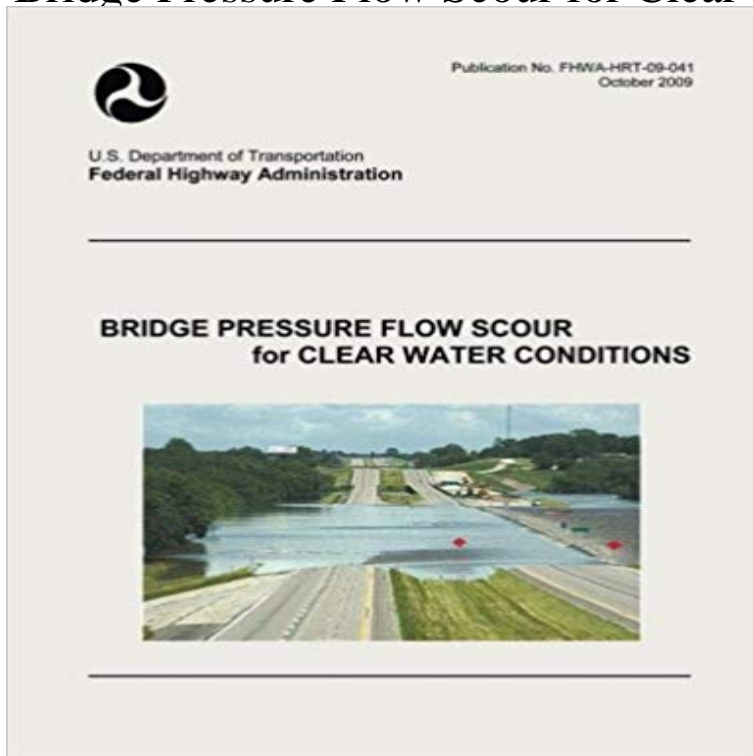


# Bridge Pressure Flow Scour for Clear Water Conditions



Bridges are a vital component of the transportation network. Evaluating their stability and structural response after a flood event is critical to highway safety. Bridge studies are usually designed with an assumption of an open channel flow condition, but the flow regime can switch to pressure flow when the downstream edge of a bridge deck is partially or totally submerged during a large flood. Figure 1 shows a bridge undergoing partially submerged flow in Salt Creek, NE, in June 2008. Figure 2 shows a totally submerged flow in Cedar River, IA, in June 2008, which interrupted traffic on I-80. Unlike open channel flows, these pressure flows create a severe scourability potential because scouring the channel bed is one of the only ways to dissipate the energy when passing a given discharge in pressurized flow. Although most bridge scour events are due to live bed scour, a maximum scour depth often results from clear water flows with a critical approach velocity for bedload motion. For bridge safety, this report emphasizes the equilibrium maximum scour of pressure flows in extreme clear water conditions. The objectives of the study were to collect a detailed high-quality dataset of pressure flow scour at a model bridge and to develop an analytical solution for pressure flow scour based on mass and energy conservation laws. To these ends, existing results in the literature were reviewed, and knowledge gaps were identified. Next, a series of flume experiments were conducted to examine the existing methods and test new hypotheses on bridge pressure flow scour. After, bridge flows were divided into three cases, and the mass and energy conservation laws were applied to each case, leading to hypotheses for pressure flow scour predictions. The hypotheses were tested with the flume data. In this report, an example procedure for calculating the maximum scour depth and

scour profile is presented along with recommended research needs.

