APPENDIX 9.8

WYG Environment
part of the WYG group

VINCI Construction UK Limited

Glan Usk School, Newport

Remediation Validation Report

Volume 1 of 2

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1.0 Introduction

1.1 Appointment

WYG Environment (WYG) was appointed by VINCI Construction UK Limited (VINCI) to act as 'Environmental Engineer' for the proposed redevelopment of land at Glebelands, Newport for use as a new primary school and housing (Planning Application Reference number 00/0768).

The schedule of services provided by WYG are detailed in an appointment document dated 11th March 2008, reference CAR_LIB1-#2204066-V1-WYG_Appointment (4) and included a staged contaminated land assessment. Remediation was required as part of a risk management strategy to be protective of site end users and the wider environment.

1.2 Remediation objectives

The remedial strategy, as documented within WYG Report 'Planning Support – Enhanced Ground Contamination Risk Assessment and Remediation Strategy' dated January 2006 (reference E3808/GO/PSS-RemStrat/Jan06/V2), was submitted to and approved by the planning statutory consultees, principally the Environment Agency Wales (EAW) and Newport City Council (NCC) Environmental Health and Public Protection department.

In summary, the strategy comprised four key elements as presented below:

- Removal of PCB drums and residual waste;
- Capping the site with buildings, hardstanding or imported materials in soft landscaped areas or gardens;
- Gas protection measures for all site buildings, and;
- The realignment of Lotery's reen within an impermeable, lined channel (See Section 2.5 with regards to development phasing).

In addition to the strategy, WYG detailed specific performance criteria for the remediation contractor to follow during the works which are detailed within WYG Report 'Performance Criteria for Remediation' dated January 2006 (reference E3808/GO/PerfCriteria/Jan06/V1).

1.3 Report scope

This verification report contains a record of the remediation works carried out at the site and is a requirement in accordance with reserve matter planning condition 7 - *On completion of the works of remediation the applicant shall provide a certification report, compiled by a suitably qualified engineer who has supervised the works, which confirms that the remediation works have been completed fully in accordance with the approved remediation strategy.*

The report has been compiled in accordance with guidance given in the Environment Agency's Contaminated Land Report (CLR) 11: Model procedures for the management of contaminated land.

The report is subject to the WYG report conditions contained in Appendix A. The information contained in this report is intended for the use of VINCI Construction UK Limited. WYG can take no responsibility for the use of this information by any third party or for uses other than that described in this report.

2.0 Site Details and Background Information

2.1 Site location and description

The site is located between a railway line and the eastern bank of the River Usk approximately 200 m south of the M4 motorway and 1km north of Newport city centre, (see Figure 1). The site occupies approximately 8.1 hectares, is roughly rectangular in shape and is centred at around National Grid Reference of 331750, 189550.

A drainage ditch (Lotery's Reen) transects the site east to west. Prior to the current development works, the land north of Lotery's Reen had recently been used for recreation and comprised an all-weather running track, clay surface sports pitch, clubhouse and changing rooms.

The area south of Lotery's Reen is currently disused land and comprises a generally level area of wild grasses and young trees.

The land to the north of Lotery's Reen is approximately 2m higher than the land to the south, at an approximate level of 9.0 to 9.0m AOD compared to levels of typically 7.0m to 7.5m AOD.

2.2 Summary of site history

The site is recorded as undeveloped, green fields until circa 1937, at which point tipping began over the northern part of the site. No records of the type or quantity of material tipped are known to exist, however anecdotal evidence suggests that it included material from a local chemical factory involved in the manufacture of polychlorinated biphenyls (PCBs). PCBs were commonly used as coolants and insulating fluids for transformers and capacitors and as plasticizers in paints and cements. PCB production was banned in the 1970s due to the high toxicity of most PCB congeners and mixtures.

It is believed that tipping was, in part, undertaken to raise the site above flood levels. The majority of the north of the site was filled prior to 1946, with the remaining land (the southernmost portion of the phase 1 area north of the reen) being filled between 1955 and 1966. A clothing factory was built in the southern (phase 2) area of the site circa 1955 and was demolished by 1994. The sports facilities and associated recreational facilities, located within the northern section of the site were constructed circa 1966 and were demolished sometime between 2006 and 2008.

2.3 Summary of previous investigations

The site has undergone a number of phases of ground investigation and subsequent assessment to determine the likely risk posed to human health and the wider environment. A complete list of previous site investigations and ground contamination assessment reports are included in Appendix C of this report and are summarised below.

Prior to 2003, three site investigations had been undertaken across the site, a number of heavy metals and hydrocarbons as well as asbestos were identified as contaminants of concern.

A Ground Conditions Desk Top Study, Ground Investigation and Tier 3 QRA were undertaken by WYG in 2003 to identify the risk posed by the site in terms of human health and the wider environment.

The results of this work identified the need for risk management at the site including: the installation of a cap in areas of soft landscaping to remove the pathway between contaminants in the Made Ground and site users to control the risk to human health. Neither the Made Ground nor the perched water within it was assessed as posing significant risk to the River Usk. It was therefore concluded that the contamination present on the site did not pose a significant risk to controlled waters. This assessment did not include PCBs due to the insufficient dataset available at that time.

A further WYG Site investigation was carried out in October 2004 to further assess the extent and nature of the PCB contamination across the site. The results of the investigation identified a number of areas which contained drummed PCB material.

Norwest Holst Soil Engineering Division undertook a further site investigation targeted specifically to the drummed PCB waste in March 2007 and confirmed through testing the typical nature of the drummed material to be either a thick red or thick brown grease.

Further potential pollutant linkages were identified and a risk management and remediation strategy for the site was developed by WYG and is discussed in more detail here in section 4.1.

2.4 Summary of ground and groundwater conditions

Typical ground conditions encountered during the previous site investigation are outlined below;

- Made Ground, over:
- Alluvial deposits, over:
- River terrace gravels, over:
- Lower Old Red Sandstone deposits.

The Made Ground identified across the site was heterogeneous and generally poorly compacted with main constituents of: ash, clinker, bricks and rubble, glass, metal, ceramic and plastic. A number of fragmented and corroded drums were also identified. The Made Ground ranged in thickness between 2.0m and 3.0m.

The alluvium typically consisted of dark brown and grey clay between 2.0m and 8.0m thick with occasional peat layers between 0.5m and 3.3m. River terrace deposits consisting of red brown clayey sand and sand and gravel between 0.5m and 1.5m were identified in a number of locations beneath the alluvium. Bedrock consisted of deposits from the Lower Old Red Sandstone of unproved thickness across the site.

Groundwater has been identified within deposits associated with the Lower Old Red Sandstone, localised perched lenses of water within the alluvium and a perched water body within the Made Ground.

2.5 Planned development and phasing

The permissible development is for a primary school on the northern part of the site and a residential development on the southern part of the site. It was originally envisaged that both would be undertaken simultaneously. However, it is now understood that the residential development is due to be completed as a separate, second phase of construction.

The agreement to phasing of the development, and consequently, an the phasing of the remediation works, is confirmed with NCC Planning Department as detailed within a letter from Mark Hand, Development Manager dated 18th November 2008 (reference MH/SAD/03/1531/05). A copy of this letter is included in Appendix B.

Phase II of the development will include the proposed re-alignment of Lotery's reen within a lined, impermeable channel and filling/capping of land to the south of Lotery's reen.

A detailed plan showing the Phase 1 development, new school and associated playing fields is presented as Figure 2.

3.0 Project Team

The key project team are outlined in the flow chart below with additional contributors shown in Table 1.

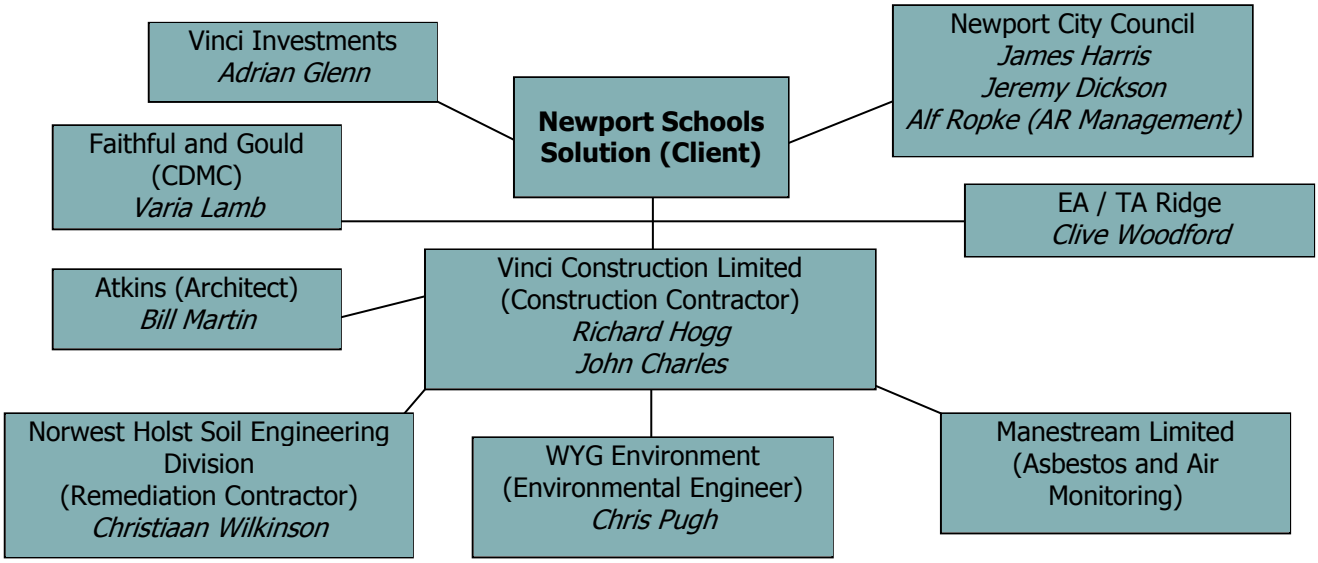


Table 1 – Project Team and Contact Names

Company	Role	Contact Names
Newport Schools Solutions	Main Client consisting of Vinci Investments and Newport City Council	
Vinci Construction (UK) Limited	Main Contractor for construction and remediation works.	Richard Hogg (Civils) John Charles (Building)
WYG Environment (WYGE)	Independent Validation Consultant providing validation services of remediation works.	Chris Pugh
Norwest Holst Soil Engineering Division (NHSED)	Remediation Contractor	Christiaan Wilkinson
LandClean Limited	Remediation Sub Contractor for PCB removal works	Nathan Eades Keith Rogers
Terradat (UK) Limited	Geophysical Consultants.	Simon Hughes
Manestream Limited	Environmental Consultants providing boundary air monitoring services.	
ECOS	Accredited Chemical Testing Laboratory	
ChemTest	Accredited Chemical Testing Laboratory	

4.0 Remediation Overview

4.1 Strategy

The remedial strategy was outlined in WYG Report 'Planning Support – Enhanced Ground Contamination Risk Assessment and Remediation Strategy' dated January 2006 (reference E3808/GO/PSS-RemStrat/Jan02/V2). This document has been formally supported by the key technical planning application consultees, namely the EAW and NCC Environmental Health and Pubic Protection Department.

Based on the findings of the ground investigations and subsequent detailed quantitative risk assessment (dQRA) a number of pollutant linkages were identified. The remediation strategy described risk management and remedial activities designed to break the pollutant linkages and control to a level acceptable to all parties, in the site specific development context, the associated risk to human health and the wider environment.

The risk management and remedial strategy consists of the following actions considered necessary to meet the requirements of the United Kingdom Contaminated Land Regime (UKCLR):

- Protection of human health through the removal or severance of significant pollutant linkage between identified contamination on the site and future site users.
- Protection of controlled waters through the removal or severance of significant pollutant linkage between identified contamination on the site and the River Usk.

Additional objectives of the remediation (not directly determined by dQRA, however equally important) included:

- Removal of identified drum waste to alleviate the local residents' perception of ground contamination risk.
- Removal of identified drum waste to positively influence the commercial current and future status of the site.

