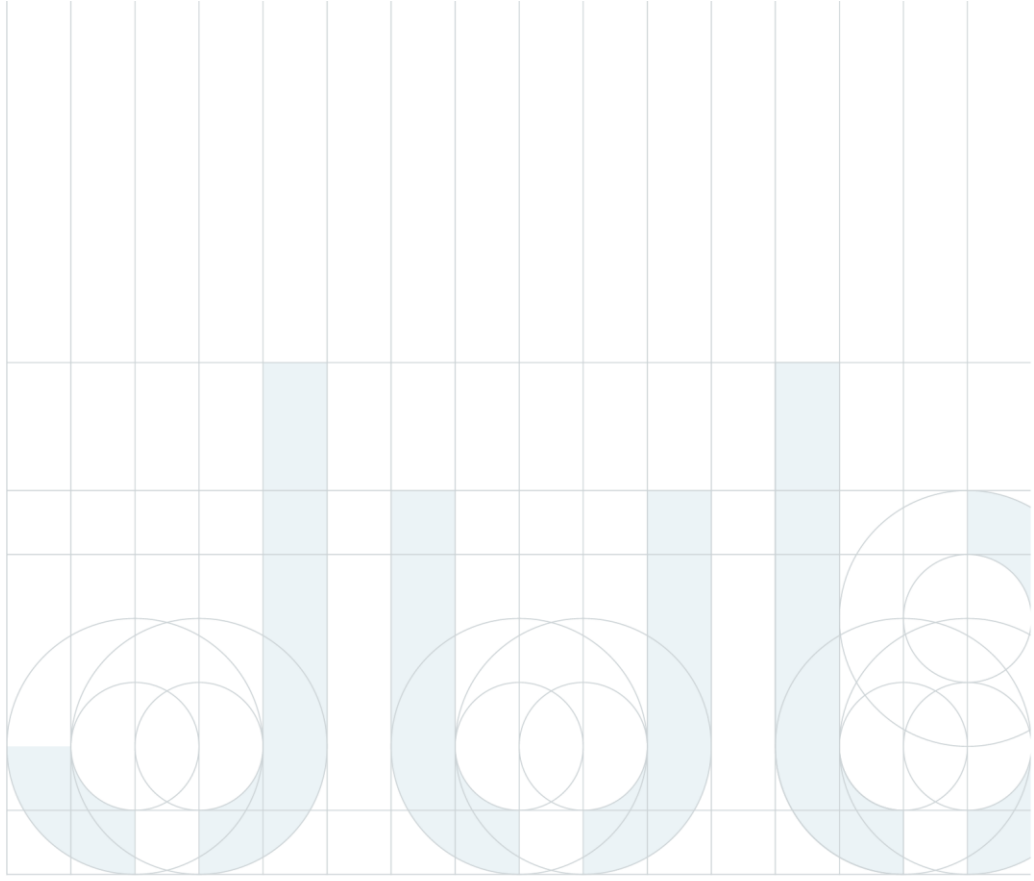




Abbey School, Neath



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1 Project Information

1.1 Project Information

Client BAM Construction

1.2 Project Details

Project Name Abbey School

Location Neath

Jubb Project Number 19264

1.3 Report Details

Version Rev 2

Status Second Issue

Date 10/05/2022

1.4 Project Authorisation

ISSUE HISTORY:

Version	Date	Detail
1	31/03/2020	Planning Issue
2	10/05/2022	Second Issue

AUTHORISATION:

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2 INTRODUCTION

2.1 General

This report has been prepared by Jubb Consulting Engineers Limited (Jubb) to address the proposed remedial works for primary school development at the Former Dŵr y Felin Comprehensive School, which has now been demolished. This remediation strategy report has been updated based on the revised capping solution proposed by the contractor.

The report includes proposed mitigation measures for dealing with known contamination at the site including known contamination hotspots encountered during the Phase 2 investigation works carried out by Jubb in 2019 (in the context of the proposed primary school), management of existing asphalt surfaces, and a discovery strategy to deal with any unexpected contamination.

This Remediation Strategy has been prepared to mitigate the potential risk(s) to human health as identified in various previous reports as set out below.

2.2 Site Description

The site is approximately 3.3 Ha in area, and irregular in shape due to the presence of Neath Abbey Infants School to the east of the site. The eastern half of the site forms two separate terraces occupied by abandoned level playing fields. To the western half of the site, the site forms approximately three different terrace levels, which were previously the site of multiple school buildings. The site slopes moderately downhill to the east by 5°. At the time of investigation, these buildings had been demolished, with only the foundations and floor slabs remaining *in-situ*. Demolition material was observed to be crushed and distributed around the slab areas infilling topographic lows and was also used to form graded slopes. Towards the centre of the site, running north-south is a 4 m high soil/fill batter present between the playing field and the car park and a 3.5 m high soil/fill batter present between the school and the car park. Additional soil cut/embankment batters are present to the northwest of the site at the northern playing field up to 3.5 to 4 m in height.

