CURRICULUM VITAE – Gerhardus Petrus Jacobus Diedericks

1. PERSONAL DETAILS

Position	Senior lecturer
Name of firm	Stellenbosch University, Department of Mathematical Sciences
Profession	Lecturer / Applied mathematician / Numerical modeller
Date and place of birth	13 July 1966, Johannesburg
Nationality	South African
Language capabilities	Afrikaans, English
Business address	Division of Applied Mathematics General Engineering Building Room A411 Banghoek Road Stellenbosch, 7600
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2. BIOGRAPHICAL SKETCH

Dr Diedericks obtained the degrees of B.Sc., B.Sc. (Honours), M.Sc. and Ph.D. from the Stellenbosch University. His Ph.D. focussed on the flow of Newtonian fluids and electrical conduction through anisotropic porous media. Part of this work was in collaboration with the Laboratoire de Génie de Procédés, IUT, University of Nantes.

While completing his Ph.D. he joined the Coastal Dynamics and Marine Resources group at the Council for Scientific and Industrial Research (CSIR) in 1996 where he remained in the field of hydrodynamics and sediment transport. Primarily involved in research projects concerning the production of turbulence under breaking and non-breaking waves, he was also involved in developing and validating Finite Element and Finite Difference models of nearshore coastal processes, sediment transport and morphological changes. Computer software packages (e.g. Delft3D) were also applied to simulate hydrodynamic processes.

He joined the Stellenbosch University at the beginning of 2001 as a senior lecturer where he conducted research in the fields of flow through porous media and coastal processes. He taught Calculus, Fluid Mechanics and Mechanics. He supervised an MSc student and presented short courses in coastal processes at the University of Dar es Salaam in Tanzania as well as at the Civil Engineering Department, Stellenbosch University. While employed by the Stellenbosch University he also conducted contract work for the consulting company WL | Delft Hydraulics (now Deltares), the CSIR and the Water Research Commission.

He then returned to the CSIR and was employed as a senior researcher by the NRE unit of the CSIR in Stellenbosch since 1 May 2006. For most of the time he was involved with commercial work concerned with diamond mining optimisation and rehabilitation, doing sediment related work as part of design teams and participating in Environmental Impact Assessments. He has conducted contract research and development work and he has managed a portfolio of projects for a number of years. He was the acting research group leader for the Coastal Systems research group.

He is presently employed as a senior lecturer by the Division of Applied Mathematics at Stellenbosch University since 1 August 2012 where he teaches, conducts research and participates in commercial projects.

3. EDUCATION

3.1 Qualifications

1999 Ph.D., Stellenbosch University, Applied Mathematics (Fluid Mechanics)
Pore-scale modelling of transport phenomena in homogeneous porous media.
1992 M.Sc., Stellenbosch University, Applied Mathematics (Fluid Mechanics)
Tracer dispersion in isotropic porous media.
1990 M.Sc., Stellenbosch University, Physics (Laser Spectroscopy)
Atomic vapour laser isotope separation of Zirconium.
1988 B.Sc. Honours, Stellenbosch University, Physics (Experimental Physics).
1987 B.Sc., Stellenbosch University, Natural Science (Physics and Applied Mathematics).

3.2 Short courses attended

2012 Coastal Engineering course and seminar on *Coastal Engineering within Climate Change*, presented at the Stias Centre, Stellenbosch University, 27 February to 2 March 2012.
2001 Workshop on *fluid-mud modelling and storm surge modelling* using Delft3D, presented at the Delft3D user conference, Delft, The Netherlands, 2001.
2000 *Morphological modelling with DELFT3D-MOR*, presented by Ir. J. Walstra (from Deltares), Stellenbosch, South Africa, June 2000.
1999 The COPEDEC V short *courses in Coastal and Port Engineering*, presented by Prof. H. de Vriend (from University of Twente), Cape Town, South Africa, 16-17 April 1999.
1997 *Coastal Engineering semester course* (WO03), presented by Dr. J. Rossouw at the Stellenbosch University.
1996 The International Workshop on *Finite Elements Methods*, presented by R.L. Taylor and P.R.J. Owen, Midrand, South Africa, 1-2 July 1996.
1995 Three month *C++ programming course*, Damelin College, Cape Town.

4. EMPLOYMENT HISTORY

August 2012 to present
Senior lecturer, Department of Mathematical Sciences, Division of Applied Mathematics, Stellenbosch University.

May 2006 to August 2012
Senior researcher, Natural Resources and the Environment Unit, CSIR, Stellenbosch.

January 2001 to April 2006
Senior lecturer, Department of Applied Mathematics, Stellenbosch University.

April 1996 to December 2000
Mathematical modeller, Council for Scientific and Industrial Research (CSIR), Environmentek, Stellenbosch.

January 1996 to July 1996
Part-time lecturer in Physics, University of the Western Cape, Bellville.

