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REMEDIATION STRATEGY
HYDRO ALUMINIUM

1. BACKGROUND

E3P has been instructed by Hydro Aluminium Ltd (the Client) to develop a combined remediation strategy for the proposed scheme to construct a recycling materials sorting facility and covered storage bays with associated service infrastructure and external hardstanding located to the southwest of Hydro Aluminium, herein referred to as the Site.

The development of the risk management strategy for the subject sites includes the following tasks:

- Identification of the relevant pollutant linkages;
- Review of site characteristics;
- Development of remedial objectives;
- Selection of appropriate remedial technology; and
- Development of remedial strategy.

It should be noted that this document pertains solely to contaminated land matters and does not take into consideration any geotechnical items.

1.1. PREVIOUS WORKS

The following phases of desk study have previously been carried out at the site:

- **E3P** – Phase I Geoenvironmental Site Assessment. Report Ref. 16-685-R1-3, dated October 2024, Prepared for Portal Construction NW Ltd.

The following phases of Geoenvironmental investigations and assessments have previously been carried out at the site:

- **Genesis Environmental Ltd** – Site Report of Hydro Aluminium Deeside, Wrexham. Report Ref: ADE/178/SR, dated August 2021, Prepared for Hydro Aluminium Ltd.

- **E3P** – Phase II Geoenvironmental Site Assessment. Report Ref: 16-685-R2-3, dated October 2024, Prepared for Portal Construction NW Ltd.

To inform the assessment of the potential risk to contaminated land within the context of the proposed residential development and to inform the preparation of the remediation strategy, the pertinent points from the above Geo-environmental Investigation letter reports are summarised within Section 1.2 below.

For the avoidance of any doubt, the aove reports should be read both as a precursor to and in conjunction with this document.

1.2. SITE SUMMARY

TABLE 1.1 SITE SUMMARY – HYDRO ALUMINIUM

Site Address	Hydro Aluminium Deeside Ltd, Bridge Road, Wrexham, LL13 9PS	
Proposed Development	Hydro Aluminium Ltd intends to construct a proposed recycling materials sorting facility and covered storage bays with associated service infrastructure and external hardstanding.	
Occupancy/Use	The subject site is a rectangular shaped parcel of land located to the east of Wrexham and is currently used for storage of goods by Hydro Aluminium Deeside Ltd. Goods stored on site comprise aluminium billets manufactured through a recycling process within the main facility located to the north east of the development area. There is a large mound running along the southwestern boundary extending approximately 7 m above ground level. There is also a smaller mound running along the northeastern boundary adjacent to the main Hydro Aluminium Deeside Ltd facility, however this only extends 2-3 m above ground level. The material within the mounds appears to be a mix of soil and stones with some timber and metal. Scrub vegetation is present on the north-eastern mound with the southwestern stockpile covered in semi-compacted soil and gravel. Semi-mature trees line the north-western and southwestern boundaries, with no vegetation present in the northern sector. A service road runs through the centre of the site with an associated weigh bridge. A storage area and lorry park are present in the northwest and southeast respectively.	
Environmental Setting	**Superficial Geology**	Glacial Till – CLAY, SAND, GRAVEL
	Bedrock Geology	Salop Formation – MUDSTONE, SANDSTONE and CONGLOMERATE
	Hydrogeology	Superficial – Secondary Undifferentiated Aquifer Bedrock - Secondary A Aquifer An active groundwater abstraction licence is recorded 559m south-east for the purpose of process water.
	Hydrology	The nearest off-site surface water feature is a drainage channel located 15 m north-west.
	Flood Risk	Unaffected by flooding from rivers.
Site History	Historical mapping suggests that the site remained as undeveloped agricultural land with ponds until circa 1949, when it was transformed as a part of Royal Ordnance Factory (ROF) Wrexham.	

	A number of buildings were constructed and associated tracks, which remained in place until circa 1976 when all buildings were removed from site. By 1986, the site was vacant with no features noted on the mapping and it remained this way until 2000 when an entry gate was constructed along the south-eastern boundary. By 2020 the service road through the centre of the site had been constructed, and the site remains in this layout to the present day.
Landfill Sites	No historic or currently licensed landfill sites or backfilled mineral workings within close proximity to the site.
Radon	Lower Probability Area (<1% affected) - No radon protection measures required.
Ground Conditions	**Made Ground: 0.00 m bgl to 4.00 m bgl** Made Ground was encountered within all exploratory hole locations on the site and can generally be split into three distinct strata occurring in the lorry park, the goods yard and the stockpiled material respectively. Within the lorry park area in the south of the site Made Ground was encountered from ground level to 1.00 m bgl. Made Ground comprises grey sandy gravel with cobbles. Gravel is fine to coarse angular to subrounded of mudstone, brick, concrete and limestone. Cobbles are subangular of concrete. Made Ground within the goods area in the north of the site was generally encountered from ground level to 0.50 m bgl. In WS108 localised Made Ground was encountered to 2.00 m bgl. Made Ground comprises a 250 mm concrete slab overlying grey sand with gravel of mudstone and limestone to a depth of 0.50 m bgl. In WS108 a membrane was encountered at 0.50 m bgl which is underlain by brown slightly sandy gravel with cobbles. Gravel and cobbles comprise mudstone, brick and concrete. Due to a barrel refusal at 2.00 m bgl the full extent of Made Ground within WS108 could not be proven. Made Ground within the mounded stockpile in the west of the site was encountered from ground level up to 4.00 m above ground level. It should be noted, however, this is not a true representation of the depth of Made Ground beneath the site as the material is built up from natural ground level. The stockpiled material generally comprises brown reworked sandy gravelly clay with cobbles. Gravel is fine to coarse angular to subrounded of mudstone, limestone, brick, concrete, plastic, metal, timber and ceramic. Cobbles are subangular of brick and concrete. Localised sandy gravel of ash and asphalt was encountered within TP109 and WS106 between 2.00 and 2.80 m. **Topsoil:** No topsoil has been identified on-site. **Drift Deposits: 1.10 m bgl to >18.25 m bgl** Drift deposits were encountered in all exploratory hole locations in the lorry park and goods yard, apart from WS108 where the full extent of Made Ground could not be proven. Drift deposits were also not encountered within certain locations on the stockpile due to the height of the mounded material. Drift deposits are uniform across the site comprising reddish stiff medium strength to very stiff high strength brown slightly gravelly slightly silty CLAY with rare cobbles. Gravel is fine to medium subangular to subrounded of mudstone. Cobbles are subrounded of mudstone. Localised areas of firm low strength clay were encountered at 14.00 m bgl in CP101 and CP103. **Bedrock:** The solid geology was not encountered during the site investigation.