The site is bound to the south by The Drive, to the east by Heol Penlan, Neath Abbey Infant School and residential housing to the north-eastern corner of the site, to the north by farmland and a covered reservoir and to the west by forestry and a single residential building. Running along the western site boundary is a 3-4 m high grass cutting, forming slope angles up to 38°. Car parking (asphalt surfaces occupy the centre of the site. The site is completely enclosed with 2 m high palisade security fencing.

2.3 Previous Reporting

Jubb and Géotechnique (Wales) Limited have undertaken the following reports at the site:

- Integral Géotechnique (Wales) Limited, October 2014. Dŵr y Felin School, Neath, Site Investigation Report, Document Ref: 11437/CF/14/SI/Rev A; and
- Jubb Consulting Engineers, November 2019. Abbey School, Supplementary Ground Conditions Assessment Report.

2.4 Planning Status

Planning Application Recommended for Approval was received in December 2019 following an appeal, under reference P2019/5679.

Under the existing consent, a number of planning conditions were proposed, including Condition 22 which relates to investigation of contaminated land at the site as follows:

- *In the event that contamination is found at any time when carrying out the approved development that was not previously identified, work on site shall cease immediately and shall be reported in writing to the Local Planning Authority. A Desk Study, Site Investigation, Risk Assessment and where necessary a Remediation Strategy must be undertaken in accordance with the following document :- Land Contamination: A Guide for Developers (WLGA, WAG & EAW, July 2006). This document shall be submitted to and agreed in writing with the Local Planning Authority. Prior to occupation of the development,*

The above planning conditions are pre-commencement and hence need to be discharged as soon as practicable to allow the development to proceed.

This report provides details of the proposed remedial actions required to allow discharge of the relevant planning condition(s).

2.5 Proposed Land-Use and Soft Landscaping

The consented scheme includes two storey T-shaped building which occupies the majority of the western portion of the site, with areas surround as hard standing paved areas and paved car parking to the south and access road to the southeast of the site. A MUGGA asphalt surfaced pitch is positioned to the northwest of the site.

Soft-landscaping has been proposed in all peripheral areas of the western portion of the site. The majority of the eastern portion of the site is soft landscaped which includes a grassed sports pitch. Trees have been indicated along the north-western site boundary and towards the centre of the site.

NB - All tree planting will be carried out within tree pits appropriate to the proposed tree species, and with due regard to the proximity to sensitive structures.

3 SITE CONDITIONS AND SUMMARY OF RISKS

3.1 Geology and Ground Conditions

The 1:50,000 scale geological map (Swansea -Sheet 247) indicates the site to be underlain by the Swansea member, which form part of the Upper Pennant Measures. These deposits typically comprise a green-grey, lithic arenite, known as Pennant Sandstone with thin mudstone/siltstone and seatearth interbeds and mainly thick coal layers.

The Grovesend Formation is present to the north and northeast of the site, comprising argillaceous mudstone and siltstone. The basal contact of the unit is with the Swansea Four-Feel Coal (equivalent of the Llasntwit No.3 Seam). Bedding is expected to be dipping by 18 to 25° to the west in areas east of the Dyffryn Fault.

The bedrock is shown to be overlain by surficial Glacial Till deposits comprising a mixture of clays, sand, gravel and boulders.

The Dyffryn Fault is shown approximately 200 m west of the site (trending north-south, with downthrow to the east) and the Cwm Felin fault is approximately 300 m to the east (trending north-south, with downthrow to the west).

