In Situ Soil And Groundwater Bioremediation Techniques

New and Emerging in Situ Soil and Groundwater Remediation Technologies

Organic pollutants cause several environmental problems if discharged to air or water body. The occurrence of organic pollutants in the ecosystem, their risk and removal methods are very important issues. This book deals with several aspects of organic pollutants, especially in the light of organic pollutants monitoring, risk assessment as well as the practical application of different techniques for removing it from the environment. The book is divided into three sections contains 9 chapters. The first section explains monitoring of organic pollutants in soil and water. The second section discuses its risk to human, soil and plants. The third section focus on the different treatment process for the removal of organic pollutants.

Remediation Technologies for Soils and Groundwater

The pollution of soil and groundwater by heavy metals and other chemicals is becoming a serious issue in many countries. However, the current bioremediation processes do not often achieve sufficient remediation, and more effective processes are desired. This book deals with advances in the bioremediation of polluted soil and groundwater. In the former chapters of this book, respected researchers in this field describe how the optimization of microorganisms, enzymes, absorbents, additives and injection procedures can help to realize excellent bioremediation. In the latter chapters, other researchers introduce bioremediation processes that have been performed in the field and novel bioremediation processes. Thus, the readers will be able to obtain new ideas about effective bioremediation as well as important information about recent advances in bioremediation.

Practical Techniques for Groundwater & Soil Remediation Proceedings of the February 19-22, 1990, conference held at Newport Beach, California. Conference Directors: PAUL T. KOSTECKI, EDWARD J. CALABRESE, and CHARLES E. BELL. Advisory Committee: RICHARD BOZEK, EEI; TERRY BRAZEL, SWRCB; MARK COUSINEAU, AG; SETH DAUGHERTY, Orange County; RALPH De La PARRA, SCE; JERRY HAGGY, Shell; JOHN HANBY, HAL; JOHN HILL, ICF; JOHN HILLS, City of Anaheim; DOROTHY
Organic Pollutants Sustainable Remediation of Contaminated Soil and Groundwater: Materials, Processes, and Assessment provides the remediation tools and techniques necessary for simultaneously saving time and money and maximizing environmental, social and economic benefits. The book integrates green materials, cleaner processes, and sustainability assessment methods for planning, designing and implementing a more effective remediation process for both soil and groundwater projects. With this book in hand, engineers will find a valuable guide to greener remediation materials that render smaller environmental footprint, cleaner processes that minimize secondary environmental impact, and sustainability assessment methods that can be used to guide the development of materials and processes. Addresses materials, processes, and assessment needs for implementing a successful sustainable remediation process. Provides an integrated approach for the unitization of various green technologies, such as green materials, cleaner processes and sustainability assessment. Includes case studies based on full-scale commercial soil and groundwater remediation projects.

In-Situ Remediation of Soil and Groundwater Contaminated with Toluene This report provides a comprehensive and thorough overview of conventional engineered processes and technologies used for the remediation of contaminated sites.

Innovations in Ground Water and Soil Cleanup

Practical Design Calculations for Groundwater and Soil Remediation, Second Edition

Ground Water Issue Practical Techniques for Groundwater and Soil Remediation is a compilation of articles by the author that were printed in the National Ground Water Association (NGWA) magazine Groundwater Monitoring Review. The book provides valuable data, emphasizes the practical aspects of remediation, presents results from actual remediation programs, and helps readers prepare remediation strategies. The book also includes detailed technical data on treatment equipment performance and the costs associated with their design and operation. A unique feature of the book is that it also contains data from treatment systems that did not work. Practical Techniques for Groundwater and Soil Remediation is a "must have" source of invaluable data and tips that will be useful for all groundwater and soil remediation professionals.