4.2 Summary of remediation works

In order to meet all aspects of the remedial strategy outlined above, the Phase 1 remedial work consisted of four key components as detailed below.

- *Removal of identified drummed PCB waste and associated residues* – excavation and off site disposal of the identified drummed PCB waste and associated contaminated soils to meet the remedial target values (RTV) accepted by the EAW for the site. RTVs were based on risk to controlled waters and calculated using the Environment Agency's Remedial Targets Methodology (RTM).

- *Groundwater Monitoring* – during ground intrusive works (in particular the PCB source removal and subsequent building piling operations) groundwater testing was undertaken to monitor potential effects on groundwater quality and assist in checking that pollutant pathways were not activated by the works on site.

- *Capping Layer* – construction of a clean capping layer built up from existing site levels to a minimum thickness of 600 mm across the areas of the site not capped by buildings or hardstanding namely soft landscaping and playing fields with a visible barrier at the base of the cap. This removes the linkage between the general Made Ground and the future site users.

- *Land gas protection system* – the WYG report titled 'Planning Support Land Gas Monitoring and Risk Assessment' dated January 2006 (reference E3808/JC/Landgas/PlanningSupport/Jan06/V3) outlined landgas risk control and management strategies to minimise the risk to buildings from potential ingress of landgases identified on site.

4.3 Timeline of works undertaken

A summary of the works undertaken and key dates is provided below:

Activity	Responsible Contractor	Key Dates
Installation of groundwater and land gas monitoring boreholes	NHSED	17th June – 20th June 2008
Excavation of drums and impacted soils	Land Clean	23rd June – 31st October 2008
Groundwater monitoring	NHSED	20th June 2008 – 12th March 2009
Surface water monitoring	NHSED	23rd June 2008 – 12th March 2009
Boundary air monitoring	Manestream	24th June – 28th October 2008
Disposal of material to either incinerator/landfill (including pre-treatment).	Land Clean	30th June 2008 – 9th April 2009 (not continuous)
Construction of Capping Layer	VINCI Construction	1st September 2008 – 5th November 2009

4.4 Summary of verification plan

WYG hold the duty of care responsibility for verifying the remedial works to monitor and check compliance with the EAW and NCC accepted remedial performance specification for each of the aspects outlined above. A summary of the verification process is presented below.

- *Removal of drummed PCB waste and residual soil*
    - Full time supervision by a WYG Engineer to ensure operations were carried out in accordance with the approved and agreed methodologies.
    - Supervision of the collection of soil samples for chemical compliance testing and assessment of data on completion of excavations and the classification of excavated material as suitable for reuse on site or requiring off site disposal.
- *Groundwater Monitoring*
    - Supervision by a WYG Engineer of groundwater monitoring and review of chemical analysis data.

- *Capping Layer*
    - Part time supervision during the construction of the capping layer and installation of visual barrier.
    - Supervision of the collection of capping layer samples for chemical compliance testing and assessment of chemical data.
    - Inspection and measurement of as built capping layers for the presence of the visual barrier and thickness of capping layer.

5.0 Groundwater monitoring

5.1 Programme

A previous dQRA undertaken on the site indicated that identified contaminants in the Made Ground and perched groundwater did not pose a significant risk to the groundwater or the River Usk. However, to check that the construction works did not have an adverse effect on key environmental receptors, groundwater monitoring was undertaken during the remediation and construction period to check for any changes in chemical quality.

The groundwater monitoring specification was prepared by WYG and agreed by the EAW prior to the start of the construction works. Ten groundwater monitoring boreholes were installed by NHSED along the western and southern boundaries of the site. The locations of the monitoring boreholes are shown in Figure 4 and borehole logs included within Appendix G. Eight of the boreholes were installed to monitor for potential changes occurring in the perched groundwater within the Made Ground (perched on top of the alluvium). Two additional boreholes were installed within the deeper aquifer within the St. Maughans sandstone deposits of the Lower Old Red Sandstone beneath the alluvium.

One monitoring round was undertaken prior to the commencement of the PCB remediation excavation works with subsequent monitoring rounds being undertaken at weekly intervals during the excavation of the drums and PCB contaminated soils. This process was continued whilst piles were installed as part of the foundations for the school building. A summary of the groundwater monitoring records is presented in Appendix J.

Table 2 – Summary of groundwater monitoring programme

Description	Summary
Pre-remediation works monitoring	1 round (23rd June)
Monitoring concurrent with remediation excavation works *Piling activity*	20 rounds (weekly 26th June and 31st October 2008) *15th September until 3rd of October 2008*
Post-remediation excavation works monitoring.	18 rounds (weekly 6th November 2008 and 12th of March 2009)
Post works (following completion of ground works and PCB removal)	1 round (16th of April 2009)

5.2 WYG Site attendance

WYG provided full time supervision during the installation of the monitoring boreholes and during all monitoring rounds whilst ground works and PCB removal were ongoing. All groundwater monitoring results were supplied to WYG by NHSED. The WYG site visit reports are included as Appendix E.

5.3 Methodology

All boreholes were purged prior to monitoring (minimum of five well volumes or dry) with the purged water collected in secure containers prior to of site disposal. To check the effectiveness of the purging, aquifer parameters were monitored after each well volume to ensure they had stabilised. Due to the discontinuous nature of the perched groundwater and associated low groundwater yields, some boreholes were shown to contain insufficient volumes of water to provide sufficient sample for every round of monitoring.

The groundwater samples were sent to EcoS and later Chemtest, both UKAS accredited laboratories, and analysed inline with the WYG Performance Criteria groundwater analytical suite presented in Appendix D. Note that two different laboratories were used because the ECOS laboratory was closed and the business sold during the remedial works; therefore, all analysis work was subsequently sent to ChemTest. The analytical results are presented in Appendix J. Water samples were packed securely in cool boxes with ice-packs and sent on the day of sampling to the laboratory.

5.4 Assessment of the laboratory results

A summary of the trends in groundwater monitoring results is presented for the perched water body and the groundwater of the minor aquifer (Lower Old Red Sandstone deposits). WYG understands that the samples taken on the 10th of July 2008 were lost in transit from the site to the laboratory.

5.4.1 Heavy Metals

The laboratory results include analysis of arsenic, cadmium, chromium, mercury, nickel and lead.

Perched Water

In general, the concentrations of heavy metals in the perched water body do not indicate any variation that can be attributed to the remediation or construction works however;

- Isolated increases in the levels of mercury and lead are identified but levels are shown to return to previously seen levels in subsequent monitoring rounds.
- Selenium shows a limited increase in variability over the monitoring period. However, the majority of the data fall below the drinking water standard for selenium (10µg/l) with the exception of two values of 13µg/l which were recorded as isolated occurrences in two separate wells. The variations in levels of selenium are therefore not considered to represent a significant change in water quality as a result of the construction works.
- Levels of chromium in the made ground show a minor increase during the period after the completion of the major excavation works and the piling activities. These changes are identified in all monitoring wells and are not specifically located in the region of major onsite activities. Monitoring data from groundwater samples indicate alkalinity values of >250mg/l $CaCO_3$ and as such, the corresponding EQS 1 screening value is 50µg/l; as such all levels identified in the monitoring data are below this value. The increase in chromium levels in the perched ground water are therefore not considered to represent a significant change to the groundwater conditions in response to the on site works.

Minor Aquifer

No variations in the monitoring results for boreholes installed within the minor aquifer in terms of heavy metals were identified.

5.4.2 BTEX

Perched Water

In the majority of groundwater samples, the BTEX compounds are shown to be at levels below the laboratory limit of detection. Where results show levels above the LOD, exceedances are shown to be only marginal. There are no identifiable trends in terms of the period of works.

Minor Aquifer

Levels of BTEX chemicals in the minor aquifer are generally similar to those identified in the perched waters and do not show any identifiable trends during the monitoring period.

5.4.3 TPH

Perched Water

There are only isolated occasions where levels of TPH are shown to be above the laboratory LOD. Where levels do exceed the LOD, the occurrences are isolated and short lived (maximum recorded value 0.52µg/l in BH604), with subsequent monitoring results returning to below the LOD.

Minor Aquifer

None of the groundwater samples obtained from the minor aquifer showed levels of TPH above the laboratory limit of detection during the monitoring period.

5.4.4 PAH

Perched Water

There are no obvious trends in levels of PAH in the perched water body during the monitoring period. Initial monitoring results indicate a degree of variability in levels of PAH specifically in boreholes BH602 and BH604 (range in values from <0.02µg/l to 4.25µg/l and from <0.02µg/l to 7.86µg/l respectively). These variations are generally short lived and isolated to individual monitoring rounds. Due to the change in laboratory and a resulting change in LOD from 0.02µg/l to 0.2µg/l, the majority of results are below the LOD for the latter half of the monitoring period.

Minor Aquifer

Similar variations are identified in the groundwater of the minor aquifer. With isolated elevated levels of PAH identified during monitoring rounds and followed by subsequent levels below or around the LOD. These elevated levels are not shown to occur after the completion of the major excavations on site and are not believed to represent a significant variation in groundwater conditions in response to the works on site.

5.4.5 PCBs

Perched Water

Levels of PCB congeners are typically shown to be below the laboratory LOD during the monitoring period. Levels above the LOD (maximum value 0.15ug/l recorded in BH607) are identified in boreholes BH606, BH607 and BH608 during the main excavation period of the remediation works. These boreholes represent the closest monitoring points to the main excavation and levels return to below LOD after the completion of these works. It is considered that these levels represent a temporary reduction in water quality linked to the excavation element of the remediation works and that levels will remain below the LOD now that excavations have been completed and the source material has been removed.

Minor Aquifer

None of the groundwater samples obtained from the minor aquifer showed levels of PCB congeners above the laboratory limit of detection during the monitoring period.

5.5 Summary

In total, 40 groundwater monitoring rounds were undertaken which represent conditions before remediation and construction works started on site, weekly monitoring during the main activities (remediation excavation and piling), post remediation excavation and post completion of works. There are no trends in groundwater quality either in the perched water body or the main aquifer which can be attributed to the activities on site with the exception of the identification of PCB congeners in the perched water body in the wells closest to the main excavation. After the completion of the excavation works the levels of PCB congeners are shown to return to levels below the laboratory LOD, as was shown prior to the start of works on site. It is therefore considered that the works on site have not had a long term impact on water quality in the perched water body or the minor aquifer.

6.0 PCB Drum and Residual Soil Removal

6.1 WYG Site attendance

WYG provided on site supervision as detailed below:

- Full time supervision during the excavation of drums and associated impacted soil undertaken by Land Clean. Full time supervision was provided from the 17th June to 31st October 2008.
- Full time supervision during the collection of soil validation samples by NHSED.
- Part time supervision during the transfer of drums and impacted material from site by VINCI (although the majority of this activity coincided with other aspects of site works and associated supervision).
- Part time supervision of the pre treatment of material prior to export to landfill site.

The NHSED excavation logs documenting the excavation works are included in Appendix G and the outline of the excavations on VINCI Drawing 189573/SK/062 in Appendix Q.

6.2 Methodology

The following methodology outlines the site procedures adopted in line with performance criteria and methods documented in:

- WYG 'Performance Criteria for Remediation' (Report reference E3808/GO/PerfCriteria/JAN06/V1) dated January 2006.
- Norwest Holst Construction Limited Method Statements for PCB Removal and Disposal and addendums (Method statement reference 189573-MS025).

A summary of the WYG Performance Criteria including the soil, groundwater testing requirements, relevant remedial targets and import criteria are presented in Appendix D and the Contractor's Method Statements in Appendix F respectively.

In order to contain the contaminated material, all operations took place within a 'dirty' zone demarked by a secure fence line. All operatives were required to enter and leave the area via a decontamination unit and to wear protective clothing (overalls, boots, hard hat gloves and goggles) at all times within the 'dirty' area. All plant used on site were required to remain in the 'dirty' area and required thorough cleaning before leaving.

In the identified locations, surface material was removed from the area and stockpiled on clean plastic prior to testing for chemical compliance criteria for PCBs and the suitability of it for reuse on site as backfill material. Drums and visually contaminated material were removed from the excavations and stored in a safe and controlled manner prior to transfer off site. Material directly adjacent to the visually contaminated material was excavated and stockpiled onto impermeable plastic membrane to prevent cross contamination and tested for chemical compliance in terms of PCBs and the suitability for reuse on site. A detailed account of the excavation process is provided in section 6.3.

