C J Construction

HEOL CRWYS, CWMAVON

Outline Remediation Strategy Report

14023/LW/24/ORS/REVB

Intégral
Géotechnique

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PROJECT: **Heol Crwys, Cwmavon**

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1.0 INTRODUCTION

1.1 GENERAL

Intégral Géotechnique (Wales) Limited (IG) have been appointed as Geotechnical and Geoenvironmental Consultants by C J Construction on behalf of Tai Tarian to prepare a remediation strategy for the redevelopment of Heol Crwys, Cwmavon to a standard suitable for proposed residential end use.

The location of the site is shown in Figure 1 and a site plan is presented in Figure 2.

The development will comprise the construction of a number of low-rise residential properties with private gardens and areas of soft landscaping.

The following reports have been produced by Intégral Géotechnique (Wales) Limited for the site:

- Heol Crwys, Cwmavon, Desk Study Report, Report No. 14023/LP/22/DS dated March 2022
- Heol Crwys, Cwmavon, Coal Mining Risk Assessment, Report No. 14023/LP/22/CMRA dated July 2022
- Heol Crwys, Cwmavon, Site Investigation Report, Report No. 14023/LW/23/SI dated November 2023
- Heol Crwys, Cwmavon, Supplementary Site Investigation Report, Report No. 14023/LW/24/SSI/RevD dated April 2025

These reports have been relied upon as part of this remediation strategy and should be read in conjunction.

The purpose of this report is to provide a remediation strategy for the delivery of the site to a standard suitable for the proposed residential end use and details how the remediation works will be supervised and validated.

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1.2 PROPOSED DEVELOPMENT

The proposed development will comprise the construction of a number of low-rise residential properties with private gardens and areas of soft landscaping as illustrated in Spring Design Drawing Ref: 2575-525, dated January 2024.

The development will also include associated infrastructure such as access roads and car parking areas.

An extract of the proposed development plan is shown in Figure 3.

2.0 BACKGROUND

2.1 SITE LOCATION AND DESCRIPTION

The site is located off Heol Crwys in Cwmavon, at a National Grid Reference of 278280, 192530, see Figure 1.

The site is irregular in shape and occupies an area of approximately 1.58 hectares. The boundaries of the site are defined by Heol Crwys to the north, existing residential properties to the southwest, east, and southeast, Heol Jiwbili to the south and undeveloped land to the northeast.

A site plan is presented in Figure 2.

The elevation of the site varies from an approximate maximum 54m AOD in the north (adjacent to Heol Crwys), to an approximate minimum of 43m AOD in the south (adjacent to Heol Jiwbili).

The site comprises a developed elevated plateau area (accessed off Heol Crwys) surrounded by undeveloped vegetated slopes. A public footpath cuts through the centre of the site, connecting Heol Crwys to the north to the lower lying Heol Jiwbili to the south.

At the time of the site investigation in September 2023, the elevated plateau area was occupied by numerous single storey residential properties accessed off Heol Crwys. The properties each have small private garden areas which are secured with low picket fencing. A number of trees are sporadically located within the developed area of the site. A small electric substation is located adjacent to the properties within the northeast area.

The elevated plateau area is bounded by undeveloped vegetated slopes of varying heights and gradients that typically fall towards the south and southeast, but locally towards the southwest. The slope is retained by a brick wall along the southeast edge of the site at the boundary with several existing residential properties.

During the supplementary site investigation works carried out in March 2024, the majority of the residential properties were vacant, however, the demolition of the properties had not commenced. Vegetation removal had locally been undertaken on the crest and toe of the slopes to accommodate the intrusive investigation.

During the post demolition soil sampling carried out in June 2024, demolition and site clearance works had been completed across the eastern (Phase 1) area of the site.

2.1 SITE LOCATION AND DESCRIPTION (CONTINUED)

Additional post demolition soil sampling was carried out in March 2025, following demolition and site clearance works across the western (Phase 2) area of the site.

2.2 AVAILABLE SITE INVESTIGATION DATA

The following reports have been produced by Intégral Géotechnique (Wales) Limited for the site:

- Heol Crwys, Cwmavon, Desk Study Report, Report No. 14023/LP/22/DS dated March 2022
- Heol Crwys, Cwmavon, Coal Mining Risk Assessment, Report No. 14023/LP/22/CMRA dated July 2022
- Heol Crwys, Cwmavon, Site Investigation Report, Report No. 14023/LW/23/SI dated November 2023
- Heol Crwys, Cwmavon, Supplementary Site Investigation Report, Report No. 14023/LW/24/SSI/RevC dated July 2024

These reports have been relied upon as part of this remediation strategy and should be read in conjunction.

2.3 SITE HISTORY

The earliest edition of the map dated 1877-1878 indicated the site to be located within an area known as Cwm-avan Works. A tramway crossed approximately through the centre of the site on a northwest to southeast orientation with other lines which crossed the southwest and northeast areas. The tramway connected into an engine house to the north of the site and with branch lines which connected into the various works buildings including a Copper Works to the northeast, a Chemical Works to the southwest and a Gas Works and Iron Works located further away to the south. Meadow Pit (Coal) was also served by the tramway and was located approximately 50m to the south. The site was mainly indicated to be covered with spoil, likely to be waste materials from the surrounding works buildings. The Copper Works buildings encroached across the northeast corner of the site and coke ovens encroached across the southeast area. A limekiln was indicated on the southern boundary of the site. Beyond the works buildings there were terraces of residential properties in the area and a Public House was located to the north of the site. A terrace of properties known as David's Row encroached across the northeastern boundary of the site.

2.3 SITE HISTORY (CONTINUED)

The 1899 edition of the map indicated the tramway which crossed approximately through the centre of the site was no longer evident. Additional tramways were indicated within the southwest and northeast areas of the site. The majority of the site was still indicated to be covered with spoil materials. The Copper Works had expanded including additional buildings within the northeast area of the site and was now known as Rio Tinto Copper Works. The former Chemical Works buildings to the southwest had been extended and/or rebuilt to now be a Steel Works with the associated buildings encroaching into the site.

The Iron Works to the south was no longer present and the Gas Works had expanded. Meadow Pit was indicated to be disused by this time. The limekiln on the southern boundary was now indicated to be old.

