

US Environmental Protection Agency  
Office of Enforcement and Compliance Assurance  
Next Generation Compliance  
**ADVANCED MONITORING**

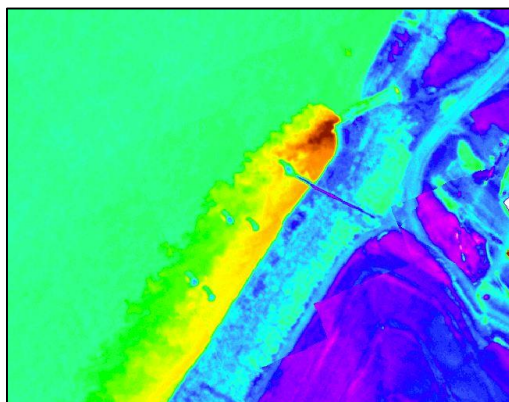
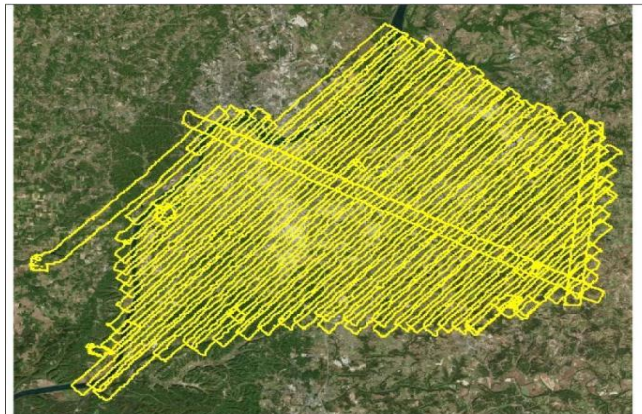
The presentation of these technologies and uses of technology is not intended as an endorsement of any type or brand of advanced monitoring technology, but to educate about the range of technologies available and their uses to improve water quality.

**Using Aerial Infrared Images to Detect Illicit Discharges  
Louisville, KY Metropolitan Sewer District**

**Summary:** Louisville, KY Metropolitan Sewer District (MSD) has been using aerial photos along with infrared and thermal images to identify MS4 illicit discharges and other issues. MSD has found that these images help save money and find problems sooner so they can be fixed sooner. There is some expertise and data analysis needed to best interpret the images and identify issues. The issues are then verified with field observations.

Infrared cameras, especially gas-imaging cameras, have revolutionized air inspections and enforcement. Now Louisville, KY is using this same type of technology to help them find and investigate illicit discharges and septic issues. How this is done:

1. Contract for flight and imaging above the local stream network. (See image at right.) Flight is done during dry periods (at least 72 hours after a storm of  $> 0.1''$ ) and when there is a larger temperature difference between the conveyance system and illicit connections (winter).
2. Sensor data must be calibrated and converted into image files, then adjusted if needed to yield the best image differentiation.
3. Anomalies found on images are investigated by field personnel.
4. Enforcement or corrective action is taken as appropriate.



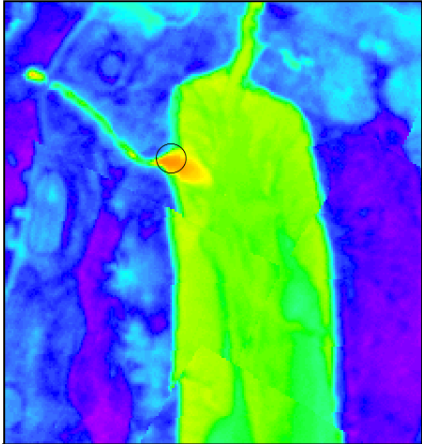
Infrared image shows permitted discharge (red) into Ohio River.

Infrared and thermal imaging detects wavelengths outside the visible range. Louisville MSD conducted these imaging flights in 2013 and 2015.

Infrared and thermal imaging and analysis saves money—it is an alternative to traditional, labor-intensive field exercises that can take months or years to complete with high costs and limited results. This method allows field investigations to be focused on areas where anomalies are detected, leading to much more efficient investigations and faster resolution of issues. In 2013, Louisville found that it spent \$105 K on imaging and about \$50 K on follow-up analysis. Compared with the

traditional approach of walking the lines at a cost of about \$450 K, the infrared and thermal imaging approach saved almost \$300 K and found issues faster so they could be fixed faster.

Louisville MSD developed standard operating procedures for evaluating thermal images. This, together with field investigation, is important because some anomalies can be due to shallow water or slopes that can show on images as warmer water.



Orange in this image shows leakage from a valve and drainage pipe into a pond. This is a repeat offender. Imaging also allows better tracking of conditions over time.



This image shows the lines of a septic field.

**Louisville, KY Contact:**

Wes Sydnor, MSD Louisville

502-540-6274, [Wesley.Sydnor@louisvillemsd.org](mailto:Wesley.Sydnor@louisvillemsd.org)

## Next Generation Compliance

<https://www.epa.gov/compliance/next-generation-compliance>

**Contacts:**

Esteban Herrera, Advanced Monitoring Team  
303-462-9385, [herrera.esteban@epa.gov](mailto:herrera.esteban@epa.gov)

Catherine Tunis, Next Gen Education/Outreach  
202-564-0476, [tunis.catherine@epa.gov](mailto:tunis.catherine@epa.gov)