

# Water quality calculations and Ionic Balance for Reverse Osmosis and Ion Exchange



Inputs in mg/L

				Conductivity (uS/cm)		
Cations		mg/L	mg/L CaCO <sub>3</sub>	meq/L	Specific	Total
Aluminum	Al <sup>3+</sup>	1	5.560	0.111		0.0
Ammonium	NH <sub>4</sub> <sup>+</sup>	1	2.780	0.056	73.5	4.5
Barium	Ba <sup>2+</sup>	1	0.730	0.015		0.0
Calcium	Ca <sup>2+</sup>	1	2.500	0.050	59.5	3.0
Copper	Cu <sup>2+</sup>	1	1.570	0.031		0.0
Hydrogen	H <sup>+</sup>	1	50.000	1.000	350	350.0
Ferrous ion	Fe <sup>2+</sup>	1	1.790	0.036		0.0
Ferric ion	Fe <sup>3+</sup>	1	2.690	0.054		0.0
Magnesium	Mg <sup>2+</sup>	1	4.190	0.083	53.1	4.4
Manganese	Mn <sup>2+</sup>	1	1.620	0.033		0.0
Potassium	K <sup>+</sup>	1	1.390	0.028	73.5	1.9
Sodium	Na <sup>+</sup>	1	2.190	0.044	59.1	2.2
Strontium	Sr <sup>2+</sup>	1	1.140	0.023	59.1	1.1

Anions		mg/L	mg/L CaCO <sub>3</sub>	meq/L	Specific	Total
Bicarbonate	HCO <sub>3</sub> <sup>-</sup>	1	0.820	0.016	44.5	0.7
Carbonate	CO <sub>3</sub> <sup>2-</sup>	1	1.670	0.033	72	2.4
Chloride	Cl <sup>-</sup>	1	1.410	0.028	76.3	2.2
Fluoride	F <sup>-</sup>	1	2.630	0.053	40	2.5
Iodide	I <sup>-</sup>	1	0.790	0.008		0.0
Hydroxide	OH <sup>-</sup>	1	2.940	0.059	197	11.6
Nitrate	NO <sub>3</sub> <sup>-</sup>	1	0.810	0.016	71.4	1.2
Nitrite	NO <sub>2</sub> <sup>-</sup>	1	1.067	0.021		0.0
Phosphate (basic)	PO <sub>4</sub> <sup>3-</sup>	1	1.580	0.031		0.0
Phosphate (basic)	HPO <sub>4</sub> <sup>2-</sup>	1	1.640	0.033	53.4	1.5
Phosphate (monobasic)	H <sub>2</sub> PO <sub>4</sub> <sup>-</sup>	1	0.520	0.010	36	0.4
Sulfate	SO <sub>4</sub> <sup>2-</sup>	1	1.640	0.033	79.8	1.7
Thiosulfate	HSC <sub>2</sub> O <sub>4</sub> <sup>-</sup>	1	0.520	0.010		0.0
Thiosulfite	SO <sub>3</sub> <sup>2-</sup>	1	0.520	0.010		0.0

Auxiliary calculations: Carbonates from Alkalinity			
Input	mg/L	mg/L CaCO <sub>3</sub>	meq/L
Al-P		1	0.02
Al-M		1	0.02
Calculated	mg/L	mg/L CaCO <sub>3</sub>	meq/L
HCO <sub>3</sub> <sup>-</sup>	0	0	0
CO <sub>3</sub> <sup>2-</sup>	0	0	0
OH <sup>-</sup>	0.340136	1	0.02

Auxiliary calculations: CO2 from pH			
Input	mg/L	mg/L CaCO <sub>3</sub>	meq/L
HCO <sub>3</sub> <sup>-</sup>	1.219612	1	0.02
pH	1		
Calculated	mg/L	mg/L CaCO <sub>3</sub>	meq/L
CO <sub>2</sub>	197285.5	224805.461	449610.9

Ionic Balance	
Totals	meq/L
Cations	1.563
Anions	0.444
Ionic balance?	FALSE
Ions to balance	mg/L
Cl <sup>-</sup>	39.669
HCO <sub>3</sub> <sup>-</sup>	48.212
Na <sup>+</sup>	25.717
Ca <sup>2+</sup>	22.379

Plutocalc Water and Wastewater App does Ionic Balance better than this spreadsheet.

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Plutocalc, like this spreadsheet was developed by Daniel BP.

