VICTORIA NORTH INFRASTRUCTURE WORK

PHASE 1 DELIVERY (PRE-DEVELOPMENT) REMEDIATION STRATEGY

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INCREASING LAND VALUE

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1 Introduction

1.1 Background

LK Consult Ltd (LKC) has been commissioned by BAM Nuttall Ltd (BAM) to produce a Phase 1 Delivery (Pre-Development) Remediation Strategy for Victoria North Infrastructure Work. The infrastructure work will be funded by Homes England Housing Infrastructure Fund. The infrastructure works are being carried out to support a subsequent residential led development being planned by a Joint Venture of Manchester City Council (MCC) and the Far East Consortium (FEC).

The work relates to planning reference 133143/VO/2022. Proposals are as detailed below:

'City Council Development for the creation of development platforms, including remediation and earthworks, and change in site levels, to allow delivery of future residential-led development at the Red Bank Neighbourhood, together with the construction of a new road and priority junction from Red Bank, new drainage infrastructure, utility and services connections and diversions, preparatory tree and shrub clearance, and demolition of certain existing structures, along with the creation of new and improved green infrastructure and landscaping including the improvements of St Catherine's Wood to form part of a City River Park, and other associated works.'

Future development is anticipated to include residential, public open space, school, retail and commercial. This development is outside the scope of current work.

The following reports, documents and plans have been provided for review:

- Victoria North HIF Infrastructure Works, Controlled Waters Detailed Quantitative Risk Assessment Report, produced by ARUP, ref: VNIF-ARP-ZZ-YYY-RP-CG-1000, P01, date: 21st August 2023.
- Victoria North HIF Infrastructure Works, Human Health PFAS Detailed Quantitative Risk Assessment Report, produced by ARUP, ref: 2023-07-27_PFAS HHRA_ISUUE_P02, date: 27th July 2023.
- Victoria North Infrastructure Works, Ground Investigation Interpretive Report, produced by ARUP, ref: VNIF-ARP-XX-YYY-RP-CG-0012 P03, date: 23rd November 2022.
- Victoria North, Emerging Water, Conceptual Site Model and Ground Investigation Rationale, produced by ARUP, ref: VNIF-ARP-ZZ-YYY-RP-CG-0013, P02, date: 21st March 2023.
- Landscape General Arrangement HIF Delivery Plan, produced by p-ie, ref: VNIF-PLA-ZZ-YYY-DR-L-1011, date: 16th September 2022.
- Victoria North HIF Inrastructure Works – Phase 1, Remediation Implementation and Verification Plan, produced by Arup, ref: VNIF-ARP-ZZ-YYY-RP-CG-0017.

Based on the findings of the above reports and plans, this Phase 1 Delivery (Pre-Development) Remediation Strategy provides details of the remediation and validation works required to ensure the site is suitable for its proposed use.

The proposed end use is taken as the completion of the earthworks and infrastructure work and does not include the final development plans and build phase element, which will be covered as part of a separate planning application.

The future report detailing the build phase requirements will include for the provision of a clean environmental cover system, installation of appropriate gas protection, installation of appropriate potable water supply pipework.

It is assumed that the above reports, drawings and plans have been approved by the Regulators (Local Authority and Environment Agency).

1.2 Site Details

The site comprises current industrial land, derelict land and woodland. It lies to the east of Red Bank, north of Roger Street and west of Dantzic Street and the River Irk. Manchester Victoria Railway Station is located to the southwest of the site. A site plan is provided in Appendix A.

There are 3no. parcels of land associated with the Victoria North Infrastructure Works named as Red Bank Plateau, Red Bank Terrace and St. Catherine's Wood. The site boundaries and named areas are shown on Plate 1-1 below:

Plate 1-1: Site boundary and named areas (extract from Victoria North Infrastructure Works, Ground Investigation Interpretive Report, produced by ARUP, ref: VNIF-ARP-XX-YYY-RP-CG-0012 P03, date: 23rd Nov 2022).

Future development within these areas will include:

- Red Bank Plateau - predominantly residential development with some local public open space.
- Red Bank Terrace - public open space.
- St Catherine's Wood – school (north) and public open space. Where possible existing vegetation will be preserved with limited areas of enhancement.

The site levels range between 45.5m AOD (former Creamline Dairies site in the west of Red Bank Plateau) to the banks of the River Irk at 29-31m AOD. Various slopes and retaining features are present on site.

1.3 Earthworks and Remediation Proposals

Based on the information provided, earthworks proposals for the Phase 1 delivery are detailed below:

- Vegetation clearance across development areas
- Removal of historic structures form area (e.g., lighting tower bases, turntable etc.)
- Excavate and dispose of materials and fill in area of historic Gas works.
- Excavate and dispose of material in area of historic engine shed area.
- Remediation to identified specific localised areas across site.
- Cut and fill works across site areas including removal of historic features.
- Regrade works to riverside slope adjacent to RB02 & RB03
- Regrade works to slope adjacent to RB01 area.
- Treatment of invasive species (JPK, Giant Hog weed & Himalayan Balsam) as located across site. This includes the excavation and removal of areas as required.
- Hydro seeding to remediated areas across site including newly regraded slope works (RB02 &03 where topsoil will be required to be imported.

The works package for the Phase 1 delivery is presented in Plate 1-2 below.

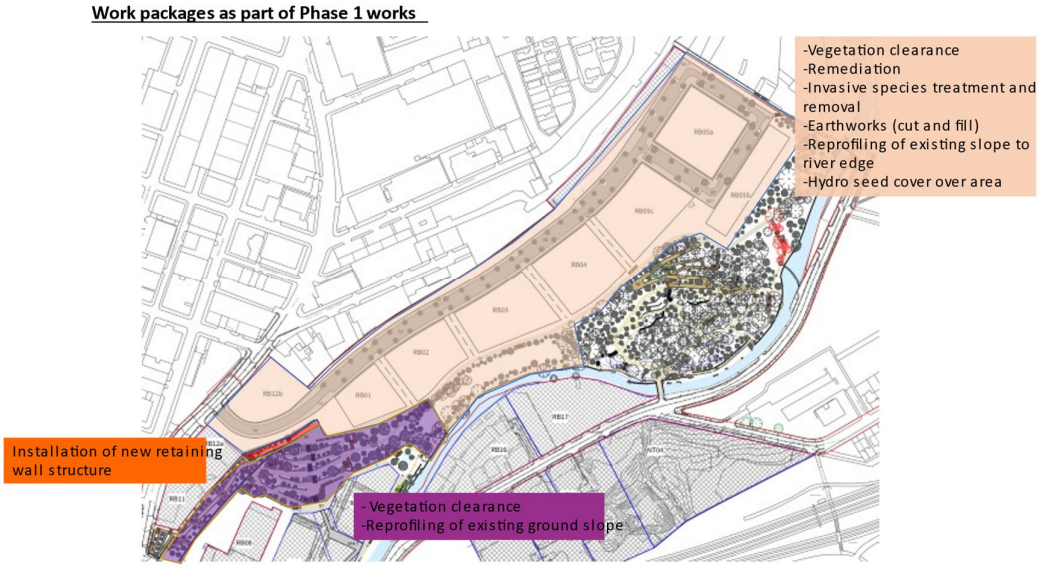


Plate 1-2: Summary proposals for Phase 1 delivery package. Provided by BAM.

Based upon all previous reports a risk to human health and controlled waters was identified for the site in relation to previous contaminative land use.

2 Phase 1 Delivery (Pre-Development) Remediation Strategy

2.1 Introduction

The recommended remedial works and validation works are outlined in the following Sections. The Phase 1 Delivery (Pre-Development) Remediation Strategy is based on the investigation work undertaken and the remedial appraisal produced by ARUP.

In order to achieve the aims of the Phase 1 Delivery (Pre-Development) Remediation Strategy , the following objectives will be set:

- Maximise sustainability through the use re-use of existing site-won materials during ground works and development.
- Ensure that the design meets with current environmental and waste legislation.
- Use of appropriate environmental controls during the remediation and development programme.
- Segregate and stockpile differing materials for validation testing for re-use or offsite disposal.
- Ensure the site is suitable for its proposed end use once all Phase 1 Delivery (pre-development) remediation and validation has been completed (on completion of earthworks and infrastructure work, prior to development).

It should be noted that the Phase 1 Delivery (Pre-Development) Remediation Strategy does not include the remediation and validation requirements of the future development work (building phase). This will be addressed separately as part of new planning applications.

It is assumed that reports produced by ARUP (listed in Section 1) have been agreed by the Local Authority and Environment Agency.

2.2 Summary of Remediation Requirements

The options appraisal recommended source removal and disposal of impacted material as the preferred option.

The following work has been identified and is detailed in the following sections, in addition testing schedule and remedial targets are also presented.

- Borehole Decommissioning.
- Site Clearance Work.
- Removal of Hardstanding / Inground Structure and Soil Turning.
- Gasworks Remediation.
- Former Carriage Works Remediation.
- TP422/TP423, TP405A Remediation (PFAS).
- Residual PFAS Remediation.
- Re-Use of Site Material.
- Stockpile Management.
- Disposal.
- Watching Brief / Unexpected Contamination.
- Health and Safety Measures.
- Asbestos in Soils.

2.3 Testing Schedules

2.3.1 Site Won and Imported Material

Testing schedules for the geochemical validation testing of imported and site won material is based on Arup specification in the Remediation and Verification Plan, as detailed in Table 2-1.

Objective	Sample / Analysis Frequency
Validation of general fill recovered for re-use within the site	1 per 500m^3. Minimum of 3.
Validation of capping fill recovered for re-use within the site	1 per 500m^3. Minimum of 3.
Validation of fill to structures recovered for re-use within the site	1 per 500m^3. Minimum of 3.

Table 2-1: Summary of validation sampling frequency.

The soil assessment criteria provided by ARUP is presented in Appendix C and will also be the testing suite. Please note RTM values to protect controlled waters will take precedent if lower (see Section 2.4) and is on the assumption this only relates to the cut and fill work within the Red Bank Plateau and Cream line Dairies Site (ACM only). Environmental capping layers will be dealt with in the future Build Phase Remediation Strategy and follow human health criteria.

2.3.2 Waste Disposal

The EA Technical Guidance for waste characterisation is summarised below:

Population (tonnes)	Number of Samples (homogeneous waste)	Number of Samples (new/heterogeneous waste)
< 100	2	5
< 500	3	8
< 1,000	5	14
10,000	11	22
+ per additional 10,000	+5 (pro rata)	+10 (pro rata)

Table 2-2: Number of Samples Required for Waste Characterisation (from Environment Agency guidance Waste Sampling and Testing for Disposal to Landfill).

Further consideration may be required if persistent organic pollutants (POPs) exceed threshold values outlined in EA guidance on POPs[1].

[1] https://www.gov.uk/guidance/identify-and-classify-waste-containing-persistent-organic-pollutants-pops

2.4 Remedial Targets

Remedial Targets Methodology (RTM) values have been calculated for the gas works, TP422/TP423, the carriage shed and for re-use activities (where soils derived from another part of the site are to be re-used within St. Catherine's Wood or Red Bank Terrace).

These derived criteria will take precedent to human health assessment criteria. The derived criteria assume removal of NAPL.