July 1994 to December 1995
Part-time lecturer in Applied Mathematics, Stellenbosch University.

March 1993 to July 1993
Part-time lecturer in Physics, University of the Western Cape, Bellville.

5. PROFESSIONAL EXPERIENCE

5.1 General

Experience in undertaking both academic (or basic) research as well as applied research and contract work was gained while being employed by the CSIR and by the Stellenbosch University.

- More than 18 years of experience in *Computational Fluid Dynamics (CFD)*, ranging from algorithmic procedures for computer code development as well as computer program implementation.

- Extensive experience in *three-dimensional computer simulations* of wave transformations, hydrodynamics, sediment transport and seabed morphology in the marine environment.

- A sound knowledge of the general field of *flow through porous media* and treating sediment transport as two-phase flow.

- A proper knowledge of *cross-shore and longshore sediment transport* obtained by conducting fundamental and applied research with commercial applications mostly in the diamond mining industry.

- *Teaching experience* by teaching to pre-graduate and post-graduate students at both Stellenbosch University (2001 to 2006 and since 2012) and the University of the Western Cape (1993 and 1996).

- *Managing of research* by setting research directions for post-graduate students, providing post-graduate supervision and mentorship and taking part in CSIR research projects as well as conducting contract research. Collating of results from large integrated research projects.

- Participation in a number of *Environmental Impact Assessments* in southern Africa as a marine environmental specialist and sediment transport specialist with focus on desalination plants, dredging, port development and surf zone operations.

- Experience in *project management, proposal generation and costing* for projects of various sizes.

5.2 Teaching

Institution	**Year**	**Course**	**Description**
University of the Western Cape Physics Department	1993 and 1996		Conceptual physics
Stellenbosch University	2001 to 2005	TW E214	Vector analysis
Department of Applied Mathematics (now Applied Mathematics Division)	2001	TW B316	Applied mathematics for engineers
	2001 to 2005	TW 354	Continuum modelling
	2002, 2003, 2004, 2005	TW 144	Modelling in mechanics
	2003, 2004	TW B154	Dynamics
	2005, 2006	TW B124	Statics
	2005	TW B242	Dynamics of rigid bodies
	2001, 2002, 2004, 2006	TW 791	Porous media modelling
	2002, 2003, 2004, 2005	TW 794	Tensor analysis
Stellenbosch University	2011 to 2018	TW 791	Porous media modelling
Applied Mathematics Division	2012 to 2016	TW 144	Vector modelling
	2013 to 2018	TW B124	Statics

5.3 Post-graduate supervision

Completed studies

L. Terblanche, MSc, 2005, Supervisor, *The prediction of flow through two-dimensional porous media*, Division Applied Mathematics, Stellenbosch University.

A.G. Fareo, Essay, 2006, Supervisor, *On the permeability of a typical breakwater*, African Institute for Mathematical Sciences.

G. Gerber, PhD, 2009, Co-supervisor, *Experimental measurement and numerical modelling of velocity, density and turbulence profiles of a density current*, Department of Civil Engineering, Stellenbosch University.

J. Wilms, PhD, 2012, Co-supervisor, *Modelling of the motion of a mixture of particles and a Newtonian fluid*, Division Applied Mathematics, Stellenbosch University.

P. Shabangu, MSc, 2014, Co-supervisor, *Investigating boundary conditions for near-shore area hydrodynamic models*, Division Applied Mathematics, Stellenbosch University.

C. Stander, MSc, 2015, Supervisor, *Analyses of extreme events in the coastal engineering environment*, Division Applied Mathematics, Stellenbosch University.

C. Trog, MSc, 2015, Co-supervisor, *Incipient motion of shells and shell gravel*, Division Applied Mathematics, Stellenbosch University.

R. Mphasha, MSc, 2016, Supervisor, *Analysis of time series data collected in the nearshore area*, Division Applied Mathematics, Stellenbosch University.

B. Gweba, MSc, 1017, Supervisor, *Developing a methodology for the assessment of wave energy along the South African coast*, Division Applied Mathematics, Stellenbosch University.

Ongoing studies

L. Terblanche, PhD (First registration 2012), Co-supervisor, *Sediment transport behind the surf zone*, Division Applied Mathematics, Stellenbosch University.

L. Viljoen, MSc, (First registration 2014), Supervisor, *Modelling the deposition of waste solids from fish farming*, Division Applied Mathematics, Stellenbosch University.

B. Tighy, MSc, (First registration 2016), Co-supervisor, *The application of machine learning for the prediction of wind speed and direction in the Gordons Bay area*, Division Applied Mathematics, Stellenbosch University.

F. Coleman, MIng, (First registration 2017), Co-supervisor, *Developing a well-calibrated real-time hydrodynamic model of False Bay*, Civil Engineering Department, Stellenbosch University.

A.E. Rakotoarisoa, MSc, (First registration 2017), Supervisor, *On incompressible flow with variable density*, Division Applied Mathematics, Stellenbosch University.