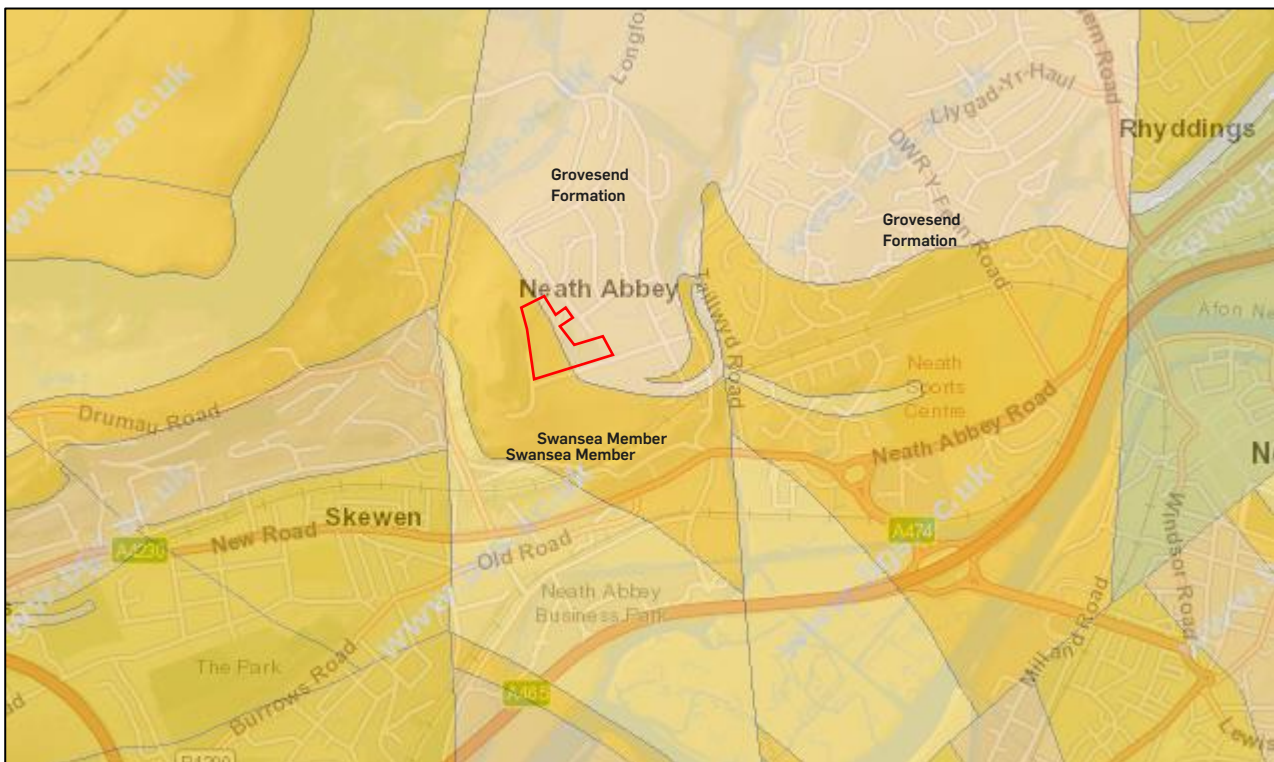


Figure 1. Geological Map (red outline of the site)

The site investigation comprised a series of trial pits, window samples and boreholes, which indicated the following ground conditions:

- Southern portion of the site:
 - Made ground up to 1.6 m comprising orange, grey and black sandy GRAVEL, slightly sandy gravelly CLAY, slightly sandy clayey SILT and COBBLES and BOULDERS with clasts of concrete, brick and sandstone. Car parking (asphalt) surfaces occupy the central southern portion of the site;

- Glacial Till Deposits comprising firm to stiff grey mottled orange brown and bluish grey gravelly CLAY and medium dense to dense very sandy very clayey GRAVEL to an average depth of 2.1 m (max 4 m depth); and
 - Light grey, grey and brown SANDSTONE with interbeds of dark grey and black coal.
- Northern and Eastern portion of the site:
 - Topsoil is present over the eastern half of the site comprising dark brown slightly gravelly sandy SILT with roots and rootlets up to 0.3 m thickness.
 - Glacial Till Deposits comprising firm to stiff grey mottled orange brown and bluish grey gravelly CLAY and medium dense to dense very sandy very clayey GRAVEL to an average depth of 2.1 m (max 4 m depth); and
 - Light grey, grey and brown SANDSTONE with interbeds of dark grey and black coal.

3.2 Summary of Contamination Encountered

The results of the Phase 2 Site Investigation carried out by Jubb in 2019 and Integral in 2004 indicated a number of contamination hotspots within the made ground with exceedances of predominantly Arsenic with PAH, TPH, Lead and Asbestos also present across the site, which have been discussed below.

Additional trial pitting was carried out by Terra Firma (South) in February 2020 to further define and delineate the extent of the contamination. The investigation comprised an additional 36 no. trial pits around known hotspot areas and 7 no. trial pits within the existing pavement areas. The location of the trial pits has been presented in drawing no: 19264-ABBY-JUBB-V1-ZZ-DR-C-650 P01. The works were directed by Jubb.

In addition, potential coal tar based asphalt is present beneath existing modern pavement areas to the south and central southern areas of the site, which are discussed further in Section 3.3 of this report.