The 1919 edition of the map indicated the configuration of the tramways within the site to have altered slightly but overall, the site remained relatively unchanged with spoil heaps still present across the site. The Steel Works buildings to the southwest had been reconfigured with some of the buildings potentially demolished.

The edition of the map dated 1936-1937 indicated single tramways crossed the northeast and southwest and with spoil heaps covering the site which still extended to the south and east. A building remained within the northeast area of the site. The Copper Works to the northeast of the site was now disused and the buildings had been demolished. The residential properties known as David's Row had also been demolished by this time, as had the former Steel Works buildings to the southwest.

The edition of the map dated 1965-1967 indicated all the tramways had now been removed from site and was now crossed by access tracks. All the former buildings associated with the works had been fully cleared from within the site and to the northeast and southwest. The spoil mounds present across the site and extending to the east and south were now indicated to be slag heaps. A surface water issue was indicated within the southeast corner of the site. Residential development had taken place in the vicinity of the site including development up to the southwest boundary of the site along Heol Cwm Mawr.

2.3 SITE HISTORY (CONTINUED)

By the edition of the map dated 1969-1978 the site had been developed with residential properties known as Rofton Bungalows. There was evidence of earthworks within the site to reprofile the spoil heap to create a development plateau. A track in a cutting crossed approximately through the centre of the site on a northwest to southeast orientation. A new channel had been constructed for the surface water issue within the southeast area, with the feature culverted under Heol Jiwbili which now formed the southern boundary of the site. The northern boundary of the site was now formed by Heol Crwys with residential properties beyond. The areas beyond Heol Jiwbili to the south and the area to the east of the site remained undeveloped.

The 1973 edition of the map indicated the site to have remained unchanged. Further development had taken place to the south of the site beyond Heol Jiwbili with the construction of a residential estate known as Penllyn which included residential properties and a health centre. The area to the east of the site remained undeveloped.

The edition of the map dated 1975-1983 indicated further earthworks within the northeastern area of the site. The earthworks were associated with the reclamation works of the area to the east with an embankment of materials pushed across the eastern and northeastern area of the site. The surface water channel was no longer present within the southeast area.

By the edition of the map dated 1978-1983 the reclaimed area to the east had been fully developed for residential use with a new development off Waun Wen. The site remained unchanged, and development continued off Waun Wen during the 1980's.

There have been no significant changes to the site or the immediate surrounding areas between the 1980's and the present day with the areas remaining developed for residential use.

2.4 SUMMARY GROUND CONDITIONS

The ground conditions encountered beneath the site comprised a considerable thickness of made ground over superficial deposits, over the South Wales Middle Coal Measures.

2.4.1 Topsoil/Disturbed Topsoil

A veneer of topsoil was encountered at the majority of the exploratory locations undertaken across the site. The topsoil generally comprised of very soft to soft brown sandy locally organic clay with roots and rootlets.

2.4 SUMMARY GROUND CONDITIONS (CONTINUED)

The topsoil was often disturbed and contained fragments of ash, clinker, timber and concrete etc.

The topsoil/disturbed topsoil was encountered at thicknesses of typically 0.1m/0.3m.

2.4.2 Made Ground

Made ground was encountered at each exploratory location and was either encountered directly beneath the topsoil/disturbed topsoil or alternatively from ground level.

The base of the made ground was not proven within the trial pits or windowless sample boreholes.

Within cable percussion borehole BH01 (located at the toe of the slope in the southern area of the site), the base of the made ground was recorded at a depth of approximately 8.0m bgl.

Within BH02 located at the crest of the slope in the eastern area of the site, the base of the made ground was not proven, with the borehole terminating at a depth of approximately 12.0m bgl on a buried obstruction / suspected boulder.

Within borehole, BH03 located at the crest of the slope in the western area of the site, the base of the made ground was not proven, with the borehole terminating at a depth of approximately 6.2m bgl on a buried obstruction / suspected boulder.

Within the rotary open hole boreholes, the base of the made ground was typically recorded at depths ranging between approximately 7.3m and 13.8m bgl. However, it should be noted that when using an open hole rotary technique, it is difficult to distinguish between the made ground or any, reworked ground to the underlying superficial deposits.

Although variability was noted within the made ground, the deposits are predominantly granular in nature varying in density between loose, locally very loose, loose to medium dense, medium dense and locally dense. The deposits are typically described as dark brown to black silty sandy clayey gravel or locally gravelly sand.

The gravel constituent typically comprised of ash, clinker, coke, coal, shale, slag (vesicular and fused), sandstone etc.

The made ground was noted to contain a variable cobble and boulder content. Where encountered the boulders typically comprised fused slag.

2.4 SUMMARY GROUND CONDITIONS (CONTINUED)

Although the made ground deposits are predominantly granular, some layers of cohesive materials (i.e., silt and clay) are also present.

It should be noted that during the excavation of the trial pits, instability was often encountered and varied from minor spalling to collapse and overbreak of trial pit sides.

Fused slag was encountered within some exploratory locations. The fused slag was difficult to drill and/or excavate through and where encountered the boreholes and trial pits often refused.

In-situ SPT testing undertaken within the windowless sample boreholes and cable percussion boreholes indicate highly variable uncorrected SPT N values ranging between 0 and >50. It should be noted that artificially high SPT N values have often been recorded due to the presence of obstructions, boulder cobbles, fused slag etc. within the made ground deposits.

2.4.3 Superficial Deposits

The made ground is underlain by superficial deposits.

It should be noted that samples of the superficial deposits were only obtained from cable percussion borehole BH01.

Within BH01, the superficial deposits were encountered at a depth of approximately 8.0m bgl and proven to extend down to a depth of 10.1m bgl. The superficial deposits encountered within BH01, where recorded as very dense brown grey very sandy gravel and cobbles of sandstone.

In-situ SPT testing undertaken within the borehole, indicate SPT ‘N’ values of >50.

The rotary open hole boreholes recorded the base of the superficial deposits at depths of between approximately 16m and 20m bgl.

According to the driller’s description for the rotary boreholes, the superficial deposits consist of a combination of silt, clay, sands and gravels. The results of the rotary open hole boreholes are further discussed below.

2.4 SUMMARY GROUND CONDITIONS (CONTINUED)

2.4.4 Bedrock

A total of 12 No. rotary open hole boreholes were drilled across the proposed development area to a maximum depth of 37.0m bgl.

