Areas within the Site.

For the avoidance of doubt the use of the phrase 'earthworks' covers movement of all site generated soils, not just those from within the 'bulk earthworks' zones shown as Drawing 10 Bulk Reclamation Earthworks (Cass reference 905/P/23) within the Remediation Strategy (report reference B0064-OC-R1-1, July 2009).

2. OVERVIEW OF THE REMEDIATION STRATEGY AND VERIFICATION PLAN

A verification plan sets out the requirements for gathering data to demonstrate that remediation meets the remediation objectives and criteria.

A remediation objective is a site-specific objective that relates solely to the reduction or control of the risks associated with one of more pollutant linkages. Remediation criteria are measures (usually, but not necessarily, expressed in quantitative terms) against which compliance with remediation objectives will be assessed.

The objectives of the Bishopton remediation scheme as a whole can be split between management objectives and technical objectives as follows in sections 2.1 and 2.2, where the technical objectives are in addition to those relating solely to pollutants.

The proposed Core Development Area (CDA), existing Environmental Testing Facility (ETF) and proposed areas of Recreational Open Space / Community Woodland Park (ROS) are shown in Figure 2.

In general terms within the CDA, the remediation follows a strategy that allows for the removal of man-made infrastructure and accommodates the removal of identified contaminated soils either from a human health and/or water environment perspective.

Within the ROS (land outwith the CDA), in general terms, all above ground structures will be demolished to ground level and where there are no risks to human health or the water environment, it is intended that below ground structures, including process drains will remain.

The ETF will remain a secure and fenced BAE Systems commercial operational facility. Further consideration will be given to remedial works required within LQMA's located within the ETF. Verification of any works described in the LQMA specific Remediation Method Statement will follow the detailed principles laid down in this document. Section 7 presents a list of possible LQMA specific requirements which may result in deviation from the principles laid down in this plan.

Each LQMA (Figure 3 refers) is to be further assessed and supported by a Remediation Method Statement (RMS) which is to be agreed by the Planning Authority before works commence on that LQMA (Condition 33).

Remediation of the wider site is to be undertaken over a 15 year plan period and it is anticipated that a RMS for each LQMA, including the level of verification that will be undertaken within each LQMA, will be provided sequentially over the plan period.

A summary of all key remediation activities is provided in Section 2.3 below.

2.1. Management objectives

- To produce a remediation strategy that can be agreed with all key stakeholders.
- To meet all regulatory requirements applicable to the development on contaminated land i.e. Planning Advice Note PAN33 Development of

Contaminated Land (Scottish Executive 2000) and to consider the views of key stakeholders on how unacceptable risks should be managed.

- To meet all regulatory requirements during the implementation of the remediation options.
- To avoid unacceptable health and safety and environmental impacts during remediation.
- To carry out remediation in accordance with good technical practice.
- To achieve successful phased remediation within the timescales required by the development and at a cost that is commensurate with the viability of the proposed scheme.

2.2. Technical Objectives

- The remediation options employed must be effective in reducing or controlling the risk.
- The remediation options must be feasible and practical taking into consideration factors such as the ground conditions, environmental setting, ecological issues and the phasing of the development.
- The remediation options employed must be durable and provide a robust solution over the lifetime of the project (and beyond).
- Sustainability of the strategy in terms of how it fits other environmental objectives e.g. habitat enhancement, use of natural resources, and avoids or minimises adverse environmental impacts e.g. transportation, water environment, air, off site landfill.
- To consider the additional benefits of the strategy in terms of enhancement of amenity and ecological value.

2.3. Site-Wide Remediation Activities

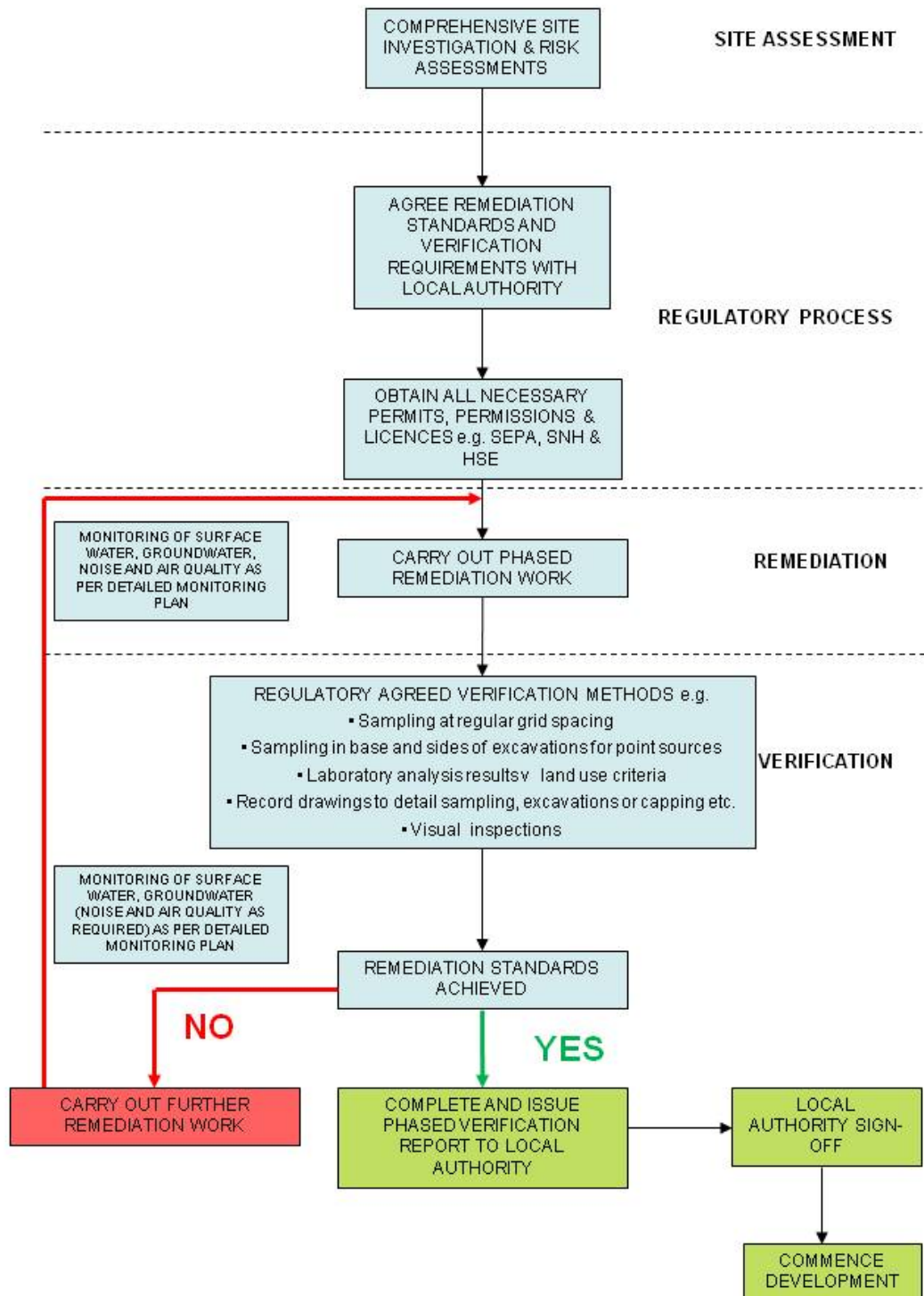
The principal remediation activities proposed to meet these objectives and mitigate the identified pollutant linkages are as follows:

1. Building decontamination.
2. Removal of redundant buildings and ancillary structures.
3. Removal of known or encountered sub-surface structures and services within the Core Development Area (CDA). Figure 2 shows the proposed land uses.
4. Removal of known or encountered contaminated sub-surface structures and services within the Community Woodland Park area of the site out with the CDA (Figure 2 refers).
5. Establishment on site of a dedicated Licensed Landfill to receive non-hazardous contaminated materials including a stable non-reactive cell to receive, for example, all asbestos containing materials (including soils). The landfill (actually a land-raise) is subject to separate planning permission and regulatory permitting (PPC).

6. Excavation and removal of known or encountered contamination hotspots within soils where applied thresholds have been exceeded, followed by verification testing and backfilling with site-won suitable recycled materials.
7. Excavation and removal of near surface soils and made ground materials around buildings and transport route areas of the site and other areas where a potential risk of above threshold contaminants have either been identified or is considered likely to be present, followed by verification testing and backfilling with site-won suitable materials.
8. Carry out a 'confidence scrape' of the otherwise 'undisturbed' surfaces of the CDA (this 'confidence scrape' comprising two types of material, reworked soils (made ground) and topsoil) followed by verification sampling and testing of the newly exposed surfaces.
9. Capping of the larger former burning grounds in the Community Woodland Park area using suitable soils to remove the potential for unacceptable pollutant linkages to humans by breaking pollutant linkages and to the water environment by reducing infiltration. Other works, prior to capping, including source removal may be required to break linkages to the water environment.
10. Non-intrusive (walkover inspection) and clearance of the existing perimeter green space and forested site areas (within the remediation planning application boundary) of surface hazardous items and litter.
11. Verification including sampling and analysis of soils. This is to be carried out on both a targeted and general site grid basis.