Assessing the Potential for In-situ Bioremediation of Soil and Groundwater Contamination from Leaking Underground Storage Tanks in Iowa Advances in Remediation Techniques for Polluted Soils and Groundwater focuses on the thematic areas for assessment, mitigation, and management of polluted sites. This book covers advances in modelling approaches, including Machine Learning (ML)/Artificial Intelligence (AI) applications; GIS and remote sensing; sensors; impacts of climate change on geogenic contaminants; and socio-economic impacts in the poor rural and urban areas, which are lacking in a more comprehensive manner in the previous titles. This book encompasses updated information as well as future directions for researchers working in the field of management and remediation of polluted sites. Introduces fate and transport of multi-pollutants under varying subsurface conditions. Details underlying mechanisms of biodegradation and biodetoxification of geogenic, industrial and emerging pollutants. Presents recent advances and challenges in assessment, water quality modeling, uncertainty, and water supply management. Provides authoritative contributions on the diverse aspects of management and remediation from leading experts around the world.

IN SITU TREATMENT OF SOIL AND GROUNDWATER CONTAMINATED WITH CHROMIUM TECHNICAL RESOURCE GUIDE U.S. ENVIRONMENTAL PROTECTION AGENCY Based on the Lectures Given during the Eurocourse on Technologies for Environmental Cleanup: Soil and Groundwater, held at the Joint Research Centre, Ispra, Italy, September 21–25, 1992

In-situ Cleanup of Petroleum Contaminated Soil and Groundwater Using Alcohol Flooding

In Situ Bioremediation In the late 1970s and early 1980s, our nation began to grapple with the
legacy of past disposal practices for toxic chemicals. With the passage in 1980 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, it became the law of the land to remediate these sites. The U. S. Department of Defense (DoD), the nation’s largest industrial organization, also recognized that it too had a legacy of contaminated sites. Historic operations at Army, Navy, Air Force, and Marine Corps facilities, ranges, manufacturing sites, shipyards, and depots had resulted in widespread contamination of soil, groundwater, and sediment. While Superfund began in 1980 to focus on remediation of heavily contaminated sites largely abandoned or neglected by the private sector, the DoD had already initiated its Installation Restoration Program in the mid 1970s. In 1984, the DoD began the Defense Environmental Restoration Program (DERP) for contaminated site assessment and remediation. Two years later, the U. S. Congress codified the DERP and directed the Secretary of Defense to carry out a concurrent program of research, development, and demonstration of innovative remediation technologies. As chronicled in the 1994 National Research Council report, “Ranking Hazardous-Waste Sites for Remedial Action”, our early estimates on the cost and suitability of existing technologies for cleaning up contaminated sites were wildly optimistic. Original estimates, in 1980, projected an average Superfund cleanup cost of a mere $3.

International Evaluation of In-situ Biorestoration of Contaminated Soil and Groundwater In situ remediation techniques have experienced a boom over the last few years, thereby producing a wide range of valuable experiences. Their results have demonstrated that in situ techniques are a mature alternative to conventional remediation techniques. Irrespective of future policy developments, it is impossible to imagine future remediation practice without the use of in situ techniques. The book presents an overview of recent developments in the field of in situ soil remediation. The book is unique in that it is not a compilation of unrelated case studies. A conceptual approach has been chosen; remediation models described in this book are illustrated from a practical point of view. The authors present the Dutch way of treating contaminated land; The Netherlands is renowned for being at the forefront of remediation techniques as a result of the country’s progressiveness and experience in this area.

Groundwater and Soil Remediation

In Situ Treatment of Soil and Groundwater Contaminated with Chromium This bestselling author presents his latest compilation of time- and cost-saving techniques, methods, and strategies for soil and groundwater remediation. This book outlines advanced technologies, including phytoremediation, air sparging, reactive zones, vacuum-enhanced recovery, and more!

Environmental Risk Assessment of Soil Contamination At hundreds of thousands of commercial, industrial, and military sites across the country, subsurface materials including groundwater are contaminated with chemical waste. The last decade has seen growing interest in using aggressive source remediation technologies to remove contaminants from the subsurface, but there is limited understanding of (1) the effectiveness of these technologies and (2) the overall effect of mass removal on groundwater quality. This report reviews the suite of technologies available for source remediation and their ability to reach a variety of cleanup goals, from meeting regulatory standards for groundwater to reducing costs. The report proposes elements of a protocol for accomplishing source remediation that should enable project managers to decide whether and how to pursue source remediation at their sites.

