GUIDANCE FOR LOCAL AUTHORITIES REGARDING LANDS POTENTIALLY IMPACTED BY POLYCHLORINATED BIPHENYLS (PCBs).

Please Note:

This document does not purport to be and should not be considered a legal interpretation of the legislation referred to herein.

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Glossary

General Terms	
Closed PCB application	A PCB application where the PCB would not normally readily migrate into the environment, e.g. use of PCB in sealed capacitors - also known as a "Non-dispersive" application.
CSM	Conceptual Site Model – A model describing how environmental receptors (including people) may be exposed to contaminants originating from a site. It represents an understanding of the site in terms of the contaminants of concern, potential receptors and the pathways by which receptors (both on and off site) may be exposed to these contaminants (pollutant linkage). The CSM is used during preliminary site risk assessment and further refined during a DQRA.
Dispersive PCB Application	A PCB application where the PCB may readily migrate into the environment, e.g. the use of PCB in building calk or paints – also known as an "Open" application.
DQRA	Detailed Quantitative Risk Assessment – a process which can be carried out where significant contamination is suspected after a preliminary site risk assessment has been completed, e.g. in cases where SGVs are exceeded. The DQRA involves the monitoring of plant material, dust and vapour for contamination and other relevant measurements to determine human exposure. SSAC are derived during a DQRA on the basis of site specific understanding of factors affecting exposure. The outcome of a DQRA may require further re-evaluation of toxicological and exposure information to assess whether the contamination is likely to result in unacceptable contaminant intake.
EPA	Environmental Protection Agency.
EU-7	A group of 7 PCB congeners used to indicate PCB contamination – PCB28, PCB52, PCB101, PCB118, PCB138, PCB153 and PCB180.
mg/kg	Milligrams per kilogram – also denoted as parts per million (ppm).
Non-Dispersive PCB Application	See "Closed PCB Application".
Open PCB applications	See "Dispersive PCB Application".

General Terms	
PCB or PCBs (physical and chemical properties)	Polychlorinated Biphenyls - a group of organic chemicals consisting of two benzene rings linked by a carbon-carbon bond where some or all of the hydrogen atoms on the benzene rings have been replaced by chlorine. PCBs are extremely stable under normal conditions, are excellent electrical insulators, have excellent heat transfer properties and are resistant to thermal degradation. PCBs pose a threat to the environment because of their toxicity, persistence and tendency to bioaccumulate, i.e., to build up in the bodies of animals, particularly at the top of the food chain. Prolonged and repeated exposure to PCBs can cause adverse effects on human health. Some PCBs are suspect carcinogens.
PCB or PCBs (regulatory definition)	Waste Management (Hazardous Waste) Regulations 1998, S.I. No. 163 of 1998 define PCBs as: • polychlorinated biphenyls; • polychlorinated terphenyls; • monomethyl-tetrachloro-diphenyl methane; • monomethyl-dichloro-diphenyl methane; • monomethyl-dibromo-diphenyl methane; or • any mixture of substances containing any one or more of the aforementioned substances in an aggregate amount which exceeds 0.005% (or 50ppm) by weight of the mixture.
PCB Congener	A unique well-defined compound in the PCB class of substances. PCB congeners differ (and are defined by) the number of chlorine atoms contained within the molecule, e.g. 2-Chlorobiphenyl (2 chlorine atoms), 3-Chlorobiphenyl (3 chlorine atoms).
PCB Directive	Council Directive 96/59/EC of 16 September 1996 on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCB/PCT).
PCB-contaminated liquid	Any liquid that contains more than 0.005% (or 50ppm) by weight of total PCBs.
PCB-contaminated equipment	Equipment which contains PCB-contaminated liquid or contained PCB-contaminated liquid which was not appropriately decontaminated.

General Terms	
POPs	Persistent Organic Pollutants - a class of substances listed under the Stockholm Convention on Persistent Organic Pollutants regarded as exhibiting the following properties 1. Toxic, 2. Stable in the general environment, 3. Bioaccumulative and 4. On release can become widely distributed throughout the environment. PCBs are classed as POPs.
PPE	Personal Protective Equipment.
ppm	Parts per million – also denoted by milligrams per kilogram (mg/kg or $mgkg^{-1}$).
SGV	Soil Guideline Values - scientifically based generic assessment criteria used to simplify the assessment of the risks to human health posed by the long-term and on-site exposure to chemical contamination in soil and hence can be used as a screening tool for the generic quantitative risk assessment of land contamination. Generally, SGVs cannot be used for assessing risks to human health from short term exposure to chemical contamination, e.g. risks from occupational exposure arising from activities on the site – site investigation, construction work.
SSAC	Site Specific Assessment Criteria - criteria developed to take account of site specific conditions e.g., exposure pathways and receptors and are derived during the DQRA process.