Where material was being transported off site, the vehicles drew up to the boundary fence line and were loaded using plant designated to the 'dirty' area through a temporary gap in the fence line. The layout of the clean and dirty areas is shown in Figure 3.

6.3 Excavation

20 site investigation trial pit locations were identified within the remediation strategy requiring targeted excavation and validation at locations shown here in Figure 3.

The location of each excavation was surveyed and marked out by VINCI prior to the start of excavation works and an area surrounding the planned extent of the excavation was scanned using a CAT to assist in locating any services in the vicinity.

The total extent of the excavation works are shown on VINCI Drawing No. 189573/SK/062 included within Appendix Q.

Excavations were carried out using a 360° excavator using two buckets, one of which was solely designated for the excavation of visually contaminated material and drums. Surface material was removed from each excavation location from an area of a minimum extent 4m by 4m. The surface material was stockpiled on an impermeable membrane and clearly labelled.

When all visually contaminated material had been excavated, non-visually contaminated material surrounding the area of the drums was excavated and stockpiled on an impermeable plastic membrane prior to sampling and comparison with the PCB RTVs.

A total number of 778 drums were identified and removed from the site during the remedial works. Due to the high concentration of drums in some areas, nine of the original locations amalgamated into one large excavation. This happened in response to the agreed methodology of 'chasing out' drums until clean faces of the excavations could be located. A summary of all the excavations are shown in Table 3. NHSED logs and photographs of the excavations are included in Appendix G. The excavation and removal of drums and PCB impacted material was completed on the 31st of October 2008.

Table 3 – Summary of Excavations

Excavation ID	Started	Completed	Comment
TP912	24th June	24th June	1 no. small drum with red grease like substance identified and excavated.
TP911	26th June	26th June	No drums identified, predominantly rubble and construction waste.
TP655A	1st July	10th July	3 no. drums and PCB related material identified and removed.
TP915	10th October	10th October	No drums identified in previous Trail Pit log or during excavation. No visual evidence of contamination.
TP656A	24th October	24th October	No drums identified in previous Trail Pit log or during excavation. No visual evidence of contamination.
TP636	23rd October	27th October	20 no. drums and PCB related material identified and removed.
TP636C	9th October	9th October	Due to close proximity, excavated as one excavation. 8 no. drums identified and removed.
TP636D	9th October	9th October	
TP656	23rd October	31st October	29 no. drums and PCB related material identified and removed.
TP656B	9th October	10th October	Due to close proximity, excavated as one excavation. 15 no. drums identified and removed.
TP656C	9th October	10th October	
TP634	24th June	31st October	Excavated as one large excavation. 702 no. drums and PCB related material identified and removed.
TP902	24th June	31st October	
TP635A	1st July	31st October	
TP905	28th July	31st October	
TP908	21st July	31st October	
TP616	21st July	31st October	
TP913	4th August	31st October	
TP914	27th June	31st October	
TP910	9th September	31st October	

A total number of 778 drums were identified and 2,778.91 tonnes of contaminated soils were identified and removed from the site during the remedial works.

All excavations were undertaken within the outlined PCB remediation area with the exception of the area to the east of the TP616 (excavated as part of the large excavation). A further drum fragment was identified outside the original boundary and the excavation extended. No evidence of PCBs was identified and a validation sample (sample reference TP616 E2) confirmed the absence of PCBs in the vicinity of the drum fragment.

6.3.1 Dewatering of excavations

During the excavation works, oily perched water was encountered within the Made Ground perched on the underlying alluvium. Examples of this oily substance are shown by Plates 11 & 41. A water extraction and treatment system was commissioned to dewater the excavations. This represents a variation in works planned prior to the start of the excavations. It is believed that the higher than average levels of rainfall experienced during the excavation period was the source of the water.

A diesel diaphragm pump was used to remove water from the excavations which was passed through a water treatment system (Plates 45-46) before being discharged under license from Dŵr Cymru Welsh Water to the foul sewer system. The rate of discharge was limited to between 20 and 30m^3 per day to comply with the licence requirements and also to control the passage of water through the treatment system. The treatment system consisted of primary and secondary settlement tanks with water then being passed through an oil-water separator, a sand filter and then two granular activated carbon chambers before being discharged into the foul water system. Weekly samples of the treated water were sent to the laboratory to check the system was performing and treating the water to comply with the discharge licence. Copies of the analysis is included in Appendix J (samples WT01 – WT08) A copy of the Land Clean Method Statement, system layout drawing and associated Dŵr Cymru Welsh Water Discharge License and a WYG spreadsheet detailing the volume of water discharged is included in Appendix F.

6.3.2 Nature of PCB products identified

During the excavation process, two main types of PCB products were identified within the drums being removed and are described below.

- A brittle dark red brown/black glass/ceramic material – fractured unevenly on impact and on exposure over time to strong sunlight would become viscous and was observed to flow under gravity. This product is shown in Plates 24-26.

- A thick red-brown grease-like substance with a varying viscosity from highly viscous to a thick but free flowing fluid. The grease like material was generally encountered within or surrounding damaged/corroded drums. The fluid type product was less dense than water, light non-aqueous phase liquid (LNAPL), and as such would float on the surface of the perched water in the excavations. Plates 18, 21 and 22 show examples of this product.

The vast majority of the drums were shown to contain the red brown grease-like substance. All the types of PCB product were confirmed by testing to contain high concentrations of PCB congeners through direct sampling of the product, soil matrix samples (samples references TP655A S03, TP902 S03 and S04), and perched water samples from excavations (sample references TP655A, TP601, TP602, TP603, TP604, TP604A, TP606A, TP606A, TP607 and TP608). The water samples were also used to inform the design of the water treatment system and were submitted in support of the application for the discharge license.

6.4 Validation of excavations

6.4.1 Sampling Procedure

Once all visually contaminated material was removed, validation samples were taken from each face and base of excavations. Where individual faces of excavations exceeded 15m^2, additional samples were taken to maintain an equitable sampling frequency.

Samples were taken by NHSED under WYG observation and supervision with material removed from the faces by the excavator using a designated clean bucket to avoid cross contamination or, in the case of the larger excavations where safe entry to the excavation was possible, by hand trowel. The samples were labelled using a standard system as summarised below. A full sample prefix identification list is provided in Appendix H and sample locations identified in Figure 5.

- Face A – northern face.
- Face B – eastern face.
- Face C – southern face.

- Face D – western face.
- Face E – base of excavation.

In the case of larger excavations, where multiple samples were obtained these were identified as A1, A2 and so on. Each sample was obtained such that it formed a composite sample of the face being validated.

Material stockpiled on site after excavation was also sampled at a minimum frequency of one sample per 500m^3 or less. These stockpiles were identified by the originating trail pit location and a stockpile reference (for example TP914 S01).

6.4.2 Chemical analysis

Soil validation samples were sent to UKAS and MCERTS accredited laboratories (ECOS Laboratory and later ChemTest) and analysed for the presence of 7 common congeners of PCBs. The ECOS laboratory was closed and the business sold during the remedial works and all analysis work was subsequently sent to ChemTest. The Remediation Target Values (RTV) for these 7 PCB congeners are presented in WYG Performance Criteria for Remediation report in Appendix C, and are reproduced below. The samples were packed securely in cool-boxes and sent by courier to the laboratory on the day of sampling. The samples were sent with an associated chain of custody sheet from the NHSED Site Engineer and then on receipt of the laboratory confirmation sheet scheduled by the NHSED Project Manager. The laboratory results are presented in Appendix I.

Table 4 – Soil PCB Remediation Target Values

PCB Congener	RTV (mg/kg)
PCB 28	10.4
PCB 52	4.25
PCB 101	9.2
PCB 118	29.4
PCB 138	4.94
PCB 153	7.13
PCB 180	2.57

Occasionally the laboratory reported the abbreviated PCB congeners as their full chemical names, these and the relevant Chemical Abstracts Service (CAS) number are reproduced in Table 5.

Table 5 – PCB abbreviation and chemical names

Abbreviated PCB Congener	Chemical name	CAS No.
PCB 28	2,4,4'-Trichlorobiphenyl	7012375
PCB 52	2,2',5,5'-Tetrachlorobiphenyl	35693993
PCB 101	2,2',4,5,5'-Pentachlorobiphenyl	37680732
PCB 118	2,3,4,4',5-Pentachlorobiphenyl	31508006
PCB 138	2,2',3,4,4',5-Hexachlorobiphenyl	35065282
PCB 153	2,2',4,4',5,5'-Hexachlorobiphenyl	35065271
PCB 180	2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065293

6.4.3 Results

233 soil validation samples were sent to the laboratory. After the receipt of the laboratory results the concentrations of PCBs in the samples were compared to the RTVs to identify any exceedances. The following methodology was then applied.

- For excavations where samples from the faces / base indicated levels of PCB congeners below RTVs it was agreed with the contractor these could be backfilled with suitable soils.
- For excavations where samples from the faces / base indicated levels of PCB congeners exceeded the RTVs further excavation was deemed necessary.
- Stockpiled material where samples indicated the concentration of PCB congeners were below RTVs was deemed suitable for reuse on site.
- Stockpiled material where samples indicated the concentration of PCB congeners exceeded the RTVs was deemed unsuitable for reuse on site and transfer off site was required.

In the case of faces requiring further excavation a 1m wide strip was removed from the face following the methodology and the face re-sampled for testing and comparison with RTVs. This process was continued until all faces of the excavations were deemed to represent concentrations of PCB congeners below the RTVs for the site.

Stockpiles of material identified as containing concentrations of PCB congeners above the RTVs, were pre-treated by visually and physically sub-subdividing the excavated material and re-tested.

A summary of all validation samples is presented in Appendix I outlining the number of samples taken and the outcome of the validation process. Table 6 outlines the number of samples with levels of PCB congeners above RTVs.

Table 6 – Summary of Validation Samples

	Face / Base of Excavation	Stockpiled Material
Number of samples taken	106	127
Number of samples with PCB congeners above RTVs.	7	44

6.5 Off site disposal of contaminated soils

Material was taken from the site to two different incinerator sites depending on capability to receive the material and also one non hazardous landfill site. On the identification of drums or visually contaminated material the works were temporarily stopped and excavation recommenced with the designated 'dirty' bucket. The storage method for the excavated drums and impacted materials varied between using tonne bags and steel barrels (Plates 35-40). This change was largely due to the differing material acceptance requirements of the two incinerator sites. The Grundon plant required the material to be sent in tonne bags and the Veoila plant insisting on the material being packaged within steel drums. The two methodologies are described below.

The drum and impacted soil material sent to the Grundon incinerator in Slough was loaded directly at the excavation face into tonne bags, labelled and stored on an impermeable plastic membrane within the dirty area prior to the transfer from site.

The Veolia incinerator plant would only accept the contaminated material within steel drums and as such, contaminated material was subsequently loaded into 200 litre steel barrels with secure lids. The steel barrels were UN approved for dangerous goods transport. To pre-treat and enable the disposal of the excavated drums, they were placed in a 16 yard skip which was placed on an impermeable membrane in a bunded area within the dirty remediation area. The excavated drums were crushed by an on site excavator and then placed into the steel barrels along with the impacted soils. The loading of the material into the barrels was aided by a scaffold chute constructed within the dirty area and is shown in Plate 35.

The material sent to landfill was physically sorted and stockpiled on site prior to being loaded into covered 8 wheel 20 tonne haulage wagons.

Drums and visually contaminated material or material which was confirmed through testing to have concentrations of PCB congeners in exceedance of the RTVs were removed from site. The material was transported to one of two different incinerator plants and one licensed non-hazardous waste landfill facility as outlined below:

- Grundons (Waste) Ltd., Hazardous Waste Incinerator, Lakeside Road, Colnbrook, Slough, SL3 0EG. Material sent here between the 30th June and 27th August 2008.
- Veoila (UK) Ltd., Incineration Plant, Bridges Road, Ellesmere Port, South Wirral, Cheshire, CH65 4EQ. Material sent here between the 8th of August and 14th of October 2008.
- Cory Environmental Ltd., Shortwood Landfill Site, Cattybrook Lane, Shortwood, Bristol, BS16 9NN. Material sent here between the 7th of January and 11th of March 2009.

