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Since 2005 Ramboll scientists have directed a long-term study sponsored by the Pavement Coatings Technology Council to monitor levels of polycyclic aromatic hydrocarbons (PAHs) in stream sediments in Austin, Texas. Effective January 2006, the City of Austin banned the use of pavement sealer products formulated with coal tar-based materials, which contain PAHs. City staff projected a 90% reduction in PAH inputs to streams from this action. To monitor the changes potentially related to the ban, Ramboll collected sediment samples at a series of Austin stream locations in 2005, before the ban, in 2008, approximately 2 years after the ban, and in 2023, approximately 17 years after the ban.

Stream characteristics in Austin are advantageous for this type of sediment monitoring over time because there are a number of stream systems with hard rock stream beds where pockets of sediment from nearby areas collect, but are then scoured away completely during subsequent storm events that yield high velocity, flash-flood type flows. Sediment collected from these stream locations is more reflective of recent inputs from the surrounding watersheds compared with cores from the bottom of silty streams where newly deposited sediment overlays older sediment beneath, making evaluation of discrete timeframes challenging.

Using this stream characteristic as a study design feature means that the results from the stream sediment samples evaluated by Ramboll reflect snapshots in time of conditions before, shortly after, and well after the ban. Samples in 2008 and 2023 were collected from the same locations along streams as in 2005, albeit reflecting recently deposited sediment not present at the preceding event.

The primary finding of the monitoring study is that sediment PAH concentrations have not changed notably since the ban.

<b>Timepoint</b>	<b>Average</b> (Sum of 16 EPA Priority PAHs)	
Before (2005)	11.1 mg/kg	24 samples
Shortly After (2008)	17 mg/kg	20 samples
Well After (2023)	11.8 mg/kg	21 samples

When analyzed statistically, there are no significant differences between the groups of results from each year. Also, comparing 2005 to 2023 results at specific locations, total PAH levels increased at 6 locations and decreased at 7 locations. In other words, there is no consistent trend downwards, nor upwards, over time. This supports a conclusion that the pavement sealer ban did not change conditions

in Austin streams and reduce PAH levels. The sources contributing PAHs to Austin stream continue to yield conditions similar to those before the ban.

Additional analyses looked at the chemical fingerprints resulting from combinations of various PAHs found in samples. PAHs are produced by combustion of fossil fuels and organic materials, including wood. PAH fingerprints can be indicative of different sources of PAHs. The most notable finding is that the 2023 fingerprints remain similar to those found in 2005. And, both 2005 and 2023 fingerprints resemble those common for sediments from urban areas across the US. The fingerprints indicate a mixture of PAH sources, which is expected from the various combustion sources in highly populated areas. Further, the fingerprints from sediment samples before and after the ban do not match those obtained from reference samples of either coal tar or coal tar-based pavement sealer. Both of these findings indicate that coal tar-based pavement sealers were not a predominant source of PAHs in Austin streams before the ban and that targeting this specific product did not substantially change the mixture of PAHs found in area streams, nor the overall levels as presented above.

PAHs are ubiquitous in sediments around urban waterways because combustion processes are ubiquitous. Coal tar-based pavement sealer products have a service life of up to approximately 5 years. At the time of the most recent sampling, 17 years after ban, new PAH inputs to streams from old pavement sealer applications would have dropped off substantially, perhaps nearly entirely. However, no corresponding change in PAH concentrations in Austin stream sediments or PAH fingerprints has been observed. The data collected in the field do not support the assertion made by Austin City staff that the ban targeting one particular product would cut PAH inputs to streams in the city by 90%.