Re-use criteria have not been derived for materials that are excavated within Red Bank Plateau and recovered for re-use within the Red Bank Plateau area. Material proposed for re-use in the Red Bank Plateau area shall be inspected and material with visual and olfactory evidence for contamination treated in accordance with the contractor's discovery and remediation strategy, or removed from site. Chemical testing data for site-won material re-used in the Red Bank Plateau area is to be presented in the Completion Validation Report.

Re-use criteria have not been derived for material within St Catherine's Wood and Red Bank Terrace that is to be locally redistributed during regrading works. 'Locally redistributed' in this context means re-use immediately adjacent to the site of origin of the material. Locally redistributed material reproposed for re-use in the St Catherine's Wood and Red Bank Terrace areas shall be inspected and material with visual and olfactory evidence for contamination treated in accordance with the contractor's discovery strategy or removed from site. Records of locally redistributed material re-used within St. Catherine's Wood and Red Bank Terrace is to be presented in the Completion Validation Report.

Gasworks Remedial Targets

The gasworks remedial targets are provided in Plate 2-1.

Contaminant	Verification target (mg/kg)	Rationale for verification target
Ammoniacal nitrogen	4.5	RTM
Benzo(a)Pyrene	3.6	RTM
Fluoranthene	7	95%ile of Plateau made ground
Anthracene	1.8	95%ile of Plateau made ground
TPH – C8-C35	1000*#	Professional judgement
*Discovery strategy to be implemented to ensure no soil with visual or olfactory evidence of contamination is re-used # If exceedances of these values are noted, the risk-derived criteria for individual carbon bands detailed in this table shall be applied.		

Plate 2-1: Proposed Soil Remedial Targets for the Gas Works (extract from Remediation Implementation Plan, produced by ARUP, ref: VNIF-ARP-ZZ-YYY-RP-CG-0017, Table 1).

Carriage Shed Remedial Targets

The carriage shed remedial targets are provided in Plate 2-2.

Contaminant	Verification target (mg/kg)	Rationale for verification target
Benzo(a)Pyrene	3.6	RTM
Fluoranthene	7	95%ile of Plateau made ground
Anthracene	1.8	95%ile of Plateau made ground
TPH – C8-C35	1000*#	Professional judgment
PFOS	<2µg/kg	Laboratory limit of detection and typical site concentration
PFOA	<1µg/kg	Laboratory limit of detection and typical site concentration
PFPA	<2µg/kg	Requested by EA
PFHxA	<2µg/kg	Requested by EA
PFHpA	<2µg/kg	Requested by EA
6:2-FTS	<2µg/kg	Requested by EA
PFHxS	<2µg/kg	Requested by EA
PFNA	<2µg/kg	Requested by EA
*Discovery strategy to be implemented to ensure no soil with visual or olfactory evidence of contamination is re-used # If exceedances of these values are noted, the risk-derived criteria for individual carbon bands detailed in this table shall be applied.		

Plate 2-2: Proposed Soil Remedial Targets for the Carriage Shed (extract from Remediation Implementation Plan, produced by ARUP, ref: VNIF-ARP-ZZ-YYY-RP-CG-0017, Table 3).

TP422/TP423 and TP405A PFAS Outlier

The PFAS remedial targets for this area are provided in Plate 2-3.

Contaminant	Verification target (mg/kg)	Rationale for verification target
PFPA	<2µg/kg	Requested by EA
PFHxA	<2µg/kg	Requested by EA
PFHpA	<2µg/kg	Requested by EA
6:2-FTS	<2µg/kg	Requested by EA
PFOA	<1µg/kg	Laboratory limit of detection and typical site concentration
PFHxS	<2µg/kg	Requested by EA
PFNA	<2µg/kg	Requested by EA
PFOS	<2µg/kg	Laboratory limit of detection and typical site concentration
PFDA	<2µg/kg	Requested by EA

Plate 2-3: Proposed Soil Remedial Targets for TP422/TP423 and TP405A (extract from Remediation Implementation Plan, produced by ARUP, ref: VNIF-ARP-ZZ-YYY-RP-CG-0017, Table 2).

As the remedial target for PFOS and PFOA are lower than the limits of detection, the limits of detection are proposed to be used as the remedial targets.

Re-Use Remedial Targets

The remedial targets for the re-use of materials within St Catherine's Wood and Red Bank Terrace were calculated for Zones 1 and 2. However as the values were similar, it was proposed to adopt Zone 1 values. These are shown in Plate 2-4.

Contaminant	Verification target (mg/kg unless stated)	Rationale for verification target
Nickel	27	RTM
Zinc	191	RTM
Benzo(a)Pyrene	3.6	NBC
Fluoranthene	7	95%ile of Plateau made ground
Anthracene	1.8	95%ile of Plateau made ground
TPH C8-C35	1000*#	Professional judgement, see note
PFOS	2µg/kg	Laboratory limit of detection and typical site concentration
PFOA	1µg/kg	Laboratory limit of detection and typical site concentration
PFPA	2µg/kg	Requested by EA
PFHxA	2µg/kg	Requested by EA
PFHpA	2µg/kg	Requested by EA
6:2-FTS	2µg/kg	Requested by EA
PFHxS	2µg/kg	Requested by EA
PFNA	2µg/kg	Requested by EA
*Discovery strategy to be implemented to ensure no soil with visual or olfactory evidence of contamination is re-used # If exceedances of these values are noted, the risk-derived criteria for individual carbon bands detailed in this table shall be applied.		

Plate 2-4: Proposed Soil Remedial Targets for Re-Use (extract from Remediation Implementation Plan, produced by ARUP, ref: VNIF-ARP-ZZ-YYY-RP-CG-0017, Table 4).

2.5 Borehole Decommissioning

Decommission all existing groundwater sampling, ground gas monitoring and groundwater level monitoring wells by grouting will be undertaken to ensure no contamination of aquifers. Any other boreholes or borehole installations encountered during the Works and not listed below are also to be decommissioned.

All borehole and borehole installation decommissioning is to be undertaken in accordance with current EA guidelines[2].

This work will be undertaken prior to cut and fill operations.

[2] Environment Agency (1996). "Decommissioning Redundant Boreholes and Wells". National Groundwater and Contaminated Land Centre.

2.6 Site Clearance Work

Vegetation clearance will be required prior to earthworks.

Any invasive species need to be appropriately managed. It is understood that a method statement for the treatment of Japanese Knotweed is being produced and this will need to be followed during the clearance work.

Any soils impacted with Japanese Knotweed will need to be appropriately disposed and will not be suitable for use within the soils selected for re-use onsite.

Asbestos screening will be undertaken on the demolished material from the Creamline Dairies site to ensure it is suitable for re-use on site. A visual inspection should be initially undertaken and sampling on a rate of at least 1 sample per 200m^3 material with a minimum of 3no. samples screened for asbestos (see Table 2-1).

Fly tipping within the site will need to be removed from site and accumulated material within the River Irk may also need to be cleared and removed from site. Testing of the waste material may be required to confirm the most appropriate disposal route (subject to the type of material and waste facility testing requirements). A watching brief for ACM pieces will be maintained during this process. ACM waste will be hand-picked by a suitably qualified and experienced person, sealed in bags (double bagged) and segregated for suitable off-site disposal.

2.7 Removal of Hardstanding / Inground Structures and Soil Turning

Areas of surface hardstanding across the site will be removed including the former rail infrastructure. Inground structures will be removed including the structures associated with the former gasworks and railway carriage shed.

Areas to remain at grade and areas of proposed filling within the Red Bank Plateau and Red Bank Terrace are to be turned to an average depth of 0.5m. Any relic structures and obstructions should be removed to a depth of 2.0m below existing ground level. Any obstructions greater than 2.0m depth will remain and be recorded. A watching brief will be in place for unexpected contamination during these works.

Material disturbed will need to be recompacted and tested in accordance with the Earthworks Specifications.

Dewatering of excavations may be required subject to groundwater levels during excavations. This will be required within the carriage shed and gasworks, where perched water is being retained within relic structures.

Most excavations will be limited to above the groundwater level. However, where deeper excavations are required, some localised excavation below the groundwater table may be required. Where relict structures are found to retain fluid contaminants, they should be drained first.

Arrangements should be made to prevent ponding in shallow excavations; the Contractor should ensure that ground levels are of sufficient gradient to enable the collection of surface water run-off in sumps or grips. Pumping from over-excavated sumps may be required to maintain satisfactory working conditions.

Contingency arrangements in other areas outside the carriage shed and gasworks area will need to be in place to remove groundwater (including contaminated groundwater if

encountered) from excavations / relict structures. Small volumes of pumped fluids / groundwater should be stored in appropriate, sealed tanks / containers and analysed for a range of determinants prior to disposal to suitable facility. Alternatively, a temporary discharge licence, including their requirements for treatment / testing, should be agreed with local utility providers prior to start on site.

A site clearance plan has been produced by ARUP (ref: VNIF-ARP-00-YYY-DR-G-0013) has been produced showing where structures, services and obstructions are present (see appendix A).

A void was noted in BH308 (small diameter brick lined shaft, approximately 7.4m deep penetrating the Chester Pebble Bed Formation). It is understood that this area is not within the current scope of works and remediation associated with this feature is not included.

2.8 Gasworks Remediation

TPH, PAH and ammoniacal nitrogen impacted ground has been identified in the gas works area (Appendix A-plan Drawing 16). The most viable remedial option is considered to be excavation and disposal offsite. This is discussed in more detail below:

Impacted soils should be excavated under the supervision of an appropriate geo-environmental engineer. The hydrocarbon impacted soils will be determined based on visual / olfactory evidence on site and the use of a photo ionising detector (PID).

Excavation should extend to include removal of any in-ground relict structures (brick structure identified to at least 2.6mbgl).

All impacted soils should be stockpiled in segregated areas on impermeable membrane ready for offsite disposal. Testing of the excavated material should be completed to undertake waste classification and to confirm the most appropriate disposal route. It is recommended that sampling is undertaken in line with EA Technical Guidance on Waste Classification[3] (subject to disposal facility requirements).

Validation samples of the remaining in-situ ground should be undertaken to confirm appropriate impacted soils have been removed. This should be undertaken at the base and sides of the excavation. The number of samples should be appropriate to the size of the excavation at *c.* 10m spacing.

The excavation should be reinstated with suitable engineered fill placed and compacted in accordance with the earthworks specification.

Dewatering of the excavation should be undertaken and abstracted water should be removed from site to an appropriate facility.

Excavation, where possible should extend until all impacted soils and relict structures have been removed. However, existing trees may prevent full excavation and removal (subject to the extent of the impacted soils). If the trees are to remain (as part of the development plan), the excavation work should cease where tree roots are encountered and samples collected from the remaining soils. The extent of the remaining impacted soils should be confirmed and recorded for inclusion in the

[3] Environment Agency. Waste Classification - Guidance of the Classification and Assessment of Waste (1st Edition v1.2.GB). Technical Guidance WM3.

verification report. Further assessment may be required if the remaining soils are above the defined remedial targets.

2.9 Former Carriage Works Remediation

TPH and PFAS impacted ground has been identified in the former carriage works area (Appendix A-plan Drawing 9). An options appraisal has been undertaken by ARUP to determine most viable remedial option.

The most viable remedial option to deal with the TPH and PFAS contamination in this area is considered to be excavation and disposal offsite. This is discussed in more detail below.

