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## **Supplementary Information**

### SI TEXT I Sediment - Analytical Methods

All sediment samples were sieved to quantify the percent fines (<63  $\mu\text{m}$ ) and percent sand (>63  $\mu\text{m}$ ). Particle size of pavement sediment and fluvial sediment samples for the <63  $\mu\text{m}$  fraction was measured at the U.S. Geological Survey (USGS) Water Science Center in Baltimore, MD, using a laser in situ scattering transmissometer (LISST-100X)

Fine sediment (<63  $\mu\text{m}$ ) was prepared for analysis in the LISST-100X by transferring an aliquot (0.0210–0.0300 g) of sample into a 125-mL Erlenmeyer flask. 10 mL of a 50 g/L solution of hexametaphosphate ( $\text{NaPO}_4$ )<sub>6</sub> was added to aid in deflocculation. Samples were placed in an ultrasonic bath for 5 minutes to disperse the particles and put on a shaking table for a minimum of 16 hours. Results are expressed as the median particle diameter ( $D_{50}$ ) of the sediment (Clifton et al., 2019).

Pavement sediment collected by vacuum to determine yields was dried at 65°C, weighed, wet-sieved to 63  $\mu\text{m}$  using polyester sieves, dried at 65°C, and weighed again. The mass of material greater than and less than 63  $\mu\text{m}$  in size was recorded. These samples were not analyzed for radionuclides or particle size.

### SI TEXT II Rainfall, Turbidity, Suspended Sediment, and Flow—Collection and Computation Methods

Rainfall data were obtained from University of Maryland, Baltimore County, Center for Urban Environmental Research and Education, who maintains a rain gage at the Dead Run streamflow-gaging station. Rainfall is recorded in increments of 0.254 mm with a model 6011-A tipping-bucket rain gage (All Weather Inc., formerly Qualimetrics). Precipitation data are post-processed to report summed precipitation depths in increments of 1 minute. Turbidity is measured using a nephelometric near-IR turbidimeter sensor, with a detection range of 0 to 4000 FNU (formazin nephelometric units), a

precision of 0.01 FNU, and accuracy of 0.3 FNU or  $\pm 2\%$  of reading. The sensor is mounted on a YSI EXO2 sonde secured to the streambed in a protective housing. Turbidity sensors are calibrated every 8 weeks using a 2-point calibration with distilled water and YSI turbidity calibration solution (YSI item 607300 (124 FNU)). Turbidity data were collected at 5-minute intervals during the study period. Suspended sediment was collected using an ISCO 6712 automated sampler over a range of storm magnitudes and compared with equal-width-increment (EWI) samples collected at base flow and at medium- to high-flow events using a DH-81 sampler at multiple verticals across the channel, following USGS protocols (Kemper et al., 2019; Edwards and Glysson, 1999; Gray and Simões, 2008). This method ensures that the ISCO point samples are comparable and if necessary corrected to EWI samples. Water samples were sent to the USGS Sediment Laboratory in Kentucky for analysis of suspended sediment concentration (SSC) ([https://ky.water.usgs.gov/technical\\_info/dist\\_sedlab\\_files/sed\\_lab.htm](https://ky.water.usgs.gov/technical_info/dist_sedlab_files/sed_lab.htm)). A relation between turbidity and SSC was established as:

$$\text{SSC (mg/L)} = \text{Turbidity (FNU)}^{0.98} * 2.4 \quad (1)$$

SSC was estimated for each 5-minute interval and multiplied by flow ( $\text{m}^3/\text{s}$ ) to compute a 5-minute suspended sediment load ( $\text{mg/s}$ ). Flow was monitored and computed at 5-minute increments by the USGS Maryland-Delaware-DC Water Science Center (U.S. Geological Survey, 2019). Precipitation data are available from the Long Term Ecological Research (LTER) Network data portal (Welty and Lagrosa, 2018); turbidity and suspended sediment data are available from the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) Hydrologic Information System (Welty and Kemper, 2018).

*Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.*

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