

INFILTRATION OF HIGHWAY STORMWATER

Protecting Groundwater and Infrastructure

(Photo: National Park Service)

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Above: Stalactites and stalagmites—formed over time when calcium salts from dissolved limestone are deposited by dripping water—create dramatically adorned subterranean chambers in Mammoth Cave, Kentucky. At more than 400 miles long, Mammoth Cave is the longest cave system in the world.

Stormwater National Pollutant Discharge Elimination System permits, sustainability and resiliency initiatives, and other pertinent regulations that apply to state departments of transportation (DOTs) increasingly have prioritized or mandated the consideration and use of infiltration best management practices (BMPs) in the highway environment.

There are growing, evidence-based concerns that, if appropriate factors are not adequately considered and addressed during planning, design, construction, and long-term maintenance, using infiltration BMPs for highway runoff may inadvertently lead to consequences to the natural and built environment. Some of these concerns include geotechnical and infrastructure issues; local increases in groundwater elevations and the impacts to infrastructure that can result; introduction, movement, or the presence of stormwater below ground pollutants; and unnatural base flows (especially in arid regions).

Additionally, state DOTs have encountered significant issues with failure of infiltration BMPs because of challenges in design, construction, or operations and maintenance. When implemented correctly, however, infiltration can have significant benefits: water supply augmentation; reduced downstream erosion and habitat degradation; enhanced (i.e., increased) dry-weather base flows in stream systems, where beneficial; and improved stream water quality.

With regard to infiltration practices, in some cases favorable conditions and proper pretreatment result in higher success rates. In other cases, feasibility clearly is limited because of such conditions as groundwater mounding (i.e., a localized increase in groundwater levels), poor soils, and other issues. Project locations with marginal feasibility tend to require more detailed investigations and careful design and implementation to meet design objectives while avoiding premature system failure.

This article summarizes new tools—developed via National Cooperative Highway

National Research Council Stormwater Report

**United States. Congress. House.
Committee on Transportation and
Infrastructure. Subcommittee on
Water Resources and Environment**

National Research Council Stormwater Report:

Stormwater Management for Transportation Facilities Shaw L. Yu, 1993 This synthesis will be of interest to highway design engineers maintenance engineers environmental personnel administrators and others responsible for the design operation and maintenance of stormwater management for highways and ancillary facilities Information is presented on the basic hydrology needed to assess stormwater impacts and on the effectiveness of stormwater management techniques Designers of highway facilities must consider stormwater management requirements within the context of both localized runoff impacts as well as downstream effects of runoff This report of the Transportation Research Board describes the management of both stormwater quantity and stormwater quality Stormwater quantity includes an overview of methods of estimating runoff and management control practices Stormwater quality management includes discussions of the most prevalent pollutants and best management practices BMP to minimize pollutants from transportation facilities Various types of structural and non structural methods are described including their design considerations and efficiencies Several stormwater management models are described with special concern for highway applications Highlights from the 1990 National Pollutant Discharge Elimination System NPDES permits are presented Urban Storm Water Management Hormoz Pazwash, 2016-04-27 Design Drainage and Storm Water Management Systems Efficiently Urban Storm Water Management Second Edition covers the design installation and maintenance of storm water management systems addresses the impact of urban development on runoff and infiltration and focuses on storm water management relative to flooding and water pollution Recogniz **Reauthorization of the Federal Water Pollution Control Act** United States. Congress. House. Committee on Transportation and Infrastructure. Subcommittee on Water Resources and Environment, 1996

Interior, Environment, and Related Agencies Appropriations for 2012 United States. Congress. House. Committee on Appropriations. Subcommittee on Interior, Environment, and Related Agencies, 2011 *The Water Quality Act of 1994, and Issues Related to Clean Water Act Reauthorization (H.R. 3948)* United States. Congress. House. Committee on Public Works and Transportation. Subcommittee on Water Resources and Environment, 1995 Distributed to some depository libraries in microfiche **Urban Stormwater Management in the United States** National Research Council, Division on Earth and Life Studies, Water Science and Technology Board, Committee on Reducing Stormwater Discharge Contributions to Water Pollution, 2009-03-17 The rapid conversion of land to urban and suburban areas has profoundly altered how water flows during and following storm events putting higher volumes of water and more pollutants into the nation's rivers lakes and estuaries These changes have degraded water quality and habitat in virtually every urban stream system The Clean Water Act regulatory framework for addressing sewage and industrial wastes is not well suited to the more difficult problem of stormwater discharges This book calls for an entirely new permitting structure that would put authority and accountability for stormwater discharges at the municipal level A number of additional actions such as conserving natural areas reducing

hard surface cover e.g. roads and parking lots and retrofitting urban areas with features that hold and treat stormwater are recommended

Improving the EPA Multi-Sector General Permit for Industrial Stormwater Discharges National Academies of Sciences, Engineering, and Medicine, Division on Earth and Life Studies, Water Science and Technology Board, Committee on Improving the Next-Generation EPA Multi-Sector General Permit for Industrial Stormwater Discharges, 2019-09-11 Industrial stormwater is derived from precipitation and or runoff that comes in contact with industrial manufacturing processing storage or material overburden and then runs offsite and enters drainage systems or receiving waters In 1987 Congress significantly expanded the National Pollutant Discharge Elimination System NPDES program through amendments to the Clean Water Act to include industrial stormwater runoff conveyed through outfalls directly to receiving waters or indirectly through municipal separate storm sewer systems The added regulation of stormwater in the NPDES program has been challenging Stormwater is produced throughout a developed landscape and its production and delivery are episodic In 2009 the National Research Council released a comprehensive report on the Environmental Protection Agency's Stormwater Program that covered all sectors of the program This study builds on that report with a focus on industrial stormwater monitoring and management

Urban Drainage David Butler, Christopher Dugman, Christos Makropoulos, John W. Davies, 2024-12-24 This new edition of a well established textbook covers the health environmental and engineering aspects of the management of rainwater and wastewater in areas of human development Urban Drainage deals comprehensively not only with the design of new systems but also with the analysis and upgrading of existing infrastructure Keeping its balance of principles practice and research the fifth edition has had the most comprehensive update of any edition so far It includes a new chapter on urban drainage planning some significant restructuring of others and the introduction of new topics including emerging contaminants wastewater surveillance AI digital twins and cyber physical security It also addresses current concerns about climate change impacts and intermittent wastewater pollution and new ideas about sustainable and resilient systems In all cases the aim is to provide comprehensive authoritative and evidence based content prioritising innovation improved methods and solutions This is an essential text for undergraduates and graduate students lecturers and researchers in water engineering environmental engineering public health engineering engineering hydrology and related non engineering disciplines It also serves as a dependable and up to date reference for drainage engineers in water service providers local authorities and consulting engineers Throughout the text extensive examples are used to support and demonstrate the key issues

Newhall Ranch Resource Management and Development Plan and Spineflower Conservation Plan, 2009

Urban and Highway Stormwater Pollution Thorkild Hvitved-Jacobsen, Jes Vollertsen, Asbjorn Haaning Nielsen, 2010-03-25 As the world population grows already burgeoning cities are becoming taxed in every conceivable way One topic that receives few headlines but significantly impacts an area's quality of health and economic development is the challenge to maintain sustainable urban drainage SUD Poor drainage can hamper

transportation add to problems of polluti

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