Table 7 shows the tonnages of material disposed of at each facility as well as details regarding containers and haulage requirements.

Table 7 – Off site disposal facilitates

Disposal Facility	Container and Haulage Requirements	Tonnage of waste disposed of at facility
Grundons (Waste) Limited,	Tonne bags and sheeted haulage wagon	67.79 Tonnes
Veolia (UK) Limited	200 litre UN approved steel drums with secure lids	482.46 Tonnes
Cory Environmental Limited	Sheeted bulk haulage wagons	2,228.66 Tonnes
		Total tonnage = 2,778.91 Tonnes

A stockpile of excavated material identified as requiring off site transfer was classified as hazardous waste due to elevated Total Organic Carbon percentage (>6%) and Loss on Ignition (>10%). The Contractor pre-treated this material within the dirty area with lime to reduce the organic carbon content and therefore reclassify the material as non-hazardous. The relevant method statement is included in Appendix F and the

process was observed by WYG and is included in the Plates 42-44. Treatment was carried out in a plastic lined bunded treatment area constructed within the dirty area of the PCB remediation area.

The lime stabilisation process was undertaken on the 5th of March 2009 and all the material had been exported to landfill for disposal by the 9th of April 2009. The surface soils above the plastic lining within bunded area were tested (ES02, ES03, ES04 and ES05) and compared against the WYG RTVs. Of these, two areas of the bund indicated the soils were suitable for reuse onsite; however, the other two samples (ES03 and ES04) exceeded the RTVs and this material was exported to a non-hazardous landfill.

Copies of the waste transfer notes from each vehicle load of contaminated material removed from site are presented in Appendix L. The Veolia incineration site also produced destruction certificates following the incineration of each load of material received and is included within Appendix L.

6.6 Geophysical survey

To supplement the chemical validation and to provide additional confidence that the removal of metal drums form the ground had been effective staged geo-physical surveys were undertaken across the remediation area. On completion of the drum excavation works, Terradat, a specialist geophysical sub contractor surveyed the site using an electromagnetic detector and magnetic gradiometer. The contractor is the same one used for the original survey at the site originally in 2004 and a comparison of both surveys is included in the Terradat Geophysical Survey Report included within Appendix O. The survey was undertaken in three separate phases (July, December 2008 and March 2009) as the remedial excavations were completed across the remediation area.

The 'thin' white line running N-S and E-W mark the boundary between the separate site visits. On the last visit, the presence of the metal fence, fences and new footpath prevented full site coverage.

When compared to the 2004 data plots, there is a marked and significant decrease in the intensity of the magnetic signature and metal response, which indicates a relative decrease in metal content across the area. The remaining anomalies appear to be due to isolated shallow features i.e. bits of rebar and other metallic debris and manholes later identified by WYG and VINCI Engineer during a site visit at the site.

7.0 Capping Layer

7.1 WYGE Site Attendance

WYGE observed on a part time basis the installation of the capping layer. WYG records are included in the site visit reports included in Appendix E. Verification of the capping layers was undertaken during five specific visits to site where exploratory holes were dug to prove formation thickness and the presence of a visual barrier at the base of the capping layer.

7.2 Methodology

The works comprised:

- A visual barrier to be placed as a visual marker and deterrent to excavations into the Made Ground;
- Importation of capping materials, subject to the chemical criteria outlined in Appendix D; and,
- Placement of a 600 mm thick cap in all soft cover land use areas.

The soft cover land uses which require the protective capping layer are shown on Atkins Drawing's 5041855_LA_4906_RevP3, 5041855_LA_4907_RevP1 and 5041855_LA_4908_RevP3 in Appendix Q. The proposed aggregate and topsoil thicknesses are shown on VINCI drawing no. 189573/SK/031 in Appendix Q. The remainder of the site is to be developed to hard landscaping and buildings whereby the hard surface provides the break in the source-pathway-receptor linkage. Details of surface finishes are included in Drawing No.'s 5041855_LA4903_revP7 and 5041855_LA4904_revP1 in Appendix Q.

7.3 Capping work elements

7.3.1 Visible Barrier

A visual barrier of an orange woven geotextile was placed on the surface of the Made Ground (Plate 52 & 68) in areas of soft landscaping, gardens, and grassed playing fields. The geotextile was laid in overlapping strips to ensure complete coverage of the required areas. The installation of the visual barrier was observed during site visits and through the excavation of exploratory holes in the capping layer.

7.3.2 Import material

Natural aggregate was imported to site for use as a capping material above the visual barrier from two local quarries. Import material was sampled at a frequency of one sample per 500m^3 as the material was imported to the site to assess the compliance with the WYG chemical import criteria as presented in Appendix D. Details of the imported aggregate are presented below in Table 8.

Table 8 – Summary of import material

Quarry	Material	Test Results	Outcome
Machen (Hansen)	Limestone	Material indicated naturally elevated concentrations of heavy metals (arsenic, cadmium and lead) associated with the geologically formed mineral veins within the limestone.	Used as piling matt and below buildings and hard cover areas
Abercarn (Lafarge)	Gritstone	13 chemical compliance test results for material imported to site between 14th January and 20th February 2009. Assessed to be suitable for use as capping material.	Used as capping material

Levels of heavy metal in the limestone sourced from Machen Quarry were deemed to be above the chemical import criteria as outlined by WYG so preserving a precautionary approach to risk management material use was restricted to sub-grade beneath hard surfacing. Alternative material was sourced from Abercarn Quarry to form the cap in areas of public open space. Copies of the imported material analytical data and correspondence with the Local Authority are included in Appendix P.

The imported aggregate was laid on top of the visible barrier and suitably compacted for the required end use. The aggregate was typically laid to a thickness of between 450mm and 500mm in the areas identified as soft landscaping and playing fields. The final capping thickness of 600 mm was attained with the addition on topsoil which was imported to site and subject to the same import criteria as the imported aggregate. One load of topsoil which was imported to site was subsequently shown exceed the chemical import criteria outlined for the site and as such was shown to be unsuitable for use. This material was removed from site and the waste transfer notes for the movements are included in Appendix L. The laboratory analysis of the topsoil material is provided in Appendix P.

Import tonnages of aggregate and topsoil for the completion of the cap are presented in Table 9 below;

Table 9 – Import Volumes of Capping Materials

	Total imported (m^3)
Aggregate	7209.00
Topsoil	4030.35

7.3.3 Validation

WYG were provided with formation level drawings of the areas requiring capping by VINCI. These drawings show the ground levels prior to the placement of the capping layer and the final levels showing the extent and thickness of capping in place on site. These drawings are presented in Appendix Q.

Independent validation of cap thickness and identification of the visual barrier at depth was provided by WYG on five occasions between 30th January 2009 and 5th November 2009. Machine dug inspection pits were excavated in the presence of a WYG engineer to allow the measurement of the depth of capping material and the presence of the visible barrier, on subsequent visits the inspection pits were excavated in preparation of the site visit and left open for inspection. The visible barrier, formed by the orange geotextile was observed in all inspection pits at the base of the aggregate layer. The location of the inspection pits are shown in Figure 6. The findings of the inspection pits are presented in Table 10 and Plates 59-100.

Table 10 – Summary of cap validation

Inspection pit	Cap thickness (mm)				Actual total cap thickness (min. 600mm)
	Aggregate		Topsoil		
	Specified	Recorded	Specified	Recorded	
TP1	550	520	50	200	720
TP2	550	515	50	200	715
TP3	450	530	150	250	780
TP4	450	450	150	350	800
TP5	450	435	150	300	735
TP6	450	460	150	220	680
TP7	450	475	150	210	685
TP8	450	435	150	165	600
TP9	450	480	150	220	700
TP10	450	410	150	190	600
TP11	450	490	150	150	640
TP12	450	470	150	270	740
TP13	450	455	150	210	665
TP14	150	50	450	700	750
TP15	450	450	150	230	680
TP16	450	450	150	240	690
TP17	150	60	450	600	660
TP18	150	200	450	400	600
TP19	150	400	450	300	700
TP20	450	300	150	300	600

The inspection pits were located across the site in all areas where soft landscaping is present. The validation process has shown that in all inspection pits the thickness of the capping system meets the minimum requirement of 600mm as outlined in the WYG Report 'Performance Criteria for Remediation' dated January 2006 (reference E3808/GO/PerfCriteria/Jan06/V1).

8.0 Environmental emissions control monitoring

8.1 Programme

Environmental monitoring was specified in order to ensure the on site excavations and ground works did not adversely impact nearby sensitive receptors including Lotery's Reen and the wider environment, site operatives and the wider public. In addition to groundwater monitoring as outlined in Section 5.0, surface water monitoring was undertaken on a monthly basis. Weekly air quality monitoring was undertaken during the active removal of PCB waste and associated soils.

8.2 WYG Site attendance

WYG provided supervision during surface water monitoring and air quality monitoring during the excavation period. Further supervision was provided on a part time basis. Monitoring results were presented to WYG after each monitoring round.

8.3 Surface water monitoring

The reen which forms the southern boundary of the current development area was monitored at two locations (SM1 and SM2) during the remediation of the PCB contamination. Surface water samples were collected on a monthly basis by NHSED. A summary of the surface water monitoring is presented in Table 11 and the locations of the monitoring points shown in Figure 4.

Table 11 – Summary of surface water monitoring

Description	Summary
Pre-remediation works monitoring	One (23rd June)
Monitoring concurrent with remediation works	7 (monthly between 2nd July and 23rd March 2009)
Post-remediation works monitoring	5 (monthly between 13th November 2008 and 16th April 2009)

The surface water samples were sent to EcoS and later Chemtest UKAS accredited laboratories and analysed in line with the WYG analytical suite presented in the Remediation Performance Criteria.

8.3.1 Potential Leachate emission incident

During the remediation works, the reen was cleared of vegetation by workers from NCC as part of regular maintenance of the reen channel. Historically the Council have reacted to flooding issues at the Bowl Club building to the north of the site by undertaking maintenance of the reen. The Council carry out regular clearance work along the channel to ensure water flow to the Usk. Following their clearance work, a small area of suspected oily leachate breakout was observed along the reen, south of the PCB remediation area (Plates 1-3) and indicated on Figure 4.

Additional monitoring was undertaken along the length of the reen within the site boundary (monitoring locations SM3 to SM6) to investigate the nature of the breakout, with sample SM3 representing surface water samples obtained directly down gradient of the observed breakout.

The incident was reported to the EAW who investigated and took further samples but identified no elevated levels of contaminants within the reen and took no further action. Correspondence relating to the issue is contained within Appendix K.

8.3.2 Analysis of results

A more detailed summary of the surface water chemical quality trends will be provided on receipt of all the monitoring data and issue of the final version of this report. The additional sampling undertaken following the suspected leachate breakout indicated elevated PAH concentrations along the entire reen section.

The results from the latest available monitoring round (6th of March 2009) indicate no concentrations exceeding relevant environmental standards.

8.4 Land gas monitoring

Baseline land gas monitoring was undertaken on the 20th June 2008 prior to the start of remediation works at the ten monitoring boreholes installed prior to the start of the remediation works. These locations are shown in Figure 4. After the completion of the piling works on site, land gas monitoring was undertaken on a weekly basis for a period of three months. This consisted of 12 monitoring rounds carried out between the 10th October 2008 and 23rd December 2008 by NHSED and the results are presented in Appendix M.

8.4.1 Analysis of Results

Land gas monitoring results collected from the ten monitoring boreholes indicate variable levels of both methane and carbon dioxide. Maximum recorded levels of 33.3% methane (steady state) and 10.6% carbon dioxide (steady state) concentration show elevated levels of both methane and carbon diode and associated diminished oxygen levels are present in areas across the site. Maximum recorded flow rates were in the order of 3.0 litres per hour. The monitoring results again confirm the findings of the WYG 'Planning Support – Land Gas Monitoring and Risk Assessment Report' report dated January 2006 (WYG reference E3808/JC/LANDGAS/PLANNINGSUPPORT/JAN06/V3) and the need for a gas protection system within the school building to prevent the accumulation of landgas.