5.4 Academic examination

External examiner for M.Sc. thesis of M. Boshoff, *Tortuosity of Isotropic Porous Media*, Department of Applied Mathematics, Stellenbosch University, 1998.

External examiner for Ph.D. thesis of J.G. Fourie, *The Mathematical Modelling of Heat Transfer and Fluid Flow in Cellular Metallic Foams*, Department of Applied Mathematics, Stellenbosch University, 2000.

Internal examiner for M.Sc. thesis of J.P. du Plessis, *Modelling and industrial application of flow through two-dimensional porous media*, Department of Applied Mathematics, Stellenbosch University, 2002.

Internal examiner (supervisor) for M.Sc. thesis of L. Terblanche, *The prediction of flow through two-dimensional porous media*, Department of Applied Mathematics, Stellenbosch University, 2005.

External examiner for M.Sc. thesis of A. Viljoen, *Simulating the Benguela return current at St Helena Bay*, Oceanography Department, University of Cape Town, 2005.

External examiner for M.Sc. thesis of D.M. Molale, *A computational evaluation of flow through porous media*, Applied Mathematics Division, Stellenbosch University, 2007.

External examiner for M.Sc. thesis of P.D. de Wet, *Powered addition as modelling technique for flow processes*, Applied Mathematics Division, Stellenbosch University, 2010.

External examiner for M.Sc. thesis of E. du Plessis, *Modelling of single phase diffusive transport in porous environments*, Applied Mathematics Division, Stellenbosch University, 2010.

External examiner for Ph.D. thesis of S. Woudberg, *Comparative analysis of predictive equations for transfer processes in different porous structures*, Applied Mathematics Division, Stellenbosch University, 2012.

External examiner for Ph.D. thesis of M. Mukaro, *Digital, statistical and wavelet study of turbulence flow structure in laboratory plunging waves*, School of Chemistry and Physics, University of KwaZulu-Natal, 2013.

External examiner for M.Sc. thesis of P. Lucca, *Flow patterns around groynes in the coastal zone*, College of Agriculture, Engineering and Science, University of KwaZulu-Natal, 2014.

Internal examiner for M.Sc. thesis of M.C. van Heyningen, *Investigating the effect of compression of fibrous porous media*, Applied Mathematics Division, Stellenbosch University, 2014.

External examiner for M.Sc. thesis of Y. Douce, *Coastline impacts of tropical cyclones and climate change on Mauritius*, College of Agriculture, Engineering and Science, University of KwaZulu-Natal, 2015.

5.5 Paper refereeing

2003 Journal of Porous Media, Handbook of Porous Media
2005 Journal of Porous Media, Chemical Engineering and Processing
2011 Applied Mathematics and Computation
2012 Estuarine, Coastal and Shelf Science
2015 Journal of the South African Institution of Civil Engineering
2016 Estuarine, Coastal and Shelf Science

6. RESEARCH EXPERIENCE

6.1 Publications in reviewed journals

Diedericks, G.P.J. and Du Plessis, J.P., 1995, *On tortuosity and areosity tensors for homogeneous porous media*, Transport in Porous Media, Vol. 20(3), pp. 265-279.

Diedericks, G.P.J. and Du Plessis, J.P., 1996, *Electrical Conduction and Formation Factor in Isotropic Porous Media*, Advances in Water Resources, Vol. 19(4), pp. 225-239.

Diedericks, G.P.J. and Du Plessis, J.P., 1997, *Modelling of Flow Through Homogeneous Foams*, Mathematical Engineering in Industry, Vol. 6(2), pp. 133-154.

Diedericks, G.P.J., Du Plessis, J.P., Montillet, A., Comiti, J. and LeGrand, J., 1998, *Flow Through a Highly Porous Multifilament Knit*, Chemical Engineering Communications, Vol. 167, pp. 21-49.

Harcourt-Baldwin, J-L. and Diedericks, G.P.J., 2006, *Numerical modelling and analysis of temperature controlled density currents in Tomales Bay, California*, Estuarine, Coastal and Shelf Science, Vol. 66(3-4), pp. 417-428.

Smit, G.J.F., Wilms, J.M. and Diedericks, G.P.J., 2011, *Two-phase flow modelling for low concentration spherical particle motion through a Newtonian fluid*, Applied Mathematics and Computation, Vol. 217, pp. 5068-5077.

Gerber, G., Diedericks, G.P.J. and Basson, G., 2011, *Particle Image Velocimetry Measurements and Numerical Modeling of a Saline Density Current*, Journal of Hydraulic Engineering, Vol. 137(3), pp.333-342.

Wilms, J.M., Smit, G.J.F. and Diedericks, G.P.J., 2013, *An analytical model to describe the motion of a low concentration of spherical particles within a Newtonian fluid*, Chemical Engineering Science, Vol. 102, pp.76-86.