Impacted soils should be excavated under the supervision of an appropriate geo-environmental engineer. The impacted soils will be determined based on visual / olfactory evidence on site and the use of a photo ionising detector (PID).

Excavation should extend to include removal of any in-ground relict structures (brick structure identified to at least 1.4mbgl).

PFAS contamination cannot be detected in the field using visual or olfactory evidence or by a PID. However, the investigation work undertaken suggests the impacted ground is confined to within the footprint of the former carriage shed. The extent of excavation will be based on the footprint of the former carriage shed structure with additional excavation where hydrocarbon impacted ground is discovered beyond this and additional testing to ensure that sufficient material has been removed.

All impacted soils should be stockpiled in segregated areas on impermeable membrane ready for offsite disposal. It is recommended that sampling is undertaken in line with EA Technical Guidance on Waste Classification (subject to disposal facility requirements).

Validation samples of the remaining in-situ ground should be undertaken to confirm appropriate impacted soils have been removed. This should be undertaken at the base and sides of the excavation. The number of samples should be appropriate to the size of the excavation at *c.* 10m spacing.

The excavation should be reinstated with suitable engineered fill placed and compacted in accordance with the earthworks specification.

Dewatering of the excavations within the carriage shed will be required due to the presence of PFAS within the perched water. Abstracted water should be removed from site to an appropriate facility.

2.10 TP422/TP423 and TP405A Remediation

Localised PFAS contamination has been identified in TP422 and TP423 (Appendix A-plan Drawing 4), adjacent to the gas works. Elevated concentrations of PFAS have also been identified at TP405A (Appendix A-plan Drawing 4), although this seems to be an isolated hotspot (based on leaching tests) at 2m depth.

The option appraisal carried out by ARUP considered the most viable remediation to be excavation and disposal offsite.

PFAS contamination cannot be detected in the field using visual or olfactory evidence or by field testing. It is recommended that additional delineation investigation is undertaken in the area to confirm the extent of the impacted ground (vertically and laterally) and confirm the extent of excavation required. The delineation work should be undertaken by soil analysis of PFAS.

Once the area has been delineated, the impacted soils should be excavated under the supervision of an appropriate geo-environmental engineer.

All impacted soils should be stockpiled in segregated areas on impermeable membrane ready for offsite disposal. Testing of the excavated material should be completed to undertake waste classification and to confirm the most appropriate disposal route. It is recommended that sampling is undertaken in line with EA Technical Guidance on Waste Classification[4] (subject to disposal facility requirements).

Validation samples of the remaining in-situ ground should be undertaken to confirm appropriate impacted soils have been removed. This should be undertaken at the base and sides of the excavation. The number of samples should be appropriate to the size of the excavation at *c.* 10m spacing.

The excavation should be reinstated with suitable engineered fill placed and compacted in accordance with the earthworks specification.

There should be a contingency for dewatering excavation if perched water is encountered. Abstracted water should be removed from site to an appropriate facility.

2.11 Residual PFAS Remediation

Very low level PFAS contamination has been identified across the site within the soil leachate phase. There is not considered to be a significant risk to receptors and no remediation is recommended.

2.12 Re-Use of Site Won Material

The proposed earthworks involves cut and fill and slope regrading. The scheme has been developed to re-use and retain materials onsite to ensure a sustainable development.

Plate 1-3 shows the details of the cut and fill and the movement of soils.

To ensure material is compliant with appropriate waste regulations, any site won material re-used onsite should be in recourse to appropriate permits or exemptions.

Considering the volumes of material to be re-used onsite a Materials Management Plan (MMP) with recourse to the CL:AIRE Code of Practice is considered the most appropriate option. This must be registered before material movement starts onsite.

The MMP will need to be registered by a Qualified Person (QP) and there must be ‘certainty of use’ for any material re-used onsite or exported to site to ensure there is no ‘sham recovery’.

[4] Environment Agency. Waste Classification - Guidance of the Classification and Assessment of Waste (1st Edition v1.2.GB). Technical Guidance WM3.

Material excavated on site should be stockpiled, processed and categorised to determine if the soil is suitability for re-use on site in line with the Earthworks Specification. Additional testing may be required to determine the engineering properties, but is outside the remit of this report.

Re-use criteria have not been derived for materials that are excavated within Red Bank Plateau and recovered for re-use within the Red Bank Plateau area. Material proposed for re-use in the Red Bank Plateau area shall be inspected and material with visual and olfactory evidence for contamination treated in accordance with the contractor's discovery and remediation strategy, or removed from site. Chemical testing data for site-won material re-used in the Red Bank Plateau area is to be presented in the Completion Validation Report.

Re-use criteria have not been derived for material within St Catherine's Wood and Red Bank Terrace that is to be locally redistributed during regrading works. 'Locally redistributed' in this context means re-use immediately adjacent to the site of origin of the material. Locally redistributed material reproposed for re-use in the St Catherine's Wood and Red Bank Terrace areas shall be inspected and material with visual and olfactory evidence for contamination treated in accordance with the contractor's discovery strategy or removed from site. Records of locally redistributed material re-used within St. Catherine's Wood and Red Bank Terrace is to be presented in the Completion Validation Report.

Soils should be compared against remedial targets provided by ARUP. It is recommended that at least 1 sample per 200m^3 material is tested with a minimum of 3no. samples tested (see Table 2-1 for further details).

Once confirmed to be suitable for re-use (where testing is required), material can be placed and compacted in accordance with the earthworks specification.

Any soils considered not suitable for re-use will need to be removed from site to an appropriate facility.

Impacted soils removed from the gasworks, TP422/TP423, former carriage shed, Japanese Knotweed area and any other impacted soils identified during earthworks should not be re-used on site.

2.13 Stockpile Management

Stockpiled material should be suitably managed. Considering parts of the site are close to a main river, stockpiles should be located a suitable distance from the river and nay existing drainage runs.

The source of each stockpile should be recorded and appropriate validation testing for the proposed re-use or potential offsite disposal should be undertaken as required. Depending on the nature of the material the potential for dust generation will be mitigated by dampening down and covering as required.

Material should be segregated by type and source. For example, construction / demolition arisings, site won subsoil, etc.

A quarantine area for suspect contaminated soils should established on site. This should comprise an impermeable lined area with a small bund to prevent run off and to minimise the risk of contaminating other areas of the site. The material should also

be covered to minimise the generation of vapours, fibres, dust and possible nuisance to adjacent receptors, and to prevent rainwater ingress which may mobilise soluble contaminants as required.

2.14 Disposal

Material required to be removed from site should be carried out under an appropriate duty of care and the results of chemical analysis and waste classification should be provided to the relevant waste facility, including POPs.

Waste records such as disposal tickets and waste carrier licences should be provided in the Site Completion Report. Photographic evidence of removal and waste removal tickets should be retained and included in the validation report.

2.15 Watching Brief / Unexpected Contamination

It is recommended that a geo-environmental engineer is present on site during the earthworks to assess any unexpected contamination or ground conditions.

This could include visual / olfactory evidence of hydrocarbons, other unusual odours or colours within the soil, suspected asbestos material, voids etc.

Should any unexpected contamination or ground conditions be identified, work should cease until an assessment of the ground is undertaken to determine the risk and possible remedial requirements.

Material will be excavated and stockpiled in a segregated area on impermeable membrane. Testing will be carried out to confirm if the material should be removed offsite to a licensed treatment facility or an assessment made of its potential for treatment and / or retention on site.

Delineation works will be undertaken to confirm the lateral and vertical extent.

Validation samples of the remaining in-situ ground should be undertaken to confirm appropriate impacted soils have been removed. This should be undertaken at the base and sides of the excavation. The number of samples should be appropriate to the size of the excavation at *c.* 10m spacing.

The excavation should be reinstated with suitable engineered fill placed and compacted in accordance with the earthworks specification.

Dewatering of the excavation should be undertaken and abstracted water should be removed from site to an appropriate facility. It is assumed that groundwater from this area will be impacted with hydrocarbons.

Any abstraction wells identified during earthworks will need to be appropriately decommissioned in line with EA guidance[5].

2.16 Health and Safety Measures

A Construction Environmental Management Plan (CEMP) and Method Statement should be produced which details appropriate Health and Safety measures to be employed during the site works.

[5] Environment Agency. Science Report SC020093. Guidance on the Design and Installation of Groundwater Quality Monitoring Points.

Risks to site workers and adjacent receptors from contamination present in the site soils can be easily mitigated by good environmental management of the site during site works. Standard health and safety precautions (as per HSE guidance) should be adopted by all workers involved with site enabling and construction works.

2.17 Asbestos In Soils

Due to the presence of asbestos containing material, it is recommended that additional precautions are taken during site clearance, earthworks and construction. The presence of asbestos in the made ground at the site presents a potential risk of generation of airborne fibres if this material is disturbed, such as for excavations to construct new foundations.

This risk can be managed by careful procedures and site monitoring to reduce the risk of airborne fibres, and it is recommended that an appropriate 'Asbestos Management Plan' is developed and adopted for all intrusive ground works which disturb the made ground in the area of concern. This should be carried out in line with CIRIA C733[6].

The locations where asbestos was identified are shown in Appendix A (plan produced by ARUP, 'Identification of Asbestos in Soil Samples'. Drawing 15 P1). Across the majority of the site, the locations where asbestos was identified is very low density. However, there is a cluster in the northeast (gasworks area) where asbestos appears more abundant.

JIWG assessments have been undertaken for work categories and output sheets are provided in Appendix B. The assessments were carried out for the following scenarios:

- NE Area (gasworks area) - excluding TT302:
  A higher density of asbestos was identified in this area and samples included within the assessment were generally loose fibres with a maximum of 0.011% asbestos within the soil sample.
- NE Area - TT302 only:
  This sample was treated separately as it was the only sample to comprise cement asbestos (significantly reduced risk of asbestos becoming airbourne); however, the percentage of asbestos within the material was higher at 1.539%.
- Remainder of the site (excluding gasworks area):
  Only sporadic asbestos was identified across the remainder of the site. Asbestos within the samples was recorded at <0.001 to 0.012%.

A JIWG assessments identified the following:

- NE Area (gasworks area) - excluding TT302: Medium Risk.
- NE Area - TT302 only: Low Risk.
- Remainder of the site (excluding gasworks area): Medium Risk.

The following outputs were produced (all areas):

[6] CIRIA (2014). "Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks". C733.

Risk Assessment Outputs

Probable Licensing Status	Non-Licensed Work
RPE*	EN149 type FFP3 disposable
Dust Suppression**	Manual/localised dust suppression
Hygiene/Decontamination***	Localised and basic personal decontamination facilities

*Where RPE has to be worn continuously for long periods (e.g. more than 1-hour), then powered RPE may be necessary.
**Reduction in control measures possible if natural mitigation factors are present (e.g. raining, wet ground)
***Guide only; suitability of selected personal hygiene measures may be reviewed on a site/contamination-specific basis

The above outcomes should be used as an aid to determine the requirements of the Asbestos Management Plan.

This is expected to include precautions to limit dust generation, air monitoring and appropriate PPE for site workers.

If evidence of additional asbestos is identified during earthworks (i.e. visible asbestos), further assessment will be required and the Asbestos Management Plan updated.