Terms Relating to Electrical Equipment

Capacitor	A passive electrical component consisting of a pair of conductors separated by a dielectric (insulator). Capacitors allow the flow of alternating current in a circuit. Capacitors can be used to counteract inductive loadings from sources such as electric motors and transmission lines in electrical power distribution (see Power Factor Correction Unit).
Circuit Breaker (CB)	A device used to open or close an electric power circuit either during normal power system operation or during abnormal conditions. During abnormal conditions, e.g. when excessive current runs through the circuit, a circuit breaker opens to protect equipment and surroundings from possible damage. Dielectrics used in CB range from oil to compressed gases, e.g. air, SF_6.
Dielectric	A material that does not conduct an electric current under normal conditions i.e. an electrical insulator.
Power Factor Correction Unit (PFCU)	A combination of capacitors and/or inductors used to correct power distortions caused by certain electrical components in a circuit. Some electrical components, e.g. motors, rectifiers, distort the delivery of current from a distribution system whereby the real power – the capacity of a circuit to perform work – is not equal to the apparent power – the product of the current and voltage of the circuit. PFCUs are used to minimise such distortion and make the circuit appear more resistive, i.e. to attain the situation where the real power equals apparent power of the circuit.
Transformer	An active component of power management systems, electrical transformers are used to 'transform' voltage or current from one level to another, usually from a higher voltage or current to a lower voltage or current by applying the principle of magnetic induction between coils to convert voltage and/or current levels. Dielectrics used in transformers can range from oils, air to solid resins.

1. INTRODUCTION

This document has been prepared by Geosyntec Consultants Ltd. for the Environmental Protection Agency ("the Agency") with a view to providing guidance to Local Authorities regarding lands potentially impacted by contamination due to Polychlorinated Biphenyls (PCBs).

2. BACKGROUND INFORMATION ON POLYCHLORINATED BIPHENYLS

PCBs are listed as a class of Persistent Organic Pollutants (POPs) under the Stockholm Convention[1]. PCBs have long been recognised as posing a threat to human health and the environment because of their toxicity, persistence in the environment and tendency to bio-accumulate (i.e. to build up in the bodies of animals, particularly at the top of the food chain). Additionally, some PCBs are suspected carcinogens.

PCBs are practically insoluble in water, but are soluble in other media such as oils. Because of their relatively high chemical stability, high electrical insulation properties and high thermal conductivity, they were used widely in electrical transformers, capacitors and electrical switchgear. Although the use of PCBs was banned in the EU in the late 1980s it is recognised that those still remaining in existing equipment, particularly some electrical power management systems, pose a continuing health and environmental threat. If released to the environment PCBs persist for years or decades. While PCBs usually remain in the immediate vicinity of the release point contamination may spread through erosion and/or displacement of materials.

Legislation aimed at reducing the threat to human health and the environment posed by PCBs include the PCB Directive[2] and the POPs Regulation[3]

Further information on PCBs can be found on the EPA PCB-dedicated webpage www.pcbs.ie.

[1] The Stockholm Convention on Persistent Organic Pollutants, May 22, 2011 (see http://chm.pops.int).
[2] Council Directive 96/59/EC of 16 September 1996 on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCB/PCT).
[3] Regulation (EC) No 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants and amending Directive 79/117/EEC.

3. LEGISLATIVE CONTEXT

Council Directive 96/59/EC of 16 September 1996 on the disposal of PCBs and PCTs (polychlorinated terphenyls) sets out the requirements for the disposal of PCBs and PCTs with the aim of reducing the risk posed by PCBs/PCTs to human health and the environment. Part IV of the Waste Management (Hazardous Waste) Regulations 1998 (S.I. No. 163 of 1998) gave effect to the Directive 96/59/EC requirements by setting out the disposal and decontamination requirement for PCBs and certain PCB-contaminated equipment. PCB-contaminated materials are defined as materials containing more than 0.005% total PCB by weight or 50ppm. Equipment containing aggregate volumes greater than 5 litres of PCB-contaminated materials with total PCB concentrations greater than 0.05% by weight (or 500ppm) must have been decontaminated or disposed of in an environmentally sound manner before December 31, 2010. Equipment with aggregate volumes greater than 5 litres of PCB-contaminated materials with total PCB-concentrations between 0.005% and 0.05% by weight (or between 50ppm and 500ppm) must be disposed of in an environmentally sound manner at the end of its useful life. The Regulations also require PCB-contaminated equipment and any premises where such equipment is located to be labelled appropriately (see Appendix 2 for examples of such labels). Additionally, all PCB-contaminated equipment with aggregate volumes of PCB-contaminated materials greater than 5 litres must be reported annually to the EPA for inclusion on the National PCB Inventory.