The generic assessment criteria used in this case are generally the LQM/CIEH Suitable 4 Use Levels (S4ULs), based on minimal or tolerable risk and are intended to be protective of human health. Different criteria are provided for a variety of land use, and the criteria for "Residential without plant uptake" has been adopted here.

Arsenic

During the Phase 2 investigation works, 7 no. Arsenic hotspots were encountered, which required further investigation to delineate extent and concentrations of the contamination.

Arsenic was the most widely distributed contaminant across the site, with elevated levels detected within 11 no. of the additional sample locations.

18 no. of the 68 no. soil samples were found to be elevated above the Generic Assessment Criteria (40mg/kg), the mean of the sample data was 33mg/kg, with a range of values from 4.3 - 270 mg/kg.

The Upper Confidence Limit (95 percentile) for the Arsenic concentrations is 55mg/kg, so in general Arsenic concentrations across the site can be considered to be above the adopted C4SL threshold values of 40mg/kg.

The background Arsenic values as published by the National Soil Inventory (NSI) under the DEFRA and BGS dataset indicate average 'background' concentration of 74.14 mg/kg in this area.

As indicated above, the site is located in an area known to be heavily mineralised, which is typically associated with elevated concentrations of various heavy metals, including Arsenic.

Due to absence of any specific anthropogenic source of the elevated arsenic concentrations, it is considered that they are 'naturally elevated' due to the chemistry of the bedrock and subsoil.

Lead

During the previous phase of investigation, elevated Lead was detected in 2 no. locations.

6 no. of the 68 no. soil samples were found to be elevated above the Generic Assessment Criteria (130mg/kg), the mean of the sample data was 66mg/kg, with a range of values from 4.0 – 690 mg/kg.

The Upper Confidence Limit (95 percentile) for the Lead concentrations is 120 mg/kg, so in general Lead concentrations across the site can be considered to be below the adopted C4SL threshold values of 130mg/kg.

The background Lead values as published by the National Soil Inventory (NSI) under the DEFRA and BGS dataset indicate average 'background' concentration of 124.57 mg/kg in this area.

As indicated above, the site is located in an area known to be heavily mineralised, which is typically associated with elevated concentrations of various heavy metals, including Lead.

Polyaromatic Hydrocarbons (PAH)

PAH exceedances were previously encountered at a single location during Phase 2 works.

However, more widespread PAH exceedances were detected within 6 no. of the 9 no. investigated hotspot locations for Benzo[b]fluoranthene, Benzo[a]pyrene and Dibenz[ah]anthracene. A single sample from TP219 contains elevated of all three of these PAHs.

Benz[a]anthracene

Exceedances in Benz[a]anthracene were encountered in WS4 of 140 mg/kg and in WS5 of 25mg/kg in excess of the Generic Assessment Criteria of 15mg/kg.

Statistical analysis of dataset as a whole indicates a UCL 95 value of 23.8mg/kg, which is in excess of the adopted Generic Assessment Criteria values. The exceedance encountered in WS4 can be considered an outlier, which if excluded from the dataset the UCL 95 is calculated at 4.5mg/kg, which is well below the adopted GAC of 15mg/kg.

Chrysene

A single exceedance of Chrysene was encountered in WS4 of 130mg/kg, which is in excess of the adopted Generic Assessment Criteria value of 32mg/kg. However, the calculated UCL 95 of the dataset is 22.1mg/kg, which is well below the adopted values.

Benzo[b]fluoranthene

Exceedances in Benzo[b]fluoranthene were encountered in WS4 of 180mg/kg and in WS5 of 34mg/kg, TP206 of 4.9mg/kg, TP207 of 5.7mg/kg, TP219 of 15mg/kg and TP220 of 4.1mg/kg in excess of the Generic Assessment Criteria of 4mg/kg.

Statistical analysis of dataset as a whole indicates a UCL 95 value of 16mg/kg, which is in excess of the adopted Generic Assessment Criteria values.

However, the highest two Benzo[b]fluoranthene values encountered in the dataset are both indicated as an outlier to the data set. If these two values are excluded, the recalculated UCL 95 value is 2.2mg/kg, which is below the Generic Assessment Criteria of 4mg/kg.

This would suggest the two highest values of Benzo[b]fluoranthene encountered are 'hotspots', and not indicative of the site wide concentrations of Benzo[b]fluoranthene.

Benzo[a]pyrene

Exceedances in Benzo[a]pyrene were encountered in TP114 of 3.5mg/kg, in WS4 of 93mg/kg, 20mg/kg in WS5 and 8.9mg/kg in TP219 in excess of the Generic Assessment Criteria of 3.2mg/kg.