	Groundwater: Groundwater was not encountered during the site investigation.
Human Health Risk Assessment	A Tier I human health risk assessment has been undertaken using the chemical analysis results of the soils and comparing them to the relevant Tier I criteria. Elevated concentrations of Lead have been identified within one isolated location and is therefore considered to be a localised hotspot. Given that the development will be covered in hardstanding comprising either buildings, concrete slabs or asphalt the pathway through dermal contact and soil ingestion will be broken, removing the associated risks to the end users. During the enabling works and build phase works on site construction workers will mitigate the associated risks through PPE and good site hygiene during the short-term exposure. Additionally, if proposed landscaping were to be constructed within this area, commercial developments generally have a 300mm 6F2 capping across the entire of the development platform and the landscaped area would be subject a clean 300mm growing medium that will also break the associated pathway. No asbestos has been identified within any of the tested samples. Due to the proximity of the electrical substation on site 3 samples were tested for PCB compounds. Results show concentrations of PCB to be below the limit of detection (LOD). PCBs were encountered during the previous Gemini investigation. Due to the historical use on site as an ordnance factory, selected samples were tested for explosive compounds found in cordite. All result showed the compounds to be below the LOD. Chemical analysis of the natural clay drift deposits has identified these soils to be acceptable for use as subsoil within the proposed soft landscaping areas. There are no suitable sources of topsoil on site.
Controlled Waters Risk Assessment	Marginal exceedances in metalloids have been identified across the site within groundwater surface water and leachate samples. Heavy metals have been the only determinants to be noted to be exceeding the EQS and DWS criteria; however minimal elevated concentrations against the DWS were identified and as such the surface water features are considered to be at greater risk. It should be noted that leachate analysis overstates the risk and due to the thickness of cohesive clay overlaying the bedrock aquifer, it is considered that there is no unacceptable risk to the secondary A aquifer. The m-BAT tool has shown that copper, despite exceeding EQS threshold values, is not bioavailable and does not pose an unacceptable risk to the surface water receptor. The RCR for zinc exceeded the EQS threshold value and is therefore considered bioavailable, however, no exceedances for zinc have been identified within on site soil, leachate or groundwater samples and therefore it is considered that zinc is not leaching from site. It is likely that zinc exceedances in the surface water samples is due to leaching from the surrounding industrial area. Furthermore, cohesive clay deposits across the site will reduce the migration of contamination to the inland river. It is recommended that further analysis of the surface water in the inland river and drain should be undertaken as groundworks progress, if they are scheduled to remain.

Ground Gas	Given that there is no obvious source of ground gas and no elevated readings have been encountered, it is recommended that the site is classified as CS1 and no gas protection measures are required. In the vicinity of WS104, WS105 and WS106, stockpiled Made Ground was encountered to a depth of 4.00 m, in these areas the carbon dioxide concentration has been detected as levels of CS2, however the GSV values fall as CS1 and the locations are not beneath the proposed structure.
Potable Water Supply	The assessment of the current ground conditions indicates that PE pipeline would be suitable. However, post-remediation and enabling works ground conditions may be different from those identified during this site investigation. This will need to be confirmed following the completion of a UKWIR risk assessment following remediation and enabling works.

2. SITE REMEDIATION AND ENABLING WORKS

2.1. SUMMARY OF REMEDIATION OPTIONS

It is considered that the following combination of remediation technologies provides the most sustainable, viable and economic solutions that will ultimately result in the successful remediation for the site(s):

- Management of soils impacted by PCBs and lead.
- Watching brief during remedial earthworks by a UXO specialist given the site historical use as part of Royal Ordnance Factory (ROF) Wrexham.
- Removal of soil from mounds along the southwestern and northeastern boundaries.
- Construction of a 300 mm clean **cover system** to all landscaped areas on site in accordance with the detailed methodologies herein.
- Use of potable water supply infrastructure that will be compliant with United Kingdom Water Infrastructure Risk (UKWIR) assessment criteria.

2.2. OVERVIEW OF WORKS

Prior to the commencement of works on-site, the contractor must establish all necessary plant, equipment, and site welfare facilities as is necessary to complete the contract within the agreed timescales to the rationale as outlined in the following subsections.

For the avoidance of any doubt, the proposed operations as set out herein document the required performance objectives and validation sampling protocols; however, the specific methods of work deployed to ensure the remediation objectives are achieved in a compliant manner on-site will be the responsibility of the appointed contractor.

RE-1 – SITE CLEARANCE OPERATIONS

Post-demolition general site clearance and provision of welfare, offices and site security are to be determined as per the contract requirements.

The Site currently has a building in the centre of the site and associated hardstanding and likely below-ground structures. These will require demolition and removal.

Vegetation material should be removed in a controlled manner with full compliance with any ecological mitigation measures that are required for the works. Any such measures are outside the scope of this report.

All vegetation should either be stockpiled at a pre-agreed location or alternatively removed from site in accordance with waste permitting regulations.

All root networks are to be removed from beneath the building footprint.

RE-2 – RETENTION OF IDENTIFIED PCB AND LEAD IMPACT

The most recent Geoenvironmental Assessment undertaken by E3P in October 2024 identified no elevated concentrations of contaminants when screen against general acceptance criteria for a commercial development. However, a previous inestigation undertaken by Genesis Environmental Ltd in August 2001 reported elevated concentration of PCBs and a single elevated concentration of Lead 25,900 mg/kg in TP6 (the report indicated elevated concentrations of lead and zinc, however all but one concentration was below the current screening values for a commercial development). Unfortunately an exploratory hole location plan from the Genesis Environmental Ltd investigation has not been made available for review. It is noted that PCBs are relatively immobile and the majority of the site following development will be surfaced by hard cover.