An outline of the verification process and how it fits into the overall remediation of the site is provided in the following diagram:

Process Flow Chart - Remediation



B0091/0C/11 revA – 6th July 2011

3. SCOPE OF REMEDIATION

3.1. Introduction

The Remediation Strategy for the Bishopton Site provides information on the proposed remediation. The strategy is based on the findings of the Stage 2 Interpretative Report (ref. B0060-00-R2-1 BAE Systems Environmental, 2009) where risks were identified to human health and the water environment as a result of land contamination that require remediation.

The Remediation Strategy summarised a number of site-wide and other more localised pollutant linkages driving remediation. These are summarised in tabular form in section 3.2.

It is recognised that the technical objectives and the remediation activities which resulted from them are broad based and since their establishment further site assessment work is being undertaken on an LQMA by LQMA basis. This, when completed, may result in changes to some of the broader based remediation activities when addressing the specific requirements of the smaller LQMA site.

Remediation method statements for each LQMA will take cognisance of all Stages of investigation, including Stage 2 and more recent investigative works.

Following remediation works in each LQMA a detailed verification report will be provided for each LQMA, with draft contents as outlined in Section 6 of this report.

Each LQMA Remediation Method Statement will contain a bespoke verification design, following the principles laid down in this document, to ensure that a robust assessment is guaranteed. Section 7 presents a list of possible LQMA specific requirements which may result in deviation from the principles laid down in this plan.

3.2. Stage 2 Investigation Risk Management Options and Scope of Remediation

A key objective of the Stage 2 Site Investigation was to delineate identified sources to provide more precise estimates of the quantities of materials requiring remediation through treatment or disposal. In some instances a number of treatment options may be suitable for remediation purposes.

The site-wide pollutant linkages (E1-E4) driving remediation, and the remedial options selected were:

Item	Source (with significant linkage)	Selected Remediation Option
E1	Spillages and leakage associated with process and storage buildings. (Site-wide)	Buildings: Controlled burning, except within 400m of occupied housing. Combination of cleaning, remote control and hardened plant demolition within the 400m zone. Land: Excavation 0.35m deep in areas in proposed residential zones adjacent to process building doorways. 0.15m confidence scrape within the CDA.
E2	Spillage and leakages during transportation of materials. (CDA only)	Identifiable ground locations and hard surfaces cleared of propellant granules/fragments by sweeping/vacuuming and hand picking, Fully remediated by option for E1 above.
E3	Asbestos-containing materials in building fabric and soils. (Site-wide)	Controlled removal by specialist contractors, wastes placed in on site landfill
E4	Fragments of tarmac in made ground (CDA only)	Remediated by demolition & removal of built infrastructure and works for option for E1 above.

Table 1 - Selected Remediation Options – Site Wide

The other more localised pollutant linkages (L1-L9) requiring remediation and the remedial options selected were:

Item	Source (with significant linkage)	Selected Remediation Option
L1	Burning Ground (CDA)	Removal of appropriate materials to on site landfill
L2	Burning Grounds (Community Woodland Park)	Application of site-won clay to form a low permeability cap.
L3	Oil-impacted hot spots in CDA	Removal of soils, treatment by bioremediation, re-use within Community Woodland Park as a soil ameliorant
L3	Oil-impacted hot spots in Community Woodland Park	Application of suitable site-won cover materials in a capping layer
L4	Metals and asbestos impacted hot spots in CDA	Removal of appropriate materials to on site landfill
L4	Metals-impacted hot spots in Community Woodland Park	Application of suitable site-won cover materials in a capping layer
L5	Underneath/adjacent to sub-stations in CDA	Removal of appropriate materials to on site landfill, e.g asbestos contaminated soils
L5	Underneath/adjacent to sub-stations in Community Woodland Park	Application of suitable site-won cover materials in a capping layer
L6	Tip and waste processing areas in Community Woodland Park	Clearance of above ground waste (e.g. asbestos) and application of suitable site-won cover materials in a capping layer, further cover with landscape soils
L7	White Phosphorous in drains and local soils	Excavation, treatment to ensure all phosphorus combusted, on site landfill
L8	Picrite and associated contamination in former Picrite Lagoons	Additional surface water monitoring, further option appraisal
L9	Areas of Community Woodland Park with munitions risk	Surface search including metal detection

Table 2 – Selected Remediation Options – Localised

Table's 1 & 2 precede the current and future programme for LQMA specific assessments and detailed remediation method statements.

Following this process remediation options will be reviewed for all LQMAs, taking cognisance of potential risks to both the water environment and human health.

3.3. LQMA Risk Management Options, Scope of Remediation and Remediation Criteria

On completion of the supplemental investigation in each LQMA area, the application of the Conceptual Site Model for each LQMA will be updated and the relevant pollutant linkages considered under the redevelopment scenario for that LQMA.

The relevant pollutant linkages driving remediation in the context of a particular LQMA, and the remedial options selected will be summarised in the site assessment report for that LQMA, as will the remediation criteria. This will include selected remediation options to mitigate the risk to the water environment if required. As such, in addition to the site wide aspects developed in this document, some of the plan for the verification of remediation actions may be specific to a particular LQMA. In this case the actions will follow the principles detailed in this document and will be recorded as part of the Remediation Method Statement for that LQMA. Section 7 presents a list of possible LQMA specific requirements which may result in deviation from the principles laid down in this plan.

4. VERIFICATION METHODS

4.1. General Principles

There are a number of different remediation techniques and activities that will be employed to bring the Site back into beneficial use. Each remediation treatment action is designed to deal with a particular relevant pollutant linkage or group of such linkages.

There are some site-wide general principles that are being applied to the verification process and these are set out below before considering more specific applications to the Core Development Area (Section 4.2) and the Community Woodland Park (Section 4.3).

Remediation (verification) criteria will need to be developed for soils on an LQMA basis, depending where they are placed on-site. This is driven by the individual LQMA assessment process which uses site specific data for water, geology and soils. The results of this will provide relevant criteria to be applied to the remediation and verification of specific parts of the site according to their future proposed uses.

Details of the verification testing suites for total soil concentrations and their minimum reporting limits are set out in Appendix 1. The four flow charts at Appendix 2 shows three tiers of verification relating to hot spot removal, pre-earthworks grid verification testing and post-earthworks grid verification testing (on final site surfaces) together with the specific consideration of the landscape mounds in the Community Woodland Park and topsoil.

Section 7 presents a list of possible LQMA specific requirements which may result in deviation from the principles laid down in this plan.

Hot spot removal

Where an exceedence is identified as a single localised hotspot the hotspot will be removed by excavating an area of 5.0m x 5.0m centred on the sample point and either extending from ground surface to the base of the layer in which the sample failed or a maximum of 0.30m below the level that the sample failed if still in the same material type at that depth (Tier 1 on the flow chart above).

The findings of the Stage 1 and Stage 2 investigations identified elevated concentrations of explosives in the near surface soils within 25m of particular building types, the greater distances of 20m to 25m extending from the entrance of the buildings. These areas will be excavated to a depth of 0.35m below ground level as hot spots for removal to the on-site landfill, with pre-treatment if necessary to reduce the explosive concentration to less than 10,000mg/kg (1%); such pre-treatment including ex-situ bioremediation, thermal or caustic treatment.

Verification samples are to be taken at the base of the excavation and at the centre point for each cut side face of the open excavation i.e. for a hotspot excavation of minimum plan dimensions 5m x 5m – 5nr. verification samples will be taken one at the centre of each vertical face and one in the centre of the base Exceedence of the remediation criteria will trigger investigation which, as well as visual inspection of the material type, may lead to further sampling and or excavation and verification.

For excavations greater than 5m x 5m on plan (e.g. where contamination has been 'chased out' extending original minimum hot spot dimensions) sample frequencies

are to be maintained at a minimum of 1 per 5 linear metres in each excavation face and one per 25m² of excavation base area. This minimum sampling frequency will provide a correlation between the excavation and verification of potentially larger hot spots and the excavation and verification of a minimum hot spot area of 5m x 5m. Analysis of verification samples will be conducted in all contamination 'hot-spot' excavations for those specific contaminants that triggered the 'hot-spot' by failure of the remediation criteria.

Dependent on any LQMA specific conditions, these sampling frequencies may be reviewed however a minimum sampling frequency of 1 per 5 linear metres of each excavation face, and 1 per 25m² per excavation base will be maintained.

Prior to backfilling the excavation is to be surveyed for record purposes and final verification point co-ordinates recorded.

Depending on finished site levels, the excavation will be backfilled with suitable site won soils. The backfill soil will be tested for explosives, metals and metalloids, speciated PAH and petroleum hydrocarbons, and asbestos at a minimum frequency of one test per 500m³ of backfill (e.g. for a one metre deep hotspot one sample for hotspots occupying an area of up to 500m² increasing to five samples in the case of a hotspot occupying an area of 2500m²). The samples will be assessed against the relevant soil assessment criteria taking into account the next land use and the water environment. The frequency could therefore be less than 500m³ depending on the actual geometry of the hotspot.

