

This document addresses frequently asked questions (FAQs) on the approach used by **CARO Analytical Services** to test for parameters listed on [Schedule 11 of the BC Environmental Management Act – Contaminated Sites Regulations](#).

Principles: Ambient air or soil gas samples are collected onto sorbent media using calibrated air sampling pumps. Compounds are quantified through thermal desorption (TD) or solvent extraction followed by gas chromatography. This approach is cost effective, allows for a broad list of parameters from a single analytical run and allows for the analysis of larger volumes of air than direct analysis approaches thereby providing lower detection limit ability.

What soil vapour parameters can CARO test for?

The [Schedule 11 of the BC Environmental Management Act – Contaminated Sites Regulations](#) provides a comprehensive list of potential soil vapour compounds. CARO has currently validated analysis for over 100 Schedule 11 compounds including: Volatile Organic Compounds (VOCs), VPH and Polycyclic Aromatic Hydrocarbons (PAHs).

CARO has developed standard Soil Vapor Capabilities lists which has been done through dialogue with various environmental consultants and is representative of what may be found at typical contaminated sites. CARO has validated many other compounds and is also continuing to validate additional compounds as necessary. Contact CARO for more information.

What detection limits can CARO achieve?

CARO's detection limits are based on a minimum detectable analyte mass (μg) divided by the sample volume collected (m^3). This provides a minimum reported detection limit (RDL) in $\mu\text{g}/\text{m}^3$ units. CARO RDL's are lower than the lowest Schedule 11 regulatory limits when using 6-10L of air. [CARO has prepared tables](#) to assist with determining the optimum sample volumes necessary to achieve the applicable regulatory limits required for your site.

What is adsorption? What "media" types are used to collect soil vapour samples?

Adsorption is a process that occurs when a gas accumulates on the surface of a solid (sorbent) material. For soil vapour applications, this involves drawing ambient air or soil gas through media designed specifically to adsorb certain groups of compounds.

Sorbent media currently employed by CARO include:

- **Thermal Desorption (TD) Tubes** - VOCs and aggregate organic parameters are collected onto multi-bed sorbent tubes specifically designed to capture these analyte groups. These compounds are thermally desorbed then identified and quantified using gas chromatography coupled with mass spectrometry (GC/MS) and/or flame ionization detection (GC/FID).
- **XAD-2 Resin Filters** - PAHs are collected onto a specifically designed proprietary resin (XAD-2). These compounds are solvent extracted then identified and quantified using gas chromatography coupled with mass spectrometry (GC/MS).



What are the primary advantages & challenges of sorbent medias?

CARO has evaluated all the possible sample collection approaches for soil vapour monitoring and we understand the advantages and disadvantages of each. We have chosen sorbent medias (TD Tubes & XAD-2 Filter Tubes) to provide our clients with the most cost effective, practical and technically sound approach for collecting and analyzing soil vapour.

Sorbent medias allow for collection and analysis of relatively large volumes of air compared to direct air analysis approaches. This is important, as larger sample volumes allow for lower detection limit ability.

Sorbent medias tend to be more cost effective and they can provide a broader list of possible compounds in a single analytical run than direct air analysis methods. With this,

TD sorbent medias had traditionally been susceptible to moisture which decreased sorption potential. CARO has worked with our supplier to develop a custom hydrophobic TD media that is optimized for VOC's and for moist conditions. Study data indicates that up to 30L of 90% RH air can be sampled with minimal risk of VOC breakthrough.

Historically, TD Tubes had provided a single analysis opportunity. This caused problems where parameters exceed the instrument calibration range, or where instrument problems occurred. CARO has addressed this by being the first BC laboratory to commission next-generation analytical equipment with sample recollection. This provides the ability to run replicates, dilute high samples and conduct rechecks. This equipment is state-of-the-art and also greatly improves performance with a broader scope of detectable parameters and unmatched low level resolution.

What equipment is available from CARO?

CARO can provide all sampling equipment necessary for soil vapour monitoring including: air sampling pumps (for rent), tubing, y-splitters, flow restrictors, field flow monitors, equipment manuals, TD Tubes and XAD-2 Resin Filters. We ensure fresh batteries and we calibrate all pumps prior to use. CARO also confirms pump calibration upon return to the lab.

CARO is committed to supporting the equipment requirements for this market segment and for ensuring our clients are properly trained.

We recognize that clients will have greater control over equipment availability, operation and costs if they acquire a basic compliment of in-house equipment (pumps and tubing). CARO would be more than happy to assist with sourcing this equipment.

What technical support can CARO provide?

CARO understands that soil vapour monitoring requires a higher level of project management than is necessary for soil or water sampling - ***we are committed to collaborating with our clients to ensure trouble-free and successful projects.***

It is recommended that sufficient time and discussion be invested to ensure that sampling and project plans are well developed prior to sampling. This will assure availability of equipment and help ensure the teams understanding of logistics, parameters of concern, regulatory criteria, sampling volumes, and QC requirements.

CARO's primary soil vapour development and support team includes senior staff: CARO-Richmond's Business Manager (Patrick Novak) and CARO-Richmond's Technical Manager (Stephen Varisco). They are supported by CARO's President (Brent Mussato), who through BCELTA has prepared the BCMOE method for soil vapour using sorbent media.

Please feel free to contact the following individuals to discuss your project needs:

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