These exceedances can be mitigated by the installation of a 300 mm chemically suitable cover system within areas of soft landscaping or placement under hardstanding or the building footprint.

RE-3 – EXCAVATION, BREAKING AND PROCESSING OF ALL ABOVE- AND BELOW-GROUND STRUCTURES

Obstructions, relict foundations, and infrastructure (apart from live services) are to be removed from the areas of proposed commercial development, including where no foundations and infrastructure is proposed.

It will be the contractor's responsibility to remove all obstructions from the sites.

Obstructions encountered within the near-surface soils will be chased to their full depth and removed; if not possible, the obstruction must be surveyed with the location communicated to E3P, the client and the developer.

Where natural soils are present at a relatively shallow depth, extreme care should be taken to ensure that the natural cohesive deposits remain undisturbed with a full reduced-level survey to be completed to map the depth of filled/processed material.

RE-4 – SURFACE WATER MONITORING

The nearest surface watercourse is a drainage channel located 15 m NW of the site and there is also a drain present in the far north east of the site.

Surface water samples should be obtained to ensure no detrimental effect during the enabling works. It is proposed to complete monitoring prior to the main earthworks commencing, during the works and at the end of the works.

RE-5 – PREPARATION OF LANDSCAPED AREAS FOR COVER SYSTEM

As part of the land remediation works, landscaped areas will be prepared in a manner that will facilitate the placement of the clean cover system during the development phase of the works. The preparation of the areas requiring clean cover is critical in ensuring delivery of the site in a manner that will ensure no risk to the proposed end users.

Where Made Ground is deemed unsuitable for retention in a landscaped area, the area will be subject to a reduced-level dig to remove unsuitable material to a minimum depth of 300 mm below finished landscaped area level or verified natural stratum (whichever is the shallower).

Excavated soil will be stockpiled pending the results of the appropriate validation testing (to be completed in accordance with this specification) prior to reuse in an area of no sensitivity or, where necessary, this material will be removed from site in accordance with UK waste management legislation.

The placement of certified subsoil and topsoil will be completed as part of the developer works/build-phase mitigation plan.

All landscaped areas where a cover system is required will be subject to independent validation.

RE-6 – PROVISION OF SUBSOIL

The shallow natural drift deposits (predominantly cohesive soils) present on the site have indicated they are suitable for use as subsoils within the clean cover system.

Subsoil (site-won and imported) will require testing in line with the schedule present within Section 3.3 and Table 3.1.

RE-7 – PROVISION OF TOPSOIL

No material that would be deemed suitable for use as topsoil is present on either site; and as such, there will be a requirement to import suitable material for use within the proposed development.

Topsoil will require testing in line with the schedule present within Section 2.3 and Table 2.1.

The landscaped areas will require depth validation to satisfy the requirements of the CML in order to demonstrate that the appropriate thickness has been provided as a growing medium.

RE-8 – INDEPENDENT VALIDATION: WATCHING BRIEF

Given the site history and potential contamination sources identified within the ICSM, a degree of uncertainty remains with regard to the potential for as yet unidentified contamination impact within the near-surface soils and groundwater beneath the building footprint.

It will therefore be necessary that the on-site contractor notifies E3P if any previously unidentified contamination is encountered.

Furthermore, given the site history as part of Royal Ordnance Factory (ROF) Wrexham it is is recommended that a Stage 2 Detailed Risk Assessment is undertaken prio to the commencement of groundworks and that a watching brief is carried out by a specialist UXO specialised for the duration of the earthworks.

RE-9 – WASTE SOILS SURPLUS TO REQUIREMENTS

It is understood that that the materials constined with the bund along the southwestern and north eastern boundaries of the site is to be removed as part of the enabling works prior to construction of the proposed development. This will be deemed to be a waste in accordance with the Waste Framework Directive (Article 3(1) Waste Framework Directive 2008/98/EE). The waste producer – but ultimately, the landowner – is responsible for the compliant disposal of such materials.

A formal waste classification assessment must be undertaken, irrespective of any future options or considerations for those materials that will removed from site. Waste classification should only be made following the Environment Agency *Technical Guidance WM3 – Guidance on the Classification and Assessment of Waste*.

To remove the surplus material from site it will either need to be sent to a disposal site (landfill), to a permitted treatment facility or, dependent on the waste classification assessment, it may be suitable for use on a permitted land improvement or restoration operation.

Subject to suitability, these soils can be transferred to the receiving site, subject to an approved permit or materials management plan following guidance in the CL:AIRE *Definition of Waste: Code of Practice*.

RE-10 – VALIDATION OF MATERIALS FOR POTABLE WATER SUPPLY INFRASTRUCTURE

No UKWIR Risk Assessments have been undertaken for the Site.

As such, it is recommended that UKWIR Risk Assessments should be undertaken for both sites to confirm the most suitable potable water supply pipework, and to ensure that potable water infrastructure is constructed in accordance with a suitably robust risk assessment and design compliant with UKWIR.

RE-11 – REMEDIAL VERIFICATION REPORT

The collation of information relating to site clearance, chemical testing, remedial works, remedial verification, material movements and waste transfer documentation is required, where appropriate.

Complete remedial validation i.e. the retention and clean capping on PAH impacted materials is to be reported in line with regulatory guidance. This will include a detailed risk assessment. The report will be submitted to the local authority for approval following completion.

2.3. VALIDATION SAMPLING PROTOCOL

In accordance with the current requirements of the regulatory authorities, validation samples will be collected from all materials that are to be subject to movement under the protocols outlined within this remediation and enabling works strategy, or for materials to be imported onto site to facilitate the proposed residential development.