If the backfilled hotspot surface is at the new finished surface level it will probably be subject to further verification as part of the final grid verification at the grid spacing and depths identified below for the full soil chemical suite of explosives, metals and metalloids, speciated PAH and petroleum hydrocarbons, and asbestos.

Grid verification pre and post earthworks

Where cut-fill operations are required to provide the new development surfaces within the CDA (including the recreational open space features within it) and new features within the Community Woodland Park there will effectively be two levels of verification to demonstrate the effectiveness of the remediation works: pre and post bulk earthworks verification (Tier 2 and Tier 3 on the flow chart above).

Following excavations and verification for hot-spot removal, sampling on a grid across larger areas will be undertaken. This verification grid will also supplement the existing site investigation data on a grid density appropriate to confirm suitability for new use prior to the reclamation earthworks cut-fill operations in the CDA and Community Woodland Park. The grid sizes to be employed are:

CDA Residential	-	25m x 25m
CDA Commercial	-	50m x 50m
CDA Recreational Open Space (including 100m buffer zone to CDA)	-	50m x 50m
Community Woodland Park	-	100m x 100m

Depth of sampling on the grid will be 0.05m and 0.3m below existing ground level. In areas that will subsequently be cut by more than 0.5m below existing ground

level to achieve the new development platform levels (and therefore used as fill material elsewhere on the Site) additional grid sampling at depth will be undertaken every metre or change of strata. Basic geotechnical classification testing will also be undertaken every metre of cut where materials are to be re-used.

Areas of topsoil surface scrape will not be routinely backfilled and any new areas of exposed made ground (if encountered at less than 300mm) will have the benefit of grid pre-verification testing (Tier 2) to inform our understanding of localised ground conditions. If not in areas of earthworks cut and fill the exposed surface will also benefit from the grid final-verification testing (Tier 3).

The soil testing suite for the intermediate (Tier 2) grid verification will be for explosives, metals and metalloids, speciated PAH and petroleum hydrocarbons, and asbestos. The samples will be assessed against the relevant soil assessment criteria taking into account the next land use and the water environment for that area or the area in which the soil is to be used.

Where a grid pre-verification failure is recorded the results will be assessed to determine its significance, and if appropriate a 25m² area will be excavated to 0.5 mbgl centred on the location of the failure and the excavation will be tested and verified for the determinand(s) that was found to fail. If the verification tests are found to pass, depending on finished levels, the excavation will be backfilled using clean verified material. However, if verification test result(s) are found to fail the excavation will be extended in order to track the contamination and allow subsequent verification. Alternatively further investigation will be undertaken to determine the extent of contamination followed by excavation, removal and verification.

Depending on finished levels, the verified extent of a hot-spot excavation will be backfilled with suitable verified site won soils.

Following completion of cut-fill operations to provide the new development surfaces further verification (Tier 3) will be carried out on the new finished surfaces at the same grid spacing identified above at 0.05m and 0.3m below the finished surface level.

Development layouts are not known at the present time, but if known the Tier 3 25m CDA residential grid can be adjusted to maximise the number of garden areas sampled. It should be noted that the finished surface level of the verification testing is the finished surface of the earthworks to create the new development platform. The developer will have to import subsoil and topsoil to garden and landscape areas that are verified as suitable for use as part of their scheme. As such, on the basis that there will be at least 0.15m of subsoil and 0.15m of topsoil, the deeper of the Tier 3 earthworks verification samples will be some 0.6m below the new garden level. Taking a typical spade depth for digging as 0.3m this will cover the potential for residents to 'double dig' their back gardens for growing vegetables.

The soil testing suite for the final Tier 3 grid verification will be for explosives, metals and metalloids, speciated PAH and petroleum hydrocarbons, and asbestos. The samples will be assessed against the relevant soil assessment criteria taking into account the next land use and the water environment for that area.

4.2. Specific Considerations within the Core Development Area

Confidence scrape

On sites where explosive devices (e.g. fuzes, detonators, shells) could be present there is always a concern that small numbers of these devices may have been dropped or dumped on the site, but not deliberately buried. Where the next use comprises more sensitive end uses with regular and unrestricted public access such as residential development, a confidence scrape is likely to be more appropriate than extensive metal detection or geophysical scanning.

It should be noted that whilst Bishopton was an explosives manufacturing site and not an ordnance filling factory there are, however, two areas where ordnance is more likely to be found: the ammunition breakdown area and Georgetown. Both of these areas are within the Community Woodland Park and not the CDA (see section 4.3 and non-intrusive clearance process). The white phosphorous area (which lies within LQMA 15 in the CDA) was used for the filling of phosphorus grenades and remediated in 2003.

Removal of the upper 0.15m of soil in areas not covered by buildings and hard standing addresses potential uncertainties associated with the loss of explosive devices and ammunition in ammunition filling and assembly sites. This allows removal of vegetation cover and rapidly demonstrates the absence of explosive devices/fragments.

The presence of explosive devices/fragments (ordnance) is not expected within the CDA (due to no history of handling, storage or use within the CDA) and distances of up to 25m from a large number of explosives process buildings will effectively have had soil removed to 0.35m below ground level as hot spots. Undertaking a 150mm surface scrape (confidence scrape) within the CDA in areas beyond hot spots and between buildings and hard standing will address any perceived risk of explosives being present in the development area.

The confidence scrape of the otherwise 'undisturbed' surfaces of the CDA comprises two types of material; namely reworked soils (Made Ground) and topsoil.

Both types of confidence scrape soils will be subject to the Tier 2 grid verification sampling set out in section 4.1 above (i.e. a 25m grid in the CDA residential and 50m grid in the CDA commercial and CDA recreational open space); the 0.05m deep sample being within the confidence scrape depth and the 0.3m deep sample below it.

All the confidence scrape soils will be removed from the CDA.

The reworked soils meeting the more conservative of the relevant human health and water environment risk assessment criteria will be used as bulk soils to create part of the landscape mounds in the Community Woodland Park (see also Landscape Mounds subsection in 4.3).

Assessed against the relevant soil assessment criteria taking into account the next land use and the water environment for the area in which it is to be used, the topsoil will be used to either create the final layer of the landscape mounds in the Community Woodland Park or be used as topsoil in the Community Woodland Park.

Those soils not meeting the criteria for re-use within the Community Woodland Park will, subject to any pre-treatment, be placed within the on-site landfill licensed for such material.

4.3. Specific Considerations within the Community Woodland Park

Landscape mounds

Three landscape mounds will be constructed within the Community Woodland Park with soils derived from the CDA. Following any hot spot removal, this will primarily include natural soils (SUD ponds and cut materials), reworked natural soils (blast mounds) and surface confidence scrape soils (reworked soil and topsoil) meeting the more conservative of the human health (residential with plant uptake) and water environment criteria for those areas as set out in the report 'Justification Document Recreational Landscape Mounds, Bishopton' (BAE Systems Environmental, February 2010).

Made Ground materials meeting both the human health and water environment criteria could be placed within the landscaped mound features.

Whilst testing will already have been undertaken on these soils at source, minimum sampling frequencies and analytical testing suites have been set out in the report 'Justification Document Recreational Landscape Mounds, Bishopton' (BAE Systems Environmental, February 2010). For the confidence scrape soils this will be one sample per 1000m³ placed in a mound, for the blast mound soils one per 500m³ placed in a mound and for the natural soils such as the Linwood and Paisley Formation, one per 2000m³ placed in a mound.

Former building slabs

Where buildings have been demolished and former building slabs are to be retained the slabs will be punctured to allow drainage. One sample will be taken from immediately beneath each slab (a hole is to be formed through the slab for access to each sample location) at the frequency of one sample position for every 625m² of any one slab with a minimum of one sample position per slab. At each location samples will be taken at 0.10m and 0.6m below slab soffit to characterise fill material and natural soil. Soil samples will be analysed for explosives, metals and metalloids, speciated PAH and petroleum hydrocarbons and assessed against water environment criteria.

Failure to meet the appropriate water assessment criteria will require further sampling with the potential for the slab to be removed and the soil immediately beneath it treated as a hotspot.

Where the next use requires building ground slabs to be covered with site won soils for landscaping purposes the soils will have first been tested in a stockpile to ensure they are suitable for use prior to placement. If the stockpile comprises natural soils the minimum sampling will be one per 2000m³. If the stockpile comprises reworked natural soils from blast mounds the minimum sampling will be one per 500m³. Soil samples will be analysed for explosives, metals and metalloids, speciated PAH and petroleum hydrocarbons, and asbestos and assessed against the relevant thresholds applied to a Community Woodland Park end use.

Following placement from the stockpile, one in ten of existing building slabs will be sampled at 0.1m to 0.15m below the new topsoil level from the centre of the slab

area. Samples will be analysed for explosives, metals and metalloids, speciated PAH and petroleum hydrocarbons, and asbestos and assessed against the relevant soil assessment criteria taking into account the next land use and the water environment for that area of the Community Woodland Park.