Diedericks, G.P.J., Trog, C.N.A. and Smit, G.J.F., 2018, *Incipient motion of shells and shell gravel*, Journal of Hydraulic Engineering, Vol. 144(3), pp.(06017030) 1-8.

6.2 Chapters in books

Du Plessis, J.P. and Diedericks, G.P.J., 1997, *Pore-scale modelling of interstitial transport phenomena*, Chapter 2 of Fluid Transport in Porous Media, (Ed. J.P. du Plessis), Vol. 13, Advances in Fluid Mechanics Series, Computational Mechanics Publications, Southampton, pp. 61-104.

Budnikov, E.Yu., Kostyuchenko, I.G., Lakeev, S.G., Maksimychev, A.V., Perov, S.P., Diedericks, G.P.J., Mocke, G.P., Smith G. and Bloom, I., 1999, *The methodology of the time series analysis on the basis of the determinate chaos theory*, Chapter 38 of the Atlas of Temporal Variations in Natural, Anthropogenic and Social Processes, Vol. 2, Cyclic Dynamics in Nature and Society, (Eds. S.I. Alexandrov and A.G. Gamburtev), State Scientific-Technical programme, The Russian Foundation for Basic Research, Moscow, pp. 66-67.

[*]Theron, A.K., Diedericks, G.P.J., Maherry, A. and Rossouw, M., 2010, *Potential impacts of climate change on the coastal zone: How far from the sea should we be?*, Chapter 8 of the South African Risk and Vulnerability Atlas, Department of Science and Technology, pp. 43-45.

[*]Received the CSIR Executive Director's award of excellence for a team effort.

6.3 Published conference proceedings

Du Plessis, J.P. and Diedericks, G.P.J., 1993, *On contaminant dispersion in isotropic porous media*, in Water Pollution II – Modelling, Measuring and Prediction (Eds L.G.Wrobel and C.A. Brebbia), Proceedings of the Second International Symposium on Water Pollution, Milan, Italy, June 21-23, pp. 91-100.

Diedericks, G.P.J., Smit, F. and Mocke, G.P., 1999, *Development and validation of the 2DH nearshore circulation model – FEMCIRC*, Proceedings of the Fifth International Conference on Coastal and Port Engineering in Developing Countries, Cape Town, April 1999, pp. 202-217.

Smit, F., Mocke, G.P. and Diedericks, G.P.J., 1999, *A Process-based model of cross-shore sediment transport and beach profile evolution*, Proceedings of the Fifth International Conference on Coastal and Port Engineering in Developing Countries, Cape Town, April 1999, pp. 288-299.

Dunkley, E.C., Mocke, G.P., Diedericks, G.P.J. and Tançzos, I., 1999, *Evaluation of bed shear, vertical mixing and reference concentration formulations*, Proceedings of the Fourth International Symposium on Coastal Engineering and Science of Coastal Sediment Processes, New York, June 1999, pp. 253-268.

Mocke, G.P., Govender, K., Alport, M., Diedericks, G.P.J. and Smit, F., 2000, *Modelling of digitally imaged water levels and flow fields in the surf zone*, Proceedings of the 27th International Conference on Coastal Engineering, Sydney, July 2000.

Theron, A.K., Diedericks, G.P.J., Huizinga, P., Basson, G.R. and Kemp, A., 2002, *Measurement and modelling of sediment dynamics in estuaries*, In: ENVIRO FLOWS 2002, Proceedings of the International Conference on Environmental Flows for River Systems, incorporating the 4th International Ecohydraulics Symposium. Cape Town, South Africa. Estuaries And Near-Coast Ocean Ecosystems: pp. 40-55.

Diedericks, G.P.J., Smith, G. and Luger, S., 2004, *Morphological Modelling Under an Event-Driven Wave Climate*, Proceedings of the 29th International Conference on Coastal Engineering, ASCE, Lisbon, September 2004, pp. 2823-2835.

Wilms, J.M., Smit, G.J.F. and Diedericks, G.P.J., 2009, *Two-phase flow modelling for low concentration spherical particle motion through a Newtonian fluid*, 4th Symposium on Numerical Analysis of Fluid Flow and Heat Transfer (part of the International Conference of Numerical Analysis and Applied Mathematics 2009 (ICNAAM 2009)), AIP Conference Proceedings 1168, doi:10.1063/1.3241554, pp. 673 – 676.

Theron, A. K., Rossouw, M., Barwell, L., Maherry, A., Diedericks., G.P.J. and De Wet, P., 2010, *Quantification of risks to coastal areas and development: wave run-up and erosion*, CSIR 3rd Biennial Conference 2010, Science Real and Relevant, CSIR International Convention Centre, Pertoria 30 August – 01 September 2010, South Africa, pp 16.