Local Authorities are responsible for the enforcement of the 1998 Regulations within their respective functional areas, and have enforcement powers available to them under the Waste Management Act 1996, and also under the Water Pollution (Local Government) Act 1977, (as amended). These powers relate to situations where pollution is being caused or is likely to be caused, whether by PCBs or other substances.

Under Section 55 of the Waste Management Act and with a view to preventing or limiting environmental pollution, the Local Authority may serve notice on a person holding, recovering or disposing of waste, requiring them to take specific actions. If a person on whom such a notice has been served does not comply with the terms of the notice the Local Authority concerned may take such steps as it considers reasonable and necessary to secure compliance with the notice, and may recover any expense incurred. There are similar provisions under Section 12 of the Water Pollution (Local Government) Act in relation to the prevention or control of pollution of waters.

Regulation (EC) No 850/2004 on persistent organic pollutants as amended (EU POPs Regulation) implements the requirements of the Stockholm Convention within the EU. The Regulation bans the production and placing on the market of POPs. The EU Regulation also defines the concentration limits of certain POPs above which wastes are deemed POPs wastes and must be managed as such. The national Persistent Organic Pollutants Regulations 2010 (S.I. No. 235 of 2010) implements the requirements of EU POPs Regulation into Irish law. The Irish POPs Regulations also outline the requirement for cooperation between the EPA and Local Authorities for the purposes of enforcement of the Regulations.

4. POTENTIAL SOURCES OF PCBs

Because of their chemical stability and their excellent electrical insulation and thermal conductive properties, PCBs have been used in widespread industrial, commercial and domestic applications. PCB applications are commonly categorised as either “dispersive” or “open” or “non-dispersive” or “closed” applications as follows:

- Open applications: use as heat exchange fluids, hydraulic oils, lubricating oils and as additives in paints, plastics, solvents, adhesives and cements.
- Closed applications: use as insulating fluid in electrical transformers, capacitors, power factor correction units, lighting ballasts, vacuum pumps and submersible pumps.

Provided the PCBs remain contained within the equipment they are associated with, there is no immediate risk of environmental impact. However, the risk of environmental impact increases in situations where PCB-containing oils leak, or the PCB-containing equipment fails, is damaged, or is removed and not decontaminated correctly prior to disposal.

PCB contamination issues have been identified at a number of non-operational industrial sites in Ireland where items of electrical equipment have been vandalised and PCB-containing oils have been released into the environment in the process.

In order to prevent the potential occurrence or spread of PCB contamination, it is strongly recommended a complete site inspection for hazardous waste, e.g., asbestos, and all sources of hazardous waste, e.g., old electrical equipment, is carried out and all confirmed hazardous waste and potential sources of hazardous waste are removed by an appropriate contractor before any proposed demolition work on a site begins. The planning process within the Local Authority would be the appropriate vehicle to ensure such preventative measures are taken.

Further information on potential closed application sources of PCBs can be found in Appendix 1.

5. PRELIMINARY STEPS IN ASSESSING POTENTIAL PCB IMPACT

Where a Local Authority identifies a site where potential for PCB contamination is present, the preliminary steps to be taken will typically involve a site inspection, followed by the collection and analysis of samples. This section provides some guidance on what to look out for and on the collection of samples in such circumstances.

5.1 Site Inspection

If possible before visiting the site a detailed layout site plan should be obtained. This may assist in determining areas of the site where equipment potentially containing PCBs may be present. Typically such equipment will be located in rooms housing electrical switchgear, transformers, capacitors and/or power factor correction units.

The next step, assuming it is safe to do so in terms of access, is to inspect the areas of the site where potentially PCB-containing equipment may be located. ***Please refer to Appendix 4 for the Personal Protective Equipment (PPE) required to carry out such a site inspection and ensure such equipment is available and worn before entering the site concerned.*** The condition of the suspect equipment should be assessed and any evidence of oil leaks should be noted. The key signs to look out for in these areas that may indicate the presence of PCB contamination are oily liquids or oily staining of ground surfaces close to areas where equipment suspected of containing PCBs is or was located. Also, again **where safe to do so**, all labels on equipment suspected of being the contamination source, e.g. those shown in Appendices 1 and 2, should be inspected to assess the likelihood the equipment concerned contains PCBs.