Rail lines

There are two types of rail lines on the Bishopton site: standard gauge and narrow gauge. Within the CDA they will have been removed as part of the wider site clearance prior to earthworks to create new development levels. Within the Community Woodland Park the standard gauge track will be removed and the track ballast excavated, physically screened and recycled. The narrow gauge track however, used by small diesel powered locomotives, is set in concrete with the concrete typically 1.5m wide or where tracks join, 3m to 4m wide.

Across the Community Woodland Park the intention is to retain a number of the concreted narrow gauge rail track as footpaths. Those tracks that are not required as footpaths will be removed, the steel and concrete recycled and the surface covered in soil.

The narrow gauge rail track typically sits on made ground comprising clinker, brick, blaes and ashy silty clay which across the Site has an average thickness of 0.8m. Analysis during the Stage 2 investigation has indicated elevated PAH and, to a lesser extent, metal concentrations in the upper 0.1m to 0.3m of made ground.

Those runs of narrow gauge track to be retained as footpaths will be subject to visual inspection and where identified, the surface cleared of propellant granules/fragments by sweeping/vacuuming and hand picking. Following this exercise, verification surface sample frequencies at the edge of the concrete containing the narrow gauge rail track are to be maintained at a minimum of one per 50 linear metres of track on each side of the concrete containing the narrow gauge rail track. Testing will be for explosives, metals and metalloids, hydrocarbons and speciated PAHs, and assessed against the relevant soil assessment criteria taking into account the next land use and the water environment for that area of the Community Woodland Park. Failed samples will trigger the hot spot removal process as described in Section 4.1 of this document.

Where standard or narrow gauge rail is completely removed the corridor of exposed soil will be a maximum of three to four metres wide, subsequently requiring top soil cover, where it is to be incorporated into landscaping for the Community Woodland Park. Verification sample frequencies will be maintained at a minimum of one sample within the corridor for every 50 linear metres of rail corridor. Failed samples will trigger the hot spot removal process as described in Section 4.1 of this document.

Testing will be for explosives metals, metalloids, speciated PAH, petroleum hydrocarbons and asbestos, and assessed against the relevant soil assessment criteria taking into account the next land use and the water environment for that area of the Community Woodland Park. The majority of these soils will subsequently be covered with topsoil.

Topsoil

Topsoil generated from the CDA will be used to in the Community Woodland Park to provide topsoil cover to the new landscape mounds, former building slabs, areas

such as former burning grounds to be capped (the topsoil in this case being the final layer of an engineered cover solution) and other areas that may require topsoil for the next use.

The topsoil will already have been tested on the intermediate grid verification for the CDA identified in section 4.1 above for explosives, metals and metalloids, speciated PAH and petroleum hydrocarbons, and asbestos.

Topsoil meeting the relevant soil assessment criteria for the Community Woodland Park will be placed in stockpiles within the country park for subsequent use. The stockpiles will be further sampled at the rate of one test per 1000m³ for explosives, metals and metalloids, speciated PAH and petroleum hydrocarbons, and asbestos to confirm suitability before subsequent placement.

Materials used within the three recreational landscape mounds in the Community Woodland Park (LM1, LM2 and LM3) have to meet the lower of the residential with plant uptake human health screening criteria and the water environment criteria for those areas ('Justification Document Recreational Landscape Mounds, Bishopton' (BAE Systems Environmental, February 2010)). The lower of the Community Woodland Park criteria for human health (or CDA recreational open space for human health if within 100m of a residential plot) and the water environment criteria for that area applies to all other areas of the Community Woodland Park outside the footprint of the recreational landscape mounds as well as the final surface soils on the landscape mounds themselves (Justification Document refers).

Following completion of topsoil spreading in those areas requiring it within the Community Woodland Park further verification will be carried out on the new finished surfaces at the 100m grid spacing identified above for the Community Woodland Park at 0.05m and 0.3m below the finished surface level for the full testing suite of explosives, metals and metalloids, speciated PAH and petroleum hydrocarbons, and asbestos as previously indicated in section 4.1.

Landfill footprint

As part of the preparation of the surface for the new PPC licensed landfill within the Community Woodland Park (actually a 'land raise'), following removal of any hot spots and topsoil and foundations within two metres of ground level, the footprint of the land raise itself will be sampled on a 50m x 50m grid at 0.05m and 0.3m below ground level for explosives, metals and metalloids, speciated PAH and petroleum hydrocarbons, and asbestos. The samples will be assessed against the relevant thresholds applied to a Community Woodland Park end use.

Ex-situ bioremediation

Where a requirement for bio-remediation is identified (potentially petroleum hydrocarbons and explosives) then as well as validation of the excavation to confirm verification of extent in the ground, there will be a requirement to undertake monitoring of the specific remediation parameters within the treatment area (either within the PPC permitted area or other designated area licensed under the appropriate regime).

The verification criteria for treatment will depend on the final end use of the material; re-use or pre-treatment prior to landfill.

Surface capping

Areas identified as suitable for capping (possibly burning grounds, slabs, etc) within the Community Woodland Park will have the capping material sourced on site. Clay materials will be sourced from LQMA 04. Verification will comprise surveying methods to produce as-built drawings showing capping thickness and detail (as necessary) as well as chemical testing of the capping materials used.

The soils comprising the engineered cover (e.g. natural or reworked natural cohesive soils and/ or natural or recycled granular soils compacted to an appropriate engineering specification) will be sampled at the rate of one test per 1000m³ (this frequency may be less as soils generally will arise from sources such as building blast mounds, surplus from cut / fill, or the borrow pit) and will be tested for explosives, metals and metalloids, speciated PAH and petroleum hydrocarbons, and asbestos to confirm chemical suitability before subsequent placement. Soil samples will be assessed against the relevant soil assessment criteria taking into account the next land use and the water environment for that area of the Community Woodland Park.

Topsoil used to provide the final surface to the areas of surface capping will have been tested and meet the criteria set out in the topsoil sub-section above.

Non-intrusive clearance of existing perimeter green space and forested site areas of hazardous items and litter

Risk management is required to provide a greater degree of confidence with respect to the potential presence of devices at ground surface in some of the wooded areas within the Community Woodland Park.

A two stage, non-intrusive clearance process will be implemented.

In order to maintain control and to be able to quantify and validate these remedial works, the identified areas of woodland will be segregated into nominal 1,000m² grids. The first stage of the non-intrusive clearance process will be a full, systematic, visual, surface search (Type 1 Survey) of each grid using appropriately trained personnel.

This is not dissimilar to a police 'forensic' search, in that the personnel will form a 'human chain' covering between 25-50 metres and will use rakes in an attempt to locate all surface man-made items. All located items will be recorded, surveyed and assessed in order to determine their relative risk.

Following this, any items found will be removed from the green space/ woodland in a manner so as to minimise disturbance to the woodland and disposed of accordingly. Any items of Unexploded Ordnance (UXO) or explosives found will be marked and made secure for subsequent disposal. Dependent upon the nature of any item encountered, disposal may occur either on or off site but in any event will be carried out in accordance with current best practice guidance (Joint Services Publication (JSP) 364 Joint Service Explosives Ordnance Disposal Manual 1993, or edition current at the time).

The Type 1 survey will be followed by a systematic instrument search (Type 2 Survey). The second stage will also be undertaken using the 1,000m² grid basis using competent personnel equipped with ordnance locators. All located anomalies will be investigated, recorded and (if munitions related) removed. Depending on

their nature, other metallic objects will either be removed and recycled or left in-situ. Any items of UXO or explosives found will be marked and made secure for subsequent disposal. Dependent upon the nature of any item encountered, disposal may occur either on or off site but in any event will be carried out in accordance with current best practice guidance.

Following completion of these remedial works all the items or anomalies will be accurately recorded on a plan and a verification report specific to these works will be prepared and presented to the appropriate Regulatory Authorities.

On completion of the specified works, it is considered that explosive risk associated with the green space/ woodland will have been reduced to an appropriate level and will be safe for public access. However, it should be noted that no non-intrusive search procedure can be 100% effective. Therefore, future Woodland Management Plans will detail appropriate responses to the discovery of munitions related items, particularly after tree falls or heavy rain

4.4. Imported Materials Testing

The only imported materials currently envisaged are 9,000m³ of leachate drainage stone for the construction of the on-site landfill. This will comprise graded natural quarried stone certified by the quarry. As such, chemical compliance testing on the certified natural stone will be undertaken at the rate of one sample per 2,000m³ for metals and metalloids, speciated PAH and petroleum hydrocarbons, to confirm chemical suitability for use within LQMA03.

4.5. Summary of Verification Sampling Frequencies and Testing Suites

Table 3 below summarises the chemical verification frequencies and testing suites set out in this section of the report.