8.5 Site Boundary Asbestos Air monitoring

Site boundary asbestos air monitoring was undertaken by Manestream Limited at three locations on site (see monitoring records presented in Appendix N) on a weekly basis during the remediation works. Baseline monitoring was undertaken on the 17th June prior to the start of the remediation works with 17 weekly monitoring visits undertaken between the 24th June and 28th October 2008. The monitoring results indicate that all samples taken were reported at <0.01 fibres/ml and deemed satisfactory.

The Manestream method statement and the weekly monitoring records presented in Appendix N.

9.0 Site Completion Conditions

The main objectives of the Remediation Strategy for the site are presented below in light of the phased approach to the development as outlined in Section 2.5. The completion conditions for each objective are presented in the following sections:

- Removal of PCB drum and residual waste:
- Capping the site with buildings, hardstanding or imported materials in soft landscaped areas or gardens: and
- Gas protection measures for all site buildings.

9.1 Removal of PCB Contaminated Material and Associated Soils

The aim of the remediation strategy was to remove from site material visually containing PCB contaminated material identified during previous site investigations as well as additionally identified zones of unacceptable contamination identified during the progress of the remediation works. This was successfully achieved and validated by audit testing prior to the backfilling of excavations with material deemed suitable for reuse on site.

Unsuitable materials were disposed of in suitably licensed off site facilities.

9.1.1 Remnant contamination

The contamination removed has been identified by investigation and excavation on a risk, and not a total basis in accordance to the WYG Remediation Strategy. The main drivers for the removal of PCB were perception of risks to health and land values rather than as a requirement of the CLR assessment process. Areas not excavated may contain further unidentified contamination which may be revealed during further construction phases and following risk analysis may also require removal in line with the strategy outlined in the documents referenced herein. Supplementary geophysical investigation work has confirmed a significant reduction in the metallic content of the Made Ground, the metal content of the Made Ground has been shown by historic works to correlate with the PCB drum material.

9.2 Capping System

A capping system has been constructed to break the pathway between the identified contaminants in the Made Ground and site users. In areas where buildings and hard standing are not present a capping system of minimum thickness of 600 mm has been constructed. Material used in the construction of the capping layer has been certified as suitable for use on site in line with agreed chemical import criteria. The system has been assessed though the inspection of 20 trial pits across the site in areas of soft landscaping. The inspection pits indicate that the minimum thickness of 600mm had been met in all locations.

9.3 Gas Protection System

The WYG 'Planning Support – Land Gas Monitoring and Risk Assessment Report' report dated January 2006 (WYG reference E3808/JC/LANDGAS/PLANNINGSUPPORT/JAN06/V3) stated that a minimum 'two element' (membrane and vented void) level of protection was required to the school building. Discussions with a specialist gas protection contractor highlighted the Clean-Air Blanket (CAB) system as a suitable mitigation measure for land gas in the school building.

VINCI commissioned Prestige Air-Technology Ltd. to install an Air Inlet Manifold and Sub Floor Probe System that form part of a Clean Air Blanket gas protection system. Post construction monitoring conducted by Prestige Air-Technology Ltd. confirmed that the system was operating within the system specification requirements (methane concentrations below 1% volume by volume and carbon dioxide below 1.5% volume by volume).

A copy of Prestige Air-Technology's Completion Certificate and post construction monitoring is included in Appendix R. .

9.4 Completion statement

The remediation strategy was to appropriately reduce the risks (as revealed by analytical modelling but also related to risk perception) associated with the identified contamination. Impacted soil has been removed and excavations validated prior to backfill with suitable material. Suitable materials were also imported to site to construct the capping system. This document records how this strategy has been achieved by the methodology stated herein.

Prior to any future works, the Future Operational Management Considerations, outlined in subsequent section, should be considered. Any future works should be undertaken in an appropriate and controlled manner such that they do not have an adverse impact upon overall ground conditions and the remedial works undertaken at the site.

Backfill materials have been placed in accordance with the Specification for highways works and this has been demonstrated through validation testing. However, as a result of the zonal nature of the excavations, an allowance should be made for some degree, albeit limited, of potential differential settlement.

9.5 Future Operational Management Considerations

A number of operational management activities are outlined below. These activities include maintenance requirements for the site and safeguards for future site users to make sure the capping system remains effective and contact with any residual contamination is prevented.

- Capping layer thickness (minimum 600 mm) should be preserved and changes in site levels or soft landscaping areas should be undertaken with in consideration of maintaining the 600mm depth of cap.
- Excavations and maintenance to buried services should not progress below the visual barrier without adequate control measures in place to: manage potentially contaminated soils, protect site workers and property, control emissions to the environment, and protect site users. It is recommended that any intrusive works below the visual barrier are planned with the assistance of a competent environmental manager, consultant or engineer.
- In the event of excavation within the capping layer or below the visual barrier should be re-instated with similar materials and with a minimum capping layer of 600 mm. The re-instatement should b validated and recorded submitted to NCC.
- All future site owners should be informed of the potential nature of the residual contamination on site and the form of the capping system in place to make sure that levels of protection are maintained throughout the future of the site.
- Future developments on site should be protective of the capping system.

10.0 Statutory Consultees

Prior to the commencement of remediation works on site the remediation strategy and performance criteria for remediation were agreed to by the statutory consultees, including Newport City Council Public Protection and Environmental Services and Environment Agency Wales (EAW). The response from EAW was subject to:

- Being consulted should the proposals regarding the reen be altered.
- The remediation strategy (WYG 'Planning Support – Enhanced Ground Contamination Risk Assessment and Remediation Strategy' report, ref. E3808/GO/PSS-RemStrat/JAN06/V2) being submitted to the local planning authority for consultation and agreement with the EA prior to any work being undertaken.
- A foundation Works Risk Assessment Report being submitted to the local planning authority for consultation with the EAW prior to works commencing (this was forwarded by the piling contractor).

10.1 Contact Details for Statutory Consultees

- Ms Jackie Walters, Environment Agency Wales.
- Mr Andrew Williams, Scientific Officer, Newport City Council Environmental Health Public Protection Department.
- Mr Mark Hand, Development Manager, Newport City Council Planning Department.

10.2 Site Visits

Visits to site were undertaken by Mr Andrew Williams of NCC Environmental Health Public Protection Department on the 23rd June and 10th September to inspect the ongoing remedial works on site.

EAW were consulted by Vinci Construction Limited regarding the potential leachate breakout event into Lotery's Reen. Two representatives visited site on the 23rd June to collect samples and assess the situation. No further visits were undertaken and no further action was taken.

10.3 Correspondence

Additional correspondence with the Statutory Consultees was undertaken concerning three aspects of the remedial works as outlined below.

- *Phased Development of Works*. Agreement was obtained from Newport City Council Planning Department regarding the phased development of the site and the exclusion of the realignment of Lotery's Reen from the initial phase of development.
- *Potential Leachate Emission.* EAW were consulted regarding the potential breakout of leachate into Lotery's Reen. Correspondence is included in Appendix K.
- *Imported Aggregate Material.* NCC Environmental Health Public Protection Department were consulted regarding the elevated levels of heavy metals in the aggregate imported for the capping system. Agreement was reached for the use of the material beneath areas of hard standing or buildings with additional material imported for the construction of the capping system. The correspondence is included in Appendix P.

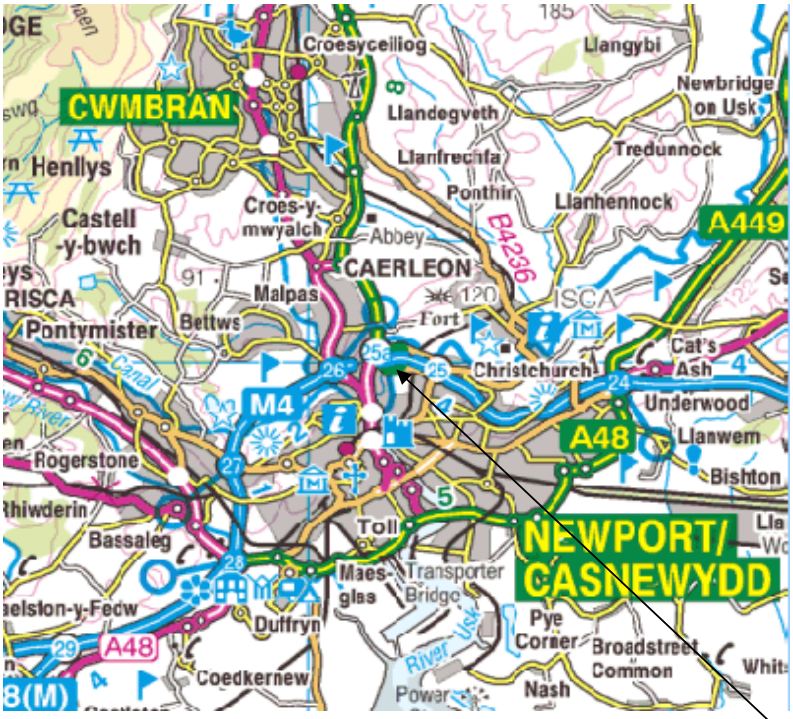
10.4 Discharge of Planning Consent

Permission was granted for the original development plan for the whole site on the 31st October 2000. This permission was subject to 20 planning conditions. Condition 7 involves the requirement to validate the implementation of any remediation activities to the satisfaction of the relevant statutory authorities. The reason for the condition is stated as "in the interest of residential amenities and to safeguard the interests of future users of the site". It states:

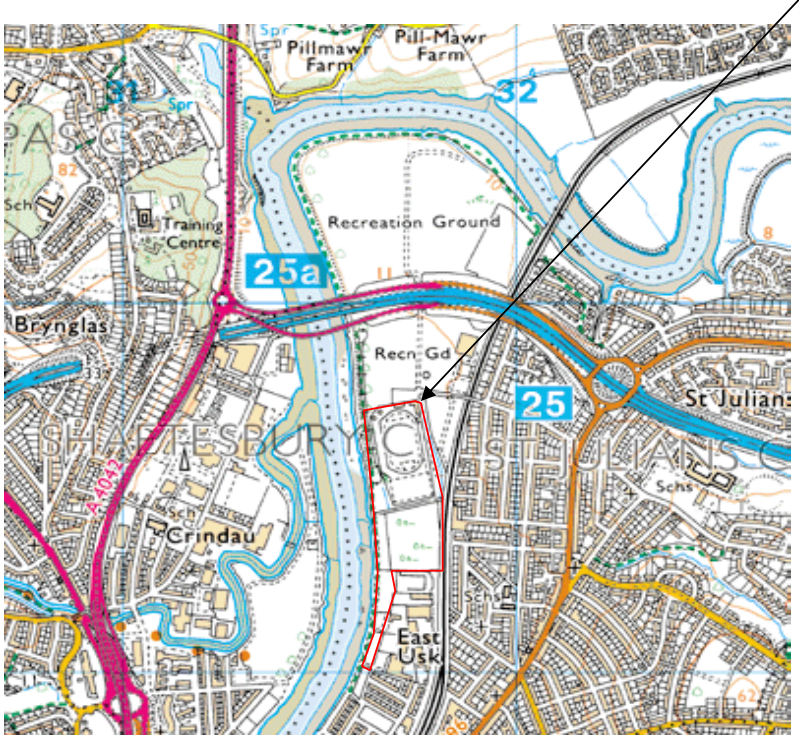
"On completion of the works of remediation the applicant shall provide a certification report, compiled by a suitably qualified engineer who has supervised the works, which confirms that the remediation works have been completed fully in accordance with the approved remediation strategy."

This report is presented in order to aid the partial discharge of Condition 7. It is noted that a full discharge of this condition is unlikely until the original proposed works to the reen (placed within a concrete lined channel) are completed.