In cases where suspect equipment has been removed in an uncontrolled way or vandalised, peripheral areas should also be inspected, as PCB-containing oils may have been released from the equipment in areas some distance from the original location of the equipment.

During the site inspection, consideration should be given to drawing up an initial sampling plan, that is, a list of locations and materials that should be sampled during a subsequent site visit (or possibly during the same site visit). In some cases, either where a relatively large number of potentially PCB-contaminated equipment was or is located or where there are numerous areas of observed oil stains, all oil contamination on a site should be checked for PCB content.

In situations where there is evidence that a release of PCBs may have occurred, an assessment should be made as to the risk of the suspected PCBs and suspected PCB-contaminated materials spreading or migrating beyond the immediate area of the release. One of the key concerns would be that rainfall could mobilise PCB-contaminated sediments or liquids and that these could enter site drains. The need for emergency response work to control any such risks should be ascertained at this stage.

The tasks required to limit migration of contaminated materials and to limit access to contaminated areas will be site-specific, but may include the following:

- Erecting temporary physical barriers and/or warning signs to control access to the area;
- Covering suspect material with plastic sheeting, particularly in outdoor areas where there is potential for the suspect materials to come into contact with rainfall and/or surface water run-off.

Once these controls have been put in place, then the suspect materials should be sampled and the samples analysed to determine whether the suspect liquids or oil staining contain PCBs at concentrations that require further action.

5.2 Initial Sampling

Prior to visiting the site to collect samples, a number of sample bottles and swabs should be obtained from a laboratory accredited to carry out analysis for PCBs.

When taking samples, ensure the potential for sample cross-contamination is minimised by using clean sampling utensils to collect samples or by cleaning the utensils between taking samples. The materials that should be considered for sampling may include one or more of the following:

- ***Surface soil*** – use a spatula or similar tool to transfer soil into a laboratory-supplied container. Try to exclude coarse gravel/cobble sized particles.
- ***Sediment/debris*** on concrete or other hardstanding – as above.
- ***Porous surfaces (e.g. concrete, masonry, wood)* –** use a chisel or drill to penetrate 5 – 20mm into the surface and transfer the arisings into a laboratory-supplied container.
- ***Non-porous surfaces*** – use a laboratory-supplied swab saturated with hexane to systematically swab a 100mm by 100mm square area. Place the swab in a laboratory-supplied bottle. This method may also be used on porous surfaces at this initial sampling stage where there is oily staining suspected of containing PCBs.
- ***Liquids* –** use a short length of tubing like a pipette to collect a sample from the liquid to be sampled and transfer the liquid into a laboratory-supplied bottle. Avoid getting the sampled liquid on to the outside of the sample bottle.

Label the samples in a systematic way including date and time of sampling, and mark the sample locations and sample references accurately on a site plan. Take measurements and GPS coordinates where possible, so the sample locations can be recorded with reasonable accuracy.

It is important that the individuals carrying out the inspection and sampling do not to come into direct contact with any liquids that potentially contain PCBs or surfaces that are suspected of being PCB-contaminated. As such, appropriate personal protective equipment (PPE) must be worn during the site inspection and initial sampling (see Appendix 4 for information on appropriate PPE). Care should also be taken not to step on potentially contaminated surfaces. This is important from a health and safety perspective, and also to limit the spread of the suspected PCB contamination. Where this is unavoidable, single-use over boots or wipes should be used and consigned for appropriate disposal.

6. ASSESSMENT OF INITIAL RESULTS

6.1 Source-Pathway-Receptor Concept

Contaminated land and groundwater problems are typically conceptualised by considering potential source-pathway-receptor "linkages", regardless of the substances involved. These are often termed potential "pollutant linkages". Potential pollutant linkages at a particular site are collectively referred to as the "Conceptual Site Model" or CSM. The CSM is often represented in the form of a diagrammatic cross section through the site, highlighting the sources, pathways and receptors.

Potential receptors at risk of impact from land and groundwater contamination at a particular site might include human health (on-site and in some cases off-site), water resources, and groundwater/surface water dependent ecosystems. In some cases soil function and livestock may also be a consideration. If complete source-pathway-receptor scenarios exist then there is a potential pollutant linkage that needs to be characterised and assessed.

For further guidance on the development and use of CSMs and the assessment of potential pollutant linkages see Chapter 3 of the Agency's guidance document on unregulated landfills[4].

6.2 Initial Assessment of Laboratory Data

It should be noted that the presence of PCBs in the initial soil or water samples does not necessarily mean that corrective action is required. Rather, the results need to be assessed with reference to generic screening criteria and also the sensitivity of the site setting to determine the need for further work.