Soil samples destined for chemical analysis will be collected at regular intervals in appropriate sampling containers. All samples will subsequently be stored in cooled boxes prior to submission to a UKAS/MCERTS accredited laboratory.

All samples will be collected using appropriate personal protective equipment (PPE) and sampling equipment, which will be cleaned at each sampling location.

A detailed copy of E3P Ltd sampling methodology, QA procedures and laboratory chain of custody forms will be documented within the site records and presented with the final validation report for the site.

Where material is found to contain concentrations of potential contaminants at levels in excess of the site-specific screening criteria (as detailed within the enclosed appendices), E3P will undertake further assessment and recommendations on the appropriate use for the material in question, which may involve the disposal of such materials off-site to a suitable waste management facility.

The sampling frequency for materials to be managed under the remediation strategy is presented within Table 2.1, overleaf.

TABLE 2.1 SPECIFICATION OF CHEMICAL VALIDATION LABORATORY ANALYSIS

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Site-Generated		
Site-Generated 6F2	1 Sample per 1000 m^3	A/B/C/D
Site-Won MADE GROUND General Backfill	1 Sample per 250 m3 where visual and/or olfactory impact is identified	G
Site-Won MADE GROUND General Backfill	1 Sample per 1000 m^3	A/B/C/D
Site-Won MADE GROUND General Backfill	1 Sample per 2000 m^3	I
Site-Won Natural Backfill	1 Sample per 2000 m^3	A/B/C/D
Site-Generated Subsoil (150 mm Landscaped Cover)	1 Sample per 250 m^3	A/B/C/D
Site-Generated Topsoil Cover (150 mm Landscaped Cover)	1 Sample per 50 m^3	A/B/C/D
Hotspot Validation Samples	1 Sample per 10 m of linear excavation to base and sidewall	E/G
Imported		
6F2	1 Sample per 1000 m^3	A/B/C/D
Subsoil Greenfield Source (150 mm Landscaped Cover)	1 Sample per 200 m^3	A/B/C/D
Subsoil Brownfield Source (150 mm Landscaped Cover)	1 Sample per 50 m^3	A/B/C/D
Topsoil Greenfield Source (150 mm Landscaped Cover)	1 Sample per 200 m^3	A/B/C/D
Topsoil Brownfield Source (150 mm Landscaped Cover)	1 Sample per 50 m^3	A/B/C/D
General Engineering Fill (Class 1 and 2 Soil)	1 Sample per 1000 m^3	A/B/C/D

Notes
Suites of Analysis:

A. Speciated PAH.
B. Speciated TPH (C5-C35).
C. Asbestos (ID).
D. CLEA Inorganic Heavy Metals.
E. Speciated PAH, Banded TPH and VOCs.
F. SVOC/Speciated TPH.
G. On-Site Screening for VOC Using Calibrated PID.
H. Leachate 2:1 Speciated PAH and Banded TPH.
I. Leachate Analysis of Inorganic Heavy Metals, TPH, Sulphate and PAH.

All analysis prescribed above to be completed by UKAS-accredited laboratory.

2.4. REMEDIATION CONTRACTORS SITE MANAGEMENT AND RESPONSIBILITY

The appointed remediation contractor will take full and overarching responsibility for all methods of work required to complete the site remediation and enabling operations to ensure the delivery of the site and the completion of the objectives in a safe, legislatively compliant manner that ensures no pollution to the subject site or the wider environs.

For individual remediation operations as set out within this performance specification, the contractor will provide site-specific methods of work for individual operations pertaining to the removal and treatment of contaminated liquids and soils. For each and every operation as set out herein, the contractor will provide a written methodology of works to be supplied to the supervising geo-environmental engineer prior to the instigation of operations on-site.

The site manager will be responsible for documentation of each day's activities with a full recorded schedule of works completed and corresponding site-specific method statements that have been utilised to ensure the completion of the task to the required standard.

3. ENVIRONMENTAL MONITORING AND VALIDATION

3.1. SITE MANAGEMENT

The tracking of materials will be based on the following hierarchy:

- The principal contractor will have the responsibility for setting out areas of the site on the basis of the contract specification.
- Operatives will have instructions only to excavate and to emplace materials in specified areas as assigned by the site manager/foreman.
- The site manager (employed by the principal contractor) will issue daily instructions to drivers regarding the placement of materials sourced from specific stockpiles or areas, ensuring that appropriate documentary evidence is collected that details which materials are going where and why.
- An E3P consultant, who will be in attendance as required, will:
    - Inspect the excavation areas and certify that the correct materials are being excavated;
    - Conduct spot checks on loaded vehicles to ensure compliance with this remediation strategy; and,
    - Ensure that any loads that fail visual, olfactory or spot checks either remain on the vehicle or, if unloaded, are excavated and set aside. This material will be treated according to the recommendations of the E3P site engineer.
- E3P will conduct an audit of waste consignment notes. All material imported and removed from site will have duty of care/consignment notes, copies of which will be retained on-site by the site manager.
- Materials directly reusable will be incorporated into the earthworks, subject to operational conditions and phasing of excavations, in which case they will be stockpiled prior to final placement.

3.2. COMPLETION

Following the completion of the remediation works, a report will be compiled by the environmental consultant detailing all site enabling works undertaken, waste consignment notes, and all site investigations, laboratory test certificates and validation testing undertaken.

A certificate of completion of earthworks should be included within the report which should then be issued to the local authority for their approval.

E3P considers that with the adoption of the above best practices the site can be safely redeveloped. The site enabling works process and presence of any residual contamination (if this is the case) should be recorded for future reference by landowners/occupiers. Future development at the site where this may result in penetration of new areas of hardstanding should be subject to no-less-stringent measures with respect to assessment and, where appropriate, monitoring, than those set out herein.

4. RECORD-KEEPING AND VERIFICATION

4.1. RECORD-KEEPING

During the course of the remediation and site enabling works, the on-site E3P consultant will undertake the following record-keeping protocols:

- Detailed daily site diary including material movements;
- Sampling register, testing results, photographs, details of locations of hydrocarbon-impacted soils (drawings), details of hotspot removals, details of consignment notes of any hydrocarbon-impacted material that is required to be disposed of off-site; and
- Detailed surveys (volumes).