Figures

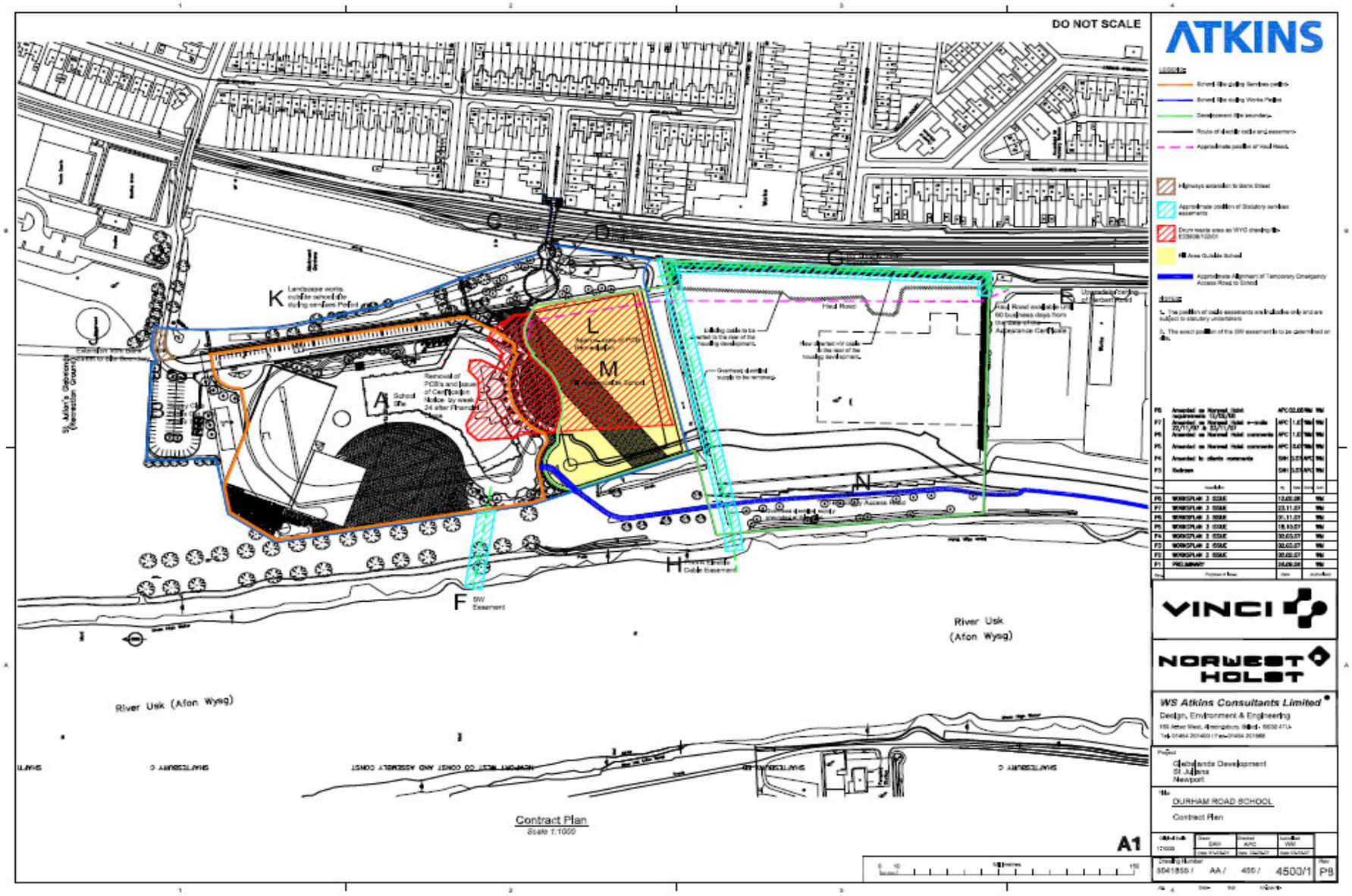


Site Location



WYG Environment
5th Floor, Longcross Court, 47 Newport Road, Cardiff
Tel: 02920 829200
Fax: 02920 455321
Environmental Consultancy
Ground Engineering Services

Project	Drawing Title	
Glan Usk School, Newport	Site Location Plan	
Client: VINCI	Checked by: RMD	Drawing No.: FIGURE 1



WYG Environment 5th Floor, Longcross Court, 47 Newport Road, Cardiff Tel: 02920 829200 Fax: 02920 455321 Environmental Consultancy Ground Engineering Services	Project Glan Usk School, Newport	Drawing Title School Development Plan	
	Client VINCI	Checked by RMD	Drawing No. FIGURE 2

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS

NOTES:
1. THIS TOPOGRAPHICAL SURVEY HAS BEEN TRANSFERRED FROM THE INFORMATION PROVIDED BY INITIAL SURVEYS Dwg. No. 6002/A0 DATED 13:10:03 AS DETAILED BELOW.
2. THIS DRAWING AND SURVEY ARE TO ORDNANCE SURVEY DATUM 'BEST FIT ONLY'.
3. THE PROPOSED DEVELOPMENT LOCATIONS AND SITE BOUNDARY HAVE BEEN TRANSFERRED FROM THE INFORMATION PROVIDED BY WYG (CARDIFF) Dwg. No. A017242-700 DATED 25:08:03 AND IS SUBJECT TO CONFIRMATION.
4. CONTRACTOR TO DEFINE LIMITS OF EXCAVATION ON SITE BASED ON VISUAL ASSESSMENT OF MATERIALS. WYGE TO AGREE LIMITS OF ALL EXCAVATIONS THROUGH ON SITE VALIDATION.

INDICITIVE AREAS OF PCB CONTAMINATION REQUIRING EXCAVATION AND VALIDATION

AREA FOR GEOPHYSICAL VALIDATION SURVEY

SCHOOL

DECONTAMINATION UNIT. PEDESTRIAN ENTRANCE AND EXIT TO DIRTY ZONE

DIRTY ZONE

LOADING AREA FOR LORRIES

EXISTING SEWER

REFERENCE

- ROAD/ ACCESS AREAS
- APPROXIMATE SITE BOUNDARY
- BH.8 BOREHOLE LOCATIONS – EXPLORATION ASSOCIATES (EA) JUNE 2000
- TP.1 TRIAL PIT LOCATIONS – EXPLORATION ASSOCIATES (EA) JUNE 2000
- BH529 BOREHOLE LOCATIONS – NORWEST HOLST SEPTEMBER 2003 **
- TP625 TRIAL PIT LOCATIONS – NORWEST HOLST SEPTEMBER 2003
- WG.14 BOREHOLE LOCATIONS – ENVIRONMENTAL ADVISORY UNIT (EAU) 1994
- BH BOREHOLE LOCATIONS – OCTOBER 2004
- CPT CONE PENETRATION TEST LOCATIONS – OCTOBER 2004
- TP TRIAL PIT LOCATIONS – OCTOBER 2004

** 400's SERIES ARE A COMBINATION OF EA 2000 AND EAU 1994 BOREHOLES. DETAILS ARE INDICATED IN BRACKETS.

REV	DESCRIPTION	BY	CHK	APP	DATE

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47 NEWPORT ROAD
CARDIFF
CF24 0AD
TEL: +44 (0)29 2082 9200
FAX: +44 (0)29 2045 5321
e-mail: cardiff@wyg.com

Client: VINCI

Project: GLAN USK SCHOOL, NEWPORT

Drawing Title: PRE – WORKS REMEDIATION AREA

Scale @	Drawn	Date	Checked	Date	Approved	Date
A2 1:500	PJ	07.05.09	sr	07.05.09	CBP	07.05.09

Project No.	Office	Type	Drawing No.	Revision
A042139	4406	ENV	FIGURE 3	00

FILENAME : N:\ENVIRONMENTAL\PROJECTS\A042139 – DURHAM ROAD SCHOOLS GLEBELANDS\DRAWINGS & FIGURES\VALIDATION REPORT DRAWINGS\A042139 –FIGURE 3.DWG | PLOTTED DATE : 07 May 2009 16:29:45 | PLOTTED BY : PAM.JOHN

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS

NOTES:
1. THIS TOPOGRAPHICAL SURVEY AND NORWEST HOLST SITE INVESTIGATION INFORMATION HAS BEEN TRANSFERRED FROM THE INFORMATION PROVIDED BY INITIAL SURVEYS Dwg. No. 6002/A0 DATED 13:10:03 AS DETAILED BELOW.
2. THE SITE BOUNDARY HAS BEEN TRANSFERRED FROM THE INFORMATION PROVIDED BY WYG (CARDIFF) Dwg. No. A017242-700 DATED 25:08:03 AND IS SUBJECT TO CONFIRMATION.
3. THIS DRAWING AND SURVEY ARE TO ORDNANCE SURVEY DATUM 'BEST FIT ONLY'.

SITE BOUNDARY

EXISTING SEWER

EXISTING SEWER

CUTLINE

CUTLINE

SITE BOUNDARY

BH601 BH602 BH603 BH604 BH604A BH605 BH606 BH606A BH607 BH608

SM1 SM2

KEY:

- GROUNDWATER AND LAND-GAS MONITORING BOREHOLE SCREENED IN MADE GROUND.
- GROUNDWATER MONITORING BOREHOLE SCREENED IN OLD RED SANDSTONE.
- SURFACE MONITORING POSITION REEN
- EXAMPLE DIRTY AREA

Mean High Water

River Usk (Afon Wysg)

Mud

Works

0 50m

REV	DESCRIPTION	BY	CHK	APP	DATE

Client: VINCI

5th FLOOR
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e-mail: cardiff@wyg.com

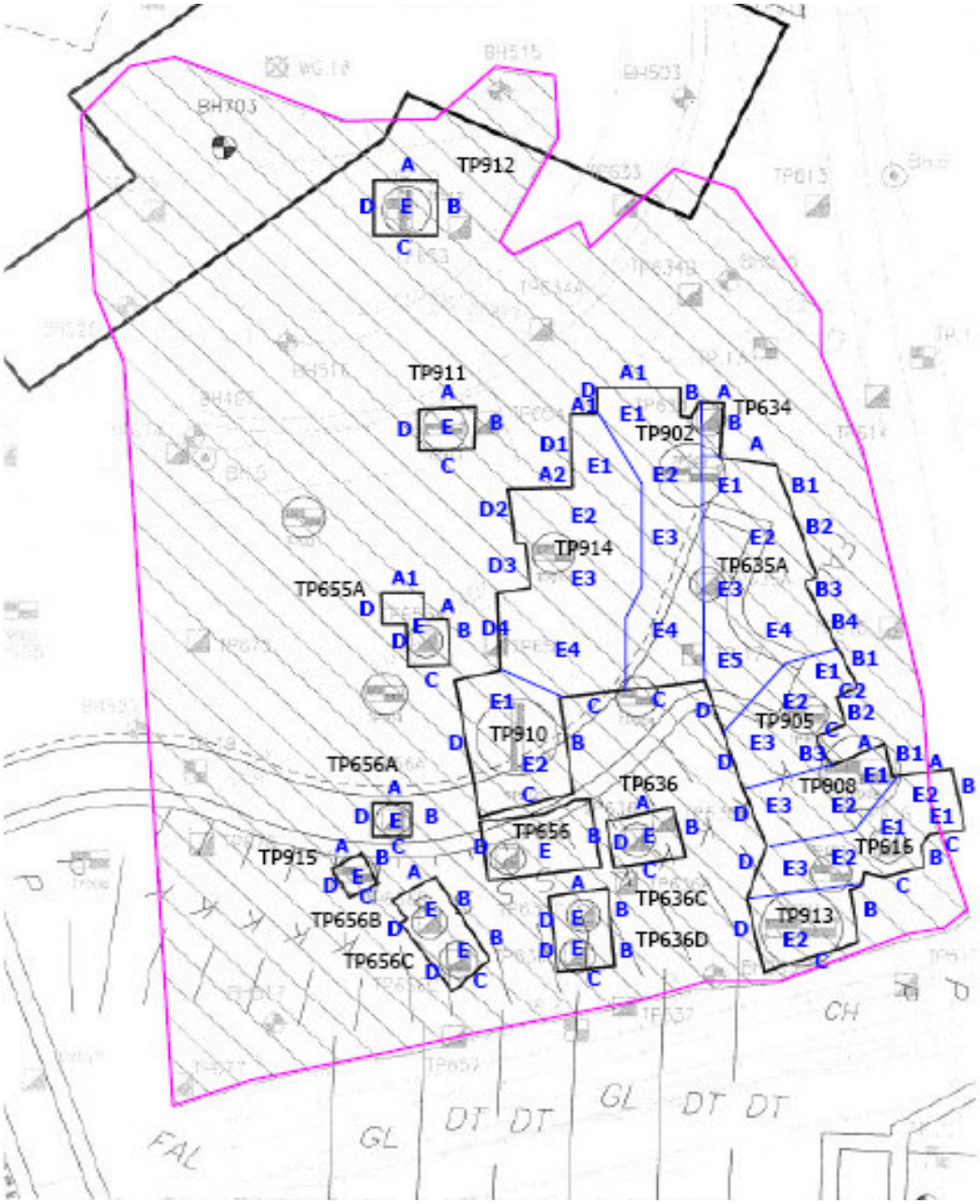
Project:
GLAN USK SCHOOL, NEWPORT

Drawing Title:
MONITORING INSTALLATIONS

Scale	Drawn Date	Checked Date	Approved Date
A2 @ 1:1000	PJ 08.04.09	RMD 08.04.09	CBP