Wilms, J.M., Smit, G.J.F., Diedericks, G.P.J., 2010, *On particle-particle interaction forces for dilute systems*, 5th Symposium on Numerical Analysis of Fluid Flow and Heat Transfer (part of the International Conference of Numerical Analysis and Applied Mathematics 2010 (ICNAAM 2010)), AIP Conference Proceedings 1281, pp. 187-190, doi:10.1063/1.3498277.

Smith, G., De Wet, P., Diedericks, G.P.J. and Soltau, C., 2012, *Shoreline modelling adaptations for massive sand and gravel discharges on an exposed shoreline*, Proceedings of the 8th International Conference on Coastal and Port Engineering in Developing Countries, Chennai, India, February 2012.

Terblanche, L., Diedericks, G.P.J., Smit, G.J.F. and Troch, C.N.A., 2018, *Interstitial flow field measurements of a monochromatic wave in a two-dimensional, rectangular, non-staggered structure*, Proceedings of the 7th International Conference on the Application of Physical Modelling in Coastal and Port Engineering and Science (Coastlab,18), Santander, Spain, May 2018.

6.4 Single authored and first authored contract reports

CSIR, 1999, *Tidal and wave-driven circulation modelling along palaeo-coastlines offshore of Oranjemund*, Client: De Beers Marine, Report nr. ENV-S-C 99112.

CSIR, 1999, *User and technical reference manual for STSURF version 1.1*, Client: CSIR Executive, Report nr. ENV-S-I 9903

CSIR, 1999, *Development, validation and application of the two-dimensional depth-averaged nearshore circulation model – FEMCIRC*, Client: CSIR Executive, Report nr. ENV-S-I 9904.

CSIR, 2000, *De Beers Marine hydroforcing project Memo: Listing and description of refinements to the system*, Client: De Beers Marine, Report nr. ENV-S-C 99113.

CSIR, 2000, *Assessment of the mouth dynamics of the Zandvlei Estuary*, CLIENT: Report nr. ENV-S-C 2000-058.

CSIR, 2007, *On the modelling of sand-mud mixtures*, Client: CSIR Executive, Report nr. CSIR-NRE-ECO-IR-2007-0047-C.

CSIR, 2008, *On sediment dynamics for the inshore project*, Client: Namdeb, Report nr. CSIR-NRE-ECO-ER-2008-0102-C.

CSIR, 2008, *Wind, wave and current conditions for the Innershelf Project – Elizabeth Bay*, Client: Namdeb, Report nr. CSIR-NRE-ECO-ER-2008-0103-C.

CSIR, 2008, *Wind and wave conditions for the Innershelf Project – Bogenfels*, Client: Namdeb, Report nr. CSIR-NRE-ECO-ER-2008-0104-C.

CSIR, 2008, *Accretion predictions in the G and U areas for SAND trials*, Client: Namdeb, Report nr. CSIR-NRE-ECO-NR-2008-006-C.

CSIR, 2008, *Accretion predictions of sand-gravel mixtures for Project SAND*, Client: Namdeb, Report nr. CSIR-NRE-ECO-NR-2008-0126-C.

CSIR, 2008, *Accretion modelling for the Floating Treatment Plant rebuild project*, Client: Namdeb, Report nr. CSIR-NRE-ECO-ER-2008-0077-C.

CSIR, 2008, *Determining offshore waves for KwaZulu-Natal*, Client: CSIR Executive, Report nr.

CSIR, 2009, *Environmental monitoring and shoreline modelling for the dredge mining at Bogenfels beach, Pocket Beaches Site 11/12*, Client: Namdeb, Report nr. CSIR-NRE-ECO-ER-2009-0039-B.

CSIR, 2011, *Reconfiguration of the East London sand trap to enable trail dredging*, Client: Transnet, Report nr. CSIR-NRE-CO-ER-2011-0008-B.

Diedericks, G.P.J., Theron, A.K. and De Wet, P., 2011, *Assessment of groyne designs along the Richards Bay harbour entrance channel*, Client: Transnet, Report nr. CSIR/NRE/CO/ER/0095/B.

CSIR, 2011, *On cross-shelf sediment mobility along the KwaZulu-Natal coast*, Client: CSIR Executive, Report nr. CSIR/NRE/CO/IR/2011/0047/A.

Diedericks, G.P.J. and Wilms, J.M., 2013, *Assessment of wave condition in Granger Bay: Baseline conditions*, Client: Khula Environmental Consultants and the V&A Waterfront, Report nr. BIMUS-2013-GD001, Department of Mathematical Sciences.

Diedericks, G.P.J. and Smit, G.J.F., 2013, *Far-field modelling of the discharge of seawater at elevated temperatures within the V&A Clocktower precinct*, Report nr. BIMUS-2013-GD002, Department of Mathematical Sciences.

Diedericks, G.P.J., Terblanche, L. and Smit, G.J.F., 2014, *Assessment of changes in wave condition in Granger Bay*, Client: Khula Environmental Consultants and the V&A Waterfront, Report nr. BIMUS-2014-GD001, Department of Mathematical Sciences.

