

Sitelab Corporation
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**Evaluation Study:
 Sittingbourne, United Kingdom**

New regulations by the European Union require laboratory testing for polyaromatic hydrocarbons (PAHs) when recycling or disposing old tar or asphalt from road planings.

Sitelab's portable UVF-3100D and TD-500D analyzers have similar sensitivity to these types of compounds. The equipment is easy to operate and samples can be tested in the field in less than five minutes. A 5 gram sample is extracted in solvent using disposable test kits and then measured on the instrument which is calibrated using Sitelab's PAH calibration kit. Results will directly correlate to certified laboratories using GC/MS methods.

Sitelab's analyzers cannot detect one compound from another, but response factors are commonly used to estimate Benzo[a]Pyrene (BAP) or other PAH compounds of concern.

DGL Testing Services, Ltd, a UKAS accredited laboratory, sent two samples to Sitelab Corporation for analysis. They needed to know if the Total PAH content was below 1,000 ppm and if Benzo[a]Pyrene was below 50 ppm. These regulatory limits dictate how the paving industry can reuse the contaminated material when mixing it with newer bitumen used in making asphalt.

Traditional laboratory methods are expensive and can take days to weeks to perform. Other screening techniques, like PAK marker sprays that are sometimes used are not quantitative and are not as accurate compared to Sitelab's ultraviolet fluorescence technology.

Laboratory GC Analysis Showing PAHs in Six Samples Collected from 20+ year-old Asphalt Sites in England

Concentrations below are in ppm units (mg/Kg)

Naphthalene	130	209	7	302	37	2
Acenaphthylene	75	35	9	12	5	11
Acenaphthene	124	109	57	85	50	2
Fluorene	212	159	34	101	65	6
Phenanthrene	1101	741	517	401	311	48
Anthracene	296	212	152	110	87	17
Fluoranthene	983	596	414	253	272	85
Pyrene	753	437	299	176	204	78
Benzo[a]Anthracene	388	223	148	86	98	41
Chrysene	400	243	162	101	114	43
Benzo[b]Fluoranthene	280	158	113	55	76	40
Benzo[k]Fluoranthene	277	167	107	62	81	40
Indeno[1,2,3]Pyrene	227	132	78	41	63	34
Dibenzo[ah]Anthracene	54	33	23	11	16	6
Benzo[ghi]Perylene	209	110	68	39	51	36
Benzo[a]Pyrene	336	192	109	65	89	48
Total PAH Compounds:	5,845	3,756	2,297	1,900	1,619	537

BAP Response Factors: RF=17 RF=20 RF=21 RF=29 RF=18 RF=11

Response factors are calculated by dividing each sample's Benzo[a]Pyrene concentration by the Total PAH concentration. **Average RF = 19.**

TD-500D



PAH Results	BAP*
2,270 ppm	119 ppm
2,400 ppm	126 ppm

UVF-3100D



PAH Results	BAP*
2,000 ppm	105 ppm
2,120 ppm	112 ppm

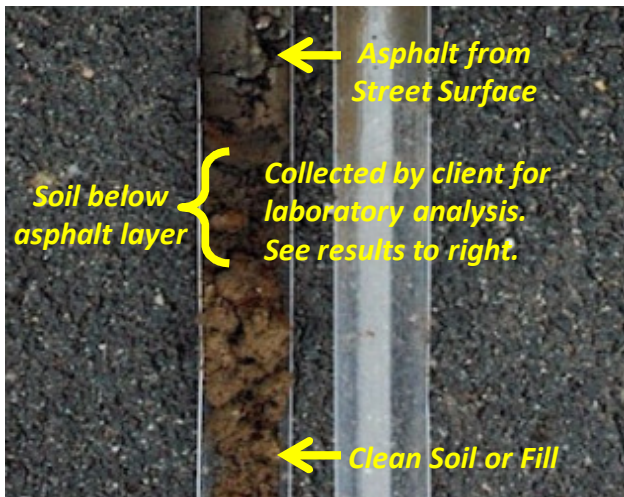
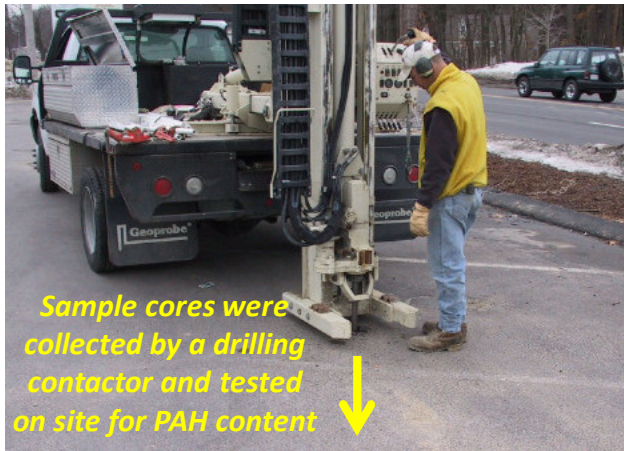
*Benzo[a]Pyrene concentrations calculated by dividing PAH results by 19