The rotary open hole boreholes were drilled to profile the depth of bedrock and investigate the presence of any shallow coal seams and/or any associated shallow unrecorded shallow mine workings.

As previously stated, it should be noted that when using an open hole rotary technique, it is difficult to distinguish between made ground, reworked ground, superficial deposits and weathered bedrock.

The rotary open boreholes generally encountered rockhead at depths of between approximately 16.0m and 20.0m bgl.

According to the driller's description, the encountered bedrock typically comprised mudstone with some siltstone and locally bands of sandstone.

Intact coal seams were encountered within all of rotary boreholes, at the following depths:

- RC01 between 16.4m and 17.3m (0.9m thick)
- RC02 between 24m and 25.5m (1.5m thick)
- RC03 between 19.2m and 19.5m (0.3m thick) and between 34.3m and 35.8m (1.5m thick)
- RC04 between 32m and 32.4m (0.4m thick) and between 33.4m and 33.9m (0.5m thick)
- RC05 between 29.7m and 30.4m (0.7m) and between 31.8m and 32.5m (0.7m thick)
- RC06 between 29.7m and 30.4m (0.7m) and between 31.8m and 32.5m (0.7m thick)
- RC07 between 21m and 21.5m (0.5m thick) and between 23.5m and 25m (1.5m thick)
- RC08 between 22.5m and 23.5m (1m thick, with mudstone bands) and between 26.6 and 27m (0.4m thick)
- RC09 between 22.1m and 22.9m (0.8m thick)
- RC10 between 33.8m and 34.6m (0.8m thick)
- RC11 between 29m and 30.5m (1.5m thick)

2.4 SUMMARY GROUND CONDITIONS (CONTINUED)

- RC12 between 18m and 18.9m (0.9m thick), between 20m and 21.5m (1.5m thick) and between 31.1m and 31.3m (0.2m thick)

All coal seams were encountered as intact, and no soft drill, loss of flush or void/mine workings were encountered in the rotary open hole boreholes.

2.4.5 Groundwater

During the 2023 initial site investigation, groundwater was not encountered within windowless sample boreholes.

During the supplementary site investigation, groundwater was encountered within the following locations, as summarised in Table 1.

Table 1: Summary of Groundwater Depths During Intrusive Investigation

Exploratory Location	Depth to Groundwater Strike (m bgl)	Comment	Strata
BH01	9.0	Strike	Superficial Deposits
RC01	10.2	Strike	Superficial Deposits
RC02	15.5	Strike	Superficial Deposits
RC03	15.3	Strike	Superficial Deposits
RC04	16.2	Strike	Superficial Deposits
RC05	11.7	Strike	Superficial Deposits
RC06	15.0	Strike	Superficial Deposits
RC07	15.1	Strike	Superficial Deposits
RC09	16.1	Strike	Superficial Deposits
RC10	15.0	Strike	Superficial Deposits
RC11	21.5	Strike	Bedrock
RC12	10.5	Strike	Bedrock

The groundwater conditions are based on observations made at the time of the fieldwork. It should be noted that groundwater levels may vary due to seasonal and other effects.

Groundwater levels were also measured during visits to site to sample groundwater and monitor ground gas. The shallowest groundwater level during the site visits is provided in the summary below in Table 2. The depth to groundwater has been converted to a groundwater level with respect to ordnance datum.

2.4 SUMMARY GROUND CONDITIONS (CONTINUED)

Table 2: Summary of Groundwater Levels During Monitoring Visits			
Borehole	Depth to Groundwater (mbgl)	Approximate Ground Level (mAOD)	Approximate Groundwater Level (mAOD)
BH01 (deep install)	8	53.7	45.7
BH02 (deep install)	Dry	n/a	n/a
BH03 (deep install)	Dry	n/a	n/a

2.5 IDENTIFIED CONTAMINATION - SOILS

2.5.1 Topsoil/Disturbed Topsoil

A total of 5 samples of the topsoil/disturbed topsoil were tested for contamination, including asbestos.

The results of the laboratory testing indicate that the majority of the analysed chemical elements or compounds are present at concentrations below the appropriate thresholds.

However, the initial screening indicates exceedances of arsenic, beryllium, lead and mercury.

Asbestos was not detected within the screened samples.

2.5.2 Made Ground

A total of 23 samples of the made ground were tested for contamination, including asbestos in accordance with the findings of the Desk Study.

The results of the laboratory testing indicates that the majority of the analysed chemical elements or compounds are present at concentrations below the appropriate thresholds.

Within the made ground samples, elevated concentrations of arsenic, beryllium, copper and lead were detected above the relevant thresholds.

2.5 IDENTIFIED CONTAMINATION - SOILS (CONTINUED)

Selected samples were also analysed for petroleum hydrocarbons, volatile organic compounds (VOC) and polychlorinated biphenyls (PCBs).

The results of the laboratory testing indicate that the analysed petroleum hydrocarbon bands are either detected at concentrations below the appropriate thresholds or below the laboratory limits of detection.

The results of the VOC testing indicates that the majority of analysed compounds are all below the laboratory limits of detection.

A single exceedance of trichlorofluoromethane (CFC-11) was detected in a soil sample (S14) at a concentration of 240ug/kg. While there are currently no published generic assessment criteria or threshold values for this compounds, a site-specific screening value (SSSV) of 2,860ug/kg was derived based on a residential end use scenario with homegrown produce. The measured concentration of 240ug/kg falls well below the calculated SSSV of 2,860ug/kg, and as such, the presence of trichlorofluoromethane is not considered to pose a significant risk to future site users.

The results of the laboratory testing for PCB 7 congeners indicate that the concentrations of the analysed PCB congeners are below the laboratory limit of detection and therefore the concentrations are below the appropriate residential threshold.

Asbestos fibres, consisting of loose chrysolite and/or amosite fibres were detected in two samples at <0.001% and 0.002% asbestos by weight.

2.5.3 In-situ Natural Ground

No visual or olfactory evidence of contamination of the in-situ natural ground was identified during the drilling of the cable percussion boreholes and rotary open hole boreholes. At the time of writing this report no samples of natural ground had been tested. It is considered likely that concentrations of determinants within the natural ground are likely to be naturally occurring and as such, the natural ground poses no significant threat to human health or the environment.

2.6 IDENTIFIED CONTAMINATION - GROUNDWATER

It should be noted that it was not possible to obtain groundwater samples from BH02 and BH03 as the wells installed within these boreholes were recorded as dry.

