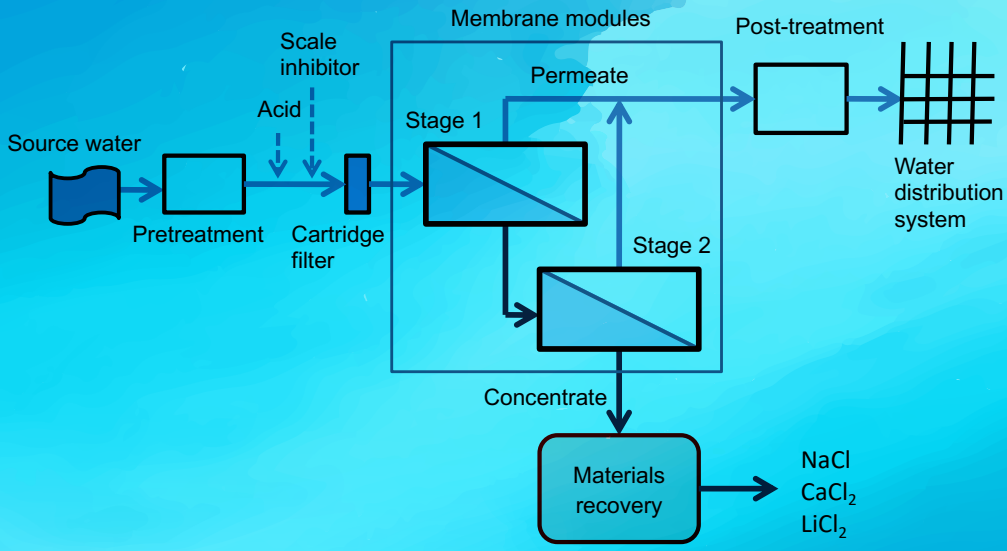
CONCENTRATE MANAGEMENT IN DESALINATION: CASE STUDIES

SECOND EDITION



Task Committee on Development of Prestandards for Concentrate Management Case Studies of the Desalination and Water Reuse Committee of the Water, Wastewater, and Stormwater Council

Edited by
Berrin Tansel, Conrad G. Keyes Jr., Luzma F. Nava, and April J. Lander

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Concentrate Management in Desalination

Case Studies

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Sponsored by
Development of Prestandards
Concentrate Management in Desalination
Case Studies Task Committee

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Preface

Committee's Background in Concentrate Management in Desalination

In 2004, there was no industrywide concentrate management performance standards for the types of desalination and water reuse technologies identified in *Desalination and Water Purification Technology Roadmap* (US Bureau of Reclamation and Sandia National Laboratories 2003), especially for inland desalination facilities that do not have ready access to ocean disposal. In addition, brackish and seawater desalination and concentrate management regulations vary significantly from state to state, region to region, and internationally in terms of both field testing and monitoring requirements. Much of the United States contains extensive brackish groundwater resources (Krieger et al. 1957). Because much of this supply underlies more easily accessible and higher-quality freshwater resources, it has remained primarily untapped; but, as freshwater resources become increasingly scarce and water demands increase, treatment of brackish water sources has gained consideration, especially as desalination technologies are improved and costs become more competitive.

In 2005, several organizations including the American Water Works Association (AWWA), Ground Water Protection Council (GWPC), Water Reuse Foundation (WRF), and the Environmental Protection Agency (EPA) agreed to work cooperatively through a collaboration between ASCE and the Environmental and Water Resources Institute (EWRI) to develop a consensus-based assessment and provide recommendations and guidance on sound and commonly acceptable concentrate management practices for new and existing desalination and water reuse facilities (Keyes et al. 2012).

Through ASCE/EWRI, and with the support of the Sandia National Laboratories (SNL), working group members were recruited from a wide range of interested water professionals including water resource managers, water technology developers, water utilities, and regulatory agencies; this group became the Concentrate Management Working Group (CMWG) in 2005. CMWG was designed to leverage the expertise of government, industry, and research organizations involved in desalination, water reuse, technology evaluation, and environmental protection to provide a broad perspective on concentrate management issues.