Only limited data was used in the potable pipeline risk assessment. At this stage, it is assumed that barrier pipe will be required. If potable water pipes are to be installed as part of the Earthworks, it is recommended that additional testing is carried out along the pipeline route (post remediation and earthworks) at pipeline depth to confirm the appropriate pipeline material. If no further testing is undertaken, barrier pipe should be used.

2.18 Summary of Remediation and Validation Requirements

Area / Activity	Remediation Requirements	Validation Work	Testing Schedule	Remedial Targets
Borehole Decommissioning	Decommissioning of all existing monitoring wells to ensure no cross contamination of aquifers. In line with EA guidelines. To be undertaken prior to cut and fill activities.	Records from contractors to be provided including photographs of work undertaken.	N/A	N/A
Riverbank Knotweed Clearance	Vegetation Clearance including the removal of Japanese Knotweed.	TBC in Japanese Knotweed method statement.		
Creamline Dairies	Confirmation of the suitability of demolished material for re-use.	Testing of stockpiled material.	1 sample per 500m^3, min. 3no. samples. Suite 1.	Presence of ACM.
			Note: if this material is to be used as part of an environmental cover system in future development additional testing / assessment will be required in respect to suitability for use (see Table 2-1).	
All Areas and Riverbed Fly tipping	Removal of all fly tipping as part of site clearance. Watching brief for ACM pieces to be undertaken (ACM to be segregated and disposed of accordingly). Including possible removal of debris within riverbed.	Testing of stockpiled material.	Subject to waste type and disposal facility requirements.	N/A
All Areas Removal of hardstood, structures and soil turnover	Removal of hardstood ground. Relic inground structures to be removed to a depth of 2.0mbgl. Any obstructions greater than 2.0m will remain and be recorded. Soil turnover to approx. 0.5m across the site. Dewatering if required.	Record including photographs of work undertaken. Records to include any areas of deep obstructions remaining in the ground.	N/A	N/A
Gasworks	Excavation of impacted material and relic structures under the supervision of a geo-environmental consultant.	Remaining in-situ soils to be tested to confirm impacted soils removed.	Minimum 5 litre composite sample collected from the base and each side of the excavation. Sample to be taken at 25m grid spacing. Suite 4.	1. Ensure no visual olfactory evidence of hydrocarbons / volatiles remain. 2. Compare against Gasworks Remedial Targets[1]. 3. Compare against Re-Use Criteria[4], where applicable. RTM values take precedent.
	Impacted soils to be segregated on impermeable membrane for offsite disposal.	Testing of excavated material to confirm the waste classification.	See EA Technical Guidance on Waste Classification. Suite 2 and 3.	N/A (for offsite disposal)
	Dewatering, where required. Impacted groundwater to be stored for offsite disposal.	Testing of impacted groundwater to confirm the waste classification.	Subject to volume and waste facilities requirements. Suite 7.	N/A (for offsite disposal)
	Backfilling of excavation with suitable material in line with earthworks specification.	N/A	N/A	N/A

TP422/TP423 and TP405A	Delineation trial pits to confirm the extent on PFAS impacted material. Trial pits at approximately 25m spacing around TP422 and TP423. Trial pit at the location of TP405A and at least 4no pits surrounding (subject to ground conditions encountered).		Soil testing in each pit at approx. 0.5m, 1.5, and 2.5m depths (subject to ground conditions). Perched / shallow groundwater samples to be collected (subject to ground conditions). Suite 5 (soil) and 6 (water).	Compare against TP422/TP423 and TP450A Remedial Targets[3].
	Excavation of PFAS impacted material under the supervision of a geo-environmental consultant.	Remaining in-situ soils to be tested to confirm impacted soils removed.	Minimum 5 litre composite sample collected from the base and each side of the excavation. Sample to be taken at 25m grid spacing. Suite 5.	1. Compare against TP422/TP423 and TP405A Remedial Targets[3]. 2. Compare against Re-Use Criteria[4], where applicable. RTM values take precedent.
	Impacted soils to be segregated on impermeable membrane for offsite disposal.	Testing of excavated material to confirm the waste classification.	See EA Technical Guidance on Waste Classification. Suite 2 and 3.	N/A (for offsite disposal)
	Dewatering, where required. Impacted groundwater to be stored for offsite disposal.	Testing of impacted groundwater to confirm the waste classification.	Subject to volume and waste facilities requirements. Suite 7.	N/A (for offsite disposal)
	Backfilling of excavation with suitable material in line with earthworks specification.	N/A	N/A	N/A
Former Carriage Works	Excavation of impacted material and relic structures under the supervision of a geo-environmental consultant.	Remaining in-situ soils to be tested to confirm impacted soils removed.	Minimum 5 litre composite sample collected from the base and each side of the excavation. Sample to be taken at 25m grid spacing. Suites 4 and 5.	1. Ensure no visual / olfactory evidence of hydrocarbons / volatiles remain. 2. Compare against Carriage Shed Remedial Targets[2]. 3. Compare against Re-Use Criteria[4], where applicable. RTM values take precedent.
	Impacted soils to be segregated on impermeable membrane for offsite disposal.	Testing of excavated material to confirm the waste classification.	See EA Technical Guidance on Waste Classification. Suite 2 and 3.	N/A (for offsite disposal)
	Dewatering, where required. Impacted groundwater to be stored for offsite disposal.	Testing of impacted groundwater to confirm the waste classification.	Subject to volume and waste facilities requirements. Suite 7.	N/A (for offsite disposal)
	Backfilling of excavation with suitable material in line with earthworks specification.	N/A	N/A	N/A

All Areas – Reuse of site-won material	To be undertaken in line with appropriate legislation and guidance (MMP with recourse to CL:AIRE Code of Practice). Material excavated on site should be stockpiled, processed and categorised to determine if the soil is suitability for re-use on site in line with the Earthworks Specification. Material proposed for re-use in the Red Bank Plateau area shall be inspected and material with visual and olfactory evidence for contamination treated in accordance with the contractor's discovery and remediation strategy, or removed from site. Chemical testing data for site-won material re-used in the Red Bank Plateau area is to be presented in the Completion Validation Report. Material within St Catherine's Wood and Red Bank Terrace that is to be locally redistributed during regrading works. 'Locally redistributed' in this context means re-use immediately adjacent to the site of origin of the material. Locally redistributed material reproposed for re-use in the St Catherine's Wood and Red Bank Terrace areas shall be inspected and material with visual and olfactory evidence for contamination treated in accordance with the contractor's discovery strategy or removed from site. Records of locally redistributed material re-used within St. Catherine's Wood and Red Bank Terrace is to be presented in the Completion Validation Report.	Material to be placed in the Red Bank Plateau will need to be tested to confirm suitability. Material within St Catherine's Wood and Red Bank Terrace that is to be locally redistributed during regrading works will need to be inspected visually and olfactory for suitability.	1 sample per 500m^3 (min. 3 samples). Suite 2.	Compare against Re-Use Criteria[4].
Disposal	Material required to be removed from site should be undertaken under an appropriate duty of care and the results of chemical analysis and waste classification should be provided to the relevant waste facility.	Testing of excavated material to confirm the waste classification.	See EA Technical Guidance on Waste Classification. Suite 2 & 3.	For offsite disposal, testing results to be provided to waste facility.
		Waste records such as disposal tickets and waste carrier licences should be provided.	N/A	N/A
Stockpile Management	The source of each stockpile should be recorded with associated testing (as detailed above). Stockpiled material should be suitably managed. Considering parts of the site are close to a main river, stockpiles should be located a suitable distance from the river and nay existing drainage runs. Material should be segregated by type and source. Quarantine areas for suspected contaminated soils to be established until use / disposal route is confirmed.	Records including photographs of work undertaken.	N/A	N/A

All Areas Watching Brief / Unexpected Contamination	Geo-environmental engineer to be present during groundwork to assess any unexpected contamination. Impacted material to be excavated and stockpiled in a segregated areas on impermeable membrane. Delineation work to confirm lateral and vertical extent. Dewatering, where required. Potentially impacted groundwater to be stored for offsite disposal. Further assessment to confirm most appropriate action (i.e. re-use on site or disposal). Verification samples of remaining soils. Backfilling of excavation with suitable material in line with earthworks specification. Abstraction wells (if any are identified) to be appropriately decommissioned in line with EA requirements.	Remaining soils to be tested to confirm impacted soils removed.	Minimum 5 litre composite sample collected from the base and each side of the excavation. Samples to be taken at 25m grid spacing. Testing Suite subject to contamination identified.	Subject to location on site. 1. Ensure no visual olfactory evidence of hydrocarbons / volatiles remain. 2. Ensure no visible ACM remains. 3. Compare against Re-Use Criteria[4], where applicable. RTM values take precedent.
		Testing of excavated material to confirm if material will be re-used or disposed of.	Subject to contaminants of concern. 1 sample per 500m^3 (min. 3 samples) and in line with EA Technical Guidance on Waste Classification (whichever is most conservative). Suite 2 & 3, possible SVOCs and VOCs.	Subject to potential re-use activity: 1. Ensure no visual olfactory evidence of hydrocarbons / volatiles remain. 2. Ensure no visible ACM remains. 3. Compare against Re-Use Criteria[4], where applicable. RTM values take precedent.
		Testing of impacted groundwater to confirm the waste classification.	Subject to volume and waste facilities requirements. Suite 5.	N/A (for offsite disposal)
Health and Safety	A Construction Environmental Management Plan (CEMP) and Method Statement should be produced which details appropriate Health and Safety measures to be employed during the site works.	Record to be provided of precautions undertaken during earthworks.	N/A	N/A
All Areas Asbestos Management	Asbestos Management Plan should be developed across the site.	Record to be provided of precautions undertaken during earthworks.	N/A	N/A

Table 2-5: Summary of Remediation and Validation Requirements.

Testing Suites:
Suite 1 – (soils) Asbestos Screen (if present, ID and Quantification to be undertaken).
Suite 2 – (soils) Metals, cyanide, pH, sulphate, speciated PAH, SOM, TPHCWG, BTEX.
Suite 3 – (soils) WAC Stage 2.
Suite 4 – (soils) SOM, TPHCWG, BTEX, SVOCs, VOCs.
Suite 5 – (soils) PFAS (PFBA, PFPA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnA, PFDoA, PFBS, PFPeS, PFHxS, PFHpS, PFOS, PFDS, PFOSA, 6:2-FTS)
Suite 6 – (leachate / water) PFAS (PFBA, PFPA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnA, PFDoA, PFBS, PFPeS, PFHxS, PFHpS, PFOS, PFDS, PFOSA, 6:2-FTS)
Suite 7 – (water) TPHCWG, BTEX, SVOCs, VOCs, PFAS.

Remedial Targets
1 – Gasworks Remedial Targets.
2 – Carriage Shed Remedial Targets.
3 – TP422/TP423 and TP405A Remedial Targets
4 – Re-Use Criteria for Zones (
(derived by ARUP – Victoria North HIF Infrastructure Works, Remediation Implementation Plant, produced by ARUP, ref: VNIF-ARP-ZZ-YYY-RP-CG-0017).

Soil sampling frequency (imported and site won)

Testing schedules for the geochemical validation testing of imported and site won material is based on Arup specification in the Remediation and Verification Plan, as detailed in Table 2-1.