2.6 IDENTIFIED CONTAMINATION - GROUNDWATER (CONTINUED)

The groundwater sample from BH01 was obtained from the groundwater within the superficial deposits.

During the initial and recent supplementary investigation, there was no evidence of a persistent shallow / perched groundwater body within the made ground.

The results of the groundwater monitoring programme indicate elevated concentrations of copper and nickel.

Based on the results of the groundwater testing, site specific PNECs (Predicted No-Effect Concentrations) have been calculated for copper and nickel with the Water Framework Directive M-BAT (Metal Bioavailability) Tool (using a function of dissolved organic carbon (DOC), calcium and pH).

The results of the M-BAT assessment indicate concentrations of nickel are below their respective PNECs.

Copper concentrations detected within the first and third round of testing remain elevated above their respective PNECs.

2.7 IDENTIFIED CONTAMINATION - GROUND GAS

The results of the gas monitoring programme show a maximum methane concentration of <0.5% and a maximum carbon dioxide concentration of 1.4%. A maximum gas flow rate of <0.3l/hr was measured during the gas monitoring programme.

In accordance with CIRIA Report C665 a Gas Screening Value (GSV) of <0.0042l/hour has been calculated. This GSV corresponds to gas Characteristic Situation 1.

Reference should also be made to BS8485:2015+A1:2019. In accordance with BS8485:2015:2019 and based on the results of the gas monitoring with the site being classified as Characteristic Situation 1 (CS1), for Development Types A and B (private and private with building management control, respectively), the minimum gas protection score required is zero and therefore no specific gas protection measures are required.

Basic radon protective measures are required within the site.

2.8 DETAILED SITE-SPECIFIC RISK ASSESSMENT – HUMAN HEALTH

The 'general' approach for assessing the potential risk to a receptor is by a combination of qualitative and quantitative risk assessment.

A quantitative risk assessment would involve selecting and deriving generic assessment criterion to compare low risk substances, based on the fate, transport and toxicological properties and the exposure scenario being considered.

With regards to assessing risk to human health, a generic quantitative risk assessment have been undertaken using published screening criteria values for a proposed residential with home grown produce end use.

There are no published screening criteria values for asbestos, and neither are there any in preparation. As discussed in CIRIA Report C733 Asbestos in Soil and Made Ground: a Guide to Understanding and Managing Risks, agreement has yet to be reached in the UK on an appropriate toxicological criterion on which a screening value for asbestos could be based. It also states that 'based on current knowledge, it is believed that that a scientifically defensible UK GAC (generic acceptance criteria) for asbestos in soil cannot be developed or imported.'

It is therefore considered that a more qualitative assessment of the potential risk is appropriate, as asbestos is determined to be a non-threshold substance.

CIRIA Report C733 states that asbestos (asbestos containing materials and asbestos containing soils) only present a risk to health if airborne fibres are released into the atmosphere. The report goes on to state that the number of fibres released into the air from asbestos containing soils is likely to be influenced by a number of site-specific factors, as listed below.

- Characteristics of the asbestos (concentration, degree of heterogeneity, depth in relation to final ground level, volume/area, type, condition, extent of bonding, weathering, fraction of free fibres, shape of fibres)
- Characteristics of the soil (type, moisture content, surface vegetation, presence of hard standing)
- Weather (humidity, precipitation, temperature, ground freezing, wind speed and direction)
- Land use/soil disturbing activities (behaviour of receptors, distance between receptor and source, types of activity, duration/frequency of activity, dust mitigation measures).

2.8 DETAILED SITE-SPECIFIC RISK ASSESSMENT – HUMAN HEALTH (CONTINUED)

The depth below ground level of the asbestos containing soils is imperative to the potential risk posed.

CIRIA Report C733 states that in the absence of significant physical disturbance, exposure to airborne asbestos fibres from soil will be from friable materials or asbestos fibres present at, or very close to, the soil surface (the soil – air interface).

Materials that have been buried, or are below the soil surface, will pose a lower, or less immediate, risk as these materials are unable to release airborne fibres unless brought to the soil surface by physical activity/disturbance.

The contamination test results, and investigation observations showed elevated concentrations of arsenic, beryllium, lead and mercury within the topsoil/disturbed topsoil and elevated concentrations of arsenic, beryllium, copper and lead with the made ground.

Asbestos fibres, consisting of loose chrysolite and/or amosite fibres were detected in one sample of made ground at <0.001% and 0.002% asbestos by weight.

Given the elevated concentrations within the topsoil/disturbed topsoil and made ground, along with the presence of asbestos within the made ground, it is considered that a potential risk to human health may exist via the following relevant pollutant linkages:

- Dermal contact
- Ingestion of soil or soil derived dust
- Ingestion of soil attached to homegrown produce
- Ingestion of homegrown produce
- Inhalation of soil bourn dust.

It is considered necessary to protect future site end users and construction operatives from exposure to the contamination recorded.

The remediation works to be carried out at the site have been designed to address the identified potentially active contaminant pathways listed above.

Areas outside the development areas i.e. the existing inaccessible vegetated sloping ground does not pose any risks to casual visitors and trespassers and therefore the remedial measure specified within this remediation strategy relate to the proposed development areas as indicated on Figure 4. It should be noted that this is subject to agreement with the Local Authority Environmental Health Officer.

2.9 DETAILED SITE-SPECIFIC RISK ASSESSMENT – CONTROLLED WATERS

The findings of the site investigation do not indicate the presence of a shallow perched groundwater body within the made ground deposits beneath the site.

Based on the findings of the rotary drilling, the main groundwater body beneath the site lies withing the natural superficial deposits, as demonstrated by the groundwater monitoring results at the locations of the installed wells in BH01, BH02 and BH03.

During the supplemental site investigation, groundwater was identified within the superficial deposits during the drilling of the rotary open hole boreholes and cable percussion borehole BH01, at depths of between approximately 9.0m ad 16.1m bgl.

Minimal contamination has been recorded within the groundwater beneath the site. The only contaminants to exceed the initially adopted ‘tier 1’ screening values were copper, and nickel.

Subsequent assessment has demonstrated that all of the nickel concentrations and the copper concentration (recorded during round 2 of the groundwater testing) fall below their respective site specific PNEC concentrations (calculated using the WFD M-BAT tool). As such, the recorded metal concentrations are not considered significant and are likely to be representative of normal background levels within the formerly industrialised area of South Wales.

