

Name of Expert:	Ricardo dos Reis Benoliel de Carvalho
Date of Birth:	24th of December, 1970
Country of Citizenship/Residence	Portugal / Lisbon

Education /Degrees:

- 1996** DEGREE IN CIVIL ENGINEERING (Hydraulics, Water Resources and Environment, 5-years course), INSTITUTO SUPERIOR TÉCNICO-UNIVERSITY OF LISBON (www.ist.utl.pt)
- 2013/14** POST-GRADUATION IN STATISTICS AND INFORMATION MANAGEMENT, ISEGI-Statistics and Information Management Institute, UNL-Universidade Nova de Lisboa (www.novaims.unl.pt)
- 2013** POS-GRADUATE MANAGEMENT COURSE, AT CEGE-Center for Management Studies of ISEG-Economics and Management Institute, UNL-Universidade Nova de Lisboa (www.iseg.ulisboa.pt)

Education /Courses:

- POSTGRADUATE IN STATISTICS AND INFORMATION MANAGEMENT, at ISEGI-Statistics and Information Management Institute (www.novaims.unl.pt), UNL- Universidade Nova de Lisboa, comprising 1 year classes of statistics, survey methods, data analysis, econometrics, forecasting methods, data mining, business intelligence, decision support systems, etc.; Final classification 16.5/20, best student in this course in 2013 (2013/14);
- POSTGRADUATE MANAGEMENT COURSE (www.ordemengenheiros.pt/pt/agenda/curso-de-especializacao-em-gestao-10-a-edicao/) for members of the portuguese Engineers Society, at CEGE-Center for Management Studies of ISEG-Economics and Management Institute of UNL-Universidade Nova de Lisboa, for a period of 10 months/144 hours, including classes in accounting and finance, business law, project management and evaluation, human resources, marketing and services, production and supply chain, strategic management and entrepreneurship (2013);
- MIKE 21 FLOW MODEL HD FM – 2D HYDRODYNAMIC MODELLING USING FLEXIBLE MESH (www.mikepoweredbydhi.com/products/mike-21), promoted by DHI-Lisbon/Portugal, focused on 2D hydrodynamic simulations with MIKE 21 Flow Model HD FM, using the flexible mesh, including a practical application to the Tachus Estuary in Portugal (24 e 25 de march 2015);
- INTRODUCTION TO PROCESSES LITTORAL - LITTORAL DRIFT AND COASTLINE EVOLUTION MODELLING WITH LITPACK (www.mikebydhi.com/Products/CoastAndSea/LITPACK.aspx), DHI course held in Lisbon/Portugal, addressing the modeling of coastal processes, coastal sediment transport calculations, models setup, shoreline evolution due to new structures, results visualization and presentation, practical examples LITPACK software, etc. (1st and 2nd July, 2014);
- MACBETH MULTICRITERIA ANALYSIS, an introduction course to a model for measuring attractiveness by a categorical based evaluation technique, based on an interactive approach that requires only qualitative judgments about differences to help a decision maker quantify the relative attractiveness of different options (7th January, 2008);
- LITTORAL DYNAMICS, course on coastal engineering, held at LNEC, based on 4 learning modules about coastal zone hydrodynamics, sediment transport, study methodologies and also coastal zone works examples and technical visit to Caparica coastal zone (3rd to 6th April, 2006);
- AGENDA XXI-LITORAL, Agenda 21 workshop, organised by the EEUC-The Coastal Union and the Dept. of Science and Environmental Sciences of the FCT/UNL and held at the Costa da Caparica university campus, where there was a discussion and debate about the main challenges in order to achieve a sustainable development policy for the portuguese coastal zone (27 and 28th January, 2006);
- PORT SHELTERING, WAVE CLIMANTE AND SEICHEING, a FUNDEC curse held at IST-Lisbon Technical University, which included maritime and port concepts, port sheltering and basin seicheing, and practical examples supported by the CGWAVE mathematical model included in the SMS-Surface Modelling System (5 and 6 December 2005);
- HYDRODYNAMIC MODELLING IN COASTAL ENGINEERING, held by FUNDEC (www.civil.ist.utl.pt/fundec/) at the technical University of Lisbon (www.ist.utl.pt), which included theoretical matters about estuaries, hydraulic equation/solution of long period waves, field data collection procedures, and also practical modelling examples with the SMS mathematical modelling package (2nd to 4th December, 2003);
- COASTAL PROCESSES, course held at IST and organized by FUNDEC, which included concepts about maritime hydraulics, coastal hydrodynamics, sediment budget, wave propagation, coastal line models and evolution of barrier islands, sandy coasts and littoral cliffs (9th to 12th of October, 2000);
- COASTAL ZONE PLANNING AND MANAGEMENT, course held in Oporto and organized by Eurocoast-Portugal association (2nd and 3rd of March, 1999).