Project No.	Office	Type	Drawing No.	Revision
A042139	4406	ENV	FIGURE 4	00

FILENAME : N:\ENVIRONMENTAL\PROJECTS\A042139 - DURHAM ROAD SCHOOLS GLEBELANDS\DRAWINGS & FIGURES\VALIDATION REPORT DRAWINGS\A042139- FIGURE 4.DWG | PLOTTED BY : PAM.JOHN | PLOTTED DATE : 07 May 2009 16:31:17



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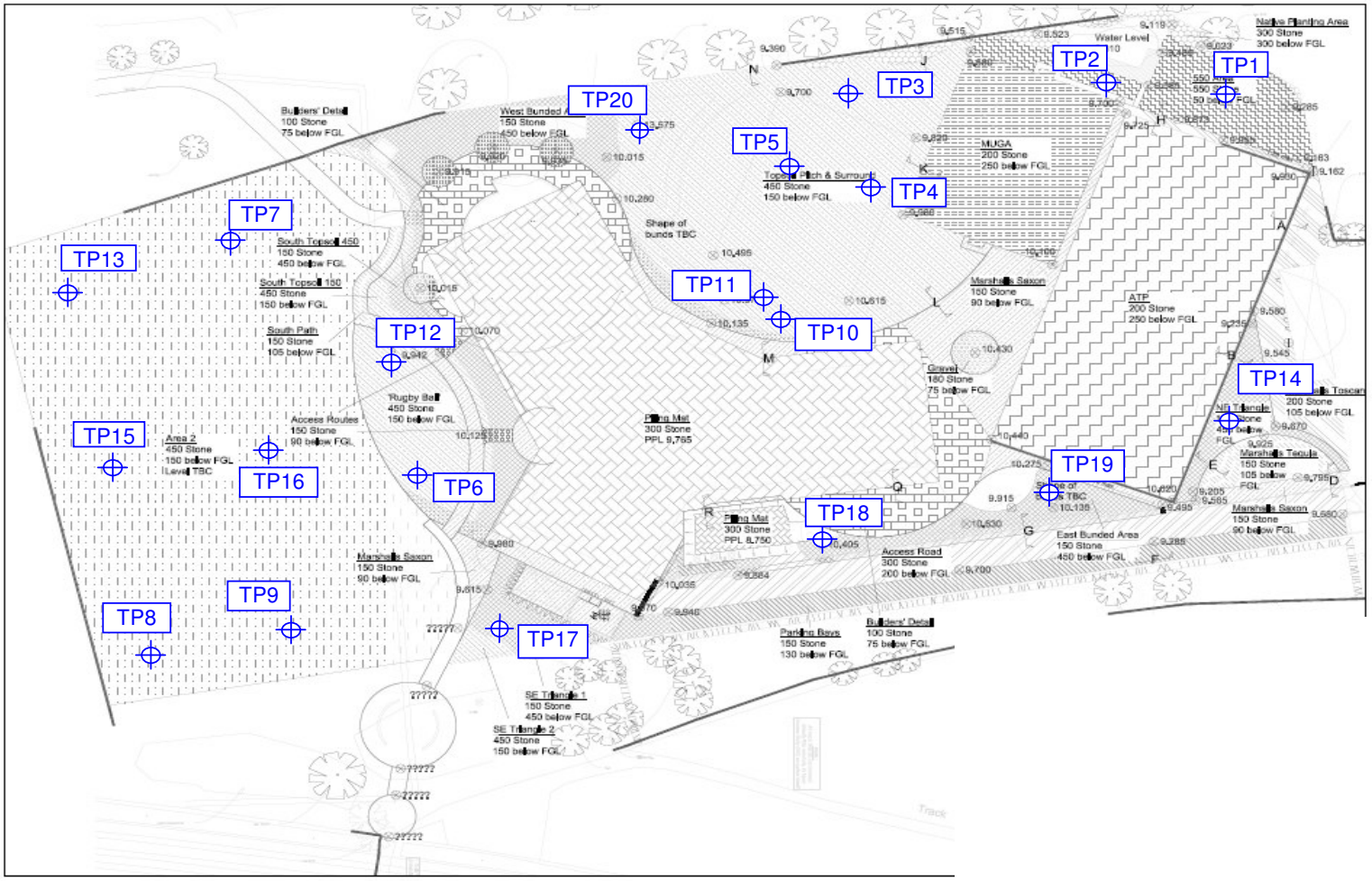
WYG Environment 5th Floor, Longcross Court, 47 Newport Road, Cardiff Tel: 02920 829200 Fax: 02920 455321 Environmental Consultancy Ground Engineering Services	Project Glan Usk School, Newport	Drawing Title PCB Removal Validation Sample Locations	
	Client VINCI	Checked by CBP	Drawing No. FIGURE 5



WYG Environment 5th Floor, Longcross Court, 47 Newport Road, Cardiff Tel: 02920 829200 Fax: 02920 455321 Environmental Consultancy Ground Engineering Services	Project Glan Usk School, Neport	Drawing Title Cap Validation Trial Pit Locations	
	Client VINCI	Checked by CBP	Drawing No. FIGURE 6

Plates

Plate Title	Plate No
Lotery's Reen showing where sheen on water was first identified	1

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Project	Plate Title
Glan Usk School, Newport	Lotery's Reen along eastern boundary of the site

Client	Checked by	Plate No.
VINCI	CBP	2

Plate Title	Plate No
Sheen on water on the bank of Lotery's Reen	3

WYG Environment 5th Floor, Longcross Court, 47 Newport Road, Cardiff Tel: 02920 829200 Fax: 02920 455321 Environmental Consultancy Ground Engineering Services	Project Glan Usk School, Newport	Plate Title Excavation of TP656	
	Client VINCI	Checked by CBP	Plate No. 4

Plate Title	Plate No
Excavation of TP911	5

WYG Environment 5th Floor, Longcross Court, 47 Newport Road, Cardiff Tel: 02920 829200 Fax: 02920 455321 Environmental Consultancy Ground Engineering Services	Project Glan Usk School, Newport	Plate Title Excavation of TP636C and TP636D	
	Client VINCI	Checked by CBP	Plate No. 6

Plate Title	Plate No
Excavation of TP636	7

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Project	Plate Title
Glan Usk School, Newport	Insitu drums in TP905

Client	Checked by	Plate No.
VINCI	CBP	8

Plate Title	
Insitu drums with surrounding waste in TP914.	9

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Project	Plate Title	
Glan Usk School, Newport	Excavation after dewatering in TP914	
Client: VINCI	Checked by: CBP	Plate No.: 10

Plate Title	Plate No
Large excavation looking north from TP913	11

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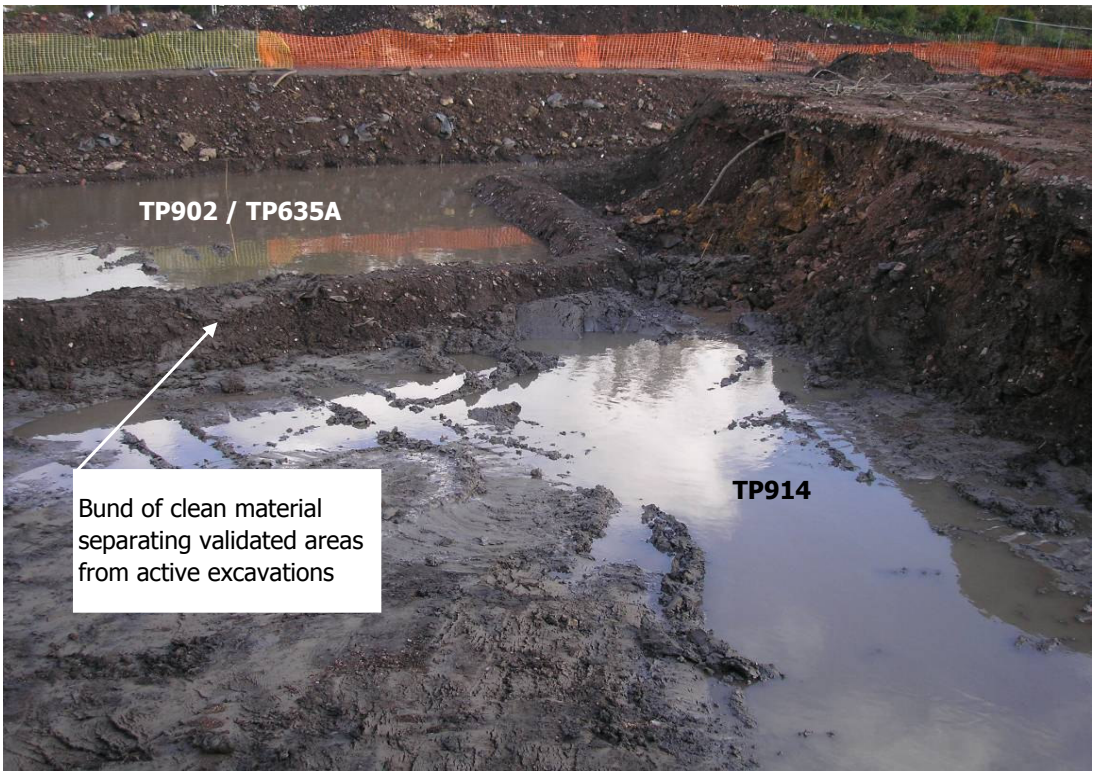
Project	Plate Title
Glan Usk School, Newport	Large excavation looking south from TP635a

Client	Checked by	Plate No.
VINCI	CBP	12

Plate Title	Plate No
Excavation of TP908	13



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Project	Plate Title
Glan Usk School, Newport	Large excavation with validated & backfilled areas behind

Client	Checked by	Plate No.
VINCI	CBP	14

Plate Title	Plate No
Large excavation during remediation	15

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Project	Plate Title
Glan Usk School, Newport	Large excavation
Client: VINCI	Checked by: CBP / Plate No.: 16

Plate Title	Plate No
Drums waiting for excavation in TP910	17

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Project	Plate Title
Glan Usk School, Newport	Excavation of drum with PCB containing material (TP914)

Client	Checked by	Plate No.
VINCI	CBP	18

Plate Title	Plate No
Excavation of drums in TP908	19

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Project	Plate Title
Glan Usk School, Newport	Removal of drums from TP914
Client: VINCI	Checked by: CBP / Plate No.: 20

Plate Title	Plate No
Red brown grease shown to contain high levels of PCBs in TP902	21

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Project	Plate Title
Glan Usk School, Newport	Viscous red brown grease shown to contain high levels of PCBs

Client	Checked by	Plate No.
VINCI	CBP	22

Plate Title	Plate No
PCB containing material leaking from exposed drum in TP910.	23

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Project	Plate Title
Glan Usk School, Newport	Brittle dark red drown glassy material with elevated PCBs