All organic contaminants including PAHs, petroleum hydrocarbons, VOCs and SVOCs were recorded at concentrations below laboratory detectable limits or the adopted ‘tier 1’ screening values.

Based on the findings of the site investigation overall level of risk to controlled waters from site sourced contamination is considered to be low and no groundwater remedial measures are considered necessary at the site.

3.0 REMEDIATION STRATEGY

A remediation strategy is proposed such that the site is prepared to a standard suitable for the proposed residential end use.

The remediation process will ensure the delivery of a suitably remediated site for development and is of critical importance to the robustness of the remediation strategy.

The following remediation strategy is proposed:

- All remaining buildings/structures to be demolished should be subject to a 'Demolition Asbestos Survey', soft strip and disposal of asbestos containing materials to a licensed tip.

- Following site strip and clearance, all exposed formations should be visually inspected and handpicked for any identified ACM. Additionally, any excavated made ground materials, any encountered buried foundations, service runs/ducts, pipework etc. should also be visually inspected and handpicked of any identified ACM. These works should be carried out by a suitably licensed contractor in accordance with an appropriate risk assessment and managed in accordance with the requirements of the Control of Asbestos Regulations (2012).

- Any handpicked ACM should be disposed off-site at a suitable licensed facility as hazardous waste. Daily records and waste transfer notes should be kept in order to document the identification and subsequent removal of any ACM. These records and waste transfer notes should be made available for review as they will be required for remediation verification.

- Following completion of any asbestos clearance works appropriate validation sampling will be required.

- Following site clearance works and completion of formation checks, all private gardens and any landscaped areas will require the provision of a minimum 600mm thick capping layer of clean, imported inert subsoil and topsoil materials placed above a high visibility geotextile membrane/anti-mixing layer in order to maintain the integrity of the capping layer and prevent upward migration of contaminants. Consideration could be given to reducing the capping layer to a 300mm thick capping layer of clean, imported inert subsoil and topsoil materials placed above a high visibility geotextile membrane/anti-mixing layer in landscaped public open spaces within the development areas.

3.0 REMEDIATION STRATEGY (CONTINUED)

- Drinking water supply pipes specification to be agreed between C J Construction and DCWW.

4.0 REMEDIATION IMPLEMENTATION

4.1 OBJECTIVES

The main objective of the proposed remediation works is to render the site suitable for residential end use. The remediation activities required in order to achieve this objective are as follows:

4.2 METHODOLOGY

The remediation works required in order to meet the objectives defined above will be undertaken as follows:

- Following site clearance works and during construction, all exposed formations within the site should be visually inspected by an asbestos awareness trained ground worker. Any identified asbestos containing materials (ACM) should be reported to the site manager and picked/disposed of by a licensed asbestos contractor.

- Any excavated material (e.g. arisings from foundation and drainage run excavations, site strip etc.) from within the site should be visually inspected by an asbestos awareness trained ground worker. Any identified ACM should be reported to the site management and picked/disposed of by a licensed asbestos contractor.

- All of the above works should be carried out under an appropriate risk assessment and managed in accordance with the Control of Asbestos Regulations 2012. Any handpicked ACM should be disposed off-site at a suitable licensed facility as hazardous waste.

- Daily records and waste transfer notes should be kept in order to document the identification and subsequent removal of any ACM. These records and waste transfer notes should be made available for review as they will be required for potential remediation verification.

- A system should be established by which any ‘unusual’ materials and potential hotspots of contamination that may be encountered are reported rapidly to the site management, so that the appropriate action may be taken, following specialist advice if necessary. An unusual material may be identified on site by colour, odour or physical nature.

4.2 METHODOLOGY (CONTINUED)

- During excavation, in order to prevent cross contamination of materials, the arisings should be segregated from any underlying natural soils.

- All arisings should be screened to remove any deleterious material such as brick, concrete, metal, timber etc. Following screening, the materials should be stockpiled separately (i.e. placed in stockpiles separate from any crushed concrete, tarmac, natural ground etc.) before being crushed to a grade suitable for reuse on site as general fill beneath building floor slabs or areas of hard standing.

- Within any private gardens and areas any landscaped areas will require the provision of a minimum 600mm thick capping layer of clean, imported inert subsoil and topsoil materials placed above a high visibility geotextile membrane/anti-mixing layer in order to maintain the integrity of the capping layer and prevent upward migration of contaminants. Consideration could be given to reducing the capping layer to 300mm thick capping layer of clean, imported inert subsoil and topsoil materials placed above a high visibility geotextile membrane/anti-mixing layer in landscaped public open spaces with the development area.

- Adoption of DCWW agreed drinking water supply pipe.

The site will be deemed remediated by the following active remedial measures:

- Breaking out and removal of redundant foundations, floor slabs, and any buried obstructions etc.

- Incorporation of a robust clean 600mm thick capping layer within proposed gardens and soft landscaped areas, with a high visibility geotextile membrane/anti-mixing layer at the base or 300mm thick capping layer with a high visibility geotextile membrane/anti-mixing layer at the base within landscaped public open spaces with development area.

- Provision of DCWW agreed drinking water supply pipe.

Review of the methodologies will be a continuing process and subject to findings of the proposed validation works, and if necessary, further quantitative and qualitative risk assessments.

4.3 OPERATIONS

The works are to be undertaken by a specialist contractor experienced in brownfield reclamation/remediation. The remediation works will be monitored by Intégral Géotechnique (Wales) Limited.

Site preparation and operational constraints will be covered in the contractor's method statements. These should include the contractor's proposals for controls and monitoring of dust, noise, vibrations and odour.

Site procedures for managing the remedial works in a manner that will not cause pollution to controlled waters will be covered in the contractor's method statements which will be submitted in discharge of the Conditions of Planning.

The proposed remediation works will be controlled by the appropriate mobile treatment license to be held by the remediation contractor, if such works become necessary. The conditions imposed under the planning process will be considered adequate to control the works.

Additionally, a system should be established by which any 'unusual' materials that may be encountered are reported rapidly to the site management, so that the appropriate action may be taken, following specialist advice if necessary. An unusual material may be identified on site by colour, odour or physical nature.