Education /Computer skills:

- MATHEMATICAL MODELLING OF AQUATIC ENVIRONMENTS – DHI MIKE21 Integrated Modelling System (www.dhisoftware.com), for simulating 2-D hydrodynamic, sediment transport and environmental phenomena in coastal zones, estuaries and rivers, aimed to support engineering studies and designs; I'm experienced with the following MIKE21 sub-models: Hydrodynamic Model (MIKE21-HD), Nearshore Wave Model (MIKE21-NSW), Boussinesq Wave Model (MIKE21-BW), Sand Transport Model (MIKE21-ST) and pre- and post-processing utilities;
- MATHEMATICAL WAVE MODELLING – Refraction-diffraction REF/DIF 2.5 wave model (Kirby & Dalrymple, Univ. Delaware, 1994) (chinacat.coastal.udel.edu/~kirby/programs/refdif/refdif.html), in MS-DOS environment, to simulate the propagation of monochromatic waves over complex bathymetries, with pre- and post-processing of model input & results with SURFER 8.0, that allows grid generation and scientific data visualization; I ported the code to Fortran 90 and added some Fortran routines for easier model interaction with Surfer 8.0;
- NAVIGATION CHANNEL DESIGN – KUBLA PORTS 2015 for the design of navigation channels according to PIANC guidelines, allowing the iterative search of best channel alignments and configurations that lead to lower dredging efforts, software follows "Harbour Approach Channels - Design Guidelines" (PIANC, 2015);
- OIL SPILLS' MODELLING – GNOME 1.3.9 – General NOAA Oil Modelling Environment and utilities like GNOME ANALYST, ADIOS 2 - Automated Data Inquiry for Oil Spills, SPILL TOOLS and DOGS, from NOAA OR&R, for the study of evolution and trajectories of aquatic oil spills (gasoline, Jet A1, diesel, fuel oil, etc.);
- AQUATIC DISPERSION OF POLLUTANTS – CORMIX 3.2 – Cornell Mixing Zone Expert System, from EPA (www.cormix.info), for modelling plume dispersion of pollutant discharges in aquatic environments, either conservative or decaying, namely municipal wastewater discharges, thermal plant cooling waters, brine from desalination plants, LNG regasification heating waters, etc.;
- OCEANOGRAPHIC AND METEOROLOGICAL DATA – Use of systems MARS-Meteorological Archival and Retrieval System and GRIB API, of the ECMWF-European Centre for Medium-Range Weather Forecast, with C, FORTRAN and/or Python interfaces, for obtaining oceanographic/climate data in WMO FM-92 GRIB ½ formats, and use of CDO-Climate Data Operators tools of the Max-Planck-Institut für Meteorologie, for manipulating that data;
- TIDE LEVEL PREDICTION – Program XTIDE 2.14 – Command line for tide prediction, harmonic analysis (HARMGEN 3.1.1 and CONGEN 1.6.2), bash scripts for GNU/Linux installation, tide events and time series generation, extraction of data from global tide models (FES 2004, TPXO 7 and NAO b99), etc.;
- PORT AND COASTAL ENGINEERING – ACES 1.07 – Automated Coastal Engineering System, from CERC (www.veritechinc.com/products/aces.htm), and RWS CRESS 2.2 and CRESS FOR WIN 8.0 - Coastal and River Engineering Support System, from IHE-Delft and others (www.ihe.nl/we/dicea/), for simplified calculation of wave processes, sediment processes and coastal and fluvial structures design;
- OFFICE & PROGRAMMING – Experience with MS Windows (10 and previous versions) and GNU Linux (Mint/Ubuntu and Fedora/CentOS), office software MS OFFICE, some programming experience with C/C++, Java, Python, FORTRAN 77/90 and Bash Shell (with VS CODE, ECLIPSE, JUPITER/IPYTHON NOTEBOOK, GNU GCC and JAVAC), also with VISUAL BASIC (OFFICE/VBA and MS VB);
- NUMERICAL ENVIRONMENTS – R SOFTWARE/R STUDIO (with LINUX Mint/Ubuntu and WINDOWS Vista/8/10), PYTHON (SciPy/NumPy/Pandas with Jupyter/IPython Notebook) and GRETL (Gnu Regression, Econometrics and Time-series Library), for scientific calculations, numerical, data analysis and statistics, econometry and forecasting, graph generation, etc.; Extreme wave statistics in coastal zones (with R SOFTWARE extRemes/ismev/POT-GPD; GEVFIT L-Moments in Fortran 90; etc.);
- STATISTICS AND DATA ANALYSIS – General Statistics (descriptive, hypothesis testing, non-parametric tests, ANOVA, etc.), Survey Methods, Multivariate Data Analysis (principal components, correspondence analysis, multiple correspondence/forms, etc.), Linear/Econometric and Forecasting models, Extreme Ocean Waves/River Floods statistics, etc. with R SOFTWARE, GRETL, IPython Notebook, and others;
- GEOGRAPHIC INFORMATION SYSTEMS – Experience as a user of GIS software using foss QGIS-QUANTUM GIS, including creation of raster and vectorial layers, editing and analysis of spatial data, charts georeferencing, surface modeling, bathymetry interpolation, dredging/landfill volume estimates, etc.;
- REGRESSION ANALYSIS – CURVE EXPERT 1.3, LAB FIT 6.0 and DATAFIT 8.0 for automatic adjustment of continuous functions to discrete tables, by means of linear and non-linear, simple or multiple, regression analysis, with function fitness ranking based on correlation coefficients.