Currently contaminated land is not regulated in Ireland, and there are no published guidelines at the time of publication of this guidance to assist in the assessment of the laboratory results from the initial sampling exercise. The Environment Agency in the UK has published Soil Guideline Values (SGVs) for a range of constituents and these are commonly used in Ireland for screening-level risk assessments. However, currently this list does not include SGVs for all the EU-7[5] indicator-PCBs.

It is possible to generate SGVs by following the UK Environment Agency's recommended methodology; however a level of expertise in environmental risk assessment is needed to generate reliable SGVs.

In the absence of SGVs for the EU-7 indicator-PCBs, for the purposes of this guidance note it is recommended that in the first instance the results be compared with EU Hazardous Waste threshold for total PCBs of 50 mg/kg (0.005% or 50ppm). As a rule of thumb, results for individual indicator-PCB congeners over 10 mg/kg should also be flagged as potentially requiring further assessment and possibly corrective action.

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[4] "CODE OF PRACTICE: Environmental Risk Assessment for Unregulated Waste Disposal Sites" (EPA, 2007) http://www.epa.ie/downloads/advice/waste/waste/epa_cop_waste_disposal_sites.pdf

[5] EU-7 - list of indicator-PCB congeners PCB28, PCB52, PCB101, PCB118, PCB 38, PCB153 and PCB180.

As outlined earlier, the need for further investigation and corrective action and its urgency, will depend to a degree on the sensitivity of the site setting – or in other words, the risk posed by the PCB-contamination on nearby receptors. For example if there is potential for PCB-contaminated sediment to be washed into drains at the site, or for members of the public to come into contact with PCB-contaminated materials, it may be expected that some form of corrective action will be required to prevent this. However if there is no public access to the site and no clear pathways linking the PCBs to a sensitive receptor then while corrective action may still be desirable, there may be more time to plan and implement the work.

7. SITE INVESTIGATIONS & CORRECTIVE ACTION

7.1 Site Investigations

In situations where there is a concern from the initial site inspection and/or the initial sampling results, regarding potential impact on receptors from confirmed or suspected PCB contamination, then generally the next step would be to contract the services of an environmental consultant with specific experience in the assessment and remediation of PCB contamination.

Initially, the environmental consultant should be requested to complete the following tasks:

- Complete an initial site inspection and a reconnaissance of the area surrounding the site. The primary aim of this visit should be to develop an initial understanding of the CSM, in terms of (i) the sources of PCB contamination, (ii) the receptors potentially at risk of impact and (iii) potentially viable migration pathways that could link the identified sources and receptors.
- Complete a desk-study, including a review of all relevant technical information on the site on the Local Authority's files, particularly any information that may assist in developing the CSM. This should include any reports completed by the Local Authority following the initial site inspection, laboratory reports from the initial sampling programme, any available reports on past site investigations or environmental site assessments, and site plans including site drainage plans. During the desk study, the environmental consultant should also draw on publicly-available information on the site history and the environmental site setting (including information on geology, hydrogeology and hydrology).
- Develop a proposed scope of work for the site investigation including a cost estimate; this should focus on (i) delineating the lateral and vertical extent of potential and known source areas and (ii) assessing whether PCBs have migrated away from these source areas along potential pathways identified in the CSM. Sampling of soils, sediments and concrete/tarmacadam pavements would typically be expected, including potentially sediments within drains and water courses close to the site that are thought to receive surface water run-off from the site. Confirmation of drainage routes and drain integrity may be necessary as part of the investigation.

In areas where the presence of PCB contamination has not been confirmed and is only suspected, one or two samples should initially be collected from close to the centre of each suspect area. When sampling to delineate the lateral extent of source areas, samples are typically collected at relatively close centres. Depending on the situation, sampling may be completed in two or more phases, starting at perhaps 5m centres and reducing to perhaps 2m centres. If PCBs are found to be present in these samples at elevated concentrations then further sampling is likely to be required to delineate the impacted area(s) and to establish the area(s) where corrective action is required.

While groundwater monitoring may be required in addition to soil/sediment/pavement sampling, it should be kept in mind that PCBs have a low aqueous solubility and groundwater impact is typically not the primary concern unless groundwater vulnerability is high (e.g. permeable soils and/or shallow groundwater table), and the site lies on a Regionally Important or Locally Important aquifer. If that is the case, then it may be necessary to install one or more groundwater monitoring wells and to collect and analyse water samples for PCBs.