5.0 REMEDIATION VERIFICATION

5.1 OBJECTIVES

A remediation verification report is required in order to record the data gathering necessary to demonstrate that the works have been carried out in accordance with the agreed strategy, confirm that the works satisfy the site remediation criteria and that the site is suitable for the proposed development.

5.2 REMEDIATION VERIFICATION METHODOLOGY AND DATA GATHERING REQUIREMENTS

The site reclamation/remediation will be verified by the following measures:

- Evidence to be provided of the site records and waste transfer notes relating to identification and subsequent removal of any asbestos containing materials (ACM).
- Validation of the chemistry and thickness of the proposed 600mm thick capping layer to be placed within gardens and landscaped areas or the proposed 300mm thick capping layer to be placed within landscaped public open space with development area.
- Validation of the high visibility geotextile membrane/anti-mixing layer at the base of the capping soils.
- Notification in the CDM file of residual risks associated with the remediated site.
- Certification by C J Construction of installation of DCWW agreed drinking water supply pipe.

6.0 FINAL REMEDIATION VALIDATION

The development will not be complete, in accordance with the remediation strategy for the site, until all buried obstructions have been removed, , all visible ACM has been handpicked and placement of the final 600mm (minimum thickness) of clean imported capping soils over a high visibility geotextile membrane/anti-mixing layer to gardens and soft finished areas or alternatively a 300mm thick capping layer of clean imported capping soils placed above a high visibility geotextile membrane/anti-mixing layer in landscaped public open spaces with development area.

In order to validate these works a series of hand dug pits will be excavated to confirm an adequate thickness of inert soils are in place. A photographic record will be kept. The capping system is to comprise imported clean inert materials conforming to the Requirements for the Chemical Testing of Imported Materials for Various End Uses and Validation of Cover Systems prepared by Welsh Land Contamination Working Group and satisfy appropriate soil guideline values for residential development with gardens. Samples of topsoil and subsoil will be taken for laboratory analysis, at a rate of 4 per 250m^3.

Placement of the required final 600mm or 300mm capping layer will be the responsibility of the developer and is usually undertaken on a plot by plot basis, late in the development programme, as plots are completed.

Reporting of the clean capping to garden areas will be submitted independently of the remediation works.

In order to aid drainage of the garden areas, it is recommended that the surface of the engineered formation is raked and loosened prior to the placement of the required high visibility geotextile membrane/anti-mixing layer and capping layer.

FIGURES

Figure 1: Site Location Plan

Project: Heol Crwys, Cwmavon	Job no.: 14023	Intégral Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
Client: Tai Tarian	Scale: 1:25,000 at A4		

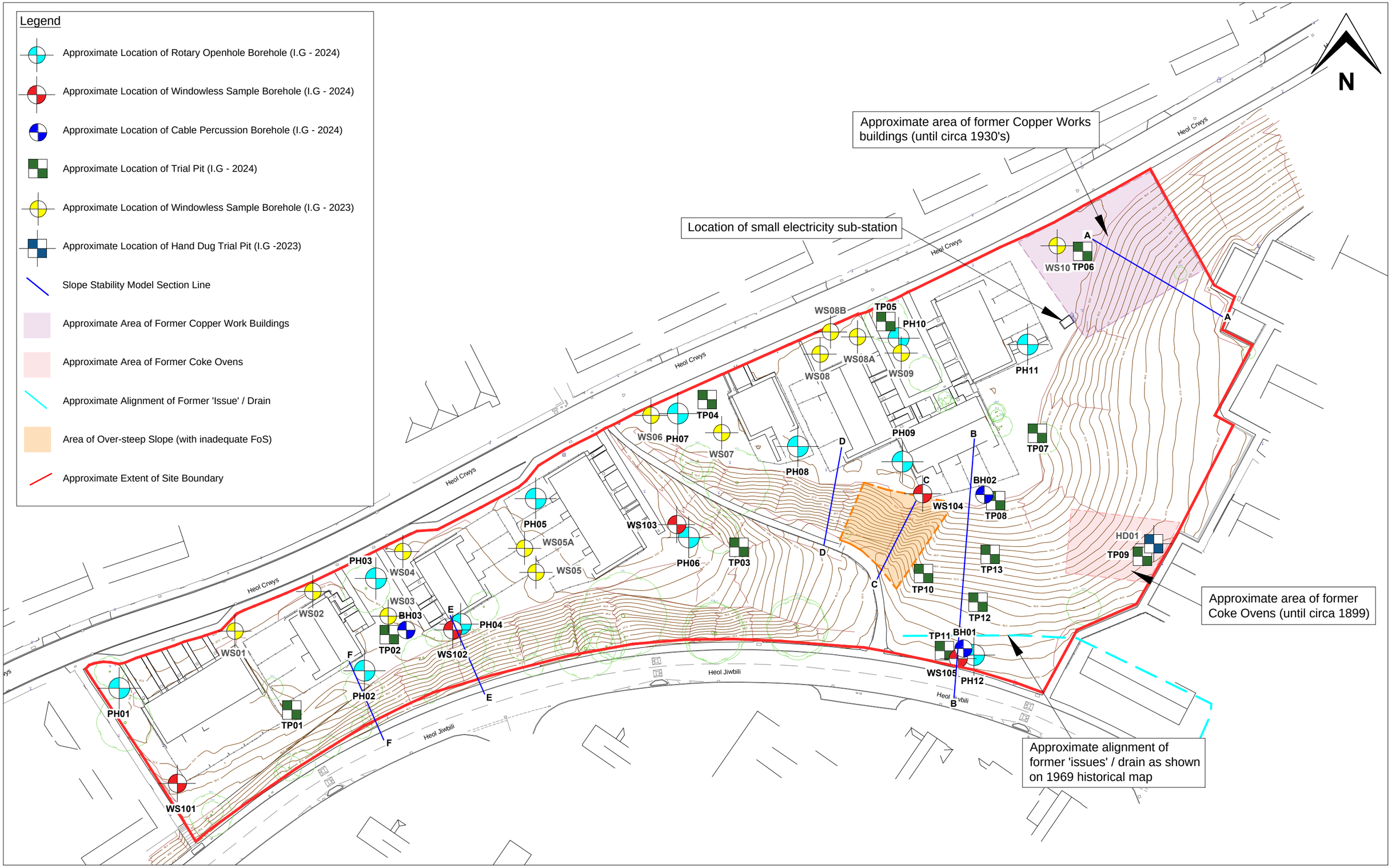

Figure 2: Site Plan / Exploratory Hole Location Plan

Project: Heol Crwys, Cwmavon	Job No.: 14023	Intégral Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
Client: Tai Tarian Ltd	Scale: 1:800 at A3		