Statistical analysis of dataset as a whole indicates a UCL 95 value of 8.3mg/kg, which is in excess of the adopted Generic Assessment Criteria values.

However, the highest three Benzo[a]pyrene values encountered in the dataset are both indicated as an outlier to the data set. If these three values are excluded from the dataset, the recalculated UCL 95 value is 0.94mg/kg, which is below the Generic Assessment Criteria of 3.2mg/kg.

This would suggest the three highest values of Benzo[a]pyrene encountered are 'hotspots', and not indicative of the site wide concentrations of Benzo[a]pyrene.

Indeno[123-cd]pyrene

A single exceedance of Indeno[123-cd]pyrene was encountered in WS4 of 55mg/kg, which is in excess of the adopted Generic Assessment Criteria value of 46mg/kg. However, the calculated UCL 95 of the dataset is 9.3mg/kg, which is well below the adopted values.

Dibenz[ah]anthracene

Exceedances in Dibenz[ah]anthracene were encountered in TP114 of 1.0mg/kg, in WS4 of 22mg/kg, WS5 of 3.2mg/kg, TP202 of 0.98mg/kg, TP204 of 1.3mg/kg, TP205 of 1.1mg/kg, TP219 of 2.7mg/kg, TP220 of 1.1mg/kg, TP221 of 0.31mg/kg, TP230 of 0.41mg/kg, TP235 of 0.35mg/kg and TP236 of 0.72mg/kg in excess of the Generic Assessment Criteria of 0.32mg/kg.

Statistical analysis of dataset as a whole indicates a UCL 95 value of 9.3mg/kg, which is in excess of the adopted Generic Assessment Criteria values.

However, the highest three Dibenz[ah]anthracene values encountered in the dataset are indicated as an outlier to the data set. If these three values are excluded from the dataset, the recalculated UCL 95 value is 0.22mg/kg, which is below the Generic Assessment Criteria of 0.32mg/kg.

This would suggest the three highest values of Dibenz[ah]anthracene encountered are 'hotspots', and not indicative of the site wide concentrations of Dibenz[ah]anthracene.

Petroleum Hydrocarbons (EC >40-70)

2 no. of the 68 no. soil samples were found to be elevated above the Generic Assessment Criteria (1900mg/kg), the mean of the sample data was 129.9mg/kg, with a range of values from 10 – 2100 mg/kg.

However, elevated results are considered to be a hotspots, and remaining values are well below the adopted assessment criteria.

BTEX and MTBE testing was also undertaken on 6 no. samples, with no detections of any determinants (values <0.01 mg/kg).

Asbestos

Asbestos was encountered within 5 no. trial pit locations. Amosite was encountered in TP236 and Chrysotile was encountered within TP119. WS05, TP224 and TP228 all within samples from the made ground.

Based on these findings and the information from the previous investigation asbestos is expected to be present throughout the made ground. Removal of made ground and building rubble will need to be carried out in general accordance with the Health and Safety Executive 'Control of Asbestos Regulations' 2012.

Radon

The Envirocheck report indicates no radon protection measures are required for new developments.

3.2.1 Contamination Plan

Relevant contamination hotspot locations are indicated on the plan below.



3.3 Pavement Coal Tar Test Results

Coal Tar contained within older road construction (i.e. tarmac dating from the 1980's or earlier) is known to be potentially hazardous to health and is classified as a Hazardous Waste, due to high quantities of PAH.

Chemical testing was carried out on the existing asphalt pavement areas to the south and central south of the site for the presence of Coal Tar. This was determined by using both PAK marker spray, and undertaking chemical testing for PAHs.

During the investigation, two layers of asphalt were visually identified. The current top surface was found to be non-reactive to the PAK spray and was generally found to be between 20 mm to 30 mm in thickness. It has been assumed that this top layer is therefore a bitumen based surfacing, does not contain Coal Tar, and would not be classified as Hazardous Waste.

However, within PTP201, PTP203, PTP204, PTP205, PTP206, a second layer of asphalt was encountered and during PAK spray testing, reacted by changing to a yellow/brown tinge colouration, indicating the presence coal tar. The layer was found to be between 30 mm to 90 mm in thickness.

3.3.1 Coal Tar/Asphalt Layer

Samples were taken of the second asphalt layer material and of the sub-base immediately below the contaminated layer for additional testing.