6.5 Contributions to contract reports

CSIR, 1998, *Port of East London wave refraction and diffraction studies*, Client: Transnet, Report nr. ENV-S-C 97159.

CSIR, 1999, *Theory of bottom boundary layers and bottom shear stresses and sediment mobility and suspended sediment concentrations – SEDVERT modelling*, Client: CSIR Executive, Report nr. ENC-S-I 9905.

CSIR, 2000, *Assessment of the DELFT3D oil spill module DELFT3D-PART: Simulation of the Hawaiian King oil spill in Saldanha Bay during September 1995*, Client: CSIR Executive, Report nr. ENV-S-I-2000-23.

WL | Delft Hydraulics, 2001, *Hydrodynamic modelling of the Hwaong Dike Closure*, WL | Delft Hydraulics report h4028.

CSIR, 2006, *Ben Schoeman dock berth deepening project: dredging and disposal of dredge spoil modelling specialist study*, Client: Transnet, Report nr. CSIR/NRE/ECO/ER/2006/0228/C.

CSIR, 2007, *Saldanha Bay iron ore export extension – Assessment of the effects of channel and reclamation design on shoreline stability*, Client: Transnet, Report nr. CSIR/NRE/ECO/ER/2006/0188/C.

CSIR, 2007, *Phase 2 expansion of the Saldanha iron ore handling facility – Shoreline stability study*, Client: Transnet, Report nr. CSIR/NRE/WR/ER/2007/0132/C.

CSIR 2008, *Marine specialist studies into the marine water quality, dredging and dredge disposal impacts*, Client: PD Naidoo and Associates for Transnet Capital Projects, Report nr.

Pulfrich, A., Van Zyl, S., Diedericks, G.P.J., Wassenaar, T. and Kemper, J., 2008, *Environmental impact assessment and environmental management plan for the inshore project: environmental management programme report*, Prepared by Pisces Environemtal Services (Pty) Ltd for Namdeb Diamond Corporation (Pty) Ltd., 182pp.

CSIR, 2009, *Marine environmental impact assessment for the seawater intake structure and brine disposal system of the desalination plant north of Swakopmund*, Client: NamWater, Report nr: CSIR/CAS/EMS/ER/2009/0015/A

CSIR, 2009, *Mitigation for erosion behind proposed bulk liquid berth (208) – Port of Richards Bay*, Client: Transnet, Report nr. CSIR/BE/IE/ER/2009/0056/B.

WSP, 2010, *Pocket Beach areas site 11 & 12 Rehabilitation of Mining Ponds*, Client: Namdeb, Report nr. WSP ref: 208113, WSP Coastal Engineers Pty Ltd.

WSP, 2010, *G35 to G75 accretion modelling*, Client: Namdeb, Report nr. WSP ref: 208169, WSP Coastal Engineers Pty Ltd.

WSP, 2010, *Shoreline accretion as a result of sand and gravel discharges in Southern Mining Area 1*, Client: Namdeb, Report nr. WSP ref: 208292E, WSP Coastal Engineers Pty Ltd.

Diedericks, G.P.J., Smit, G.J.F. and Lencart e Silva, J., 2015, Numerical modelling of the proposed sediment disposal of dredge material in Carlingford Lough, Client: Longline Environment, London, Report nr. BIMUS-2015-GD002.

CSIR, 2010, *Coega Refinery – feasibility level oil spill response analysis*, Client: PetroSA, Report nr. CSIR/CAS/EMS/IR/2010/004/C.

WML Coast (Pty) Ltd, 2016, Far-field thermal plume modelling in support of ESIA study of the Golar Hilli FLNG project, Report nr. 160513.

Longline Environment, 2017, Modelling of salmon farming waste in Finnmark, Longline Environment, London, Report nr. LLE/AKER/3/17.

6.6 Popular articles

Diedericks, G.P.J. and Van Ballegooyen, R., 2008, *Protecting the environment during port development*, ScienceScope, Quarterly publication of the CSIR, Vol. 2 (4), pp. 68-69.

6.7 Presentation of short courses

A process-based model of cross-shore sediment transport and beach profile evolution, presented at the Mathematics Department, University of Dar es Salaam, 22 June 1999.

Operation of the wave refraction model – SWAN, presented at the Mathematics Department, University of Dar es Salaam, 24 June 1999.

Estimation of nearshore waves, presented at a workshop as part of the block course in Coastal Engineering at the Civil Engineering Department , Stellenbosch University, 9-13 September 2002.

Mathematical modelling of nearhore processes, presentation of a two-week course at the Mathematics Department, University of Dar es Salaam, 27 October to 5 November 2002.

Numerical modelling with Delft3D - Introduction, presented at the eThekwini Municipality, Durban, 17-19 August 2009.