# Spreadsheet Applications In Geotechnical Engineering

**Braja M. Das**



## **Spreadsheet Applications In Geotechnical Engineering:**

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context that recognises the complex variabilities in geomaterials and model uncertainties arising from a profession steeped in empiricism By focusing on learning through computations and examples this book serves as a valuable reference for engineers and a resource for students

**Geotechnical Ground Investigation** Myint Win Bo,2022-03-18 Geotechnical investigation which is usually implemented to obtain baseline information of ground and groundwater is the focus of this book Authored by practitioner and academic who is extensively involved in geotechnical ground investigations over four continents this book covers both large scale preliminary ground investigation and intrusive detailed investigation as well as specialized in situ testing to obtain advanced geotechnical parameters of soils Both surface and borehole geophysical methods used in geotechnical investigation including methods of sampling and tools to obtain good quality soil samples are also discussed and presented in the book Written for advanced undergraduate and graduate students researchers and practitioners in the fields of geotechnical engineering geoenvironmental engineering and ground investigation the book also provides guidelines on presenting factual geotechnical data and preparing factual reports Related Link s

**Geotechnical Slope Analysis** Robin Chowdhury,Gautam Bhattacharya,Subhadeep Metya,2023-11-30 This second edition of Geotechnical Slope Analysis is an updated version of the original scholarly book In this edition concepts and applications have been thoroughly revised In particular the Initial Stress Approach has been extended to 2D problems in a more rigorous manner Additional solved numerical examples have been added in several chapters More importantly the meaning of the results is explored through interpretation The influence of initial stresses pore water pressures and seismic forces has been explored not only on performance indicators such as the Factor of Safety but also on the location of critical slip surfaces In addition to these factors it is shown that the chosen method of analysis may also have a significant influence on the location of the critical slip surface Student exercises have been included in some chapters with a view to encouraging further study and research and reference is often made to case studies of particular importance The best features of the book have been retained with continued emphasis on both deterministic and probabilistic approaches for quantifying slope performance The traditional performance indicator such as Factor of Safety can be complemented by the calculation of the Reliability Index and the Probability of Failure This book focuses on research studies concerning slope behaviour the occurrence of landslides and the use of alternative methods of analysis and interpretation The importance of uncertainties in slope performance and more broadly in geotechnical engineering is emphasised This book will be valuable to undergraduate and senior students of civil mining and geological engineering as well as to academic teachers and instructors and also to researchers practising geotechnical engineers and consultants

*Subsurface Fluid Flow (ground-water and Vadose Zone) Modeling* Joseph D. Ritchey,James O. Rumbaugh,1996

**Geotechnical Engineering** Ken K. S. Ho,K. S. Li,2001

**ICE Manual of Geotechnical Engineering Volume 1** Hilary Skinner,D G Toll,Kelvin Higgins,Mike Brown,John Burland,2023-11-17 ICE Manual of Geotechnical Engineering Second edition brings together an exceptional breadth of material to provide a definitive

reference on geotechnical engineering solutions Written and edited by leading specialists each chapter provides contemporary guidance and best practice knowledge for civil and structural engineers in the field

**Analytical Methods in Petroleum Upstream Applications** Cesar Ovalles, Carl E. Rechsteiner Jr., 2015-04-02 Effective measurement of the composition and properties of petroleum is essential for its exploration production and refining however new technologies and methodologies are not adequately documented in much of the current literature Analytical Methods in Petroleum Upstream Applications explores advances in the analytical methods and instrumentation that allow more accurate determination of the components classes of compounds properties and features of petroleum and its fractions Recognized experts explore a host of topics including A petroleum molecular composition continuity model as a context for other analytical measurements A modern modular sampling system for use in the lab or the process area to collect and control samples for subsequent analysis The importance of oil in water measurements and monitoring The chemical and physical properties of heavy oils their fractions and products from their upgrading Analytical measurements using gas chromatography and nuclear magnetic resonance NMR applications Asphaltene and heavy ends analysis Chemometrics and modeling approaches for understanding petroleum composition and properties to improve upstream midstream and downstream operations Due to the renaissance of gas and oil production in North America interest has grown in analytical methods for a wide range of applications The understanding provided in this text is designed to help chemists geologists and chemical and petroleum engineers make more accurate estimates of the crude value to specific refinery configurations providing insight into optimum development and extraction schemes