Testing results from the asphalt surface indicated PAH exceedances for Benzo[a]anthracene, Chrysene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[a]pyrene, Indeno[123-cd]pyrene and Dibenz[ah]anthracene. The results indicate excessive PAH's within 4 of the 5 samples tested for the following:

- Benzo[a]anthracene was found to be elevated above the Generic Assessment Criteria (15mg/kg), the mean of the sample data was 392mg/kg, with a range of values from 0.1 – 570 mg/kg.
- Chrysene was found to be elevated above the Generic Assessment Criteria (32 mg/kg), the mean of the sample data was 488mg/kg, with a range of values from 0.1 – 760 mg/kg.
- Benzo[b]fluoranthene was found to be elevated above the Generic Assessment Criteria (4mg/kg), the mean of the sample data was 512 mg/kg, with a range of values from 0.1 – 750 mg/kg.
- Benzo[k]fluoranthene was found to be elevated above the Generic Assessment Criteria (110 mg/kg), the mean of the sample data was 180 mg/kg, with a range of values from 0.1 – 270 mg/kg.
- Benzo[a]pyrene was found to be elevated above the Generic Assessment Criteria (3.2 mg/kg), the mean of the sample data was 284 mg/kg, with a range of values from 0.1 – 420 mg/kg.
- Indeno[123-cd]pyrene was found to be elevated above the Generic Assessment Criteria (46 mg/kg), the mean of the sample data was 212 mg/kg, with a range of values from 0.1 – 310 mg/kg.
- Dibenz[ah]anthracene was found to be elevated above the Generic Assessment Criteria (0.32 mg/kg), the mean of the sample data was 92 mg/kg, with a range of values from 0.1 – 140 mg/kg.

It is recommended that this lower layer of Coal Tar based Asphalt is removed from site as Hazardous Waste.

3.3.2 Sub-base Below Asphalt Layer

Testing immediately below the asphalt layer (maximum test depth of 0.15 m bgl) within the sub-base layer indicate PAH exceedances for the following:

- Benzo[a]anthracene was found to be elevated above the Generic Assessment Criteria (15mg/kg), the mean of the sample data was 84 mg/kg, with a range of values from 0.1 – 270 mg/kg.

- Chrysene was found to be elevated above the Generic Assessment Criteria (32 mg/kg), the mean of the sample data was 84 mg/kg, with a range of values from 0.1 – 320 mg/kg.
- Benzo[b]fluoranthene was found to be elevated above the Generic Assessment Criteria (4mg/kg), the mean of the sample data was 66 mg/kg, with a range of values from 0.1 – 200 mg/kg.
- Benzo[k]fluoranthene was found to be elevated above the Generic Assessment Criteria (110 mg/kg) in a single sample with a result of 120 mg/kg.
- Benzo[a]pyrene was found to be elevated above the Generic Assessment Criteria (3.2 mg/kg), the mean of the sample data was 55 mg/kg, with a range of values from 0.1 – 190 mg/kg.
- Indeno[123-cd]pyrene was found to be elevated above the Generic Assessment Criteria (46 mg/kg), the mean of the sample data was 40 mg/kg, with a range of values from 0.1 – 130 mg/kg.
- Dibenz[ah]anthracene was found to be elevated above the Generic Assessment Criteria (0.32 mg/kg), the mean of the sample data was 12 mg/kg, with a range of values from 0.1 – 37 mg/kg.

It is recommended that this lower layer of Sub-base is also is removed from site as Hazardous Waste.

3.4 Discussion of Pollutant Linkages and Risk

With regard to the elevated Arsenic, PAH, TPH and Lead in the soil, this is only a risk to site end-users if soils remain in-situ and exposed at the ground surface, and if end-users come into contact with impacted soils through contact, ingestion of inhalation or dust.

Once constructed, the site will provide primary school facilities, with no students occupying the site. Given the location of the majority of the hotspot contaminant areas are currently under areas of proposed hard standing, or areas of proposed cutting then the opportunity for contact between site end-users and site soils is considered to be very limited and therefore associated risk(s) are extremely low. Consideration should be made for capping areas where soft landscaping and green spaces (around the perimeter of the site and extensively to the north of the site within areas of proposed play fields) are present.

Acute (short-term) risk to construction workers coming into contact with site soils can be controlled by use of appropriate PPE and standard working practices.

Based on the above, the only significant pollutant linkage remaining (site end-users and contact with site soils) can be mitigated by use of clean topsoil capping in any soft landscaped areas.

4 REMEDIATION DESIGN

4.1 General

The following section details the proposed remediation actions for dealing with the identified risks and contaminants of concern.

4.2 Hotspot Excavation and Relocation

The principal hotspots identified (shown on figure 2 above) are to be excavated and relocated to beneath areas of hardstanding or buildings on site.

Each hotspot will be excavated as a 10m radius, and a minimum of 5 no. validation tests will be undertaken to prove contaminated materials have been removed from each location, for subsequent relocation to beneath hardstanding/buildings.

