

# Hydrocarbon Fingerprinting

## “Specialised Services Simplified”

**Leeder Consulting** specialise in non-routine laboratory analysis. Independence and commitment to your project’s “**data quality objectives**” enables us to suggest innovative and cost effective solutions. If it is high-tech, challenging, difficult or out of the ordinary, call us now.

### Specialised Services Support Decisions

Determining the type and age of hydrocarbon free product or contamination can be invaluable in identifying possible sources and determining the best approach to future action, remediation and who may be responsible.

**Hydrocarbon Fingerprinting** is applicable to most petroleum products including: leaded and unleaded motor spirits, aviation fuels, kerosene, diesel fuels, lubrication oils and fuel oils.

The Fingerprinting Analysis can detail:

- **Product identification**, including combinations of various petroleum products.
- **Age approximation**, time frame & precision depend on site & geotechnical conditions.
- **Types of Weathering** experienced, e.g. water washing, volatilisation, biodegradation.
- **Additives Present** such as Organolead (TML,TEL) and Oxygenates such as MTBE.

The Fingerprinting Report can be used to:

- **Identify the source or multiple sources of hydrocarbon contamination.**
- **Determine the timeframes and responsibilities for contamination present.**
- **Track movement and degradation of products and plumes across sites.**
- **Differentiate organic materials as Biogenic (i.e. plants bacteria algae) or Petrogenic.**

**Sample Requirements:** Analysis requires approximately 40ml of free product so a Vial (BTEX type or similar with no preservative) is ideal. Fill each vial to the top so there is no headspace. Pack the samples appropriately with chiller bricks and packing material. A small esky with the space around the samples and chiller bricks filled with absorbent packing material such as vermiculite, perlite or kitty litter is often used. Organise delivery to our laboratory as soon as possible. For samples other than free product please call us to discuss specific sampling requirements. Please ensure to include any samples of suspected sources of contamination if they are available.

**Additional Information:** To ensure the analysis and report provide relevant and useful information, it is critical to discuss the objectives in specific detail and provide as much background information and site history as possible. The more information we have, the more specific we will be able to be with our report.

**Turnaround Time:** Due to the complexity of this type of analysis, data reduction and interpretation, results are generally available in 3 - 4 weeks of receipt of samples. In cases where results are required sooner, prioritising work may be possible, however surcharges may apply.

**Information on [How hydrocarbon fingerprinting is done](#) and some interesting case studies on [How hydrocarbon fingerprinting has solved problems](#) are over the page.**

Leeder Consulting offer a range of specialised high-tech, non-routine and on-site services. Access to leading edge technology and expertise in Australia and overseas guarantees results when and where you require. To discuss your requirements or for more information **call us now**.



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## - How is Hydrocarbon Fingerprinting done ? -

Samples are prepared and extracted in the laboratory. The "Phase Separated Hydrocarbons" are then analysed using High Resolution Capillary Gas Chromatography - Mass Spectrometry, (HRCGC-MS). This technique provides superior sensitivity and specificity while allowing for a wide range of compounds to be identified and confirmed.

Biomarkers are biochemical fossils which occur in sedimentary rocks and crude oils. These compounds encode information about the age and origins of organic matter to the point where the specific oil field where petroleum products originated can be identified. Biomarker compounds are extremely resistant to weathering and remain intact even in the most severely degraded samples. Other components react differently to various forms of weathering and biodegradation. These compounds are examined, measured and compared to the biomarkers.

Crude oils and refinery feedstocks have many different characteristics in addition to the biomarkers. Different refineries and processes produce products with subtle but chemically identifiable differences.

In addition to the differences produced by the various feedstocks and processes, analysis for petroleum additives, such as organic lead, (tetraethyl and tetramethyl) and oxygenates such as MTBE can be made to build up a very specific profile of the product.

The data is assessed and compared to library of standards and compounds. The composition, type of product, estimated age, types of weathering and degradation can then be determined in detail.

Analysis and review of all these compounds, parameters and data produces a unique profile or fingerprint. This provides an insight into the product and its history and enables it to be compared and linked to other hydrocarbon products.

## - How Hydrocarbon Fingerprinting can solve problems -

The following case studies demonstrate some of the applications of Hydrocarbon Fingerprinting.

**1. Marine Oil Spill.** Following the discovery of oil washed up along a section of coastline, samples of fuels and oils were collected from a number of suspect vessels in the area at the time of the spill. The samples were fingerprinted and compared to the fingerprint of the spill. One of these vessels was confirmed as being the source of the contamination. Numerous samples were then collected and fingerprinted to determine the extent of the spill and confirm the suspect vessel as the source of the pollution. Following the cleanup samples were collected and fingerprinted to determine the effectiveness of the cleanup operation. At periodic intervals after the cleanup, samples collected and fingerprinted to determine how the residual oil contamination was degrading and if further remedial action was required.

**2. Contamination Timeframes.** Following minor earthworks on some industrial land, an area of hydrocarbon contamination was uncovered by the current tenant who claimed they were not responsible. The landlord claimed the tenant was responsible and would be liable for remediating the site. Samples were collected and Fingerprinting confirming the presence of a fairly specific type of solvent which would have been on site in that location for between 10 and 15 years. As the current tenant had been on site for only 6 years the responsibility for the contamination was attributed to the previous tenant and their activities.

**3. Who is responsible?** While digging a hole to plant a tree, a suburban gardener noticed a sheen on the water which was seeping in. The next morning there was enough "free product" floating in the hole for him to collect a cup full. The contamination of his groundwater could have been from a number of possible sources in his area so the sample was analysed initially to determine the type and approximate age of the product so that the number of sources could be narrowed down. The analysis confirmed the sample was relatively fresh unleaded petrol which had been produced from an imported crude. This meant that only one of the service stations in the area could be responsible and subsequent leak tests confirmed that they were the source.

**4. What is this Contamination?** During the assessment of a site which had no history of hydrocarbon contamination, low levels of TPH were measured in the groundwater. Even though the levels were low, the landowner and environmental consultant were mystified and concerned the levels could be indicating something wrong. Hydrocarbon Fingerprinting of the contamination being reported as TPH was actually from Biogenic sources such as plant waxes and algae, not petroleum related as initially thought.