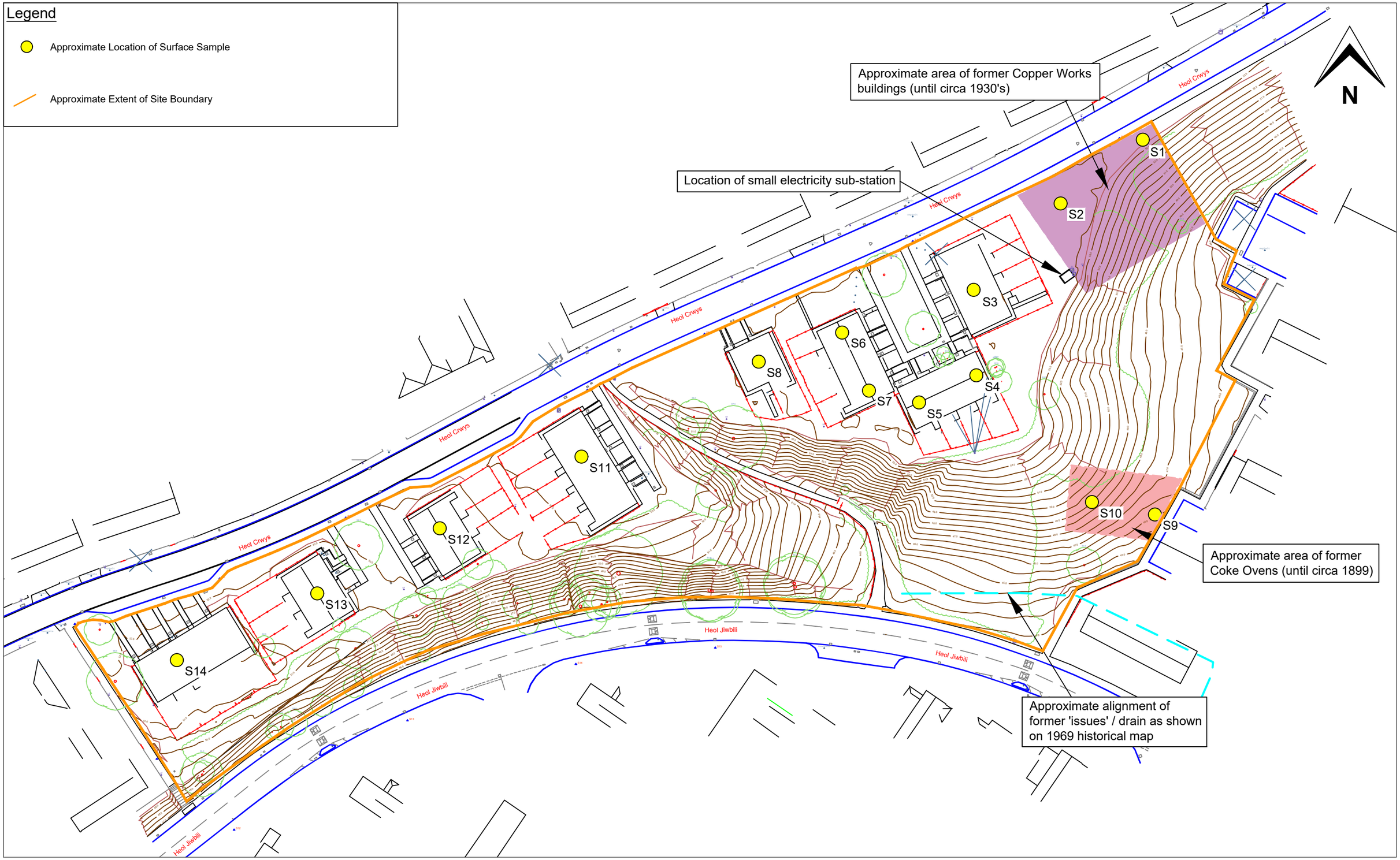

Figure 2a: Post Demolition Sampling Locations

Project: Heol Y Crwys, Cwmavon	Job No.: 14023	Intégral Géotechnique
Client: Tai Tarian Ltd	Scale: 1:1000 at A3	

Integral House,
7 Beddau Way,
Castlegate Business Park,
Caerphilly,
CF83 2AX.
Tel: 029 2080 7991