If it is necessary for the Local Authority to proceed with the site investigation (rather than the person/company responsible for the site), it is recommended that the same environmental consultant be used to manage this work. They should provide an experienced field scientist to supervise any drilling or excavation subcontractors and this field scientist should also undertake the sampling. The environmental consultant would typically subcontract the laboratory analysis work to a laboratory with the requisite accreditations.

It is important that the spread of PCB-contaminated materials is controlled during the site investigation and this aspect should be carefully planned in advance, particularly where intrusive work is being carried out. Decontamination of equipment that has come into contact with PCB-contaminated materials should be carried out in a controlled way, with any wash-water or other materials arising from decontamination being collected, tested and disposed of appropriately.

The information gathered from the site investigation, including both field observations and analytical data, should be used to refine the CSM and from this to develop a corrective action plan. An interpretive report should be prepared by the environmental consultant, which summarises the work carried out and the analytical results, as well as presenting the findings and making recommendations with regard to corrective action.

In situations where the extent of corrective action required is not clear from the results, then it may be necessary to complete a Detailed Quantitative Risk Assessment (DQRA). The risk assessment methodologies and guidance issued by the UK Environment Agency under their contaminated land framework should be followed in this regard[6].

The DQRA will generate Site Specific Assessment Criteria (SSAC), which can then be compared with the results of the site investigations. Areas of the site where the SSAC are exceeded should be considered for inclusion within the corrective action programme. However this should not be regarded as black-and-white exercise, and other issues including practicability and sustainability should also be considered.

[6] Environment Agency, 2004; Model Procedures for the Management of Contaminated Land (CLR 11)

7.2 Corrective Actions

Corrective actions will typically take one or a combination of two forms:

- ***Physical removal:*** Depending on the situation this could mean the breaking up and excavation of concrete pavements, excavation of soils, or the removal of sediments from drains. In all cases, the arisings from these operations will require transport off-site to an appropriately licensed treatment facility

- ***Containment:*** In some situations it may not be practical to remove the PCB-contaminated materials, or the cost of its removal may be prohibitive. In such cases it may be adequate to contain the material in-situ (at least in the short-to-medium term). For example a low-permeability membrane could be placed over the PCB-contaminated material, which is then overlain by a concrete pavement. Such measures are, in effect, placing a barrier between the source of contamination and the receptor, either by preventing direct contact (in the case of site users) or limiting infiltration of rainfall and thereby limiting leaching into drains, surface water or groundwater.

The following site-specific factors may determine which remedial option(s) are most appropriate to employ:

- Extent and severity of the contamination:-
    - Dimensions of area(s) impacted – the lateral and vertical distribution of contamination
    - Contaminant concentrations

- Site topography

- Location of contaminated site and the potential impact(s) on its environment, e.g. proximity to an important aquifer or Strategic Area of Conservation

- Future proposed use/development of the area, e.g. housing, garden allotments, car park.

After the most appropriate remediation option or combination of options is chosen a site remediation strategy is developed. Whichever remedial action(s) are chosen, verification of the overall effectiveness of the remediation process will be required.

Finally, it is important each stage of the process is rigorously recorded from initial site inspections to completion and verification of remedial actions. Also the decision making process outlining all decisions made and reasons for those decisions must also be documented.

8. REFERENCE DOCUMENTS

S.I. No. 163, 1998; Waste Management (Hazardous Waste) Regulations, 1998 (Part IV – Polychlorinated Biphenyls

EPA, 2008; Management Plan for Polychlorinated Biphenyls (PCBs) in Ireland

EPA, 2007; Code of Practice: Environmental Risk Assessment for Unregulated Waste Disposal Sites

BSI, 2011; Investigation of Potentially Contaminated Sites – Code of Practice, BS 10175:2011

Environment Agency, 2004; Model Procedures for the Management of Contaminated Land (CLR 11)

Appendix 1 – Potential Sources of PCB contamination.

<table>
<tr><th>Transformers</th><th>Important Information</th></tr>
<tr><td>
</td><td>Function:

Reduction of incoming line voltage to lower voltage e.g. 3-phase, for powering industrial equipment.

Internal Capacity:

Medium size units may contain 850 lt of materials while larger unit can contain 1600lt or more.