Tier	Type	Location	Frequency	Testing Suite
T1	Hotspot removal	-CDA & CWP	Minimum area of 5m x 5m and 0.3m below level at which sample failed. Hotspot verification sampling of 1 per 15 linear metres for each excavation face and one per 225m ² for the excavation base	Specific contaminants that caused the hotspot by failure of remediation criteria
T2	Grid pre-verification of soils (prior to 0.15m 'confidence scrape' in CDA)	-CDA (R) -CDA (C) -CDA (ROS) -CWP	Sampling depth of 0.05m & 0.3mbgl; every metre thereafter in areas of cut 25m x 25m grid 50m x 50m grid 50m x 50m grid 100m x100m grid	Explosives, metals, metalloids, speciated PAH, petroleum hydrocarbons, asbestos
	Volumetric - by soil type in stockpile	-Landscape mounds -Topsoil -Capping -Backfill	Confidence scrape – one per 1000m ³ Blast mound soils – one per 500m ³ Natural soils – one per 2000m ³ One per 1000m ³ , may also part of confidence scrape volume above Cover material one per 1000m ³ before placement Hotspot - one per 500m ³ Building slabs – one per 500m ³ reworked natural soils, one per 2000m ³ natural soils	Explosives, metals, metalloids, speciated PAH, petroleum hydrocarbons, asbestos. For natural soils in the landscape mounds only metals and metalloids analysis will be performed.
	Area - by feature	-CWP building slabs -CWP rail lines -Landfill footprint	One sample for every 625m ² of slab area of soil immediately beneath the slab with a minimum of one sample per slab. One in 10 buildings slabs sampled between 0.1m to 0.15m below new topsoil surface from centre of slab. One per 50 linear metres of track on each side of concrete containing the rail track where left in place Where track removed one per 50 linear metres of rail corridor 50m x 50m grid at 0.05m & 0.3mbgl	Explosives, metals, metalloids, speciated PAH, petroleum hydrocarbons, asbestos
T3	Grid post-verification of soils	-CDA (R) -CDA (C) -CDA (ROS) -CWP	Sampling depth of 0.05m & 0.3mbgl 25m x 25m grid 50m x 50m grid 50m x 50m grid 100m x100m grid	Explosives, metals, metalloids, speciated PAH, petroleum hydrocarbons, asbestos

Table 3 Summary of Chemical Verification Sampling Frequencies & Testing Suites

Notes: CDA (R) - Core Development Area Residential
CDA (C) - Core Development Area Commercial
CDA (ROS) - Core Development Area Recreational Open Space including CDA 100m buffer zone
CWP - Community Woodland Park

5. VERIFICATION RESPONSIBILITIES FOR EACH LQMA

5.1. Responsibilities

The BAE Systems Environmental Project Manager will have overall responsibility for ensuring that the remediation is carried out to the required and agreed specification and that the required level of information is gathered to demonstrate that this is the case. The Project Manager will be responsible for reviewing the Remediation Method Statement for each LQMA as the works progress and will agree any adjustments with the regulatory authority as necessary. The Project Manager will be supported by a number of Site Engineers who will direct the various remediation and earthworks elements.

The Project Manager will also be supported by a team of BAE Systems Environmental consultants and surveyors who will carry out the necessary verification works as required. The verification team will report directly to the Project Manager on completion of the verification of each element of the works. The verification team will also be responsible for preparing the various reports for submission to the planning authority.

5.2. Response Actions for Non-conformance

In the event that specified remediation criteria have not been met, then a further iteration of remediation and verification will be undertaken. This will however be preceded by an assessment of the reasons why the criteria were not met. Such responses may include further removal of contamination, further treatment or the use of an alternative remediation strategy. Any departure from the methods detailed in the Remediation Method Statement for each LQMA will be advised to and agreed with the Local Authority.

6. REPORTING

6.1. Verification Report for each LQMA

In accordance with CLR11 'Model Procedures For The Management of Land Contamination' (DEFRA and EA 2004) the Verification Report will provide a complete record of the remediation activities on each LQMA and the data collected as part of the Detailed Verification Plan to support compliance with remediation objectives and criteria. It will also include descriptions of the works with associated 'as built' drawings and details of any unforeseen conditions encountered during the works and how they were dealt with.

A typical verification report will include, but is not limited to, the following information:

- Background information – Remediation Objectives, Site Details, Project Details.
- Remediation – Methodology and Programme, Verification, Emissions Controls, Chemical and Physical Testing.
- Monitoring – Surface waters, groundwater, soil-gas.
- Final Site Conditions – Status, Remediation Extent, Post-treatment Management Needs.
- Results of surface water, groundwater or soil gas monitoring to assure the effectiveness of the remediation measures after the remediation has been implemented
- Results and interpretation of analysis of verification soil samples.
- Details of imported materials. Testing/certification to be included in report and referenced to site waste management and/or materials handling plan.
- Third Party Contacts – Consultees, Site Visits by Regulators, Statutory Requirements, Third Party Agreements.
- Supporting Information – Plans, 'As-built' drawings, photographs, Analytical Results, Health and Safety, Progress Reports, Quality Management.
- Copies of correspondence with the Planning Authority and SEPA during the progress of the works and at completion.

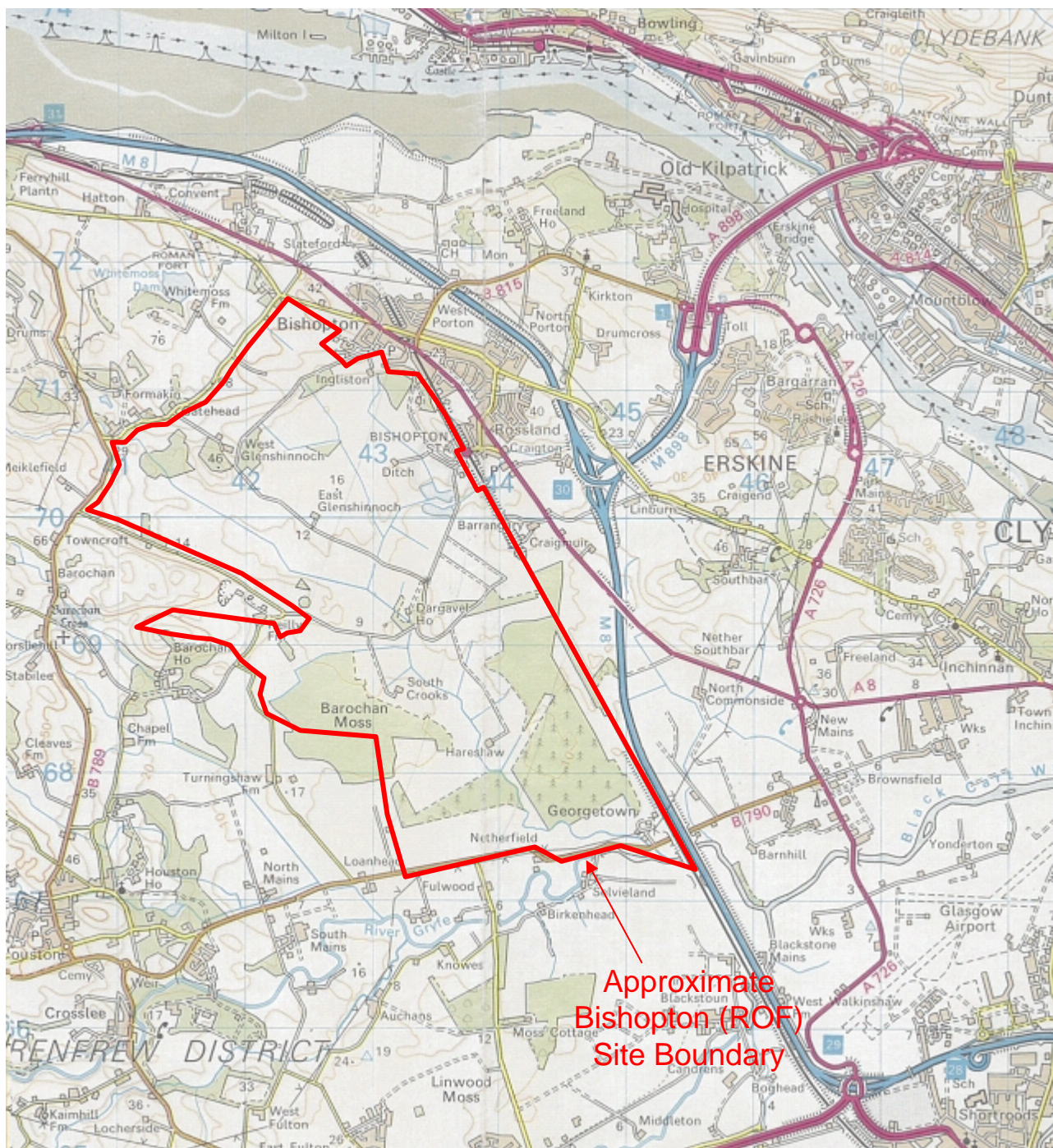
7. DEFERRED ACTIONS

The following verification actions are deferred to LQMA specific remediation method statements.