Objective	Sample / Analysis Frequency
Validation of general fill recovered for re-use within the site	1 per 500m^3. Minimum of 3.
Validation of capping fill recovered for re-use within the site	1 per 500m^3. Minimum of 3.
Validation of fill to structures recovered for re-use within the site	1 per 500m^3. Minimum of 3.

Summary of validation sampling frequency.

The soil assessment criteria provided by ARUP is presented in Appendix C and will also be the testing suite. Please note RTM values to protect controlled waters will take precedent if lower (see Section 2.4) and is on the assumption this only relates to the cut and fill work within the Red Bank Plateau and Cream line Dairies Site (ACM only). Environmental capping layers will be dealt with in the future Build Phase Remediation Strategy and follow human health criteria.

Waste Disposal Sampling Number

EA Technical Guidance on Waste Classification:

Population (tonnes)	Number of Samples (homogeneous waste)	Number of Samples (new/heterogeneous waste)
< 100	2	5
< 500	3	8
< 1,000	5	14
10,000	11	22
+ per additional 10,000	+5 (pro rata)	+10 (pro rata)

Note: If persistent organic pollutant (POPs) are above threshold values, the waste will be classified as POPs waste. POPs waste needs to be appropriately treated.

3 Phase 1 Delivery (Pre-Development) Validation Requirements

Validation requirements are summarised in Section 2.18. A Phase 1 Delivery (Pre-Development) Verification / Completion Report will be required once this phase of work has been completed. This will comprise the following:

- Confirmation of borehole decommissioning.
- Confirmation of the clearance of vegetation (including Japanese Knotweed) and fly tipping.
- Details of the removal of hardstanding / inground structures and soil turning.
- Findings of the delineation and remediation work undertaken in the areas of the Gas Works, Carriage Shed, TP422/TP423 and TP405A. Validation testing as detailed in Section 2.18. Results will be compared to the relevant derived RTMs (controlled waters) and generic assessment criteria (human health) as detailed in Section 2.4.
- Sampling of any re-used or imported material where required (soil and demolition material). Tested at the prescribed rate as required by Manchester CC (Table 2-1). Results will be compared to the relevant derived RTMs (controlled waters) and generic assessment criteria (human health) as detailed in Section 2.4.
- Testing of material to be removed from site to confirm the most appropriate disposal route. Include relevant waste transfer tickets.
- Detailed of any unexpected contamination with appropriate delineation, remedial and validation works.
- Confirmation that work was undertaken in line with the Asbestos Management Plan.

4 Conclusions

Based on information available in reports provided to LKC, a detailed Phase 1 Delivery (Pre-Development) Remediation Strategy has been produced for the earthworks and infrastructure proposed at Victoria North.

LKC should stress that no works should take place until Regulatory approval of the Phase 1 Delivery (Pre-Development) Remediation Strategy has been obtained.

Phase 1 Delivery (Pre-Development) remediation and validation work addresses the pollutant linkage identified for the site based on the earthworks and infrastructure proposed.

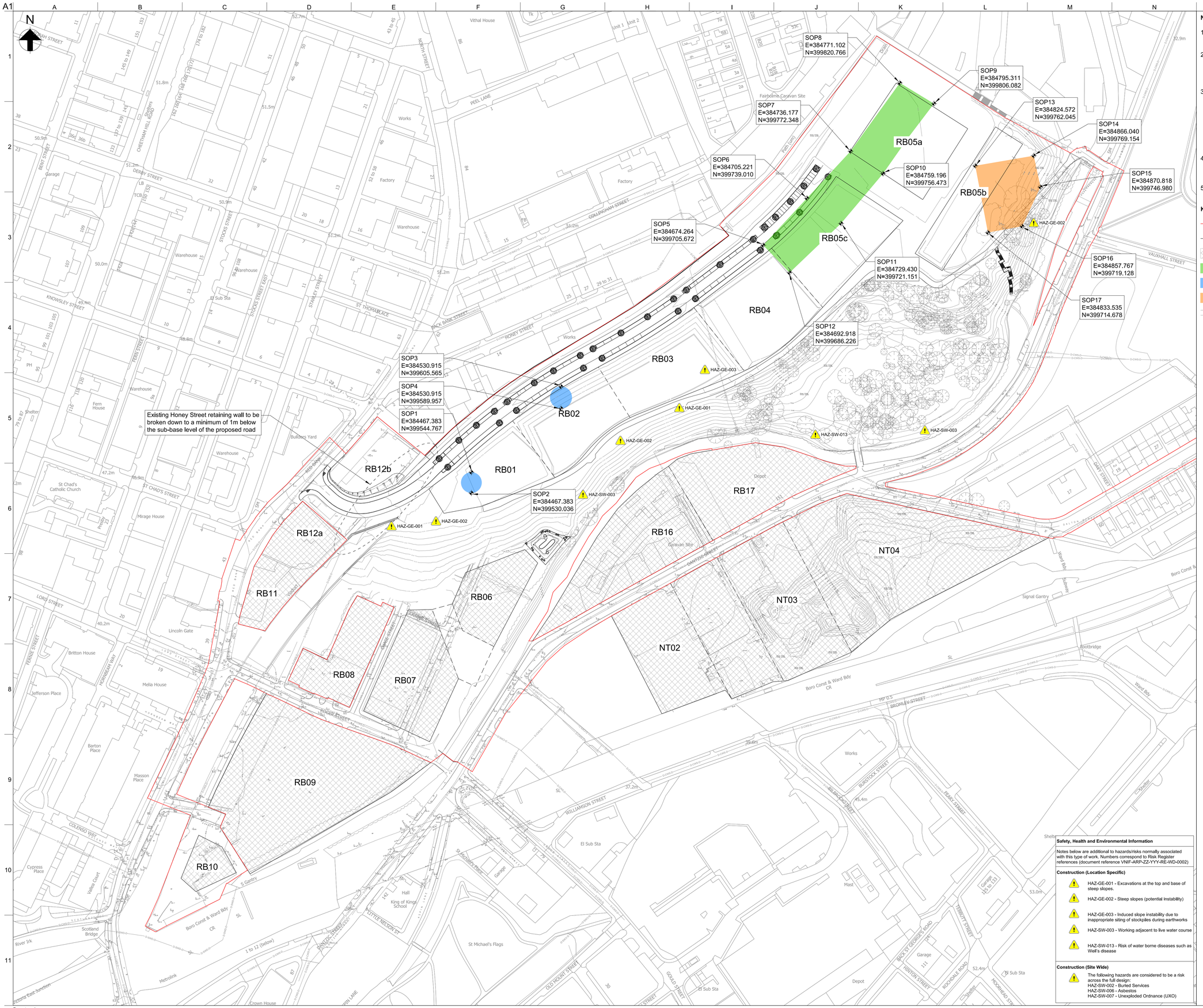
All remediation and validation work undertaken should be documented in a Verification / Completion Report once all Phase 1 Delivery (Pre-Development) works have been undertaken.

A further remediation strategy and verification / completion report will be required for the build phase of works.

Appendix A

Relevant Drawings

A1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Existing Honey Street retaining wall to be broken down to a minimum of 1m below the sub-base level of the proposed road
RB01
RB02
RB03
RB04
RB05a
RB05b
RB05c
RB06
RB07
RB08
RB09
RB10
RB11
RB12a
RB12b
RB16
RB17
NT02
NT03
NT04
HAZ-GE-001
HAZ-GE-002
HAZ-GE-003
HAZ-SW-003
HAZ-SW-013
Fairbolme Caravan Site
Vithal House
Factory
Warehouse
Works
Builders Yard
Depot
Caravan Site
St Chad's Catholic Church
Mirage House
Lincoln Gate
Britton House
Melia House
Jefferson Place
Barton Place
Masson Place
Cypress Place
Valles Court
Scotland Bridge
River Irk
Metrolink
Victoria East Junction
Crown House
King of Kings School
St Michael's Flags
Signal Gantry
Footbridge
Boro Const & Ward Bdy CR
El Sub Sta
Mast
Garage
Shelter
Hall
Subway
Ward Bdy
Boro Const &
S Gantry
SL
CR
HONEY STREET
PACK BARK STREET
SOLLINGHAM STREET
VAUXHALL STREET
WILLIAMSON STREET
BURSTOCK STREET
BROMLEY STREET
PEARL STREET
PERRITT STREET
ROCKDALE ROAD
THRYDON STREET
BECK ST GEORGE'S ROAD
OLD MOUNT STREET
GOALD STREET
SANTON STREET
LITTLE NELSON ST
COLENSO WAY
LORD STREET
DERBY STREET
KNOWSLEY STREET
ST THOMAS PLACE
STOCKS STREET
STANLEY STREET
STOCKS STREET EAST
FERN STREET
ST CHAD'S STREET
CHEETHAM HILL ROADS
NORTH STREET
PEEL LANE
BRIDGE STREET
HORNBEAM WAY
FERNIE STREET
GARY STREET
Ward Bdy
Boro Const &
Footbridge
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Depot
Works
Factory
Warehouse
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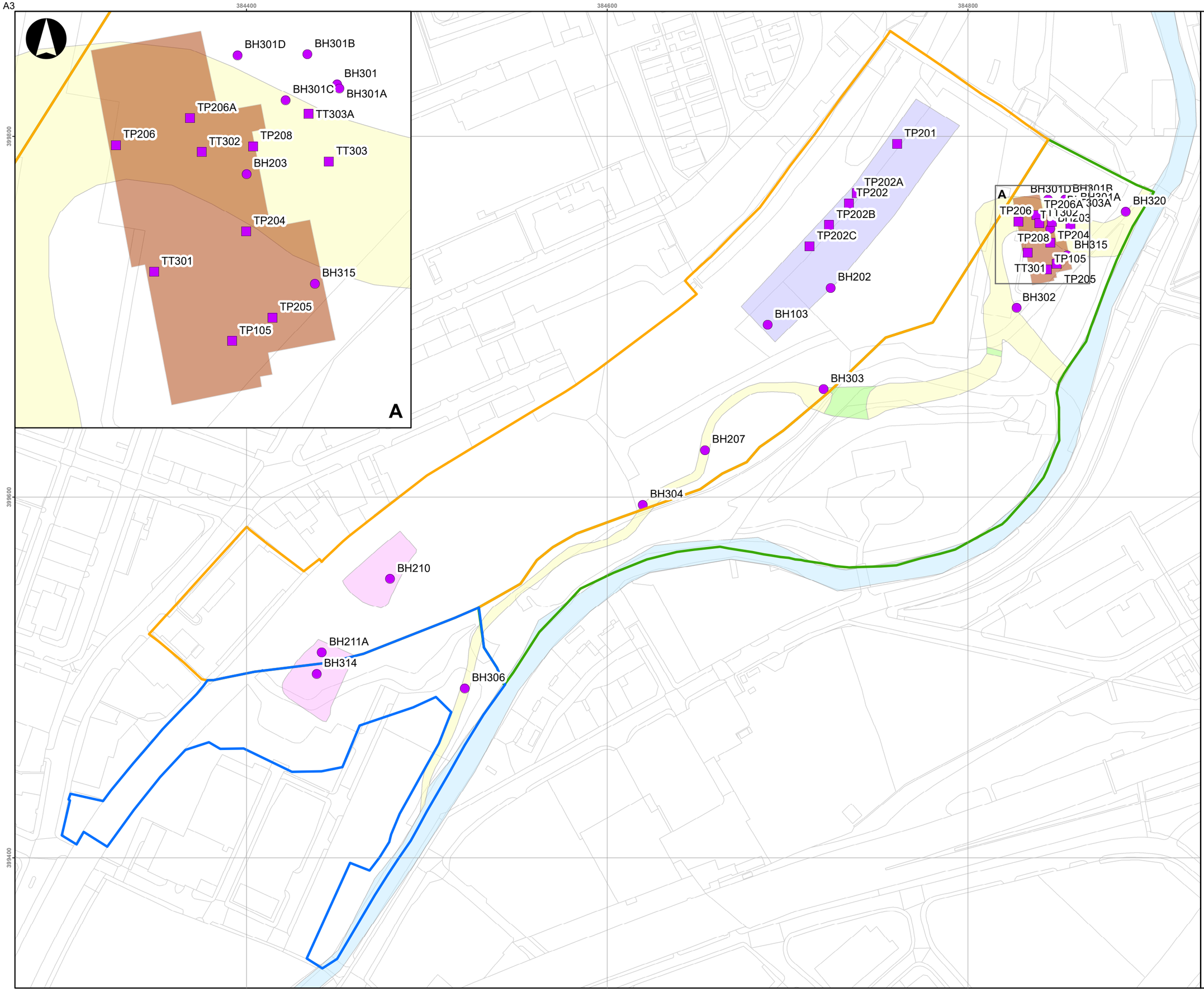
Shelter
Garage
Garage
Garage