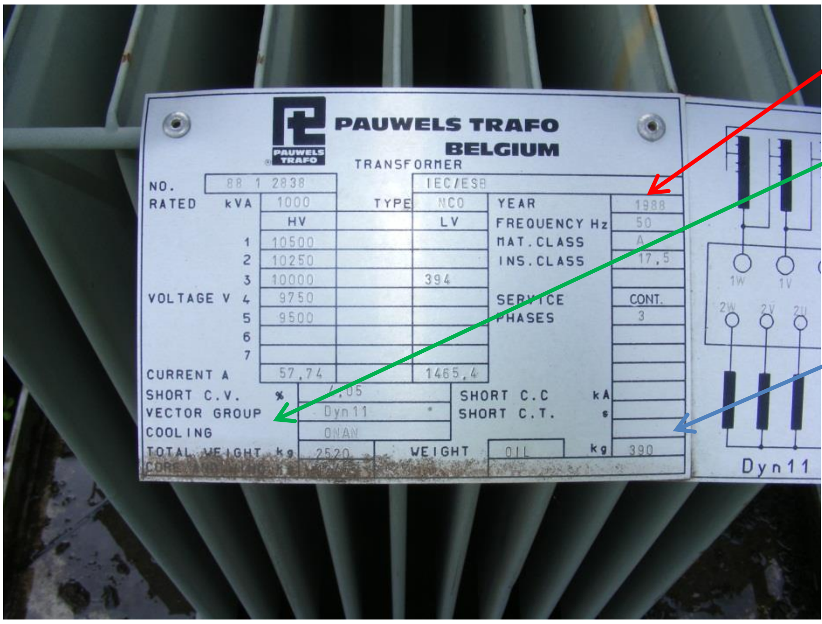
Important Indicators:

Transformers normally have manufacturer plates attached which can provide useful information on the probability of the unit being a potential source of PCB-contamination.
Units which are oil-filled and manufactured pre-1989 could potentially contain PCB-contaminated materials.
Manufacturer’s plate may specify the oil type used (for commonly used PCB-contaminated oils, please see Appendix 3).

Warning!
Danger of electric shock or electrocution. Do not touch transformers even if units are disconnected from power supply.</td></tr>
</table>

Transformers	Important Information

Transformer Labelling example.



Important Details:

1. Year of manufacture
2. Type of cooling, e.g. ONAN denotes Oil-Natural-Air-Natural, i.e. contains oil
3. Oil content.

Circuit Breakers or Switchgear	Important Information

Switchgear – bank of 3 switches.

Switchgear – Example of manufacturer's label.

Function(s):
Protection and isolation of electrical equipment.

Internal Capacity:
Approximately 50lt per switch. Units normally are assembled in banks.

Important Indicators:
Units normally have manufacturer plates attached which can provide useful information on the probability of the unit being a potential source of PCB-contamination.
Units which are oil-filled and manufactured pre-1989 could potentially contain PCB-contaminated materials.
Manufacturer's plate may specify the oil type used (for commonly used PCB-contaminated oils, please see Appendix 3).

Warning!
Danger of electric shock or electrocution. Do not touch equipment even if units are disconnected from power supply.

Capacitors & Power Factor Correction Units	Important Information

Capacitor – isolated.

Power Factor Correction Unit – consisting of 7 capacitors.

Function(s):
Counteract inductive loadings due to inductive sources such as electric motors in electrical power distribution networks.

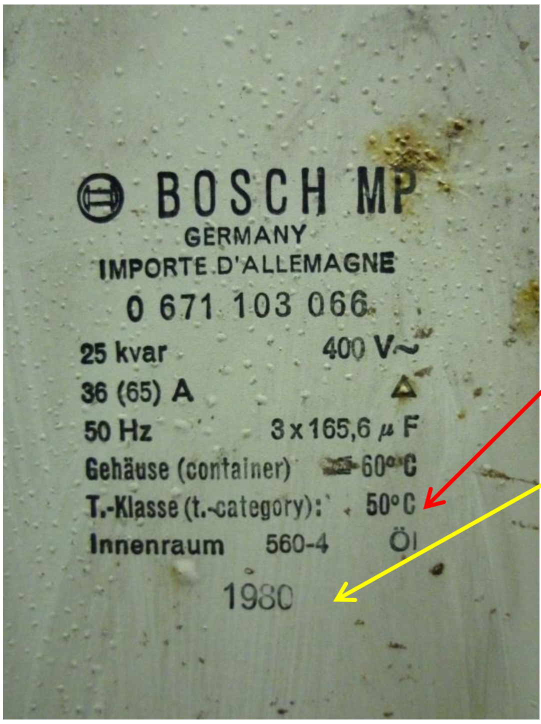
Internal Capacity:
Approximately 3lt per capacitor. Power Factor Correction Units normally consist of capacitors connected in banks.

Important Indicators:
Units normally have manufacturer plates attached which can provide useful information on the probability of the unit being a potential source of PCB-contamination.
Units which were manufactured pre-1989 could potentially contain PCB-contaminated materials.
Manufacturer’s plate may specify the oil type used (for commonly used PCB-contaminated oils, please see Appendix 3).