Record-keeping on-site, in particular movements and analysis of specific material types, will be in the form of site diaries and a remediation excavation record. This record will remain on-site and will be completed by the E3P on-site engineer during the course of the remediation and site enabling works.

4.2. VERIFICATION

The records listed above will then be compiled into a validation report produced by E3P on completion of the remediation and site enabling works, clearly referencing the origin of the materials used and testing carried out to confirm its suitability for use, where required. E3P will also prepare an as-built development drawing clearly detailing the materials present on-site to be cross referenced with the supporting validation documentation.

The validation report may include the following:

- Remediation strategy (including copies of confirmation from regulatory authorities agreeing criteria);
- Detailed surveys of all excavations and production of as-built drawings for the earthworks;
- Copy of consignment notes relating to the movement of wastes to a licensed waste management facility;
- Detailed drawings showing all sampling locations for both chemical and geotechnical testing;
- Chemical test results;
- Geotechnical test results;
- Details of qualified persons signed declaration; and
- Monitoring results if undertaken (e.g., asbestos in air, gas water).

5. CONTINGENCY PLAN

5.1. PREVIOUSLY UNIDENTIFIED CONTAMINANTS

Should significantly impacted material be encountered during the development, then it will be excavated and stockpiled on an impermeable material and sampled and tested for an appropriate range of determinants.

Once the laboratory analysis of the material is available, an assessment will be undertaken to determine whether it can be retained on-site as part of the material management plan or whether it should be disposed of off-site.

Depending on the nature of any such impact, it may be necessary to undertake validation testing of the excavation faces in order to demonstrate that no such materials are left in situ.

6. SECOND PHASE MITIGATION AND MANAGEMENT – BUILD PHASE

This document details the construction works that are required to ensure full compliance with the remediation Strategy, Regulatory Authorities, Building Control & Warranty Providers;

The following should be implemented during the build phase of the development:

- Laboratory testing of the imported topsoil;
- Chemical validation of any additional subsoil imported for use within landscaping areas;
- Placement and validation of subsoil (clean material) in a 150 mm layer within any landscaping areas;
- Placement and chemical validation of at least 150 mm imported topsoil within all landscaping areas;
- Installation and validation of potable water supply infrastructure that will be compliant with United Kingdom Water Infrastructure Risk (UKWIR) assessment criteria

The validation protocols are presented within the E3P Remediation and Enabling Works Strategy and are presented below.

6.1. PLACEMENT OF COVER SYSTEM

The Remediation Strategy for the site, with respect to human health of the future site users includes the provision of a chemically suitable clean material to be installed in all landscaped areas; the construction of the clean cover / placement of clean material shall consist of:

- 150 mm subsoil;
- 150 mm topsoil; and,
- Separation layer beneath the subsoil, either geotextile or stone layer.

In accordance with the current requirements of the regulatory authorities, validation samples will be collected from all materials that are to be imported or re-used on-site to confirm the proposed development will pose no unacceptable risk to human health or the wider environ.

Subsoil and topsoil shall be free of any deleterious materials, such as buildings materials, timber, plastics etc and conform to the requirements of BS 3882:2007.

Testing requirements for topsoil and subsoil are presented in Table 6.1.

TABLE 6.1 SPECIFICATION FOR SOIL TESTING

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Subsoil Greenfield Source (150 mm Landscaping Cover)	1 Sample per 200 m^3	A/B/C/D
Subsoil Brownfield Source (150 mm Landscaping Cover)	1 Sample per 50 m^3	A/B/C/D
Topsoil Greenfield Source (150 mm Landscaping Cover)	1 Sample per 200 m^3	A/B/C/D
Topsoil Brownfield Source (150 mm Landscaping Cover)	1 Sample per 50 m^3	A/B/C/D
General Engineering Fill (Class 1 and 2 Soil)	1 Sample per 1000 m^3	A/B/C/D

Notes
Suites of Analysis:
A. Speciated PAH.
B. Speciated TPH (C5-C35).
C. Asbestos (ID).
D. CLEA Inorganic Heavy Metals.

6.1.1. PROCEDURE FOR PLACEMENT OF CHEMICALLY SUITABLE COVER SYSTEM

Made Ground soils are to be stripped from beneath proposed areas of landscaping to a minimum of 300 mm bgl.

Landscaped areas need to be backfilled with 150 mm chemically validated subsoil, with 150 mm topsoil overlaying this. Topsoil is required to be confirmed as chemically suitable prior to placement. Where subsoil is not placed during Remediation & Enabling works, E3P will be required to return to site and undertake independent validation of the correct placement of subsoil.

The placement of 300 mm of clean material, with a separation layer comprising weither geotextile or stone, will be undertaken during the build phase works of the project.

The placement of subsoil and corresponding validation will be documented within the Landscaping Validation Letters (to be issued on completion of the contractor's works).

If natural drift deposits are encountered within the 300 mm strip, then excavations can cease here.

E3P will collect photographic evidence of the placement of 150 mm of certified topsoil and 150 mm of subsoil on completion of construction works. This element will also be checked by the Building Control Officer as part of the site completion prior to issuing of a CML certificate.

The landscaping validation procedure is detailed in Table 6.2.

TABLE 6.2 LANDSCAPING VALIDATION PROCEEDURE

PROCEDURE	METHOD
Chemical Validation	Imported subsoils and topsoil will need to be chemically analysed to confirm suitability for use with the proposed cover system prior to installation and completion of the landscaping systems. E3P will issue an email to the appropriate party with an assessment of the chemical suitability of both subsoil and topsoil. If acceptable the materials can be installed to the required depth at which time the landscaping areas will be deemed complete following a validation procedure by a suitability qualified E3P engineer.
Trial Holes	Trial holes are deemed necessary for all landscaping areas given that the 300 mm cover system will need to be placed on each landscaping area during the build phase.
Validation	Photographic evidence will be taken by E3P of the topsoil placement demonstrating the depth of topsoil and practical completion of works are required for each and every landscaping area. For landscaping areas where subsoil depths require validation by E3P during the build phase, photographs will be taken and collated by E3P.
Validation Certificate	Once the photographs of the placement of topsoil (over the clean material) have been provided, E3P will issue a validation certificate to demonstrate that the required subsoil and topsoil has been placed in the required landscaped areas along with the chemical analysis.
Completion Report	Upon completion of all landscaping areas within the development, a Completion Report will be issued providing the confirmation that all remediation requirements have been achieved.