A3



Legend

Site Area

- Red Bank Plateau
- Red Bank Terrace
- St Catherine's Wood

Exploratory hole

- Borehole
- Trial pit

Key features

- Bridge
- Carriage Shed
- Infilled Channel
- Infilled Water Body
- River Irk
- Gasworks footprint

Issue	Date	By	Chkd	Appd
P1	2022-08-05	LH	LH	LH

Metres

0 25 50 100

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Manchester M1 3BN
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www.arup.com

Client

BAM Nuttall Limited

Project Title

Victoria North

This drawing relates to
Ground Investigation Interpretive Report

VNIF-ARP-ZZ-YYY-RP-CG-0012

Drawing Title

Exploratory Holes Targetting Historical Features

Scale at A3

1:1,900

Arup Job No

282022

Suitability

Issue

Name

Drawing 09

Rev

P1

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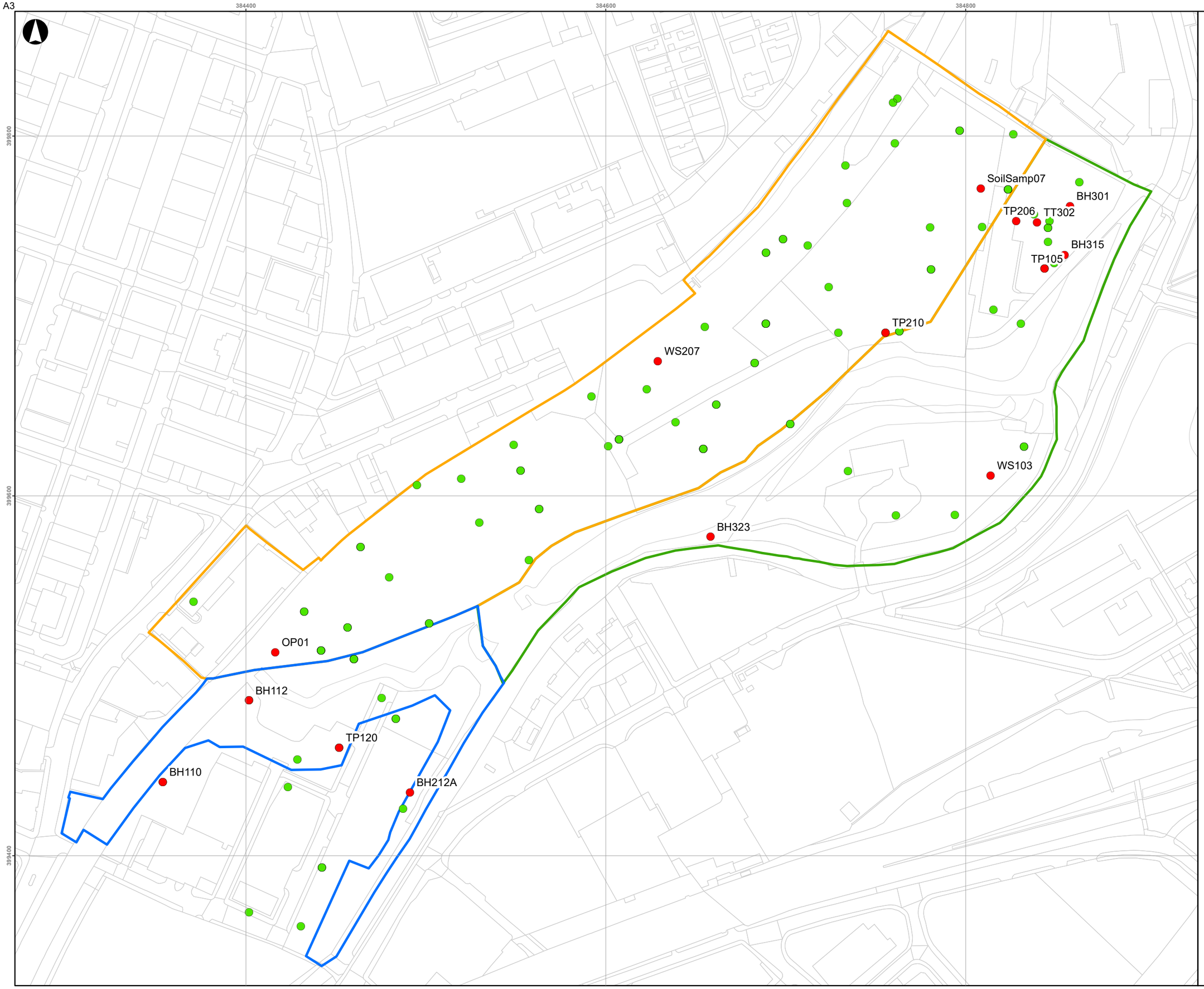
A3



Legend

Site Area

- Red Bank Plateau
- Red Bank Terrace
- St Catherine's Wood

Asbestos identification

- Asbestos detected
- Asbestos not detected

Issue	Date	By	Chkd	Appd
P1	2022-08-05	LH	LH	LH

Metres
0 25 50 100

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Manchester , M1 3BN
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Client
BAM Nuttall Limited

Project Title
Victoria North
This drawing relates to
Ground Investigation Interpretive Report
VNIF-ARP-ZZ-YYY-RP-CG-0012

Drawing Title
Identification of Asbestos in Soil Samples

Scale at A3
1:1,900

Arup Job No
282022-00

Suitability
Issue

Name
Drawing 15

Rev
P1

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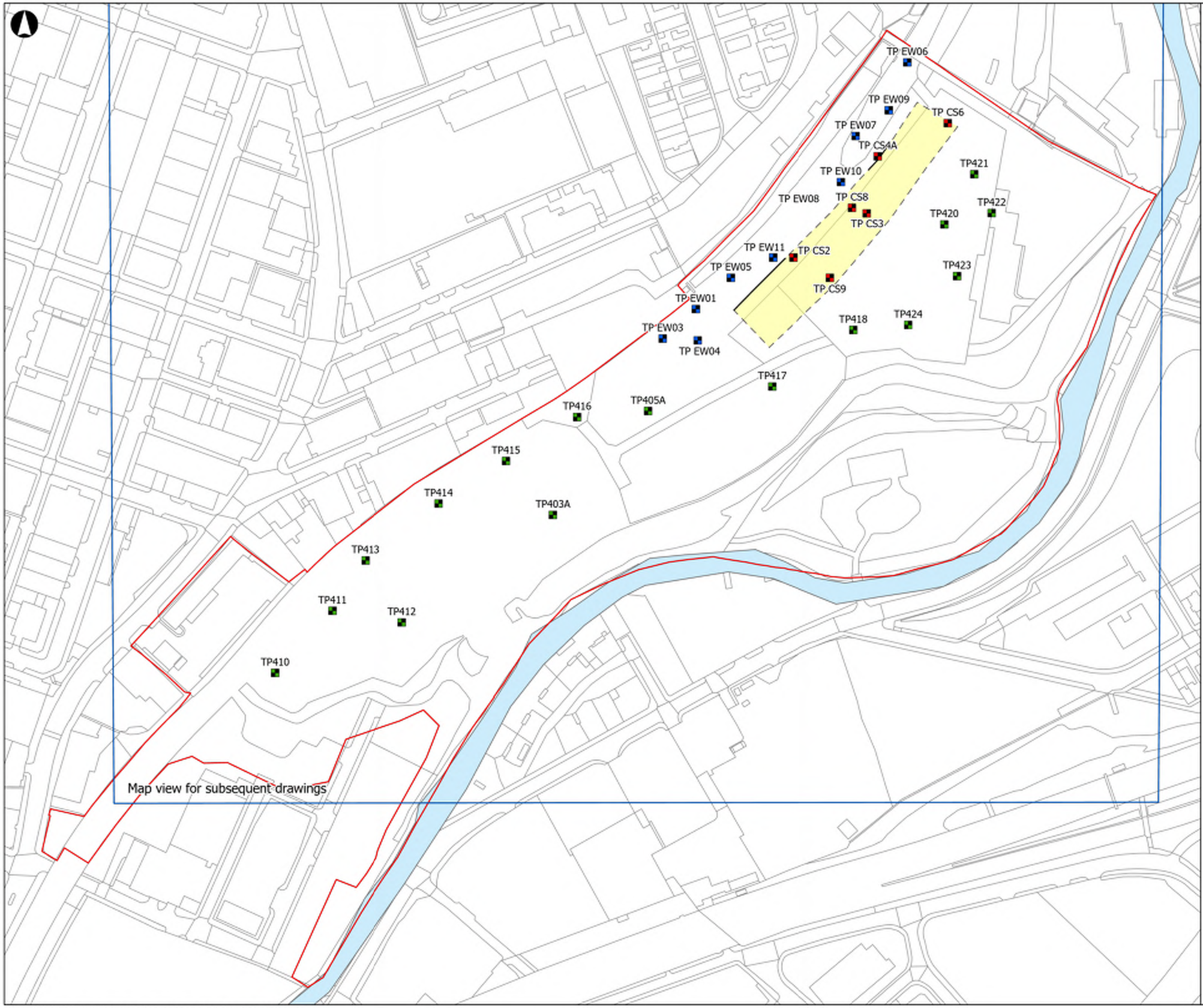

A3

Site Boundary

Trial Pit Locations

- TP40X - 400 Series Trial Pits
- TP EW0X - Emerging Water Trial Pits
- TP CS0X - Carriage Shed Trial Pits
- Carriage Shed (Confirmed Boundary)
- Carriage Shed (Indicative Boundary)
- River Irk

