TO: INDEPENDENT SCIENTIFIC ADVISORY COMMITTEE (ISAC)
FROM: EXECUTIVE DIRECTOR'S OFFICE (EDO)
SUBJECT: SEDIMENT AUGMENTATION PEER REVIEW
DATE: JUNE 26, 2024

Third-party peer review of our Sediment Augmentation Data Synthesis Compilation was conducted this spring and the final Peer Review Report is near completion. The three reviewers (James Brasington, Mark Smith, and Richard Williams) offered comments and suggestions regarding report organization, text and figure edits, and analysis and methods. Key comments regarding analysis and methods are summarized here along with proposed initial EDO responses. In advance of finalizing the Peer Review Report and sharing that Report with the Technical Advisory Committee (TAC) for discussion, we wanted to take advantage of the ISAC being assembled for the PRRIP Summer 2024 ISAC Meeting to discuss this short set of key comments and elicit ISAC feedback on the direction of the proposed EDO responses.

1. LiDAR and Raster Differencing Uncertainty

We requested feedback on our decision not to threshold our LiDAR data or quantify/account for error in our two- and three-dimensional analyses. Most reviewers understood our reasoning but wanted to be shown more clearly a) what the error was and b) how much thresholding/not thresholding would have altered results. For example, Brasington asked us to include more details and evidence regarding the LiDAR contractor's removal of systematic errors, while Williams pointed out that Anderson 2019 (which we cite) "argues that estimated uncertainty bounds should be part of a quantitative estimate of volumetric mean change" and suggests that we characterize uncertainty using either Anderson 2019 or Vericat 2017 approaches.

EDO Response: We agree with this advice and have several ideas for how to address it.

Methodological Details: We will present a more thorough description of how the LiDAR contractor collected, verified, and post-processed the data.

Systematic Error: We will test for residual systematic error in our post-processed LiDAR by showing year-to-year elevation changes at known stable points (Figure 1). Year-to-year elevation change on interstates and other stable features should be very small and normally distributed around zero. We will also investigate magnitudes of error where in-channel vegetation changed year-to-year based on Brasington's comment that the conversion from vegetation height to bare-earth elevation may be prone to systematic errors.