Validation testing to be undertaken at each location will comprise a suite of heavy metals, speciated PAH, speciated hydrocarbons, and asbestos ID.

4.3 Installation of Capping Layer

The principal remedial action is to provide a capping layer in areas of proposed soft-landscaping, to isolate end-users from any residual contaminants (As, Pb, PAH and asbestos) in superficial made ground that might be present.

The engineered capping of soft landscaped areas is therefore proposed in the following areas (see also Drawing 19264-ABBY-JUBB-V1-ZZ-DR-C-650 P01), which excludes areas of cut:

- All perimeter designated soft areas surrounding the proposed school building and car parking areas to the south of the site; and
- Entire north of the site where proposed sports pitches and soft landscaping-trees.

The engineered capping layer within these areas will comprise a total thickness of 400mm of clean imported or site won natural sub-soil and topsoil.

Tree pits will not have a marker layer and the location and size will be appropriate to the chosen tree species, and with due regard to the proximity of the proposed planting to sensitive structures.

The soils used to form the capping layer will comprise clean imported topsoil and either imported or site-won sub-soil, which will be inspected, tested and approved (in accordance with the criteria provided in **Appendix A**) before the materials are imported or used on site.

Where site won materials are to be used, material is to be inspected and tested in accordance with criteria provided in **Appendix A**, at a frequency of 1 test per 500m³. In addition, a watching brief will be maintained during placement of the imported and site won soils with any out-of-specification soils being rejected and removed from site.

Site-won material will be re-used on-site under a CLAIRE DoW CoP Material Management Plan, where appropriate, or removed from site to a licensed Waste Transfer Station, pending recovery or disposal to landfill under the Waste Regulations.

Extent of capping to be installed across the site is detailed on Drawing 19264-ABBY-JUBB-V1-ZZ-DR-C-650 P01 as indicated as soft landscaped areas in the drawing section. Engineering capping details and specification for capping material is contained in **Appendix A**.

Topsoil should comprise at least the top 200mm of the capping layer to provide a suitable growing medium for plants. Specification, testing, handling and importation of topsoil should be in accordance with *BS 3882:2015 Specification for Topsoil*.

4.4 Installation of Basic Radon Protection Measures

No radon protection measures are required for the new development.

4.5 Protection of Site Construction Workers

This Remediation Strategy focuses on chronic (long-term) risks to human health, but there exists a potential for acute (short-term) impacts to construction workers and future workers from site soils.

It is recommended that as a minimum task-specific PPE is worn at all times, that construction dust and road cleansing is managed, and that adequate messing and hand-washing facilities are provided for all site staff.

In addition, information relating to the condition of site soils should be passed onto the Client in line with the requirements of the CDM Regulations so that potential risks arising during future earthworks at the site can be avoided or mitigated.

5 UNEXPECTED CONTAMINATION DISCOVER STRATEGY

A 'watching brief' will be maintained during ground works to ensure any unidentified or unexpected contamination is identified and adequately dealt with.

In the case that suspected soil or contamination is encountered the following procedure will be followed:-

1. The site engineer/foreman/manager will inspect the suspected material and will make a judgment call based on odour and discolouration of material;
2. If the material is identified as requiring further assessment, or a structure has been identified which is retaining pollutants (such as a tank or building foundation etc.) works will cease in that area until the soils have been inspected and tested (as appropriate) by a specialist consultant (in the case that a significant source is identified Neath Port Talbot County Borough Council will be notified prior to any remedial action being undertaken);
3. On the basis of this assessment materials can then be:
 - a) Left in-situ;
 - b) Excavated and quarantined pending treatment and re-use on-site or offsite disposal;
 - c) Removed immediately to a waste treatment facility.
4. Once the appropriate method has been identified and agreed with Neath Port Talbot County Borough Council, validation and verification testing will be carried out to show that the remedial activity has been successful and these findings, along with any Waste Regulations duty-of-care paperwork will be added to the final Verification Report.

6 VERIFICATION REPORTING

A Verification Report will be compiled in line with the methodology outlined in Model Procedures for the Management of Land Contamination (CLR 11) in order to demonstrate that the works set out in the Remediation Strategy (above) have been completed.

This report will identify areas where mitigation has been carried out.

The report will include a site plan identifying areas where known hotspots have been addressed (if encountered) or where unforeseen impacts were identified during the construction phase (if encountered) and other areas where remedial works have been carried out.

This will include the details and records of the capping installed, including testing results of capping materials to demonstrate that they complied with the validation criteria.

The Verification Report will also include duty-of-care reporting under the Waste Regulations, and the Verification Report compiled under the CLAIRE DoWCoP Materials Management Plan for re-use of site-won, and imported material(s), where appropriate.