In Situ Soil and Groundwater Decontamination Using Electric Resistive Heating Technology (Six-Phase Heating).

Soil and Groundwater Pollution from Agricultural Activities

Evaluation of an In Situ Soil and Groundwater Treatment Systems for a No. 2 Fuel Oil Spill Under a Power Plant Facility This project conducted a technology assessment for in-situ bioremediation of perchlorate in soil and groundwater and assessed the suitability of electron donor amendments.

In Situ Chemical Oxidation for Groundwater Remediation This work describes the in-situ treatment of solvent-contaminated ground and groundwater which involved biological and physical treatment during a six-month commercial remediation programme.
International Evaluation of In-situ Biorestoration of Contaminated Soil and Groundwater This book offers various soil and water treatment technologies due to increasing global soil and water pollution. In many countries, the management of contaminated land has matured, and it is developing in many others. Topics covered include chemical and ecological risk assessment of contaminated sites; phytomanagement of contaminants; arsenic removal; selection and technology diffusion; technologies and socio-environmental management; post-remediation long-term management; soil and groundwater laws and regulations; and trace element regulation limits in soil. Future prospects of soil and groundwater remediation are critically discussed in this book. Hence, readers will learn to understand the future prospects of soil and groundwater contaminants and remediation measures. Key Features: Discusses conventional and novel aspects of soil and groundwater remediation technologies Includes new monitoring/sensing technologies for soil and groundwater pollution Features a case study of remediation of contaminated sites in the old, industrial, Ruhr area in Germany Highlights soil washing, soil flushing, and stabilization/solidification Presents information on emerging contaminants that exhibit new challenges This book is designed for undergraduate and graduate courses and can be used as a handbook for researchers, policy makers, and local governmental institutes. Soil and Groundwater Remediation Technologies: A Practical Guide is written by a team of leading global experts in the field.

In Situ Bioremediation of Perchlorate in Soil and Groundwater

In Situ Soil and Groundwater Remediation: Theory and Practice

In Situ Soil Remediation This critical review of the status of in situ bioremediation, which is used to clean up contaminated groundwater aquifers and surface soils, has been organized according to possibilities and restrictions. Possibilities are based on present knowledge and indicate that in situ bioremediation can achieve decontamination of aquifers and soils. Restrictions encompass the scientific, engineering, legal, and other questions that stand in the way of successful development and application of in situ bioremediation. Although much has been written about bioremediation, this critical review is unique because it is comprehensive, critical, and integrated. This situation was no accident; the organization of the authorship team and the report's contents were designed to achieve each of the three attributes. Combining a good plan, outstanding individuals contributing, and an incredible amount of work, they created a critical review that defines the technical and non-technical issues that will determine how much of an impact in situ bioremediation makes on solving the world's challenges for cleanup of our legacy of improperly disposed of materials. Readers of this review will find the issues identified and connected. They will have a solid foundation for research, application, or evaluation of in situ bioremediation in the future.

In Situ Bioremediation of Perchlorate in Groundwater Soil is an irreplaceable resource that sustains life on the planet, challenged by food and energy demands of an increasing population. Therefore, soil contamination constitutes a critical issue to be addressed if we are to secure the life quality of present and future generations. Integrated efforts from researchers and policy makers are required to develop sound risk assessment procedures, remediation strategies and sustainable soil management policies. Environmental Risk Assessment of Soil Contamination provides a wide depiction of current research in soil contamination and risk assessment, encompassing reviews and case studies on soil pollution by heavy metals and organic pollutants. The book introduces several innovative approaches for soil remediation and risk assessment, including advances in phytoremediation and implementation of metabolomics in soil sciences.

