

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 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 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 elevation of contaminants (As, Pb, PAH and asbestos) in superficial site soils (made ground).

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, comprising a basal geotextile marker layer (Terram or similar), overlain by 400mm of clean imported 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 sub-soil and will be inspected, tested and approved (in accordance with the criteria provided in **Appendix A**) before the materials are imported

to site. In addition, a watching brief will be maintained during placement of the imported 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*.

4.3 Installation of Basic Radon Protection Measures

No radon protection measures are required for the new development.

4.4 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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1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER ARCHITECTURAL, ENGINEERING AND OTHER DESIGN CONSULTANTS DRAWINGS & INFORMATION EXISTING TOPOGRAPHICAL & UTILITIES INFORMATION SHOWN IS TAKEN FROM GWAIA DRAWINGS 2885-T-OVERVIEW AND 2885-U-OVERVIEW (07.11.2019) PROVIDED BY THE CLIENT.
- 2.
3. RETAINING STRUCTURES, INCL. REINFORCED BANKS AND WALLING TO BE LOCATED WITHIN GRASSSED/SOFT LANDSCAPED AREAS. PLANTING TO ANY EARTH BANKS AND PLANTING POCKETS WITHIN GABION STRUCTURES TO LANDSCAPE ARCHITECTS SPECIFICATION.

 SITE BOUNDARY (PLANNING)

 OTHER LAND OWNED BY APPLICANT



SOFT

PROJECT:
ABBEY SCHOOL

CLIENT:
BAM CONSTRUCT UK

Revision Referencing
P = Preliminary A = Approval T = Tender C = Construction

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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