Coordinate System: British National Grid

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Metres

0 25 50 100

Rev	Date	By	Chkd	Appd	Authd
--	13/07/23	KB	CR	--	--

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Client

BAM Nuttall Limited

Project Name

Victoria North, Controlled Waters Detailed Quantitative Risk Assessment

Drawing Title

March 2023 PFAS ground investigation locations

Scale at A3

1:2,000

Role

--

Suitability

--

Project Number

282022-00

Rev

01

Drawing Number

Drawing 4

B:\280000\282022-00 Vic North\Workspaces\GI Drawings\Drawing 4 - Trial Pit Layout Soil Samples.aprx

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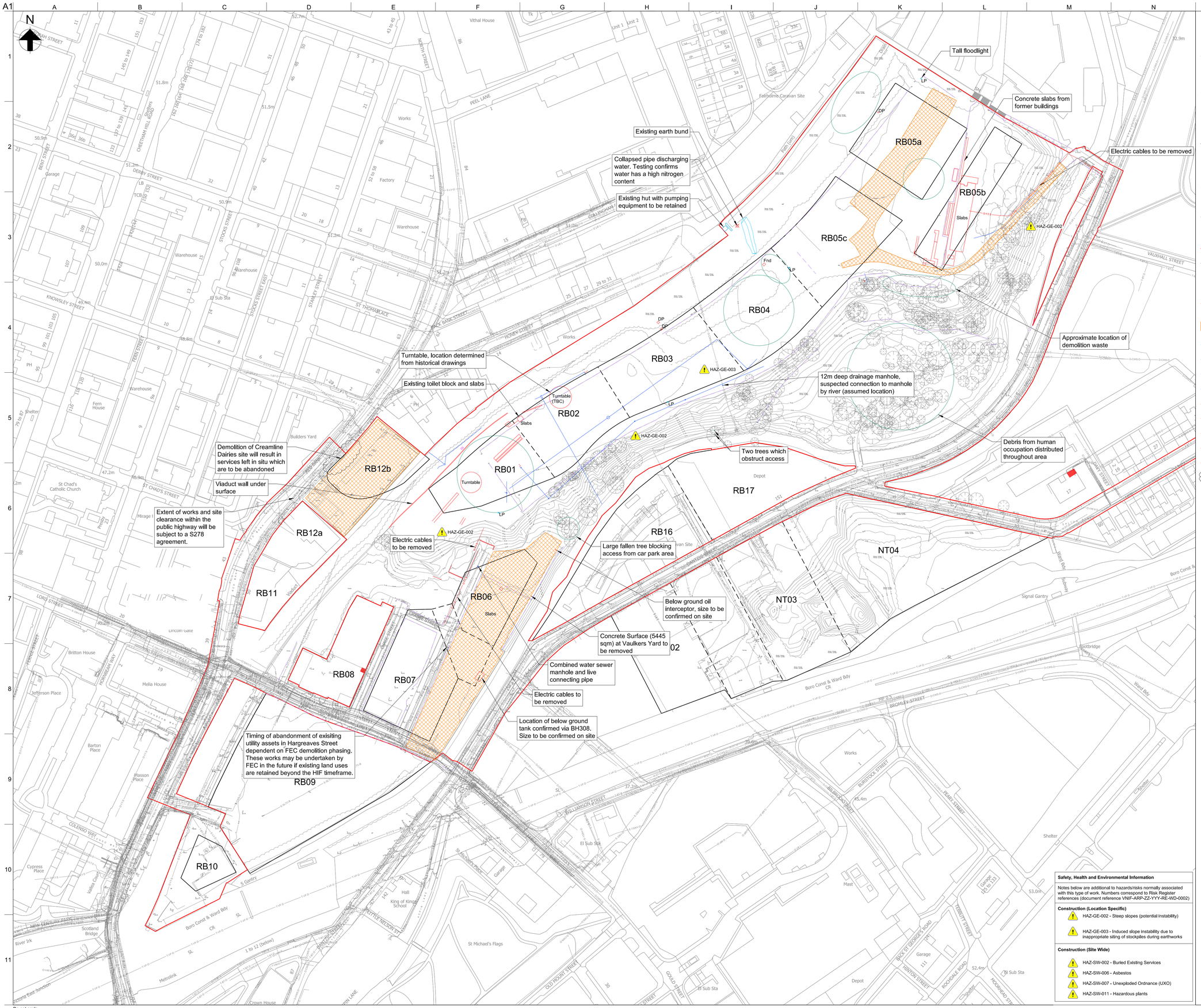
A1


N
Tall floodlight
Concrete slabs from former buildings
Electric cables to be removed
Existing earth bund
Collapsed pipe discharging water. Testing confirms water has a high nitrogen content
Existing hut with pumping equipment to be retained
RB05a
RB05b
RB05c
RB04
RB03
RB02
RB01
RB12b
RB12a
RB11
RB06
RB08
RB07
RB09
RB10
RB17
RB16
NT04
NT03
Slabs
HAZ-GE-002
HAZ-GE-003
Approximate location of demolition waste
Turntable, location determined from historical drawings
Existing toilet block and slabs
12m deep drainage manhole, suspected connection to manhole by river (assumed location)
Debris from human occupation distributed throughout area
Demolition of Creamline Dairies site will result in services left in situ which are to be abandoned
Viaduct wall under surface
Extent of works and site clearance within the public highway will be subject to a S278 agreement.
Two trees which obstruct access
Electric cables to be removed
Large fallen tree blocking access from car park area
Below ground oil interceptor, size to be confirmed on site
Concrete Surface (5445 sqm) at Vaulkers Yard to be removed
Combined water sewer manhole and live connecting pipe
Electric cables to be removed
Location of below ground tank confirmed via BH308. Size to be confirmed on site
Timing of abandonment of exisiting utility assets in Hargreaves Street dependent on FEC demolition phasing. These works may be undertaken by FEC in the future if existing land uses are retained beyond the HIF timeframe.
Turntable
Turntable (TBC)
Fairbolme Caravan Site
Vithal House
Factory
Warehouse
Works
Depot
Builders Yard
St Chad's Catholic Church
Fern House
Britton House
Melia House
Jefferson Place
Barton Place
Masson Place
Cypress Place
Scotland Bridge
Metrolink
Crown House
St Michael's Flags
King of Kings School
Hall
Garage
Mast
Signal Gantry
Footbridge
Shelter
Boro Const & Ward Bdy CR
Ward Bdy
Johnson
Yard Bdy
Boro Const &
LORD STREET
CHEETHAM HILL ROAD
DERBY STREET
BRIDGE STREET
STOCKS STREET
STOCKS STREET EAST
STANLEY STREET
ST THOMAS PLACE
KNOWSLEY STREET
HONEY STREET
BLACK BANK STREET
PEEL LANE
NORTH STREET
FERN STREET
ST CHAD'S STREET
COLENSO WAY
WILLIAMSON STREET
BURSTOCK STREET
BURLEY ROAD
BROMLEY STREET
FRAME STREET
TERRITY STREET
ROCHDALE ROAD
HIRVON STREET
BACK ST GEORGES ROAD
MOORHEAD STREET
OLD MOUNT STREET
GOULD STREET
LITTLE NELSON ST
HARGREAVES STREET
VAUXHALL STREET
JOHN STREET
NEW LEAFLAY PARK LINE
Victoria Exch Junction
River Irk
Lincoln Sale
Garage
Factory
Sub Sta
El Sub Sta
Tk
Unit 1
Unit 2
Shelter
Garage 1 to 13
Garage 111
Garage 14
Garage 17
Garage 19
Garage 27
Garage 77
Garage 151
Garage 153
Garage 160
Garage 161
Garage 163
Garage 165
Garage 167
Garage 169
Garage 171
Garage 173
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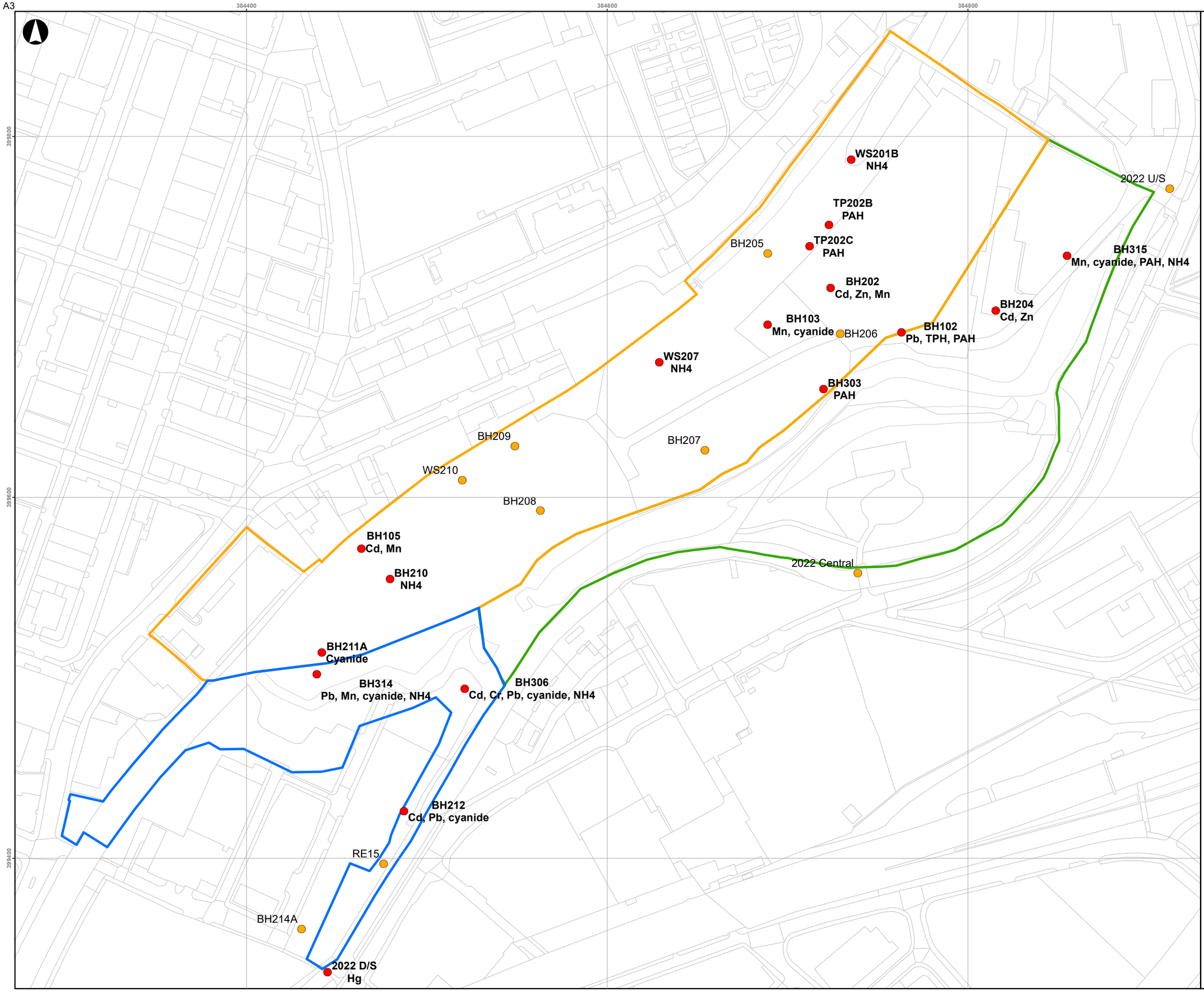
Garage 193
Garage 195
Garage 197
Garage 199
Garage