The initial meeting of CMWG (officially called the EWRI Task Committee on Concentrate Management in Desalination) was held in September 2004 in Phoenix, Arizona, in conjunction with the Water Reuse Association's national

conference. Subsequent meetings of CMWG were held in December 2004 (Las Vegas, Nevada) and March 2005 (Phoenix, Arizona).

During the 2007 EWRI Congress in Tampa, Florida, the members of the EWRI task committee and others made presentations under the organized Desalination and Water Reuse track. A regular funded meeting of the EWRI task committee was also conducted during the annual ASCE/EWRI Congress in Tampa, Florida, on May 15, 2007, where attendees included many members of the ASCE/EWRI Desalination and Water Reuse (DWR) Technical Committee. The following topic areas were determined to be the major viable options for concentrate management, and subcommittees were formed to study each option (Keyes et al. 2012):

Concentrate Management to Oceans and Bays
Discharge of Concentrate to Surface Waters and Sanitary Sewers
Discharge by Deep Well, Land Disposal, and Evaporation Ponds
Zero Liquid Discharge

This led to the development and publication of *Concentrate Management in Desalination: Case Studies* (Keyes et al. 2012).

Since that publication, the EWRI DWR Technical Committee developed the EWRI DWR Symposium at the 2013 to 2020 congresses. Appropriate announcements of topics have been placed on the Desalination and Water Reuse site within ASCE Collaborate, and many different presentations on the CM options and/or case studies have been developed. Many of the previous technical committee members and/or three task committees of the DWR were involved in the seven symposia. It was subsequently decided to generate case studies and/or develop them from the material presented at the congresses. Recently, the Discharge by Deep Well, Land Disposal, and Evaporation Pondsh CM option has been split into

Discharge by Deep Well Injection
Discharge by Land Disposal and to Evaporation Ponds

A concerted effort was made to include international case studies, as ASCE is a global society that facilitates international partnerships and the transfer of civil engineering knowledge worldwide. The officers of the current Development of Prestandards Concentrate Management in Desalination Case Studies Task Committee have international backgrounds and Spanish language skills, and one officer is an ASCE Region 10 governor responsible for all areas outside North America. As the task committee plans to publish the update in English and Spanish, the officers prepared the 2018 announcement calling for case studies to be submitted and associated case study template in both languages. The officers used their own international networks and ASCE's e-newsletter *Global Link* to reach more than 25,000 ASCE members in 177 countries.

Case Study Topic Areas

This book is a summary of new or updated case studies associated with concentrate management in desalination in each of the areas defined previously. The members (or authors) from the 2010 to 2011 EWRI task committee for developing CM in Desal Case Studies original EWRI CM in Desal Technical Committee of FY 2009 and the members of the Desalination and Water Reuse Technical Committee have updated or provided new case studies.

The Case Studies Task Committee officers are as follows:

Berrin Tansel, *Chair*
Luzma F. Nava, *Vice Chair*
Conrad Keyes Jr., *Secretary*
April J. Lander, *ASCE Region 10 Governor*

The Case Studies Task Committee officers followed this process for the creation of this book:

- Determined the appropriate case studies generated by the DWR members that could be used from the four topic areas for the document and obtained reviews of each case study by the Prestandards CM in Desal case studies ASCE Collaborate site membership;
- Selected appropriate authors for the chapters of the second edition and included them in the headings of the chapters of the document;
- Reviewed the developed materials at appropriate functions of the DWR meetings in FY 2018 and 2019;
- Reviewed and combined updated materials and generated a final draft for the second edition before the time of the 2020 EWRI Congress in Henderson, Nevada;
- Revised the final draft for the concluding review by the DWR Development of Prestandards for Concentrate Management Case Studies Task Committee before the end of FY 2020; and
- Prepared the final materials for the ASCE/EWRI publications process.

Scope of this Publication

The following chapters and appendixes provided are a revision of Keyes et al. (2012). The book has been expanded with new case studies and updated information in all chapters.