- Deviation from the principles laid down in this document e.g. a case presented for modifying the sampling and testing frequency because LQMA specific circumstances require such change
- Amendment to the proposed scope of an LQMA Verification Report e.g. a requirement to subdivide an LQMA driven by phased land release (within an LQMA) to developers or for infrastructure provision such as roads
- Change in legislation or guidance affecting the verification process e.g. changes in assessment criteria used to drive remediation and subsequent verification

Figure 1

Site Location Plan



REPRODUCED BY PERMISSION OF THE ORDNANCE SURVEY UNDER OS LICENCE NO. 100044527.
THIS MAP IS FOR IDENTIFICATION PURPOSES ONLY AND SHOULD NOT BE RELIED UPON FOR ACCURACY.

FIGURE TITLE :

Figure 1 - Site Location Plan

PROJECT :

Detailed Verification Plan Bishopton

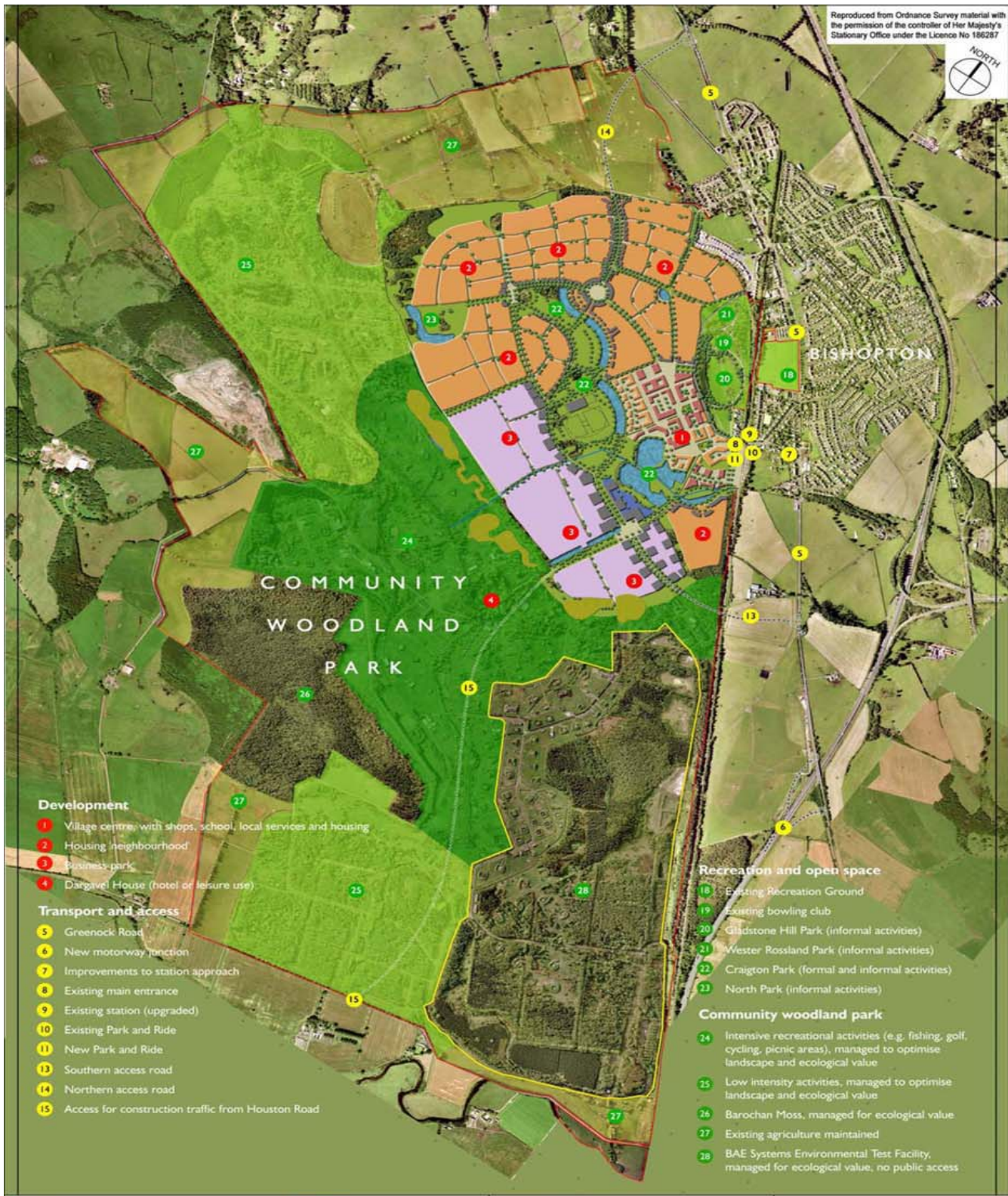
REPORT NUMBER :

B0091-0C-R13-4



Figure 2

Proposed Land Use Plan



Development

- 1 Village centre, with shops, school, local services and housing
- 2 Housing neighbourhood
- 3 Business park
- 4 Dargave House (hotel or leisure use)

Transport and access

- 5 Greenock Road
- 6 New motorway junction
- 7 Improvements to station approach
- 8 Existing main entrance
- 9 Existing station (upgraded)
- 10 Existing Park and Ride
- 11 New Park and Ride
- 13 Southern access road
- 14 Northern access road
- 15 Access for construction traffic from Houston Road

Recreation and open space

- 18 Existing Recreation Ground
- 19 Existing bowling club
- 20 Gladstone Hill Park (informal activities)
- 21 Wester Rossland Park (informal activities)
- 22 Craighton Park (formal and informal activities)
- 23 North Park (informal activities)

Community woodland park

- 24 Intensive recreational activities (e.g. fishing, golf, cycling, picnic areas), managed to optimise landscape and ecological value
- 25 Low intensity activities, managed to optimise landscape and ecological value
- 26 Barochan Moss, managed for ecological value
- 27 Existing agriculture maintained
- 28 BAE Systems Environmental Test Facility, managed for ecological value, no public access

 BAE Systems land ownership	 Housing
 BAE Systems Environmental Test Facility	 Landscaping and open space
 Mixed uses (housing, commercial and community facilities)	 Commercial

FIGURE TITLE :

Figure 2 – Proposed Land Use Plan

PROJECT :

Detailed Verification Plan Bishopton

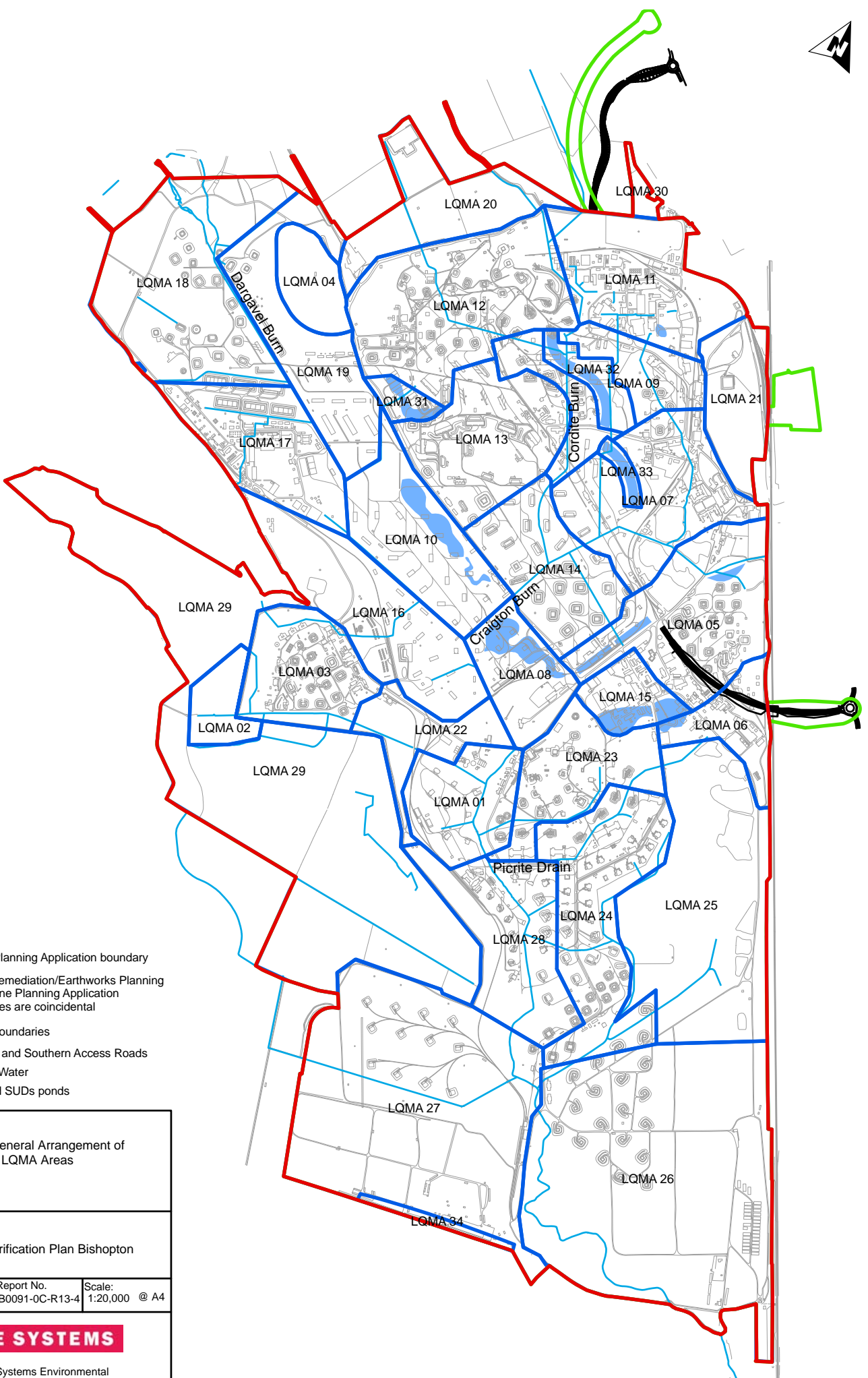
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B0091-0C-R13-4