Warning!
Danger of electric shock or electrocution. Do not touch equipment even if units are disconnected from power supply.

Capacitors & Power Factor Correction Units	Important Information
Capacitor Labelling Examples	**Important Details:**

1. Contents description & warnings



Important Details:

1. Contents description (oil)
2. Year of Manufacture

Appendix 2 – PCB-contamination warning labels – examples.

WARNING PCBs CONTAMINATED

0.05%

Internal PCB Oil Contamination Greater than 0.05% (500ppm). Awaiting Disposal. Wear Appropriate PPE.

For Proper Disposal Information contact

…………………………………..

Appendix 3 – Some trade names of commercial PCB-contaminated oils.

Aceclor	Chlorinol	Hydol	Pyralene 3011
Adkarel	Chlorintol	Hyvol	Pyralene T1
Apirolia	Chlorphen	Inclar	Pyralene T2
Apirolio	Clorphen (t)	Inclor	Pyralene T3
Areclor (t)	Deler	Inerteen 300	Pyranol
Arochlor 1221	Delor	Inerteen 400	Pyrochlor
Arochlor 1232	Diaclor	Inerteen 600	Pyroclar
Arochlor 1248	Diaconal	Kan(e)chlor (KC) 200-600	Pyronal
Arochlor 1254	Dialor (c)	Kanechor	Pysanol
Arochlor 1260	Diconal	Kaneclor 400	Safe-T-America
Arochlor 1268	Disconon (c)	Kaneclor 500	Safe-T-Kuhl
Arochlor 1270	DK	Keneclor	Saft-Kuhl
Arochlor 1342	DP 3	Kennechlor	Sant(h)osafe
Arochlor 2565	DP 4	Leromoli	Santosol
Arochlor 4465	DP 5	Leromoll	Santotherm
Arochlor 5460	DP 6.5	Magvar	Sant(h)othern FR
Aroclor	Duconal	MCS 1489	Santothern FR
Arubren	Dykanol	Montar	Santovac
Asbestol, American Corp	Educarel	Nepolin	Santovac 1
Asbestol, Monsanto	EEC-18	Niren	Santovac2
ASK	Elaol	Non-Flamable Liquid, ITE	Santowax

Askarel	Electrophenyl	No-Flamol, Wagner Electric	Santvacki
Auxol	Elemex c	Phenoclar DP6	Saut(h)otherm
Bakola 131	Elemex t	Phenoclor DP6	Siclonyl (c)
Biclor (c)	Elexem	Phyralene	Solvol
Chloroextol	Eucarel	Physalen	Sorol
C(h)lophen A30	Fenclor 42	Plastivar	Sovol
C(h)lophen A50	Fenclor 54	Pydraul	Terpenylchlore
Clophen A60	Fenclor 64	Pyralene 1460	Therminol
Clophen Apirorlio	Fenclor 70	Pyralene 1500	Therminol FR
Chloresil	Hexol	Pyralene 1501	
Chlorinated Diphenyl	Hivar (c)	Pyralene 3010	

Appendix 4 – Personal Protective Equipment – for potential PCB-contamination investigation.

Where there is a likelihood of coming in direct contact with potentially PCB-contaminated materials, Personal Protective Equipment (PPE) impervious to PCBs should be worn. If the PCBs are in closed containers such as capacitors, transformers or drums, and there is no direct contact, suitable standard PPE, e.g. safety boots, hard hat, is only required. PPE should comprise the following items;

- Gloves made of butyl rubber, neoprene, nitrile rubber, polyvinyl alcohol, Viton, Saranex or Teflon (**NOT** ordinary rubber),
- Overshoes,
- Overalls and bib-type aprons made of butyl rubber, neoprene, nitrile rubber, polyvinyl alcohol, Viton, Saranex or Teflon (**NOT** ordinary rubber).
- Safety glasses with side shields or face shields,
- Impervious coveralls made of butyl rubber, neoprene, nitrile rubber, polyvinyl alcohol, Viton, Saranex or Teflon (**NOT** ordinary rubber) should be worn when handling PCB liquids.
- Respiratory protective devices with a full face mask and a cartridge or canister suitable for use with PCBs is required when handling PCB liquids hotter than $55^{O}C$, where there is a significant amount of PCB-contaminated materials exposed to the air, or where adequate ventilation is not possible.

Hands should be washed thoroughly with warm water and soap, detergent or industrial hand cleansers before eating, drinking, smoking or using toilet facilities following site inspections for PCB-contamination.