Plate 1 provides an example of validation photographs that will be required for each area of landscaping.

PLATE 1 EXAMPLE COVER SYSTEM VALIDATION

Plot No: 4 (Car Park Landscaping)		
Depth of Strata (m bgl)	0.00-0.30	Validated TOPSOIL

Depth of Cover System Materials



Depth of Cover System Materials



Depth of Cover System at Ground Level and in Relation to Unit / Structure



6.2. POTABLE WATER SUPPLY – CONTAMINANT ASSESSMENT CRITERIA

Table 6.3 provides a summary of the threshold concentrations that must not be exceeded within remediated ground at pipeline depth in order to PE pipe works to be acceptable for the proposed development.

TABLE 6.3 PIPELINE SELECTION PE THRESHOLD CONCENTRATIONS

Contaminant Group	PE-threshold
Total VOC	0.5
Total BTEX And MTBE	0.1
Total SVOCs (Excluding PAH and those substances marked with an *)	2
EC5-EC10 Aliphatic and Aromatic Hydrocarbons	2
EC10-EC16- Aliphatic and Aromatic Hydrocarbons	10
EC16-EC40 Aliphatic and Aromatic Hydrocarbons	500
Phenols (From SVOC Analysis)*	2
Cresols and Chlorinated Phenols (From SVOC Analysis)	2
Ethers*	0.5
Nitrobenzene*	0.5
Ketones*	0.5
Aldehydes*	0.5
Amines	Fail

Upon completion of the remedial works a full UKWIR Risk Assessment should be undertaken.

We trust this information is satisfactory to your requirements, and should I be able to be of any further assistance, please do not hesitate to contact me.

Yours sincerely,

For and on behalf of E3P Ltd

Kay Kierans
Senior Geoenvironmental Consultant
(BEng (Hons), FGS, MIEnvSc, CEnv)

Enclosed

Appendix I Drawings

16-685-001 – Site Location Plan
16-685-002 – Proposed Development Plan
16-685-005 – Exploratory Hole Location Plan

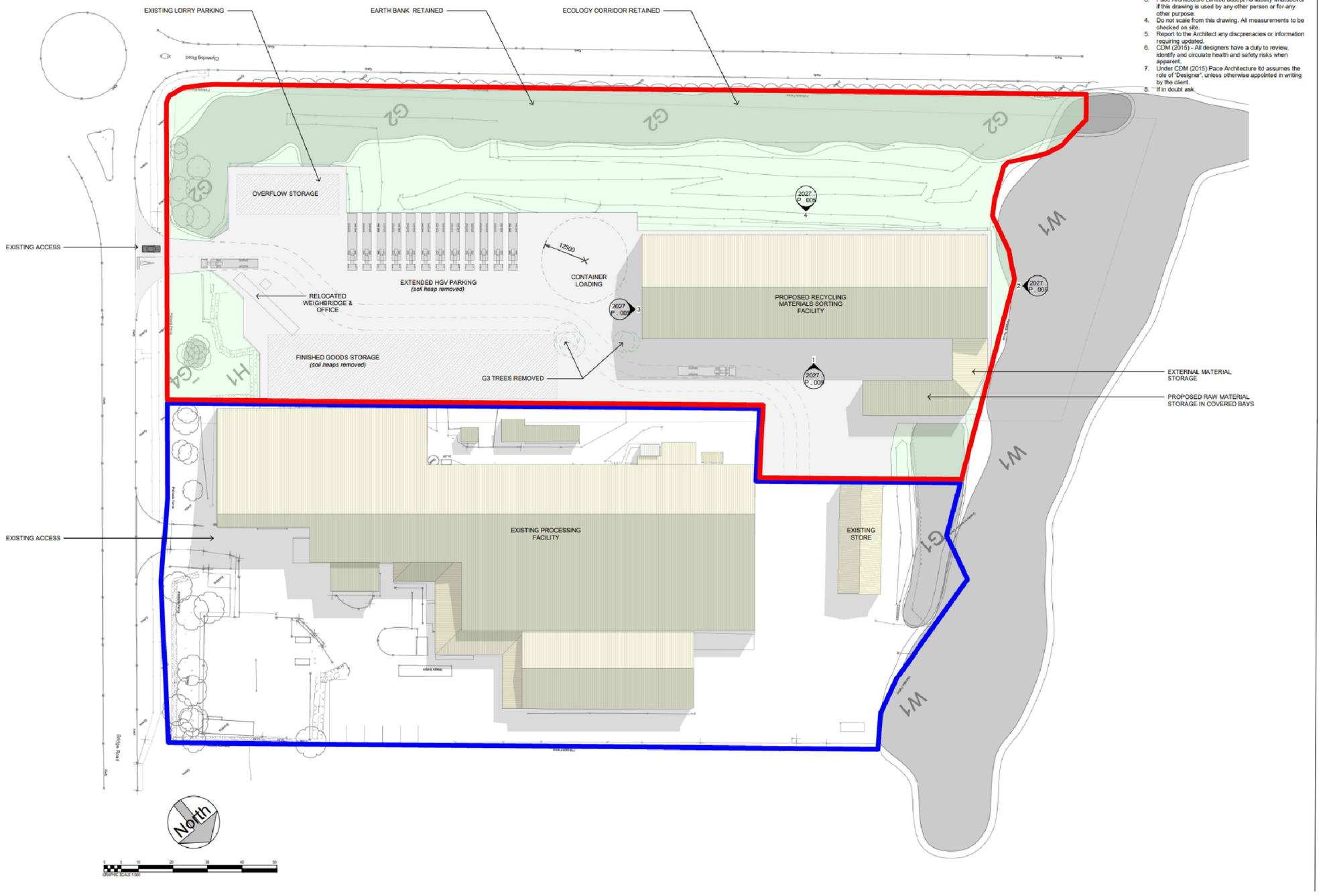
Appendix II E3P Remediation / Validation Criteria