Drawings

19264-ABBY-JUBB-V1-ZZ-DR-C-650 P01	Additional Contamination Exploratory Hole Location Plan with Proposed Surfacing (Hard and Soft)
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Appendix A: Engineered Capping Details

Soil Importation for Capping

Specification

It is expected that most of the material for the engineered capping layer will comprise clean topsoil and subsoil imported to site from commercial sources, and which has previously been tested and determined as clean and fit for purpose.

Imported top soil will comprise the balance of material, which will be subject to inspection, testing and validation, as detailed here.

The capping layer itself will comprise of three layers, as follows:

Thickness/depth	Layer	Details
0 – 200mm	Topsoil	To provide growing medium (tested to specification)
200 – 400mm	Subsoil	Suitable natural sub-soil material (tested to specification)
Basal Geotextile	Terram or Similar	To form separator layer and provide excavation barrier

Imported topsoil and subsoil shall be obtained wherever possible from a single source (preferably), which has been tested and approved in advance by the Supervising Engineer.

For each proposed source of topsoil and subsoil to be used on the site, sampling shall be carried out at a ratio of 1 to 250m³ of expected import (with a minimum of three representative samples obtained for each source).

The soil samples from the proposed sources of imported topsoil and subsoil shall be tested for the full range of contaminants listed below. The results of the laboratory testing shall be compared to the remediation criteria listed below. If one of the determinants (or the 95% upper confidence limits of all the test results) exceeds the specified acceptance criteria, then the proposed source of the soil will not be used.

On completion of the placement of the capping layer, validation inspections to verify that the minimum required thickness of 'clean' soil has been placed shall be carried out. At the same time a visual inspection of the topsoil and subsoil shall be undertaken to ensure that the materials are consistent with the previously approved sources of soils. A photographic record of the validation inspection at each nominated location will be undertaken.

Validation Criteria

Topsoil and Subsoil

All imported topsoil and subsoil shall be visually inspected to ensure the material comprises clean, naturally occurring soils and subsoils. No visual or olfactory contamination is permitted (i.e. fragments of asbestos, obvious hydrocarbon or heavy organic odours, oily soils or liquids.). Soils should be free from man-made inclusions (bricks/concrete/plastic/wire etc.).

The soils shall be tested by a UKAS accredited laboratory for the following determinants, and laboratory results shall be provided to indicate that the soils are below the relevant thresholds.

Specification, testing, handling and importation of topsoil should be in accordance with *BS 3882:2015 Specification for Topsoil*.

Contaminant	Importation Criteria (mg/kg)	Source
Metals, Semi-metals, Others		
Arsenic	40	C4SL
Cadmium	10	CLEA
Chromium III	3000	CIEH
Chromium IV	4.3	CIEH
Lead	310	C4SL
Mercury	170	CLEA
Selenium	350	CLEA
Copper	2330	CIEH
Nickel	130	CLEA
Zinc	3750	CIEH
Total Cyanide	480	CLEA
Phenol	3200	CLEA

Asbestos ID	None permitted (as fibres or fragments)	
Asbestos (visual check for identifiable fragments in soil mass/sample)	None permitted	
Speciated Hydrocarbons		
Aliphatic C5-C6	42	S4UL
Aliphatic C6-C8	100	S4UL
Aliphatic C8-C10	27	S4UL
Aliphatic C10-C12	130	S4UL
Aliphatic C12-C16	1100	S4UL
Aliphatic C16-C21	65000	S4UL
Aliphatic C21-C35	65000	S4UL
Aromatic C5-C7	70	S4UL
Aromatic C7-C8	130	S4UL
Aromatic C8-C10	34	S4UL
Aromatic C10-C12	74	S4UL
Aromatic C12-C16	140	S4UL
Aromatic C16-C21	260	S4UL
Aromatic C21-C35	110	S4UL
Poly-aromatic Hydrocarbons		
Acenaphthene	210	S4UL
Acenaphthylene	170	S4UL
Anthracene	2300	S4UL
Benz[a]anthracene	3.1	S4UL
Benzo[a]pyrene	0.83	S4UL
Benzo[b]fluoranthene	5.6	S4UL
Benzo[ghi]perylene	44	S4UL
Benzo[k]fluoranthene	8.5	S4UL
Chrysene	6	S4UL
Dibenz[ah]anthracene	0.76	S4UL
Fluoranthene	260	S4UL
Fluorene	160	S4UL
Indeno[123-cd]pyrene	3.2	S4UL
Naphthalene	1.5	S4UL
Phenathrene	92	S4UL
Pyrene	560	S4UL