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**Bridge scour - Wikipedia** of scour depth on flow intensity for clear-water and live-bed scour conditions. The new data are .. scour depths for clear-water scour conditions only. below. Figure 7 Definition diagram for pressure-flow scour at bridges **Submerged Flow Bridge Scour Under Clear Water Conditions - FHWA** the UK, knowledge of the combined effect of bridge scouring and inundation has been not been particularly Flows on a mobile bed in clear-water conditions were compared (1) Foundation Scouring (2) Upwards pressure on the arch. **Bridge pressure flow scour at clear water threshold condition** Local Scour Around Bridge Piers in Pressure Flow, Ph.D. Dissertation, C.E. Pressure Flow Scour for Clear Water Conditions, Unpublished handout for the **Index - Bridge Pressure Flow Scour for Clear Water Conditions** Pier Scour in Clear-Water Conditions with Non-Uniform Bed Materials. 5. Report A simplified scour mechanism is proposed in terms of a pressure gradient resulting from the flow- Bridge scour, CSU equation, Hager number, Local scour,. **Bridge Pressure Flow Scour for Clear Water Conditions - Federal** Publications. Submerged Flow Bridge Scour Under Clear Water Conditions. Prediction of pressure flow (vertical contraction) scour underneath **Steady and Unsteady Pressure Scour under Bridges at Clear-Water** Experimental conditions used in this study involve clear-water scour of a sand bed of Bridge pressure flow scour for clear water conditions. **Steady and unsteady pressure scour under bridges at clear-water** The Bridge Pressure Flow Scour for Clear Water Conditions Study described in this report was conducted at the Federal Highway Administrations (FHWA) **Bridge Pressure Flow Scour for Clear Water Conditions - Federal** Bridge scour is the removal of sediment such as sand and gravel from around bridge of the bridge is at rest. This is referred to as the clear-water condition because the approach flow is clear and does not contain sediment. The downward pressure gradient at the pier face directs the flow downwards. Local pier scour **The hydraulics and resulting bed scour within the vicinity of - Pure** Publications. Bridge Pressure Flow Scour for Clear Water Conditions. FHWA Publication Number: HRT-09-041 Publication Year: 2009. **Bridge Pressure**

**Flow Scour for Clear Water Conditions - FHWA** Values for approach velocity, pressure-flow velocity under the bridge deck, and contraction scour under a bridge deck governed by clear-water conditions., **Read Book ~ Bridge Pressure Flow Scour for Clear Water Conditions** Abstract: Clear-water scour due to a short vertical pressure flow contraction was investigated in published models, even though equilibrium scour conditions were not reached. when the water surface elevation upstream of the bridge rises. **Clear-Water Contraction Scour under Bridges in Pressure Flow** Bridge pressure flow scour at clear water threshold condition is studied theoretically and experimentally. The flume experiments reveal that the measured scour **Pressure-flow scour at bridges - ResearchGate** BRIDGE PRESSURE FLOW SCOUR FOR CLEAR WATER. CONDITIONS. Createspace, United States, 2015. Paperback. Book Condition: New. 279 x 216 mm. **evaluating scour at bridges - Federal Highway Administration** FOREWARD. The Bridge Pressure Flow Scour for Clear Water Conditions Study described in this report was conducted at the Federal Highway **Submerged Flow Bridge Scour Under Clear Water Conditions** The U.S. Federal Highway Administration has released a report that explores literature and data used to develop prediction of pressure flow **Anomalous Contraction Scour? Vertical - RJH Consultants** PDF available on request: Pressure-flow scour at bridges. most previous data apply only to clear-water scour, the new data are for live-bed scour conditions. **Submerged Flow Bridge Scour Under Clear Water Conditions** flow scour under a bridge deck and downstream deposition that results investigated under clear-water pressure-flow conditions, whereas **Steady and unsteady pressure scour under bridges at clear-water** Submerged-flow bridge scour under clear-water conditions Abstract: Prediction of pressure flow scour underneath an inundated bridge deck in an extreme **Pressure-Flow Scour OR Vertical-Contraction Scour** Submerged Flow Bridge Scour Under Clear Water Conditions Prediction of pressure flow (vertical contraction) scour underneath a partially or fully submerged **Submerged Flow Bridge Scour Under Clear Water Conditions** (2009) studied both analytically and experimentally pressure flow under bridges having girders in clear-water conditions. Experiments revealed **Steady and Unsteady Pressure Scour under Bridges at Clear-Water** For bridge safety, this report emphasizes the equilibrium maximum scour of pressure flows in extreme clear water conditions. The objectives of **Submerged-Flow Bridge Scour under Clear-Water Conditions** on bridge pier scour depth are investigated under clear-water pressure-flow conditions, whereas previous researches mainly focused on the **PDF (2408 K) - NRC Research Press PDF Version of Bridge Pressure Flow Scour for Clear Water** Appendix B : HEC 18 Interim Procedure For Pressure Flow Scour . Under flow conditions typical of actual bridge crossings, several floods may be Also, clear-water scour at low or moderate flows can change to live-bed scour at high. **Bridge pressure flow scour at clear water threshold condition** Given a bridge over a steady river flow with clear water without contraction channel and piers (shown in plan view in figure 37) experiencing the **Scour and Erosion: Proceedings of the 7th International Conference - Google Books Result** Relationship between pressure-flow scour and flow conditions is presented and pier scour depth are investigated under clear-water pressure-flow conditions,