APPENDIX I
DRAWINGS

DRAWING 16-685-001 – SITE LOCATION PLAN



1. This drawing has been produced for the client for the project on the site shown. It was prepared for a purpose agreed with the client and will have a commensurate degree of accuracy.
2. This drawing is not intended for use by any other person or for any other purpose without express permissions.
3. Pace Architecture Limited accept no liability whatsoever if this drawing is used by any other person or for any other purpose.
4. Do not scale from this drawing. All measurements to be checked on site.
5. Report to the Architect any discrepancies or information requiring updated.
6. CDM (2015) - All designers have a duty to review, identify and circulate health and safety risks when apparent.
7. Under CDM (2015) Pace Architecture ltd assumes the role of 'Designer', unless otherwise appointed in writing by the client.
8. If in doubt ask.



P1	REVB	16.10.2024	TG	BH
P1	REVA	09.05.2024	OW	BH
Phase	Issue	Date	Drawn	Checked

Notes:

Client: Pace

Job No: 16-685

Date: 16.10.2024

Drawing No: 002

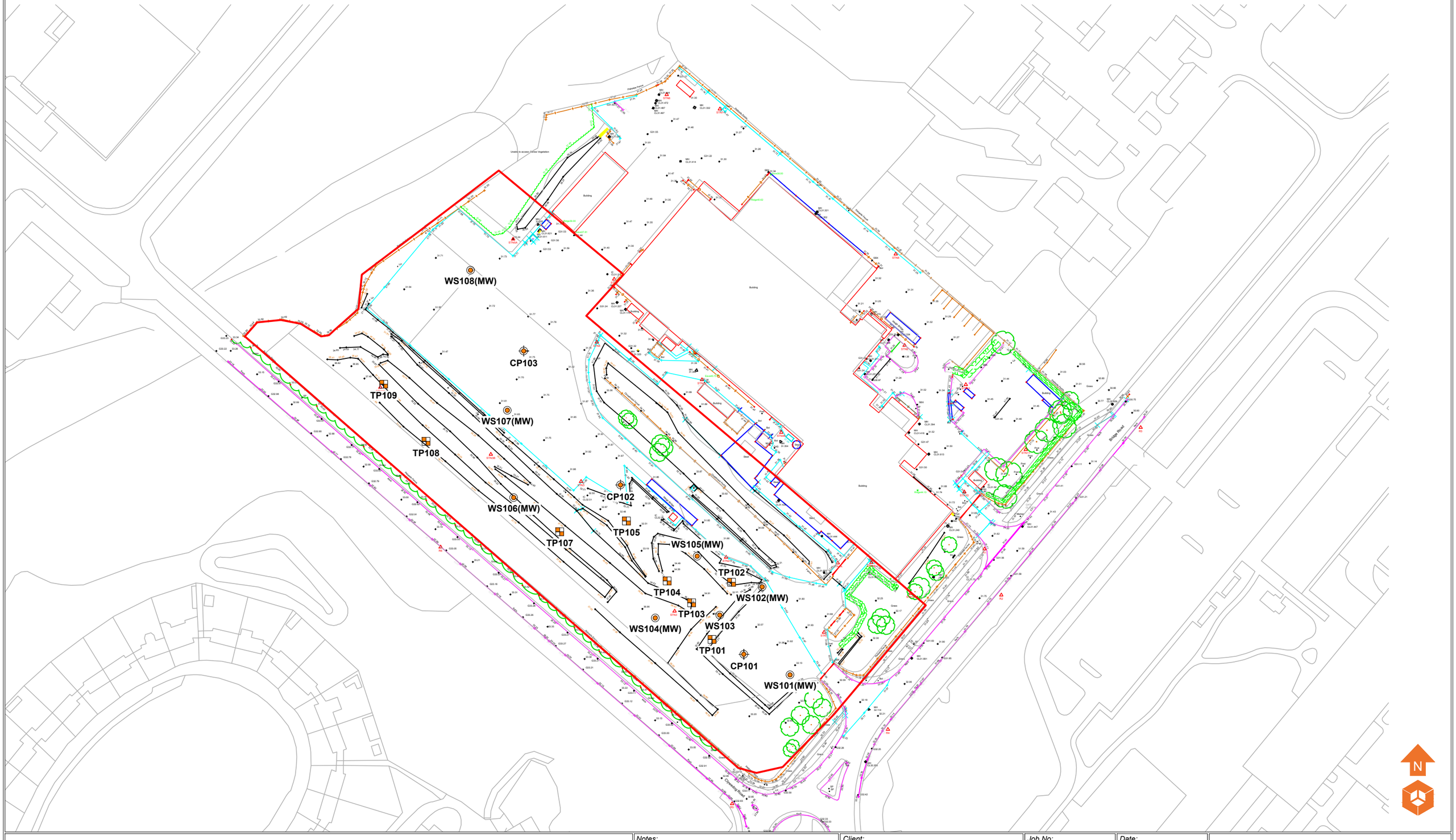
Scale: NTS

Job Title: Hydro Aluminium Deeside Ltd

Drawing Title: Proposed Development Plan

Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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Location Symbols

- WS1on — Approximate Window Sample Probehole Location
- TP1on — Approximate Trial Pit Location
- CP1on — Approximate Cable Percussive Borehole Location

Notes:

Client: Pace

Job No: 16-685

Date: 13.05.2024

Drawing No: 005

Scale: NTS@ A3

Phase	Issue	Date	Drawn	Checked
P1	REVB	13.05.2024	OW	BH
P1	REVA	29.04.2024	OW	BH

Job Title: Hydro Aluminium Deeside Ltd

Drawing Title: Exploratory Hole Location Plan

e3p
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APPENDIX II
E3P REMEDIATION/ VALIDATION CRITERIA