Figure 3

Land Quality Management Area Layout Plan



- Outline Planning Application boundary
- Where Remediation/Earthworks Planning and Outline Planning Application Boundaries are coincidental
- LQMA Boundaries
- Northern and Southern Access Roads
- Surface Water
- Proposed SUDs ponds

Figure Title:

Fig 3 - General Arrangement of LQMA Areas

Project:
Detailed Verification Plan Bishopton

Project No: B0091-OC	Report No. B0091-OC-R13-4	Scale: 1:20,000 @ A4
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Appendix 1

Verification Testing Suites & Minimum Reporting Limits

SOIL TESTS

Chemical Suite	Determinand	Minimum Reporting Limit	Current Testing Methodology
Explosives	Nitrocellulose (NC)	5000 mg/kg	<p>Overnight 2:1 solvent extraction of prepared soil samples. Analysis of extracts by Isocratic and Gradient High Performance Liquid Chromatography incorporating Ultra Violet absorption detectors capable of dual wavelength detection. Analysis by GC-TEA for EGDN and NG down to 0.1 mg/kg.UKAS accredited</p> <p>¹ It should be noted that 2, 4-dinitrotoluene (2,4-DNT) and 2,6-dinitrotoluene (2,6-DNT) are not explosives but form part of the BAE Systems Environmental's explosive suite of compounds which relates to chemicals generally used on explosives manufacturing sites.</p>
	Cyclotetramethylenetetranitramine (HMX)	2mg/kg	
	Cyclotrimethylenetrinitramine (RDX)	2mg/kg	
	Nitro glycol (EGDN)	0.1mg/kg	
	Trinitro-2,4,6-phenylmethylnitramine (Tetryl)	1mg/kg	
	Nitroglycerine	0.1mg/kg	
	2,4,6 trinitrotoluene (TNT)	0.5mg/kg	
	Pentaerythritol tetra nitrate (PETN)	5mg/kg	
	Hexanitrostilbene (HNS)	0.5mg/kg	
	Nitro guanidine (picrite)	0.25mg/kg	
	2,4,6 trinitrophenol (picric acid)	0.1mg/kg	
	2,4-dinitrotoluene (2,4-DNT) ¹	1mg/kg	
	2,6-dinitrotoluene (2,6-DNT) ¹	1mg/kg	

SOIL TESTS

Chemical Suite	Determinand	Minimum Reporting Limit	Current Testing Methodology
Metals and metalloids	Arsenic	2mg/kg	<p>Aqua regia digestion of soil samples based on ISO11.466 using a semi sealed system to retain volatile elements of interest followed by analysis using ICP-OES.UKAS accredited.</p> <p>For hexavalent chromium aqua regia digestion of soil followed by u/v spectrometry.</p>
	Beryllium	1mg/kg	
	Boron	0.1mg/kg	
	Cadmium	1mg/kg	
	Chromium (VI)	1mg/kg	
	Copper	2mg/kg	
	Lead	2mg/kg	
	Mercury	1mg/kg	
	Nickel	2mg/kg	
	Selenium	1mg/kg	
	Vanadium	2mg/kg	
Zinc	2mg/kg		
Asbestos	Asbestos	0.0001%	<p>A preliminary visual examination of the whole of the bulk sample is made to assess the sample type and the required sample treatment (if any); where possible a representative sub-sample may be taken at this stage. Sample treatment is undertaken (if required) to release or isolate fibres. A detailed and thorough search under the stereo microscope is made to classify the fibre types present. Representative fibres are mounted in appropriate RI liquids on microscope slides and the different fibrous components are identified using a polarised light microscope. UKAS accredited.</p>

SOIL TESTS

Chemical Suite	Determinand	Minimum Reporting Limit	Current Testing Methodology
PAHs	Naphthalene	0.1 mg/kg	Overnight 2:1 Dichloromethane extraction of prepared soils followed by analysis using a fully automated GC-MS system. UKAS accredited.
	Acenaphthylene	0.1 mg/kg	
	Acenaphthene	0.1 mg/kg	
	Fluorene	0.1 mg/kg	
	Phenanthrene	0.1 mg/kg	
	Anthracene	0.1 mg/kg	
	Fluoranthene	0.1 mg/kg	
	Pyrene	0.1 mg/kg	
	Benz(a)anthracene	0.1 mg/kg	
	Chrysene	0.1 mg/kg	
	Benzo(b)fluoranthene	0.1 mg/kg	
	Benzo(k)fluoranthene	0.1 mg/kg	
	Benzo(a)pyrene	0.1 mg/kg	
	Indeno(1,2,3-cd)pyrene	0.1 mg/kg	
Dibenz(a,h)anthracene	0.1 mg/kg		
Benzo(ghi)perylene	0.1 mg/kg		

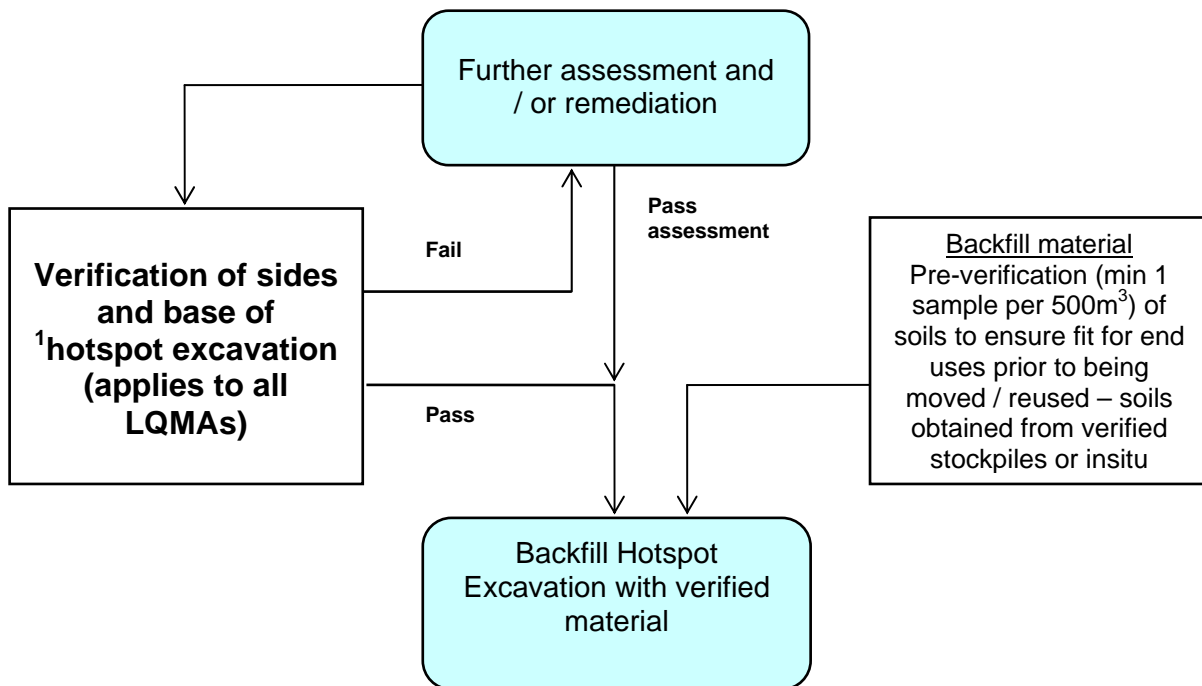
SOIL TESTS

Chemical Suite	Determinand	Minimum Reporting Limit	Current Testing Methodology
TPHCWG	Benzene	0.02mg/kg	<p>For the PRO range, an as-received sub-sample of soil is extracted with methanol. The extract is analysed by Headspace GC- MS. For the DRO range, an air-dried sub-sample of soil is extracted with Dichloromethane. The extract is analysed by GC-FID.</p> <p>Aliphatic and aromatic fractions are separated using an auto mated SPE system for DRO compounds and by Selective Ion Monitoring for PRO compounds. UKAS accredited.</p>
	Toluene	0.10mg/kg	
	Ethyl Benzene	0.1mg/kg	
	m,p-Xylene	0.1mg/kg	
	o-Xylene	0.1mg/kg	
	MTBE	0.1mg/kg	
	C5-C6 aliphatic	1.5mg/kg	
	>C6-C8 aliphatic	2.0mg/kg	
	>C8-C10 aliphatic	1.0mg/kg	
	>C10-C12 aliphatic	2.0mg/kg	
	>C12-C16 aliphatic	10mg/kg	
	>C16-C21 aliphatic	10mg/kg	
	>C21-C35 aliphatic	20mg/kg	
	>C8-C10 aromatic	1.0mg/kg	
	>C10-C12 aromatic	1.0mg/kg	
>C12-C16 aromatic	10mg/kg		
>C16-C21 aromatic	10mg/kg		
>C21-C35 aromatic	20mg/kg		