Advances in Remediation Techniques for Polluted Soils and Groundwater Accompanying CD-ROM "contains spreadsheets used in many of the example calculations, color versions of some of the illustrations, and movies illustrating the NAPL migration."-- p. vi.

Contaminants in the Subsurface

In Situ Treatment of Soil and Groundwater Contaminated with Chromium

Soil and Groundwater Contamination Contamination of soil & groundwater by chromium is a significant problem in the U.S. The poor performance of pump-&-treat systems in the mid-1980s provided the driving force for research of subsurface processes in order to develop more efficient groundwater remediation strategies & techniques. As a result, new information & treatment
In Situ Soil and Groundwater Remediation

Technologies have been developed for chromium-contaminated soil & groundwater treatment. This document brings together the most current information pertaining to the science of chromium contamination & the treatment & control of sites with groundwater &/or soil contaminated with it. List of acronyms, abbreviations, & symbols. Charts & tables.

Soil and Groundwater Remediation Technologies

Technologies for Environmental Cleanup: Soil and Groundwater Most books on ground water and soil cleanup address only the technologies themselves—not why new technologies are or are not developed. Innovations in Ground Water and Soil Cleanup takes a holistic approach to the entire field, addressing both the sluggish commercial development of ground water and soil cleanup technologies and the attributes of specific technologies. It warns that, despite cleanup expenditures of nearly $10 billion a year, the technologies remain rudimentary. This engaging book focuses on the failure of regulatory policy to link cleanup with the financial interests of the company responsible for the contamination. The committee explores why the market for remediation technology is uniquely lacking in economic drivers and why demand for innovation has been so much weaker than predicted. The volume explores how to evaluate the performance of cleanup technologies from the points of view of the public, regulators, cleanup entrepreneurs, and other stakeholders. The committee discusses approaches to standardizing performance testing, so that choosing a technology for a given site can be more timely and less contentious. Following up on Alternatives for Ground Water Cleanup (NRC, 1994), this sequel presents the state of the art in the cleanup of various types of ground water and soil contaminants. Strategies for making valid cost comparisons also are reviewed.

In Situ Soil and Groundwater Remediation

In situ remediation techniques have experienced a boom over the last few years, thereby producing a wide range of valuable experiences. Their results have demonstrated that in situ techniques are a mature alternative to conventional remediation techniques. Irrespective of future policy developments, it is impossible to imagine future remediation practice without the use of in situ techniques. The book presents an overview of recent developments in the field of in situ soil remediation. The book is unique in that it is not a compilation of unrelated case studies. A conceptual approach has been chosen; remediation models described in this book are illustrated from a practical point of view. The authors present the Dutch way of treating contaminated land; The Netherlands is renowned for being at the forefront of remediation techniques as a result of the country's progressiveness and experience in this area.

Hydrocarbon Contaminated Soils and Groundwater

This volume provides comprehensive up-to-date descriptions of the principles and practices of in situ chemical oxidation (ISCO) for groundwater remediation based on a decade of intensive research, development, and demonstrations, and lessons learned from commercial field applications.

A Field and Modeling Study of DDT in Soil and Groundwater

Following In-situ Soil Remediation

Analysis of Soil and Groundwater Microbial Population Dynamics at in Situ Bioremediation Sites in California and Texas

An introduction to the principles and practices of soil and groundwater remediation Soil and Groundwater Remediation offers a comprehensive and up-to-date review of the principles, practices, and concepts of sustainability of soil and groundwater remediation. The book starts with an overview of the importance of groundwater resource/quality, contaminant sources/types, and the scope of soil and groundwater remediation. It then provides the essential components of soil and groundwater remediation with easy-to-understand design equations/calculations and the practical applications. The book contains information on remediation basics such as subsurface chemical behaviors, soil and groundwater hydrology and characterization, regulations, cost analysis, and risk assessment. The author explores various conventional and innovative remediation technologies, including pump-and-treat, soil vapor extraction, bioremediation, incineration, thermally enhanced techniques, soil washing/flushing, and permeable reactive barriers. The book also examines the modeling of groundwater flow and contaminant transport in saturated and unsaturated zones. This important book: Presents the current challenges of remediation practices Includes up-to-date information about the low-cost, risk-based, sustainable remediation practices, as well as institutional control and management Offers a balanced mix of the principles, practices, and sustainable concepts in soil and groundwater remediation Contains learning objectives, discussions of key theories, and example problems.
Provides illustrative case studies and recent research when remediation techniques are introduced. Written for undergraduate seniors and graduate students in natural resource, earth science, environmental science/engineering, and environmental management, Soil and Groundwater Remediation is an authoritative guide to the principles and components of soil and groundwater remediation that is filled with worked and practice problems.