HUMAN HEALTH REMEDIATION TARGETS – COMMERCIAL END USE

DETERMINAND	UNITS	COMMERCIAL LANDSCAPING 300 mm COVER	PATH-WAY
Arsenic	mg/kg	79[iii]	1
Cadmium	mg/kg	120[iii]	1
Chromium (Hexavalent)	mg/kg	7.7[iii]	1
Lead	mg/kg	630[viii]	1
Elemental Mercury	mg/kg	16[iii]	2
Nickel	mg/kg	230[iii]	1
Selenium	mg/kg	1100[iii]	1
Copper	mg/kg	12,000[iii]	1
Zinc	mg/kg	81,000[iii]	1
Phenol	mg/kg	440[iii][xi]	2
Naphthalene	mg/kg	1200[iv][xi]	2
Acenaphthylene	mg/kg	15,000[iii][xi]	3
Acenaphthene	mg/kg	15,000[iii][xi]	1
Fluorene	mg/kg	9900[iii][xi]	1
Phenanthrene	mg/kg	3100[iii][xi]	3
Anthracene	mg/kg	74,000[iii][xi]	3
Fluoranthene	mg/kg	3100[iii][xi]	3
Pyrene	mg/kg	7400[iii][xi]	3
Benzo(a)Anthracene	mg/kg	29[iii][xi]	3
Chrysene	mg/kg	57[iii][xi]	3
Benzo(b)Fluoranthene	mg/kg	7.1[iii][xi]	3
Benzo(k)Fluoranthene	mg/kg	190[iii][xi]	3
Benzo(a)Pyrene	mg/kg	5.7[iii][xi]	3
Indeno(123-cd)Pyrene	mg/kg	82[iii][xi]	3
Dibenzo(a,h)Anthracene	mg/kg	0.57[iii][xi]	3
Benzo(ghi)Perylene	mg/kg	640[iii][xi]	3
TPH C_5-C_6 (aliphatic)	mg/kg	42[ii][xi]	2
TPH C_6-C_8 (aliphatic)	mg/kg	100[ii][xi]	2
TPH C_8-C_{10} (aliphatic)	mg/kg	27[ii][xi]	2
TPH C_{10}-C_{12} (aliphatic)	mg/kg	130[ii][xi]	2
TPH C_{12}-C_{16} (aliphatic)	mg/kg	1000[xiv][xi]	2
TPH C_{16}-C_{21} (aliphatic)	mg/kg	1000[xiv][xi]	1
TPH C_{21}-C_{35} (aliphatic)	mg/kg		1
TPH C_5-C_7 (aromatic)	mg/kg	370[ii][xi]	2
TPH C_7-C_8 (aromatic)	mg/kg	860[ii][xi]	2
TPH C_8-C_{10} (aromatic)	mg/kg	47[ii][xi]	2
TPH C_{10}-C_{12} (aromatic)	mg/kg	250[ii][xi]	2
TPH C_{12}-C_{16} (aromatic)	mg/kg	1800[ii][xi]	1
TPH C_{16}-C_{21} (aromatic)	mg/kg	1900[ii][xi]	1
TPH C_{21}-C_{35} (aromatic)	mg/kg	1900[ii][xi]	1

DETERMINAND	UNITS	COMMERCIAL LANDSCAPING 300 mm COVER	PATH-WAY
Asbestos	Fibres Volume Weight (%)	NFD	4

Notes 1

NFD = No Fibres Detected

Asbestos will be screened visually on-site by a qualified environmental consultant and where potential ACM is identified, representative samples will be subject to quantitative analysis of % volume by weight.

Should any ACM be identified within the soil matrices, further detailed % assessment would be required when the reported laboratory result exceeds the limit of detection for the analytical method at 0.01% by volume (weight).

Notes 2
Excludes matrices where free product is observed.

No viable exposure pathway beneath hardstanding and cover system.

Notes 3
Main exposure pathways: 1 = soil ingestion, 2 = vapour inhalation (indoor), 3 = dermal contact and ingestion, 4 = dust inhalation.

Abbreviations: GAC = general assessment criteria, n = number of samples, MC = maximum concentration, N/A = Not Applicable (no exceedance of assessment criteria), Loc of MC = location of exceedances.

i. Value derived from LQM Suitable 4 Use Levels (S4ULs) for residential end use with plant uptake.
ii. Value derived from LQM Suitable 4 Use Levels (S4ULs) for residential end use without plant uptake – these levels used below 600 mm cover system within residential gardens as soils will be present within a residential setting yet soils will not be disturbed and garden plants will not reach these soils.
iii. Value derived from LQM Suitable 4 Use Levels (S4ULs) for public open space (POS) residential.
iv. Value derived from LQM Suitable 4 Use Levels (S4ULs) for public open space (POS) park – these levels used below 300 mm POS cover system as soils will not be disturbed by any future site users and exposure to these soils will be similar to a park end use.
v. Value derived from LQM Suitable 4 Use Levels (S4ULs) alongside assessment with WM3 to ensure that materials remaining on-site do not exceed the WM3 toxicity criteria for hazardous waste.
vi. Value derived from Category 4 Screening Levels (C4SL) for residential land use with homegrown produce.
vii. Value derived from Category 4 Screening Levels (C4SL) for residential land use without homegrown produce.
viii. Value derived from Category 4 Screening Levels (C4SL) for public open space (POS) residential.
ix. Value derived from Category 4 Screening Levels (C4SL) for public open space (POS) park.
x. Mercury – based on elemental mercury.
xi. PAH and TPH levels used are for 1% SOM.
xii. Xylenes based on p-xylene (o-xylene 2600 mg/kg, m-xylene 3500 mg/kg) and is capped by its solubility.
xiii. Value derived from LQM Suitable 4 Use Levels (S4ULs) for residential end use with plant uptake due to the volatilisation risk.
xiv. BTEX is not SOM-related due to inhalation pathway.