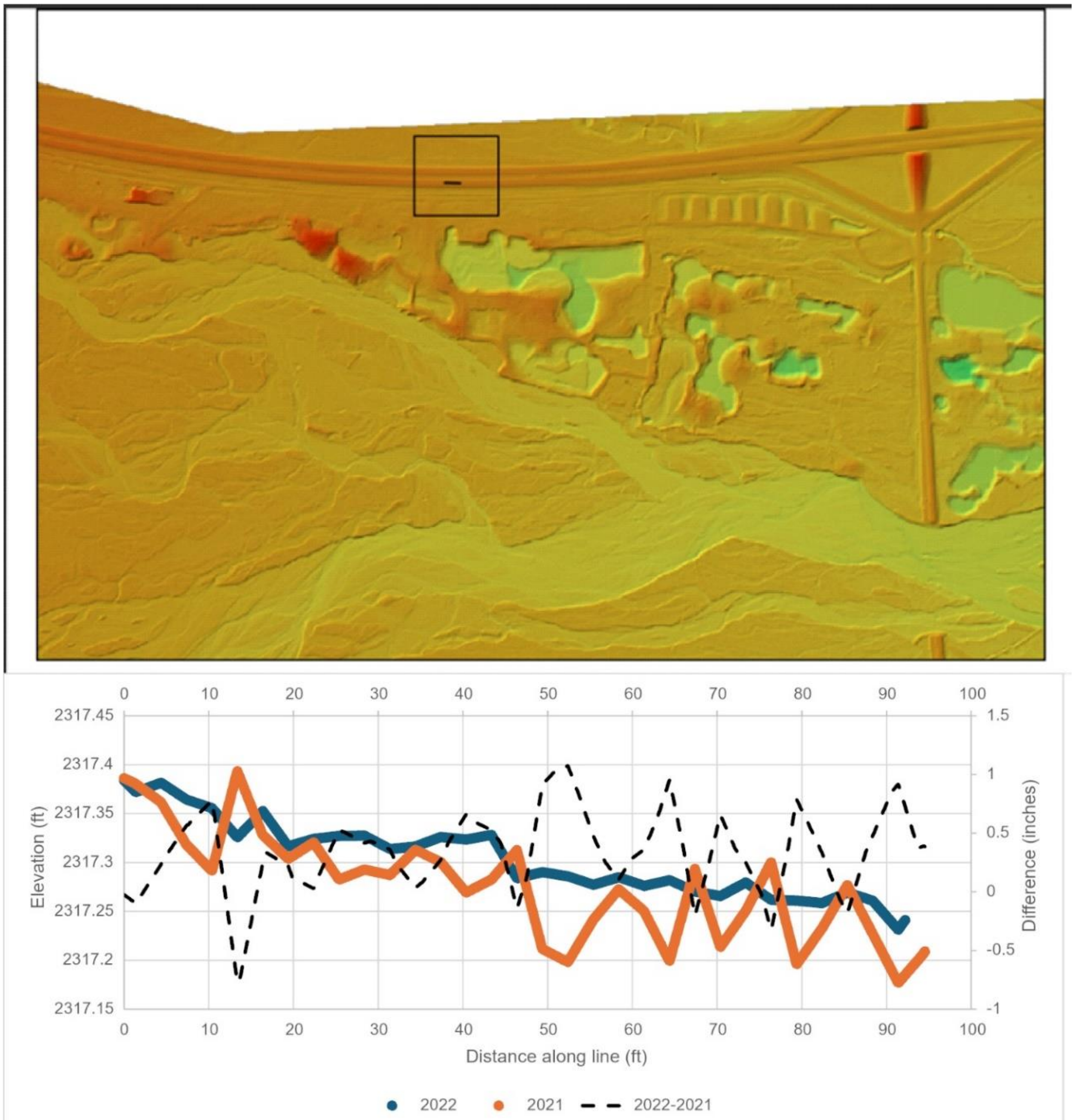

Figure 1. This illustrates a method for checking for systematic error. The top panel shows the location of the extracted line (black line in black box) and the bottom panel shows the difference between the 2022 and 2021 LiDAR elevations. In this example, 2022 data averaged 0.5 inches higher between station 50 and 100. We envision conducting similar analyses on roadways throughout our reach of interest to investigate the presence of systematic error over stable points.

Anderson, S. W. (2019). Uncertainty in quantitative analyses of topographic change: error propagation and the role of thresholding. Earth Surface Processes and Landforms, 44(5), 1015-1033. doi:10.1002/esp.4551

Vericat, D., Wheaton, J. M., & Brasington, J. (2017). Revisiting the Morphological Approach: Opportunities and Challenges with Repeat High-Resolution Topography. In D. Tsutsumi & J. Laronne (Eds.), Gravel-Bed Rivers: Process and Disasters (pp. 121-158). doi:10.1002/9781118971437.ch5

2. Lateral Erosion Delineation Method

We asked reviewers to consider whether our method of separating lateral erosion from bed aggradation/degradation was appropriate. While most found the method appropriate, Williams asked that we evaluate how the method works compared to "expert manual interpretation" as used in Wheaton et al. 2013.

EDO Response: We will address this by comparing our more automated method of hydraulic model result differencing with the Wheaton method on two small reaches of river in order to validate the automated method. Staff will independently delineate lateral erosion by hand using differenced rasters and aerial imagery, after first reviewing a manually delineated test reach. The test reach will help the staff agree upon the process and definitions, while the independent delineation will allow an examination of the effect of individual bias in manual interpretation. Areas of hand delineated lateral erosion will be compared with the area delineated in our report. We expect to visually compare the locations and intensity of lateral erosion predicted by our systematic remote sensing process and the manual interpretation. We will also quantify and compare the volumes predicted by both methods.

Wheaton, J. M., Brasington, J., Darby, S. E., Kasprak, A., Sear, D., & Vericat, D. (2013). Morphodynamic signatures of braiding mechanisms as expressed through change in sediment storage in a gravel-bed river. Journal of Geophysical Research: Earth Surface, 118(2), 759-779. doi:10.1002/jgrf.20060

3. Analyze the North Channel as a control reach

Williams suggested we conduct geomorphic analyses (wetted width, sinuosity, longitudinal profiling, etc.) on the north channel to serve as a comparison to the J2 Channel. The reasoning behind the suggestion is that these two branches of the same river have many similarities, but only the J2 Channel has been impacted by the hydropower return, so the North Channel may act as a "control reach".

EDO Response: While we agree that further examination of the North Channel would be interesting, we do not predict that it would add meaningfully to the conclusions of our report. This is mainly because the North Channel and J2 Channel differ not only in sediment inputs (clearwater return vs. natural regime) but also in flow variation and magnitude. For decades, the J2 Channel has experienced little variation in flow while the North Channel has experienced frequent very low flows and several floods (Figure 2). If the North Channel represented the J2 channel but with a natural sediment regime (i.e., no clearwater discharge), then comparisons between the wetted width, sinuosity, longitudinal profiles, and other variables between the two channels would provide helpful information on the impact of the changes in sediment transport regime since the beginning of J2 Return flows. However, we propose that the North Channel is in practice a poor control to isolate the impact of sediment transport differences.