Summary of Results

Both the TD-500D and UVF-3100D analyzers generated similar results to one another. The asphalt collected from this site is twice the action limit; PAHs are >1,000 ppm.

Both instruments are suitable for this application. Sitelab's TD-500D model is a low cost, hand-held instrument, while the UVF-3100D model can perform hydrocarbon fingerprinting and includes software to record test results to a computer. Both instruments have very low detection limits and can detect PAHs as low as 0.05 ppm.

By dividing the Total PAH results by the average response factor of "19", the concentration of Benzo[a]Pyrene can be estimated using either instrument to see if the samples also exceed the BAP action limit.



Property Redevelopment Site: Dracut, Massachusetts

Sitelab's mobile laboratory service was hired by an environmental consultant to test samples on-site for PAHs. The existing pavement was to be excavated and trucked away for disposal. Soils below the pavement, however, which contained residual fragments of asphalt, could be reused on site depending on how contaminated it was.

A split sample was collected and sent off-site to a MADEP certified laboratory. The laboratory reported 68 ppm PAH. The UVF-3100D detected 61 ppm and the TD-500D detected 85 ppm. This good correlation demonstrates both field devices are suitable for this application.

The proportions of Benzo[a]Pyrene and its 'cousin compounds' in the soil from this site is similar to the asphalt samples tested in the UK. Although Sitelab's fluorescence technology cannot detect BAP directly, response factors can be used to accurately estimate this compound, if necessary.



PAH Result = 61 ppm
BAP* = 4.1 ppm



PAH Result = 85 ppm
BAP* = 5.6 ppm

Confirmatory Lab PAH Results using U.S. EPA Method 8270 by GC/MS

Concentrations are in ppm units (mg/Kg)

Naphthalene	ND
Acenaphthylene	1.0
Acenaphthene	ND
Fluorene	1.4
Phenanthrene	11
Anthracene	3
Fluoranthene	13
Pyrene	11
Benzo[a]Anthracene	4.8
Chrysene	5.2
Benzo[b]Fluoranthene	4.8
Benzo[k]Fluoranthene	2.4
Indeno[1,2,3]Pyrene	2.8
Dibenzo[ah]Anthracene	0.6
Benzo[ghi]Perylene	2.5
Benzo[a]Pyrene	4.6
Total PAH Compounds:	68

*BAP Response Factor: 15

Samples Prepared using Solvent Extraction:

Product No. EXTR010-20



Samples are extracted in methanol using disposable test kits. Extracts are then diluted and measured on the TD-500D or UVF-3100D, which is calibrated to Sitelab's PAH kit.

PAH Calibration Kits used for Analysis:

Product No. CAL-060 for UVF-3100D

Product No. CAL-061 for TD-500D



Sitelab's calibration kits contain specially formulated, certified standards which contain the same 16 PAH compounds detected by the laboratory GC methods. The PAH calibration kits are reusable and are available with a 3-month or 6-month expiration date. Sitelab certificate of analysis and MSDS is included.