Appendix D. Grain Shear Stress, Largest Mobilized Particle, and Particle Classification for FASTMECH simulations 1 through 5, Coeur d'Alene River, Idaho

Table D-1. Grain shear stress, largest mobilized particle, and particle classification for a factor of 0.5, 1.0, and 1.5 times the dune height and (or) dune length for FASTMECH simulation 1 (river discharge, 10,500 cubic feet per second), in the Dudley reach, Coeur d'Alene River, Idaho.

[**Abbreviations:** d_a, largest mobilized particle size in millimeters; N/m^2, Newtons per square meter; ft, feet; mm, millimeter. **Symbols:** λ, wave length of dune, in feet; Δ, wave height of dune in feet; τ_b, FASTMECH simulated bed shear stress, in Newtons per square meter (see equation 3); τ'_o, grain shear stress, in Newtons per square meter (see equation 5)]

Model simulated results Average τ_b = 1.8 N/m^2 Maximum τ_b = 2.1 N/m^2		Wave length (λ) multiplication factor		
		0.5 (λ = 31.5 ft)	1.0 (λ = 63 ft)	1.5 (λ = 94.5 ft)
Wave height (Δ) multiplication factor	0.5 (Δ = 0.55 ft)	τ'_o = 1.2 N/m^2 d_a = 1.9 mm Very coarse sand	τ'_o = 1.4 N/m^2 d_a = 2.2 mm Very fine gravel	τ'_o = 1.5 N/m^2 d_a = 2.4 mm Very fine gravel
	1.0 (Δ = 1.1 ft)	τ'_o = 0.80 N/m^2 d_a = 1.4 mm Very coarse sand	τ'_o = 1.1 N/m^2 d_a = 1.8 mm Very coarse sand	τ'_o = 1.3 N/m^2 d_a = 2.0 mm Very fine gravel
	1.5 (Δ = 1.65 ft)	τ'_o = 0.58 N/m^2 d_a = 1.1 mm Very coarse sand	τ'_o = 0.88 N/m^2 d_a = 1.5 mm Very coarse sand	τ'_o = 1.1 N/m^2 d_a = 1.7 mm Very coarse sand

Table D-2. Grain shear stress, largest mobilized particle, and particle classification for a factor of 0.5, 1.0, and 1.5 times the dune height and (or) dune length for FASTMECH simulation 2 (river discharge, 14,000 cubic feet per second), in the Dudley reach Coeur d'Alene River, Idaho.

[**Abbreviations:** d_a, largest mobilized particle size in millimeters; N/m^2, Newtons per square meter; ft, feet; mm, millimeter. **Symbols:** λ, wave length of dune, in feet; Δ, wave height of dune in feet; τ_b, FASTMECH simulated bed shear stress, in Newtons per square meter (see equation 3); τ'_o, grain shear stress, in Newtons per square meter (see equation 5)]

Model simulated results Average τ_b = 2.2 N/m^2 Maximum τ_b = 2.6 N/m^2		Wave length (λ) multiplication factor		
		0.5 (λ = 31.5 ft)	1.0 (λ = 63 ft)	1.5 (λ = 94.5 ft)
Wave height (Δ) multiplication factor	0.5 (Δ = 0.55 ft)	τ'_o = 1.4 N/m^2 d_a = 2.3 mm Very fine gravel	τ'_o = 1.7 N/m^2 d_a = 2.7 mm Very fine gravel	τ'_o = 1.9 N/m^2 d_a = 2.8 mm Very fine gravel
	1.0 (Δ = 1.1 ft)	τ'_o = 0.97 N/m^2 d_a = 1.6 mm Very coarse sand	τ'_o = 1.4 N/m^2 d_a = 2.1 mm Very fine gravel	τ'_o = 1.6 N/m^2 d_a = 2.4 mm Very fine gravel
	1.5 (Δ = 1.65 ft)	τ'_o = 0.71 N/m^2 d_a = 1.3 mm Very coarse sand	τ'_o = 1.1 N/m^2 d_a = 1.8 mm Very coarse sand	τ'_o = 1.3 N/m^2 d_a = 2.0 mm Very fine gravel

Table D-3. Grain shear stress, largest mobilized particle, and particle classification for a factor of 0.5, 1.0, and 1.5 times the dune height and (or) dune length for FASTMECH simulation 3 (river discharge, 17,300 cubic feet per second), in the Dudley reach Coeur d'Alene River, Idaho.