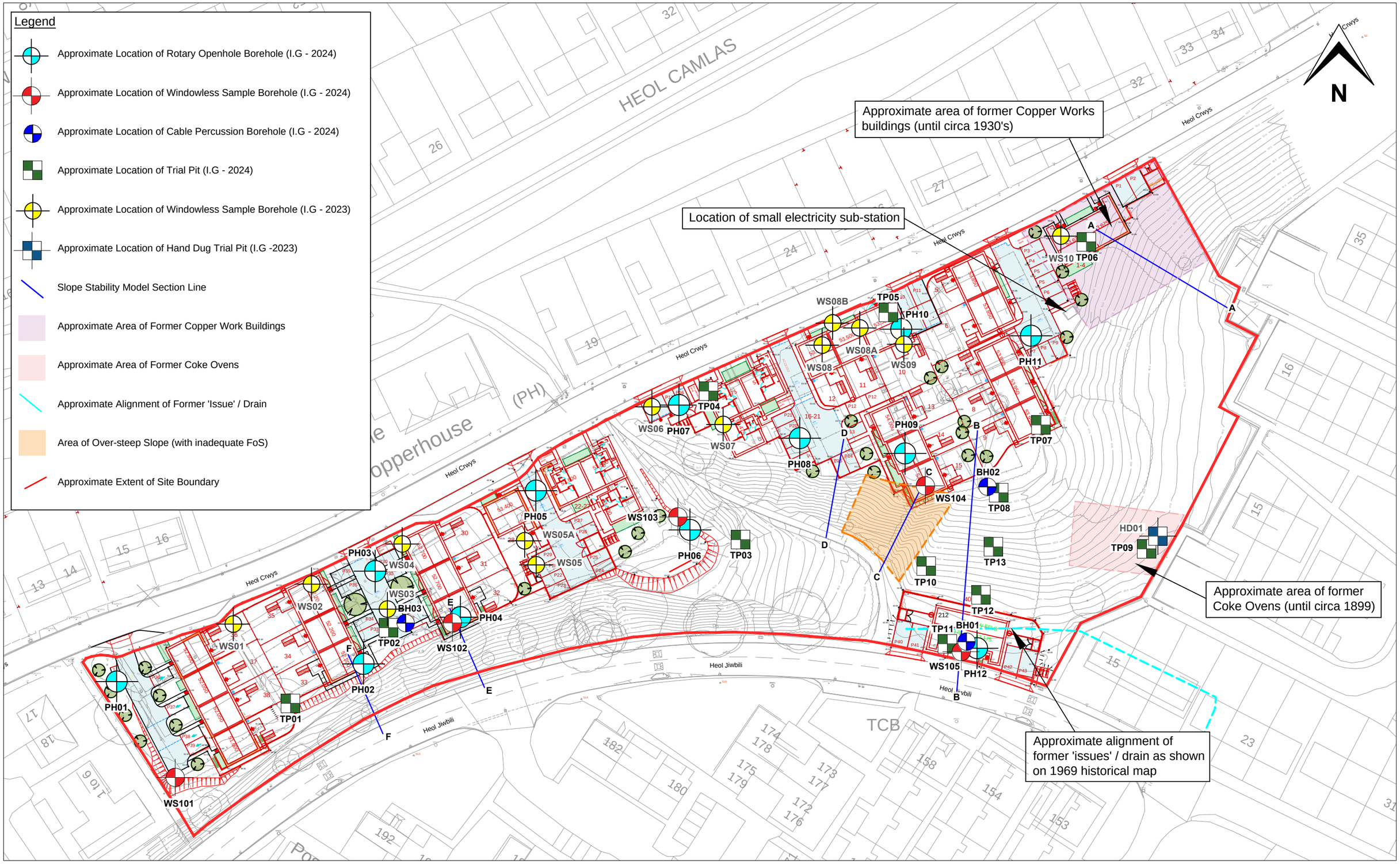

Figure 3: Extract of Proposed Development Layout

Project: Heol Crwys, Cwmavon	Job No.: 14023	Intégral Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
Client: Tai Tarian Ltd	Scale: 1:800 at A3		

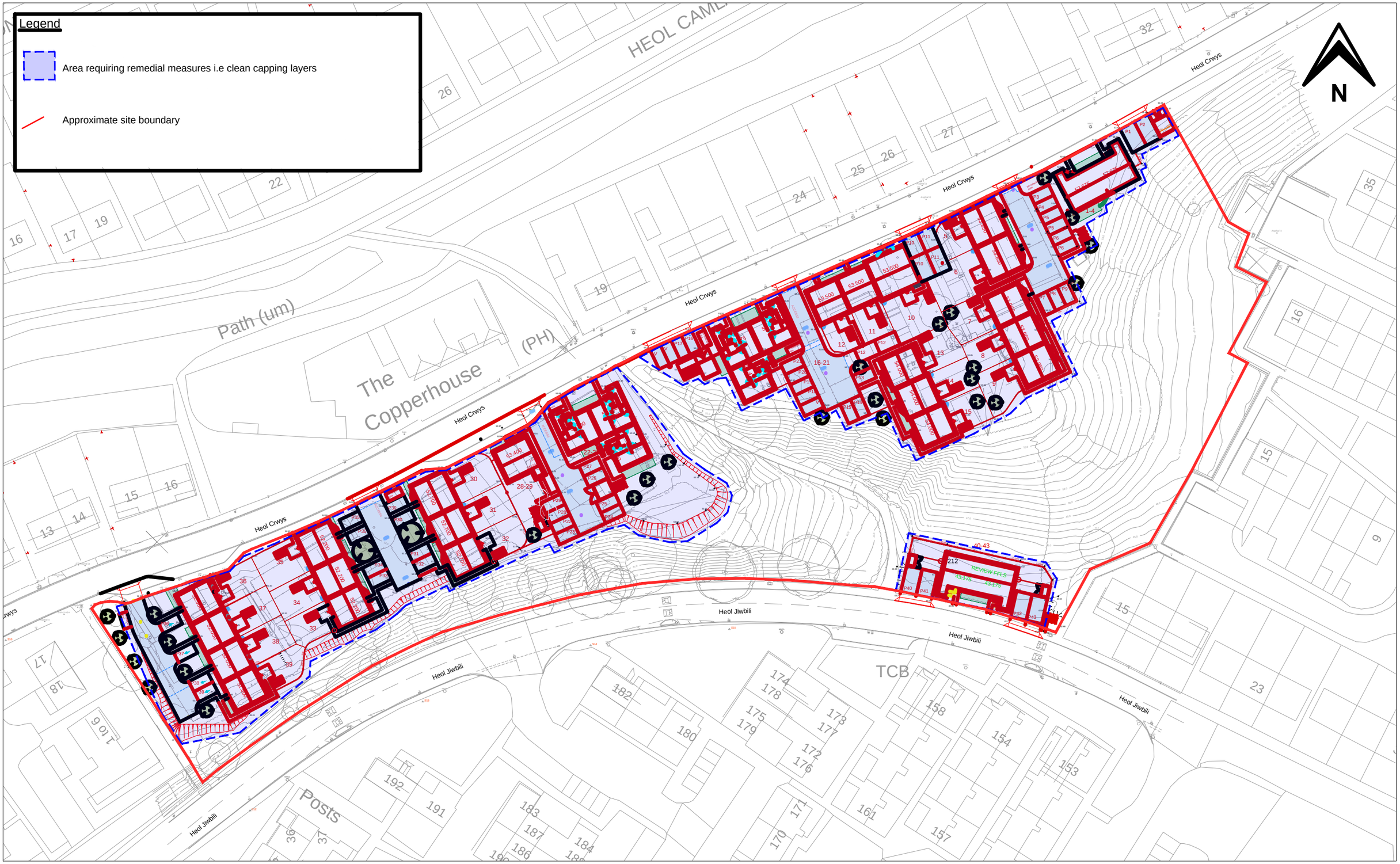

Figure 4: Areas Requiring Remedial Measures

Project: Heol Crwys, Cwmavon	Job No.: 14023	Intégral Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
Client: Tai Tarian Ltd	Scale: 1:800 at A3		