Appendix 2

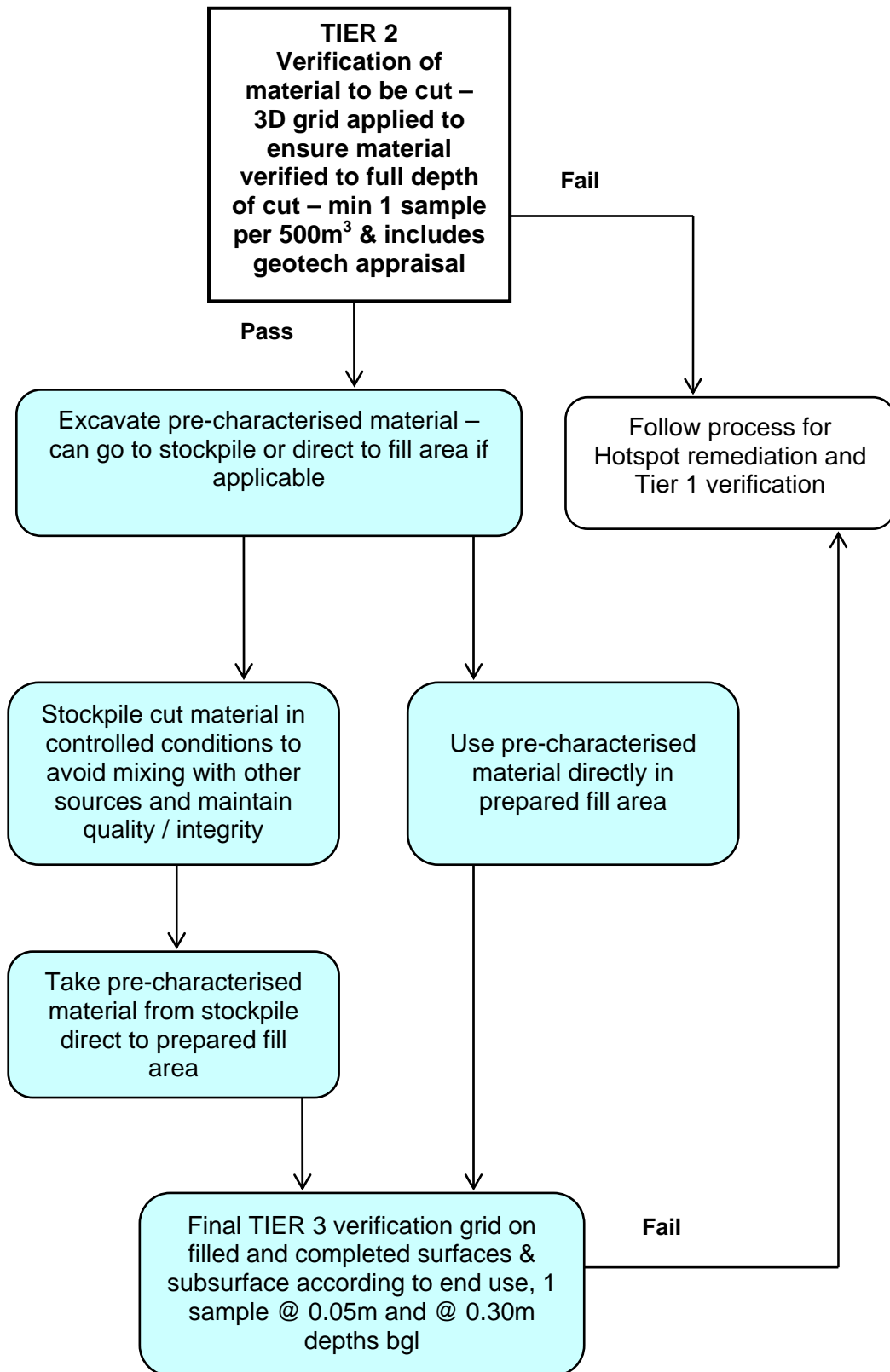
Flow Charts - General Verification Principles for Soils

Tier 1 - General Verification Principles for Hotspot Excavations

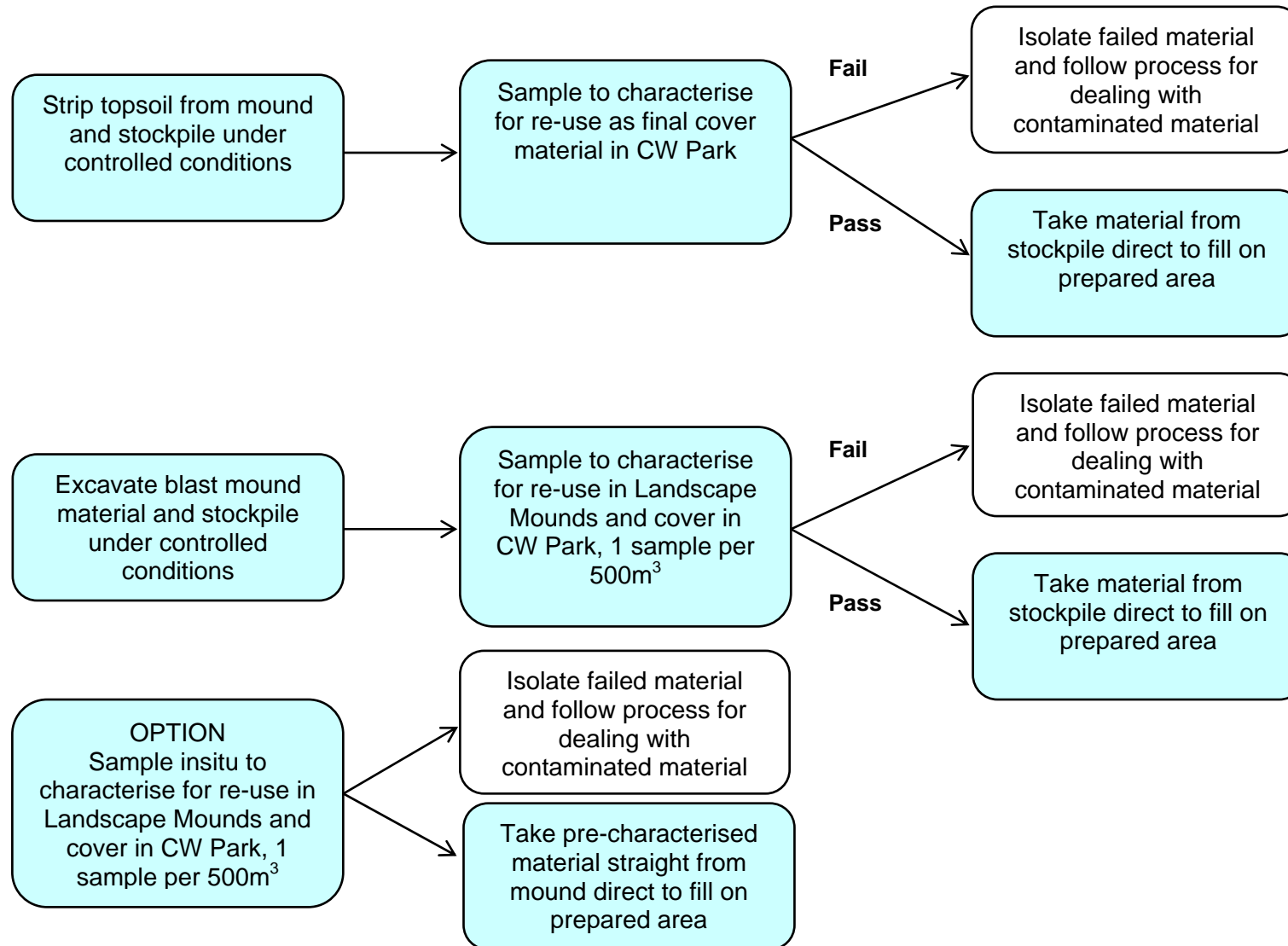


¹ - minimum hot spot size 5m x 5m on plan extending to max 0.3m below failed sample point

Tier 2 - General Verification Principles for Cut and Fill Earthworks



General Verification Principles for re-use of Blast Mound soils



Tier 2 - General Verification Principles for CDA Scrape and material arising