[**Abbreviations:** d_a, largest mobilized particle size in millimeters; N/m^2, Newtons per square meter; ft, feet; mm, millimeter. **Symbols:** λ, wave length of dune, in feet; Δ, wave height of dune in feet; τ_b, FASTMECH simulated bed shear stress, in Newtons per square meter (see equation 3); τ'_o, grain shear stress, in Newtons per square meter (see equation 5)]

Model simulated results Average τ_b = 2.7 N/m^2 Maximum τ_b = 3.3 N/m^2		Wave length (λ) multiplication factor		
		0.5 (λ = 31.5 ft)	1.0 (λ = 63 ft)	1.5 (λ = 94.5 ft)
Wave height (Δ) multiplication factor	0.5 (Δ = 0.55 ft)	τ'_o = 1.8 N/m^2 d_a = 2.7 mm Very fine gravel	τ'_o = 2.1 N/m^2 d_a = 3.2 mm Very fine gravel	τ'_o = 2.3 N/m^2 d_a = 3.4 mm Very fine gravel
	1.0 (Δ = 1.1 ft)	τ'_o = 1.2 N/m^2 d_a = 1.9 mm Very coarse sand	τ'_o = 1.7 N/m^2 d_a = 2.5 mm Very fine gravel	τ'_o = 1.9 N/m^2 d_a = 2.9 mm Very fine gravel
	1.5 (Δ = 1.65 ft)	τ'_o = 0.87 N/m^2 d_a = 1.5 mm Very coarse sand	τ'_o = 1.3 N/m^2 d_a = 2.1 mm Very fine gravel	τ'_o = 1.6 N/m^2 d_a = 2.4 mm Very fine gravel

Table D-4. Grain shear stress, largest mobilized particle, and particle classification for a factor of 0.5, 1.0, and 1.5 times the dune height and (or) dune length for FASTMECH simulation 4 (river discharge, 22,860 cubic feet per second), in the Dudley reach Coeur d'Alene River, Idaho.

[**Abbreviations:** d_a, largest mobilized particle size in millimeters; N/m^2, Newtons per square meter; ft, feet; mm, millimeter. **Symbols:** λ, wave length of dune, in feet; Δ, wave height of dune in feet; τ_b, FASTMECH simulated bed shear stress, in Newtons per square meter (see equation 3); τ'_o, grain shear stress, in Newtons per square meter (see equation 5)

Model simulated results Average τ_b = 4.0 N/m^2 Maximum τ_b = 4.9 N/m^2		Wave length (λ) multiplication factor		
		0.5 (λ = 31.5 ft)	1.0 (λ = 63 ft)	1.5 (λ = 94.5 ft)
Wave height (Δ) multiplication factor	0.5 (Δ = 0.55 ft)	τ'_o = 2.6 N/m^2 d_a = 3.9 mm Very fine gravel	τ'_o = 3.23 N/m^2 d_a = 4.6 mm Fine gravel	τ'_o = 3.4 N/m^2 d_a = 4.9 mm Fine gravel
	1.0 (Δ = 1.1 ft)	τ'_o = 1.8 N/m^2 d_a = 2.7 mm Very fine gravel	τ'_o = 2.5 N/m^2 d_a = 3.6 mm Very fine gravel	τ'_o = 2.8 N/m^2 d_a = 4.1 mm Fine gravel
	1.5 (Δ = 1.65 ft)	τ'_o = 1.3 N/m^2 d_a = 2.0 mm Very fine gravel	τ'_o = 2.0 N/m^2 d_a = 3.0 mm Very fine gravel	τ'_o = 2.4 N/m^2 d_a = 3.5 mm Very fine gravel

Table D-5. Grain shear stress, largest mobilized particle, and particle classification for a factor of 0.5, 1.0, and 1.5 times the dune height and (or) dune length for FASTMECH simulation 5 (river discharge, 28,900 cubic feet per second), in the Dudley reach Coeur d'Alene River, Idaho.

[**Abbreviations:** d_a, largest mobilized particle size in millimeters; N/m^2, Newtons per square meter; ft, feet; mm, millimeter. **Symbols:** λ, wave length of dune, in feet; Δ, wave height of dune in feet; τ_b, FASTMECH simulated bed shear stress, in Newtons per square meter (see equation 3); τ'_o, grain shear stress, in Newtons per square meter (see equation 5)]

Model simulated results Average τ_b = 5.7 N/m^2 Maximum τ_b = 6.7 N/m^2		Wave length (λ) multiplication factor		
		0.5 (λ = 31.5 ft)	1.0 (λ = 63 ft)	1.5 (λ = 94.5 ft)
Wave height (Δ) multiplication factor	0.5 (Δ = 0.55 ft)	τ'_o = 3.7 N/m^2 d_a = 5.3 mm Fine gravel	τ'_o = 4.5 N/m^2 d_a = 6.4 mm Fine gravel	τ'_o = 4.9 N/m^2 d_a = 6.9 mm Fine gravel
	1.0 (Δ = 1.1 ft)	τ'_o = 2.5 N/m^2 d_a = 3.0 mm Very fine gravel	τ'_o = 3.5 N/m^2 d_a = 5.1 mm Fine gravel	τ'_o = 4.0 N/m^2 d_a = 5.7 mm Fine gravel
	1.5 (Δ = 1.65 ft)	τ'_o = 1.8 N/m^2 d_a = 2.8 mm Very fine gravel	τ'_o = 2.8 N/m^2 d_a = 4.1 mm Fine gravel	τ'_o = 3.4 N/m^2 d_a = 4.9 mm Fine gravel

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