Numerical modelling with Delft3D - Practical, presented at the eThekwini Municipality, Durban, 16-19 August 2010.

Assessment of the numerical modelling of various projects within the Durban Bight area, presented at the eThekwini Municipality, Durban, 29-30 October 2013.

Numerical modelling with Delft3D-WAVE and Delft3D-FLOW, presented at WSP, Coastal Engineers, Africa, Stellenbosch, March 2014.

Assessment of the numerical modelling of various projects within the Durban Bight and Table Bay areas, presented at the eThekwini Municipality, Durban, 29-30 August 2016.

Hydrodynamic and sediment transport modelling to evaluate dredge disposal sites, presented at a workshop as part of the block course in Coastal Engineering at the Civil Engineering Department , Stellenbosch University, 12-16 September 2016.

6.8 Colloquia and unpublished papers read at conferences

Flow through a highly porous knit, presented at the Laboratoire de Génie de Procédés, IUT, University of Nantes, 28 February 1994.

Cross-shore modelling using the PROFSURF model, presented at the CSIR, Stellenbosch, 23 March 2000.

Pore-scale modelling of transport phenomena in homogeneous porous media, presented at the Applied Mathematics Department, University of Stellenbosch, 10 April 2000.

Sedimentation in small South African estuaries, presented at the 4th Delft3D User Conference, WL | Delft Hydraulics, Delft, The Netherlands, 26 to 28 November 2001.

Sedimentation in small South African estuaries with Delft3D-MOR, presentation of the 17th colloquium of the Department of Environmental Sciences, Wageningen University, The Netherlands, 29 November 2001.

Numerical modelling and sediment transport informing dredging projects and coastal zone management, presented at the Dredging Africa International Conference, Durban, 30 January to 2 February 2012.

7. PROJECT EXPERIENCE

Year	Project	Client / Stakeholder	Role
Computer code development and implementation			
1996/97	Development and validation of the finite element hydrodynamic model FEMCIRC	CSIR	Applied Mathematician
1998	Application of FEMCIRC to model the circulation in Elizabeth Bay, Namibia	CSIR	Modelling specialist / Applied Mathematician
1999	Further validation of the FEMCIRC model and writing of the user manual	CSIR	Modelling specialist / Applied Mathematician
1997	Conduct additional developments in the one-dimensional vertical computer program STSURF. This program simulated turbulence and sediment concentrations though the water column	CSIR	Applied Mathematician
1998	Validating the STSURF program against various test cases and writing the user manual	CSIR	Applied Mathematician
1999	Study the theory of bottom boundary layers and bottom shear stresses and sediment mobility and suspended sediment concentrations. Implement these via the STSURF model	CSIR	Applied Mathematician
2000	Assessment of the Delft3D oil spill module Delft3D-PART: Simulation of the Hawaiian King oil spill in Saldanha Bay during September 1995	Deltares	Modelling specialist
2000	Implementation of Delft3D-WAVE in the Delft3D system	CSIR	Modelling specialist
2001	Coupling of the Delft3D-FLOW and Delft-FLS models to simulate supercritical flows during a dike closure operation	Rural Research Institute, Korea	Modelling specialist employed under contract at Deltares

Year	Project	Client / Stakeholder	Role
Diamond mining optimisation and Environmental Impact Assessments for the diamond mining industry			
1999	Use the Delft3D model to simulate tidal and wave-driven circulation modelling along palaeo-coastlines offshore of Oranjemund to predict how diamonds may have moved	De Beers Marine	Project leader / Sediment specialist
2000	Develop a desktop system implemented at De Beers Marine to assess areas of diamond deposition	De Beers Marine	Project leader / Sediment specialist
2005	Delft3D modelling to assess the cumulative effects of sediment discharges from onshore and near-shore diamond mining on the Benguela Current Large Marine Ecosystem (BCLME)	BCLME Commission	Modelling specialist
2008	Determine wind, wave and current conditions for the Innershelf Project where dredgers will pump gravels ashore at Elizabeth Bay and Bogenfels	Namdeb	Project leader / Modelling specialist
2008	Predict shoreline accretion with the UniBest model in mining blocks G and U	Namdeb	Project leader / Modelling specialist
2008	Predict shoreline accretion with the UniBest model along the southern Namibian coastline to assess the impacts of rebuilding the Floating Treatment Plant	Namdeb	Project leader / Sediment specialist
2009	Accretion modelling to aid rehabilitation of mining ponds at the Bogenfels site	Namdeb/WSP	Sediment specialist
2008	A contract research project to assess the implications (operational and environmental) is sand-gravel mixtures were discharged on the beach to acquire accretion for mining	Namdeb	Project leader / Sediment specialist
2009	Shoreline accretion modelling to predict the amounts of sand necessary to maintain seawall to allow mining along the southern Namibian coast to continue	Namdeb/WSP	Sediment specialist
2010/11	New model developments to predict sand-gravel mixtures with the associates shoreline modelling	Namdeb/WSP	Sediment specialist
Environmental Impact Assessments – port developments, thermal dispersion and dredging			
2006	Marine specialist studies into the dredging and dredge disposal impact of the Ben Schoeman berth deepening project, Port of Cape Town	SRK consulting for Transnet Capital Projects	Modelling specialist
2006/7	Assessment of the effects of an enlarged dredge channel and reclamation area on shoreline stability as part of the Saldanha Bay iron ore export extension project (waves and morphology)	Transnet Capital Projects	Modelling specialist
2007/8	Marine specialist studies into the marine water quality, dredging and dredge disposal impacts of the Saldanha Bay iron-ore development projects, Port of Saldanha	PD Naidoo and Associates for Transnet Capital Projects	Hydrodynamic and morphological modelling specialist
2008/9	Three-dimensional modelling of thermal plume (brine disposal) for a planned desalination plant north of Swakopmund	NamWater	Modelling specialist
2010	Numerical modelling to assess the erosion at the proposed bulk liquid berth at the Richards Bay harbour	Transnet Capital Projects and WSP Coastal Eng.	Hydrodynamic and morphological modelling specialist
2013	Numerical modelling and assessment of changes in the wave climate due to the proposed extension of the V&A breakwater across Granger Bay	Khula Environmental Consultants and V&A Waterfront	Hydrodynamic and modelling specialist