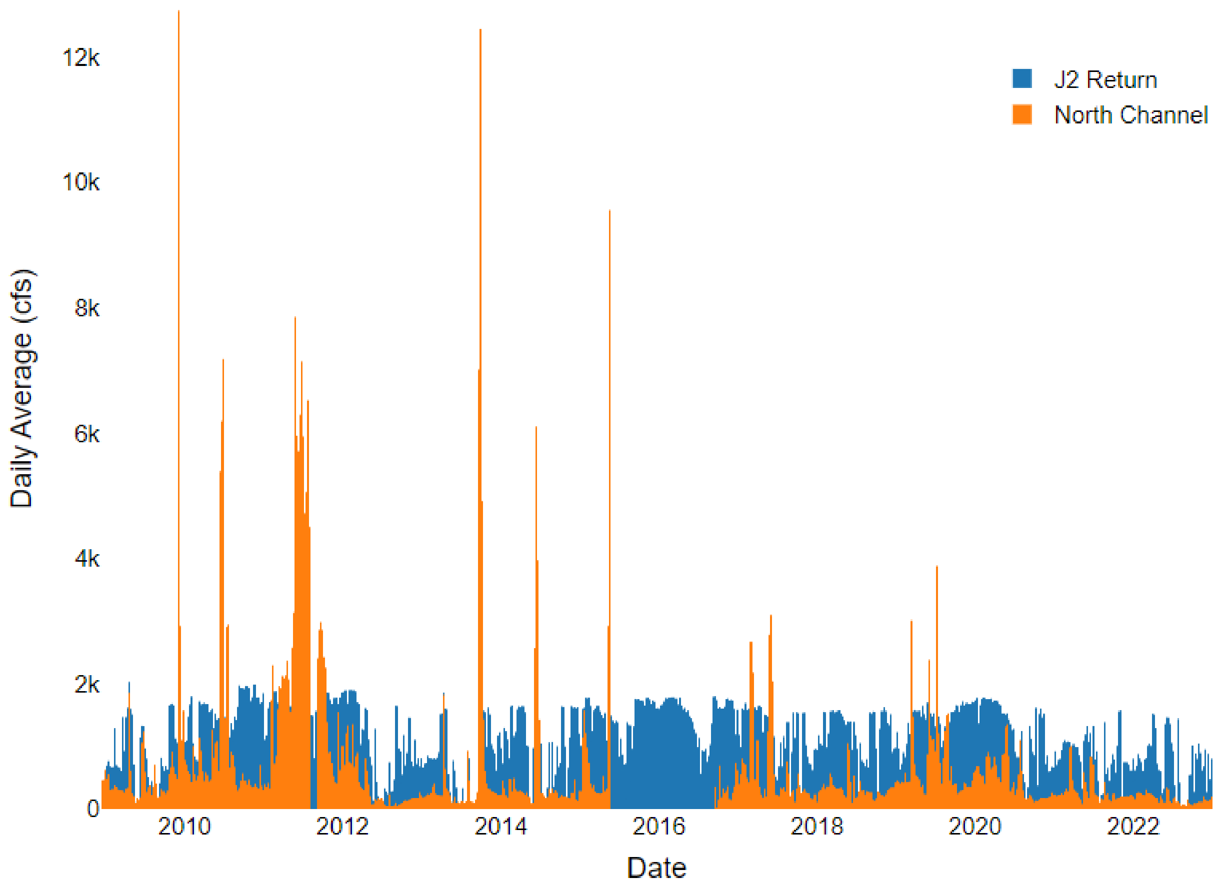

Figure 2. Daily discharge from the J2 Return and on the North Channel and at the USGS Overton gage from 2009 to 2022. J2 Return flows vary between 0 and 2,000 cfs while the North Channel varies between 0 and 12,000 cfs. Note there is a gap in gage data on the North Channel in 2016.

4. Volume Change Analysis

Brasington and Williams commented on our approach to summing bed volume change in each region to compute net change rather than providing the raw values of aggradation and degradation similar to Vericat, 2017. Williams suggested that it would be "beneficial to more extensively segregate erosion and deposition."

EDO Response: We are currently uncertain of what the benefit of this segregated accounting would be for our stakeholders. To address a different comment from Brasington we are planning to add more figures of year-to-year LiDAR differenced rasters (Figure 3). We believe these additional figures may also help to add context to our "net change" values by visually depicting the areas of aggradation and degradation on the channel bed.

Vericat, D., Wheaton, J. M., & Brasington, J. (2017). Revisiting the Morphological Approach: Opportunities and Challenges with Repeat High-Resolution Topography. In D. Tsutsumi & J. Laronne (Eds.), Gravel-Bed Rivers: Process and Disasters (pp. 121-158). doi:10.1002/9781118971437.ch5