Soil and Groundwater Remediation An introduction to the principles and practices of soil and groundwater remediation. Soil and Groundwater Remediation offers a comprehensive and up-to-date review of the principles, practices, and concepts of sustainability of soil and groundwater remediation. The book starts with an overview of the importance of groundwater resource/quality, contaminant sources/types, and the scope of soil and groundwater remediation. It then provides the essential components of soil and groundwater remediation with easy-to-understand design equations/calculation and the practical applications. The book contains information on remediation basics such as subsurface chemical behaviors, soil and groundwater hydrology and characterization, regulations, cost analysis, and risk assessment. The author explores various conventional and innovative remediation technologies, including pump-and-treat, soil vapor extraction, bioremediation, incineration, thermally enhanced techniques, soil washing/flushing, and permeable reactive barriers. The book also examines the modeling of groundwater flow and contaminant transport in saturated and unsaturated zones. This important book: Presents the current challenges of remediation practices, Includes up-to-date information about the low-cost, risk-based, sustainable remediation practices, as well as institutional control and management. Offers a balanced mix of the principles, practices, and sustainable concepts in soil and groundwater remediation. Contains learning objectives, discussions of key theories, and example problems. Provides illustrative case studies and recent research when remediation techniques are introduced. Written for undergraduate seniors and graduate students in natural resource, earth science, environmental science/engineering, and environmental management, Soil and Groundwater Remediation is an authoritative guide to the principles and components of soil and groundwater remediation that is filled with worked and practice problems.

Advances in Bioremediation of Wastewater and Polluted Soil Groundwater is an important source of water for the industrial and agricultural sectors. The course book on soil and groundwater pollution from agricultural activities introduces the reader to major agricultural activities in India and their impact on soil and groundwater.

In Situ Soil Remediation

Soil and Groundwater Remediation

Sustainable Remediation of Contaminated Soil and Groundwater Includes Illustrative Applications of Practical Design Calculations Written in a straightforward style and user-friendly format, Practical Design Calculations for Groundwater and Soil Remediation, Second Edition highlights the essential concepts and important aspects of major design calculations used in soil and groundwater remediation. Drawing from the author’s teaching and consulting experience, this text provides practical information that addresses the current needs of practicing engineers, scientists, and legal experts in the field. What’s New in This Edition: This latest edition covers important aspects of major design calculations as well as practical and relevant working information for groundwater and soil remediation. Realistic examples are used liberally to illustrate the applications of the design calculations. Many examples are designed to assist the readers in building the right concepts. The text begins with an introductory chapter; it then illustrates the engineering calculations needed during site assessment and remedial investigation. It continues with a discussion on plume migration in soil and groundwater. It then covers the mass-balance concept, reaction kinetics, and types, configurations, and sizing of reactors. The author incorporates important design calculations for commonly used in situ and ex situ soil and groundwater remediation technologies, such as soil venting, air sparging, air stripping, bioremediation, and chemical oxidation, and off-gas treatment technologies. He also presents design calculations for capture zone and optimal well spacing. Includes both SI and US customary units, as well as unit conversions. Presents examples that directly follow the design equations. Provides discussion that assists engineers in building proper concepts. Practical Design Calculations for Groundwater and Soil Remediation, Second Edition also serves as a reference or textbook for students dedicated to the study of site remediation.