Year	Project	Client / Stakeholder	Role
2013	Far-field numerical modelling and assessment of the behaviour of discharging warm water into the Victoria and Alfred basins at the V&A Waterfront	Khula Environmental Consultants and V&A Waterfront	Hydrodynamic and modelling specialist
2015	Numerical modelling of dredge routines and disposal of dredge material in Carlingford Lough	Longline Environment	Hydrodynamic and morphological modelling specialist
2016	Assistance with three-dimensional modelling of dispersion of a thermal plume for a planned Floating Liquefied Natural Gas plant (FLNG Golar Hilli)	WML Coast	Modelling specialist
2017	Numerical modelling of the dispersion of salmon farm wastes	Longline Environment	Hydrodynamic and sediment modelling specialist
2018	Evaluation and review of hydrodynamic and water quality modelling for the East London Hood Point marine outfall	WSP	Hydrodynamic and modelling specialist
Design criteria – miscellaneous			
1998	Wave refraction and diffraction studies to establish to what degree the breakwater at the Port of East London should be repaired	Transnet Capital Projects	Modelling specialist
2000	Assessment of the mouth dynamics of the Zandvlei Estuary to determine criteria to control the water level in the estuary	Aurecon	Applied Mathematician
2010/11	Conduct a study to reconfigure the sand trap at the East London harbour to allow trail dredging	Transnet Capital Projects	Hydrodynamic and morphological modelling specialist
2011	Design an additional groyne for the Richards Bay harbour entrance	Transnet Capital Projects	Hydrodynamic modelling specialist
2001	Three-dimensional hydrodynamic modelling of the Hwaong Dike Closure to establish the design criteria for the fill material	Rural Research Institute, Korea	Modelling specialist employed under contract at Deltares
2013	Numerical modelling and assessment of wave conditions at potential sites for Salmon farms	Havbrukstjenesten	Hydrodynamic and modelling specialist
Coastal systems research and contract research			
2003	Use the Delft3D-MOR model to simulate the sediment morphology to determine areas of deposition in river bends	WRC through the University of Stellenbosch	Modelling specialist / sediment specialist
2005	Assist with Delft3D modelling of the assessment of the cumulative effects of sediment discharges from onshore and near-shore diamond mining activities on the BCLME	CSIR	Modelling specialist
2007	Study the behaviour of sand-mud mixtures to model mixtures for the Regional Coastal Ecosystem Assessment for Development (ReCEAD) project	CSIR	Modelling specialist / sediment specialist
2008	Determining offshore waves for KwaZulu-Natal for the River Influenced Bight and Bays (RIBBS) project	CSIR	Modelling specialist / sediment specialist
2010/11	Assess the ability of waves along the KwaZulu-Natal coast to move sediment across the innershelf	CSIR	Sediment specialist

8. RESEARCH DEVELOPMENT

Basic research

- Modelling sediment transport as two-phase specialising on the initiation of motion of different types of sediments.

- Interaction of waves with porous media.

Applied research

- Real-time simulations and forecasting as part of the OceanSAfrica project. The OceanSAfrica initiative aims to develop operational oceanographic activities in South Africa and the region. Through this initiative opportunities exist to collaborate with the Department of Environmental Affairs, the CSIR and the University of Cape Town as well as with international institutions.

- Numerical simulations of selected bays in South Africa to improve on our understanding of the physical processes. From this follows opportunities to study impacts of Global Change such as climate change issues (sea level rise and increased storminess) on the coastal zone and contributing to development of an early warning system against storm surge for South Africa.