A3



Legend

Site Area

- Red Bank Plateau
- Red Bank Terrace
- St Catherine's Wood

GAC Exceedances

- No contaminants tested exceed GAC
- >1 contaminant exceeds GAC
- >1 contaminant significantly exceeds GAC

Issue	Date	By	Chkd	Appd
P1	2022-08-08	LH	LH	LH

Metres
0 25 50 100

ARUP

6th Floor, 3 Piccadilly Place,
Manchester , M1 3BN
www.arup.com

Client
BAM Nuttall Limited

Project Title
Victoria North
This drawing relates to
Ground Investigation Interpretive Report
VNIF-ARP-ZZ-YYY-RP-CG-0012

Drawing Title
Controlled Waters Risk Assessment

Scale at A3
1:1,900

Arup Job No
282022-00

Suitability
Issue

Name
Drawing 16

Rev
P1

\\globalgis\UK\280000\282022-00 Vic North\Workspaces\VN Phase 3 GIR - Drawing 02 onwards.mxd

© Arup

Appendix B

JIWG Output Sheets

JIWG

Joint Industry Working Group

Asbestos in Soil and Construction & Demolition Materials

Project Reference	LKC 22 1587
Site Name	Victoria North Infrastructure
Client	BAM
Run by	CB
Date	21-Oct-22
Scenario details	Earthworks - Remainder of the site

Decision Support Tool for CAR2012 Work Categories

Stage 1

Hazard Factors

		Score
Select ACM type (run model for each type to generate 'Worst Case' output)	Loose fibrous asbestos debris	3
Extent of degradation of ACMs at outset of work	Disaggregated (dominated by loose fibrous material; extreme degradation in ACM and/or free asbestos fibres/fibre bundles)	4
Friability and degree of bonding by matrix (ACM matrix, not ground materials)	Friable ACM or ACM with fibres not linked in any matrix (free dispersed fibres/fibre bundles)	4
Distribution of Visible Asbestos Across Affected Area	No visible ACMs/fibre bundles	0
Amount of asbestos fibre in selected ACM/fibre type as % of host material	Very Low quantities - <0.001 to 0.01 %wt/wt	1
Sub-total		**12**

Note: the asbestos licensing regime is unaffected by the type of asbestos fibre present in ACMs

Hazard ranking **Medium**

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It is contingent on users to satisfy themselves that the output from the tool is relevant and appropriate to the assessment being made.

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Stage 2

Exposure Factors

			Score
Anticipated airborne fibre concentration - Control Limit or SALI?	<0.01 fibres/ml		1
Anticipated duration of exposure to asbestos	> 2 hours in a 7 day period and Up to 10 hours in a day (e.g. full time occupational exposure)		4
Activity type and effect on deterioration of ACMs during work	Not low intensity, significant deterioration expected		4
Best description of primary host material matrix (soil/made ground)	Coarse to Fine Sand		2
Respirable fibre index for ACM - RIVM report 711701034 (2003)	Medium		3
Sub-total			**14**
Exposure ranking			Medium
Combined hazard and exposure ranking		**26**	Medium

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Stage 3

Risk Assessment Outputs

Probable Licensing Status	Non-Licensed Work
RPE*	EN149 type FFP3 disposable
Dust Suppression**	Manual/localised dust suppression
Hygiene/Decontamination***	Localised and basic personal decontamination facilities

*Where RPE has to be worn continuously for long periods (e.g. more than 1-hour), then powered RPE may be necessary.
**Reduction in control measures possible if natural mitigation factors are present (e.g. raining, wet ground)
***Guide only; suitability of selected personal hygiene measures may be reviewed on a site/contamination-specific basis

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JIWG

Joint Industry Working Group

Asbestos in Soil and Construction & Demolition Materials

Project Reference	LKC 22 1587
Site Name	Victoria North Infrastructure
Client	BAM
Run by	CB
Date	21-Oct-22
Scenario details	Earthworks - TT302 only

Decision Support Tool for CAR2012 Work Categories

Stage 1

Hazard Factors

		Score
Select ACM type (run model for each type to generate 'Worst Case' output)	Bonded ACMs: cement, vinyl, composites, textured decorative coatings, bitumen products	1
Extent of degradation of ACMs at outset of work	Weathered (Slight degradation in ACM; material still retains its basic integrity)	2
Friability and degree of bonding by matrix (ACM matrix, not ground materials)	Non-friable ACM or ACM with fibres firmly linked in a matrix	0
Distribution of Visible Asbestos Across Affected Area	No visible ACMs/fibre bundles	0
Amount of asbestos fibre in selected ACM/fibre type as % of host material	Large quantities - >0.1 %wt/wt	4
Sub-total		**7**

Note: the asbestos licensing regime is unaffected by the type of asbestos fibre present in ACMs

Hazard ranking Low

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Stage 2

Exposure Factors			Score
Anticipated airborne fibre concentration - Control Limit or SALI?	<0.01 fibres/ml		1
Anticipated duration of exposure to asbestos	> 2 hours in a 7 day period and Up to 10 hours in a day (e.g. full time occupational exposure)		4
Activity type and effect on deterioration of ACMs during work	Not low intensity, significant deterioration expected		4
Best description of primary host material matrix (soil/made ground)	Coarse to Fine Sand		2
Respirable fibre index for ACM - RIVM report 711701034 (2003)	Very low		1
Sub-total			12
Exposure ranking			Medium
Combined hazard and exposure ranking		19	Low

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Stage 3

Risk Assessment Outputs

Probable Licensing Status	Non-Licensed Work
RPE*	EN149 type FFP3 disposable
Dust Suppression**	Manual/localised dust suppression
Hygiene/Decontamination***	Localised and basic personal decontamination facilities

*Where RPE has to be worn continuously for long periods (e.g. more than 1-hour), then powered RPE may be necessary.
**Reduction in control measures possible if natural mitigation factors are present (e.g. raining, wet ground)
***Guide only; suitability of selected personal hygiene measures may be reviewed on a site/contamination-specific basis

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JIWG

Joint Industry Working Group

Asbestos in Soil and Construction & Demolition Materials

Project Reference	LKC 22 1587
Site Name	Victoria North Infrastructure
Client	BAM
Run by	CB
Date	21-Oct-22
Scenario details	Earthworks - NE Area (excluding TT302)

Decision Support Tool for CAR2012 Work Categories

Stage 1

Hazard Factors

		Score
Select ACM type (run model for each type to generate 'Worst Case' output)	Loose fibrous asbestos debris	3
Extent of degradation of ACMs at outset of work	Disaggregated (dominated by loose fibrous material; extreme degradation in ACM and/or free asbestos fibres/fibre bundles)	4
Friability and degree of bonding by matrix (ACM matrix, not ground materials)	Friable ACM or ACM with fibres not linked in any matrix (free dispersed fibres/fibre bundles)	4
Distribution of Visible Asbestos Across Affected Area	No visible ACMs/fibre bundles	0
Amount of asbestos fibre in selected ACM/fibre type as % of host material	Low quantities - >0.01 to <0.05 %wt/wt	2
Sub-total		**13**

Note: the asbestos licensing regime is unaffected by the type of asbestos fibre present in ACMs

Hazard ranking **Medium**

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It is contingent on users to satisfy themselves that the output from the tool is relevant and appropriate to the assessment being made.

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Stage 2

Exposure Factors			Score
Anticipated airborne fibre concentration - Control Limit or SALI?	<0.01 fibres/ml		1
Anticipated duration of exposure to asbestos	> 2 hours in a 7 day period and Up to 10 hours in a day (e.g. full time occupational exposure)		4
Activity type and effect on deterioration of ACMs during work	Not low intensity, significant deterioration expected		4
Best description of primary host material matrix (soil/made ground)	Coarse to Fine Sand		2
Respirable fibre index for ACM - RIVM report 711701034 (2003)	Medium		3
Sub-total			14
Exposure ranking			Medium
Combined hazard and exposure ranking		27	Medium

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Stage 3

Risk Assessment Outputs

Probable Licensing Status	Non-Licensed Work
RPE*	EN149 type FFP3 disposable
Dust Suppression**	Manual/localised dust suppression
Hygiene/Decontamination***	Localised and basic personal decontamination facilities

*Where RPE has to be worn continuously for long periods (e.g. more than 1-hour), then powered RPE may be necessary.
**Reduction in control measures possible if natural mitigation factors are present (e.g. raining, wet ground)
***Guide only; suitability of selected personal hygiene measures may be reviewed on a site/contamination-specific basis

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Appendix C

Generic Soil Assessment Criteria Values

Table 6/14D – Proposed topsoil and subsoil validation criteria		
Determinand		**Soil target (mg/kg)**
Metals	Antimony	500
	Arsenic	40
	Beryllium	1.7
	Cadmium	85
	Chromium	93.5
	Chromium (hexavalent)	6
	Copper	190
	Lead	310
	Mercury	56
	Nickel	26.5
	Selenium	430
	Vanadium	500
	Zinc	191
Inorganic	Cyanide	24
	Cyanide (free)	24
	Boron	500
	Phenol	500
	Phenol (Monohydric)	500
	Asbestos	No visible asbestos <0.01%
TPH	Ali >C5-C6	161
	Ali >C6-C8	500
	Ali >C8-C10	155
	Ali >C10-C12	283
	Ali >C12-C16	142
	Ali >C16-C21	50.9
	Ali >C21-C35	50.9
	Ali >C35-C44	50.9
	Aro >C7-C8	500
	Aro >C8-C10	153
	Aro >C10-C12	76
	Aro >C12-C16	208
	Aro >C16-C21	323
	Aro >C21-C35	500
	Aro >C35-C44	500
PAH	Acenaphthene	336

Table 6/14D – Proposed topsoil and subsoil validation criteria		
Determinand		**Soil target (mg/kg)**
	Dibenz-a-h-anthracene	0.32
	Fluoranthene	7
	Fluorene	183
	Indeno(1,2,3-cd)pyrene	46
	Phenanthrene	500
	Pyrene	500
	Naphthalene	13
	Acenaphthylene	500
	Anthracene	500
	Benzo(a)anthracene	15
	Benzo (g,h,i) perylene	359
	Benzo(a)pyrene	3.2
	Benzo(b)fluoranthene	4.1
	Benzo(k)fluoranthene	107
	Chrysene	32
BTEX	BTEX - Benzene	1.4
	BTEX - Toluene	500
	BTEX - Ethyl Benzene	440
	BTEX - m & p Xylene	428
	BTEX - o Xylene	475
	Xylene	428
PCBs	PCB BZ 105	0.000074
	PCB BZ 114	0.000004
	PCB BZ 118	0.000171
	PCB BZ 123	0.000006
	PCB BZ 126	0.000005
	PCB BZ 156	0.000032
	PCB BZ 157	0.000008
	PCB BZ 167	0.000013
	PCB BZ 169	0.000001
	PCB BZ 189	0.000005
	PCB BZ 77	0.000016
	PCB BZ 81	0.000001

Table 7: SSACs for PFAS derived using CLEA

Compound	Residential without homegrown produce scenario (µg/kg)	Public open space (on residential development) scenario (µg/kg)	Public open space (park) (µg/kg)
Total PFSAs (PFOS)	40.4	79.1	161.2
Total PFCAs (PFOA)	21.1	79	152.8

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