Client	Checked by	Plate No.
VINCI	CBP	24

Plate Title	
Brittle Glassy material in drum during excavation from TP655A	25

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Project	Plate Title	
Glan Usk School, Newport	Typical brittle red brown material with elevated levels of PCBs	
Client: VINCI	Checked by: CBP	Plate No.: 26

Plate Title	Plate No
Packing case with Monsanto label excavated from TP655a in the vicinity of drummed material	27

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Project	Plate Title
Glan Usk School, Newport	Coloured plastic waste commonly found in the vicinity of PCB material

Client	Checked by	Plate No.
VINCI	CBP	28

Plate Title	Plate No
Swarfe located within TP636D excavation	29

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Project	Plate Title
Glan Usk School, Newport	Redundant electricity cable on edge of TP911 excavation

Client	Checked by	Plate No.
VINCI	CBP	30

Plate Title	Plate No
Excavated PCB containing material being placed in tonne bags	31

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Project	Plate Title
Glan Usk School, Newport	Skip used to crush excavated drums

Client	Checked by	Plate No.
VINCI	CBP	32

Plate Title	Plate No
Plastic lined bunded area below skip	33

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Project	Plate Title
Glan Usk School, Newport	Drums being crushed in skip

Client	Checked by	Plate No.
VINCI	CBP	34

Plate Title	Plate No
Shute used for loading drums for removal of material from site	35

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Project	Plate Title
Glan Usk School, Newport	Telehandler moving and weighing loaded drums

Client	Checked by	Plate No.
VINCI	CBP	36

Plate Title	Plate No
Stockpiles of material requiring validation	37

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Project	Plate Title
Glan Usk School, Newport	Filled bags prior to removal
Client: VINCI	Checked by: CBP / Plate No.: 38

Plate Title	Plate No
General site activities showing loading of drums and material stockpiled on site	39

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	Client VINCI	Checked by CBP	Plate No. 40

Plate Title	
Product with elevated levels of LNAPL on surface or perched water in TP910	41

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Project	Plate Title	
Glan Usk School, Newport	Stockpile of crushed barrels and oversized material sorted prior to lime treatment	
Client: VINCI	Checked by: CBP	Plate No.: 42

Plate Title	Plate No
Lime stabilisation of bund material	43

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Project	Plate Title
Glan Usk School, Newport	Lime stabilisation of bund material

Client	Checked by	Plate No.
VINCI	CBP	44

Plate Title	Plate No
Water treatment system, installed on site	45

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Project	Plate Title
Glan Usk School, Newport	Water treatment system

Client	Checked by	Plate No.
VINCI	CBP	46

Plate Title	Plate No
Load being secured prior to removal from site to Grundon's Facility	47

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Project	Plate Title
Glan Usk School, Newport	Material awaiting removal from site to Grundon's facility

Client	Checked by	Plate No.
VINCI	CBP	48

Plate Title	Plate No
Waste identification label for material for off site disposal	49

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	Client VINCI	Checked by CBP	Plate No. 50

Plate Title	Plate No
Ground levels being raised under footprint of school building	51

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Project	Plate Title
Glan Usk School, Newport	Visual barrier used below capping material in areas of soft landscaping

Client	Checked by	Plate No.
VINCI	CBP	52

Plate Title	Plate No
Cover material with barrier membrane on top of made ground deposits	53

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Project	Plate Title
Glan Usk School, Newport	Final site levels under foot print of school building

Client	Checked by	Plate No.
VINCI	CBP	54

Plate Title	Plate No
Area of soft landscaping in northern section of site	55

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Project	Plate Title	
Glan Usk School, Newport	Footprint of access roadway on site	
Client: VINCI	Checked by: CBP	Plate No.: 56

Plate Title	
Capping material being laid on areas of soft landscaping	57

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Project	Plate Title		
Glan Usk School, Newport	Landscaping close to adjacent rugby club		
Client: VINCI	Checked by: CBP	Plate No.: 58	

Plate Title	Plate No
Excavation of TP2 through Cap aggregate layer.	59

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Project	Plate Title
Glan Usk School, Newport	Excavation of TP3 through cap aggregate layer

Client	Checked by	Plate No.
VINCI	CBP	60

Plate Title	Plate No
Excavation of TP4 through Cap aggregate layer.	61

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Project	Plate Title
Glan Usk School, Newport	Excavation of TP5 through cap aggregate layer

Client	Checked by	Plate No.
VINCI	CBP	62

Plate Title	Plate No
Excavation of TP6 through Cap aggregate layer.	63

WYG Environment 5th Floor, Longcross Court, 47 Newport Road, Cardiff Tel: 02920 829200 Fax: 02920 455321 Environmental Consultancy Ground Engineering Services	Project: Glan Usk School, Newport	Plate Title: Excavation of TP7 through cap aggregate layer	
	Client: VINCI	Checked by: CBP	Plate No.: 64

Plate Title	Plate No
Excavation of TP8 through Cap aggregate layer.	65

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Project	Plate Title	
Glan Usk School, Newport	Excavation of TP9 through cap aggregate layer	
Client: VINCI	Checked by: CBP	Plate No.: 66

Plate Title	Plate No
Installation of capping system (visible barrier & aggregate)	67

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Project	Plate Title
Glan Usk School, Newport	Section through capping layer showing basal geotextile membrane
Client: VINCI	Checked by: CBP / Plate No.: 68

Plate Title	Plate No
Installation of capping system (visible barrier & aggregate)	69

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Project	Plate Title	
Glan Usk School, Newport	Installation of capping system (visible barrier & aggregate)	
Client: VINCI	Checked by: CBP	Plate No.: 70

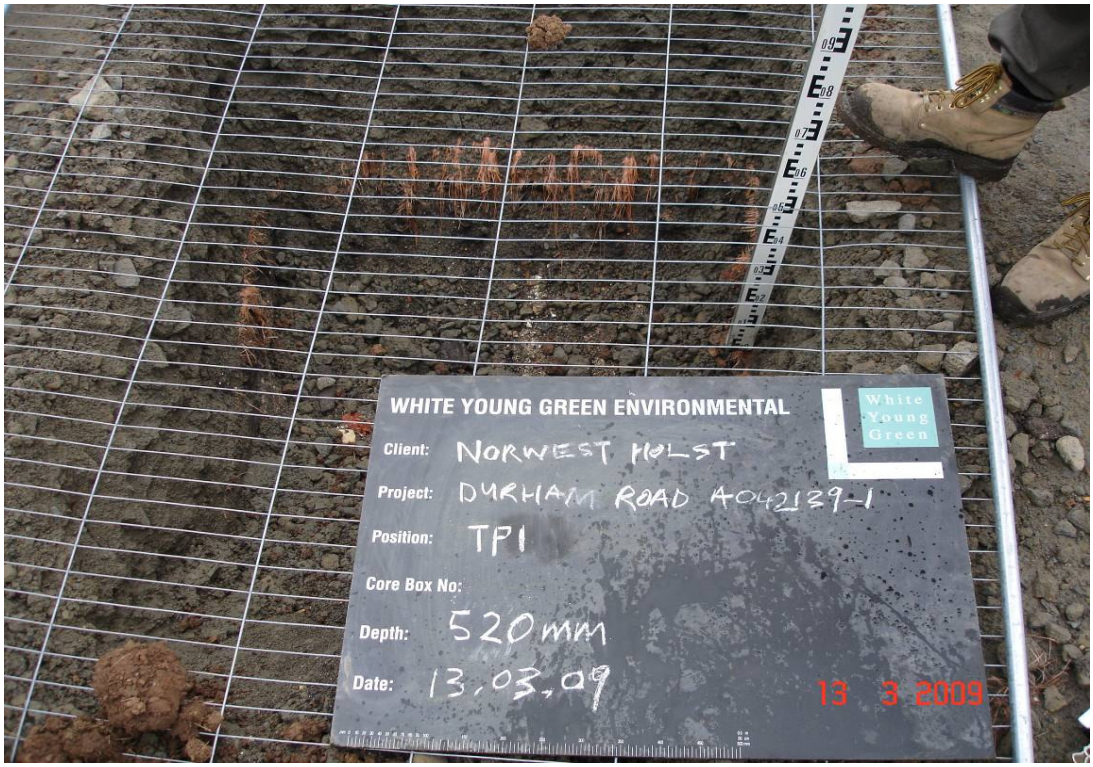

Plate Title	Plate No
Excavation of TP1 (tree pit) through Cap aggregate layer.	71

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Project	Plate Title
Glan Usk School, Newport	Excavation of TP7 through Cap aggregate layer.

Client	Checked by	Plate No.
VINCI	CBP	72

Plate Title	Plate No
Excavation of TP9 through Cap aggregate layer.	73

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Project	Plate Title
Glan Usk School, Newport	Excavation of TP10 through Cap aggregate layer.

Client	Checked by	Plate No.
VINCI	CBP	74

Plate Title	Plate No
Excavation of TP11 through Cap aggregate layer.	75

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Project	Plate Title
Glan Usk School, Newport	Excavation of TP12 through Cap aggregate layer.

Client	Checked by	Plate No.
VINCI	CBP	76

Plate Title	Plate No
Excavation of TP13 through Cap aggregate layer.	77

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Project	Plate Title
Glan Usk School, Newport	Excavation of TP14 through Cap aggregate layer.

Client	Checked by	Plate No.
VINCI	CBP	78

Plate Title	Plate No
Excavation of TP1 through cap topsoil layer.	79

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Project	Plate Title
Glan Usk School, Newport	Excavation of TP2 through cap topsoil layer.

Client		Plate No.
VINCI		80

Plate Title	Plate No
Excavation of TP18 through Cap aggregate and topsoil layer.	81

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Project	Plate Title
Glan Usk School, Newport	Excavation of TP19 through cap aggregate and topsoil layer

Client	Checked by	Plate No.
VINCI	CBP	82

Plate Title	Plate No
Excavation of TP3 through Cap topsoil layer.	83

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Project	Plate Title
Glan Usk School, Newport	Excavation of TP4 though cap topsoil layer

Client	Checked by	Plate No.
VINCI	CBP	84

Plate Title	Plate No
Excavation of TP5 through Cap topsoil layer.	85

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Project	Plate Title
Glan Usk School, Newport	Excavation of TP10 though cap topsoil layer

Client	Checked by	Plate No.
VINCI	CBP	86

Plate Title	Plate No
Excavation of TP11 through Cap topsoil layer.	87

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Project	Plate Title
Glan Usk School, Newport	Excavation of TP15 though cap aggragate layer

Client	Checked by	Plate No.
VINCI	CBP	88

Plate Title	Plate No
Excavation of TP16 through Cap aggregate layer.	89

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Project	Plate Title
Glan Usk School, Newport	Excavation of TP20 though cap aggragate layer

Client	Checked by	Plate No.
VINCI	CBP	90

Plate Title	Plate No
Excavation of TP6 through topsoil layer	91

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Project	Plate Title
Glan Usk School, Newport	Excavation of TP7 though cap aggragate layer

Client	Checked by	Plate No.
VINCI	CBP	92

Plate Title	Plate No
Excavation of TP8 through topsoil layer	93

WYG Environment 5th Floor, Longcross Court, 47 Newport Road, Cardiff Tel: 02920 829200 Fax: 02920 455321 Environmental Consultancy Ground Engineering Services	Project Glan Usk School, Newport	Plate Title Excavation of TP9 though cap aggragate layer	
Plate No.	Client VINCI	Checked by CBP	Plate No. 94

Plate Title	Plate No
Excavation of TP12 through topsoil layer	95

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Project	Plate Title
Glan Usk School, Newport	Excavation of TP13 though cap aggragate layer

Client	Checked by	Plate No.
VINCI	CBP	96

Plate Title	Plate No
Excavation through TP15 through topsoil	97

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Project	Plate Title
Glan Usk School, Newport	Excavation of TP16 though topsoil layer

Client	Checked by	Plate No.
VINCI	CBP	98

Plate Title	Plate No
Excavation of TP17 through topsoil and aggregate layer	99

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Project	Plate Title	
Glan Usk School, Newport	TP 17 showing orange barrier at base	
Client: VINCI	Checked by: CBP	Plate No.: 100