*Geotechnical Engineering Challenges to Meet Current and Emerging Needs of Society* Nuno Guerra, Manuel Matos Fernandes, Cristiana Ferreira, António Gomes Correia, Alexandre Pinto, Pedro Sêco Pinto, 2024-09-17 Geotechnical Engineering Challenges to Meet Current and Emerging Needs of Society includes the papers presented at the XVIII European Conference on Soil Mechanics and Geotechnical Engineering Lisbon Portugal August 26 to 30th 2024 The papers aim to contribute to a better understanding of problems and solutions of geotechnical nature as well as to a more adequate management of natural resources Case studies are included to better disseminate the success and failure of Geotechnical Engineering practice The peer reviewed articles of these proceedings address the six main topics New developments on structural design Geohazards Risk analysis and safety evaluation Current and new construction methods Environment water and energy Future city world vision With contributions from academic researchers and industry practitioners from Europe and abroad this collection of conference articles features an interesting and wide ranging combination of innovation emerging technologies and case histories and will be of interest to academics and professionals in Soil Mechanics and Geotechnical Engineering

Principles of Geotechnical Engineering Braja M. Das, 1997 Braja M Das PRINCIPLES OF GEOTECHNICAL ENGINEERING provides civil engineering students and professionals with an overview of soil properties and mechanics combined with a study of field practices and basic soil

engineering procedures Through three editions this book has distinguished itself by its exceptionally clear theoretical explanations realistic worked examples thorough discussions of field testing methods and extensive problem sets making this book a leader in its field *Geotechnical Engineering for Transportation Infrastructure* F. B. J. Barends,1999 **Computer Methods and Advances in Geomechanics** D. Contractor,C.S. Desai,S. Harpalani,J. Kemeny,T. Kundu,2000-01-01 Covering a wide range of topics involving both research developments and applications resulting from the 10th International Conference on Computer Methods and Advances in Geomechanics IACMAG held in January 2001 in Tucson Arizona USA The theme of the conference was Fundamentals through Applications The up to date research results and applications in this 2 volume work 1900 pages should serve as a valuable source of information for those engaged in research analysis and design practical application and education in the fields of geomechanics and geotechnical engineering **LRFD Steel Design** William T. Segui,1999 This up to date book provides a practical down to earth presentation of structural steel design that closely reflects ongoing changes in the AISC LRFD Specifications and the Manual of Steel Construction *Rock Engineering and Rock Mechanics: Structures in and on Rock Masses* R. Alejano,Áurea Peruchó,Claudio Olalla,Rafael Jiménez,2014-05-12 Rock Engineering and Rock Mechanics Structures in and on Rock Masses covers the most important topics and state of the art in the area of rock mechanics with an emphasis on structures in and on rock masses The 255 contributions including 6 keynote lectures from the 2014 ISRM European Rock Mechanics Symposium EUROCK 2014 Vigo Spain 27-29 May Fluid Flow L.C. Wrobel,C.A. Brebbia,2016-11-21 No detailed description available for Fluid Flow **The Quarterly Journal of Engineering Geology** ,1996 **Principles of Foundation Engineering** Braja M. Das,1995 A coverage of the design process via real world case studies and design problems are detailed in this text A new chapter Spreadsheet Applications For Geotechnical Engineering by Thomas F Wolff instructs the student how to make use of spreadsheets in the theories of foundation engineering Advances in Offshore Geotechnics Sumanta Halder,Shantanu Patra,Ravindra K. Ghanekar,2020-09-03 This book comprises select proceedings of the First Indian Symposium on Offshore Geotechnics It addresses state of the art and emerging challenges in offshore design and construction The theme papers from leading academicians and practitioners provide a comprehensive overview of the broad topics encompassing various challenges in offshore geotechnical engineering It covers various aspects pertaining to offshore geotechnics such as offshore site investigation soil characterization geotechnics related to offshore renewable energy converters offshore foundations and anchoring systems pipelines and deep sea explorations This volume provides a comprehensive reference for professionals and researchers in offshore civil and maritime engineering and for soil mechanics specialists **Risk and Variability in Geotechnical Engineering** Michael A. Hicks,2007 This book presents cutting edge techniques for characterising quantifying and modelling geomaterial variability in addition to methods for quantifying the influence of this variability on the performance of geotechnical structures It includes state of the art refereed journal papers by leading international

researchers along with written and informal discussions on a selection of key submissions that were presented at a Symposium at the Institution of Civil Engineers on 9th May 2005

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