Key Qualifications Executive Summary:

I graduated as a Civil Engineer (Hydraulics, Water Resources and Environmental branch, 5-years course), at the Instituto Superior Técnico – Technical University of Lisbon, in 1996. I then started working in port and coastal engineering at **PRET – Profabril Engenharia de Transportes, SA** and also in the mathematical modelling of aquatic environments at **ENVIMODE – Consultores de Hidroinformática, ACE**. One year later, I moved to another company in the same engineering group, **PROMAN – Centro de Estudos e Projectos, SA**. I worked for PROMAN for a total 22 years, on consultancy studies, designs and technical reports, mathematical modelling, and also on the drafting and evaluation of proposals and tender processes, for the Portuguese port & maritime sector. The studies/projects included port infrastructures and maritime works, namely industrial, commercial, fishing and leisure ports, specialized terminals, coastal protection works, breakwaters, dredging and navigation projects. Recently, in nov/2018 I started my own company **OCEANING – Engenheiros Consultores, Lda.**, along with two other associates, providing port & coastal engineering consultancy services for the port & maritime sector.

Period	Employing organization and your title/position. Contact information for references	Country	Summary of activities performed relevant to the Assignment
nov/2018 – today	OCEANING – Engenheiros Consultores, Lda. Position: Founder & Managing Partner / Port & Coastal Engineer / Project Manager and Designer	Portugal	I work on the coordination and execution of engineering studies, designs and technical reports, mathematical modelling of aquatic environments, and drafting and evaluation of proposals and tender processes, mainly for the Portuguese maritime & port sector.
feb/1998- sep/2018	PROMAN – Centro de Estudos e Projectos, SA Position: Port & Coastal Engineer / Project Manager/or and Designer For references: Mr. António Ressurreição / PROMAN. Phone: +351 21 304 1050	Portugal	I worked on the coordination and execution of engineering studies, designs and technical reports, mathematical modelling of aquatic environments, and drafting and evaluation of proposals and tender processes, mainly for the Portuguese maritime & port sector.
Jan/1997– feb/1998	PRET – Profabril Engenharia de Transportes, SA For references: Mr. José Cerejeira (ex- PRET director, now PROMAN consultant). Phone: +351 21 304 1050	Portugal	I worked mainly in the preliminary studies that originated the design of the Port of Sines' Container Terminal (today built and under PSA/Singapore' concession), some of which were started in 1994.
Jan/1997– feb/2003	ENVIMODE – Consultores de Hidroinformática For references: company no longer exists.	Portugal	I worked on several mathematical modelling studies simulating hydrodynamic, sediment transport and environmental phenomena in coastal zones, estuaries and rivers, using MIKE 21 from DHI – Water and Environment (www.dhi.dk - former Danish Hydraulic Institute) and other scientific software.

Membership in Professional Associations:

Portuguese Engineers' Association, Senior Member nr. 38446 since apr-2015, individual member since 2000, Specialist degree in Hydraulics & Water Resources since jan/2019 (www.ordeng.pt)

Cape Verde Engineers' Association, Member nr. 973



Publications:

- PROJECT FOR IMPROVEMENT OF MARITIME ACCESSIBILITY TO THE PORT OF SETÚBAL", article published in the 'Dossier on Coastal Works' of Construction Magazine no. 85, technical journal of Civil Engineering (July 2018);
- MONDEGO SYMPOSIUM: PAST, PRESENT AND FUTURE IN THE CONTEXT OF CLIMATE CHANGE, presentation on coastal aspects, with case study on Figueira da Foz, held at the local Engineers Association, Coimbra, June 22, 2018);
- MARITIME TRANSPORT & PORTS COURSE, at AGEPOR shipping association, held at Gare Marítima da Rocha de Conde D'Obidos, in which I gave classes in fluvial-maritime accessibilities and harbor shelter (mar/2017 and mar/2018);
- PORT STUDIES IN PORTUGAL: NUMERICAL AND PHYSICAL MODELING TOOLS, co-authored with LNEC and Portuguese marine and port works consultants, presented at the 2nd Mediterranean Days of Coastal and Port Engineering (Valencia, 23-25 May 2012);
- IMPROVING NAVIGATION CONDITIONS AND SAFETY IN THE MOUTH OF THE RIVER DOURO (ICCE 2004), co-authored by Mr. Guedes de Campos (PROMAN), Mota Oliveira and Trigo Teixeira (CEHIDRO-IST) and Mr. Tim Chesher (HR Wallingford), and presented by myself in Lisbon, at the International Conference on Coastal Engineering 2004 (24th September, 2004);
- PORT OF SINES EAST BREAKWATER EXTENSION, with co-authors Mr. Guedes de Campos (PROMAN) and Prof. Mota Oliveira (CEHIDRO-IST), presented by myself at the 2nd Portuguese Port & Coastal Engineering Meeting, organized by PIANC's Portuguese section (18th October, 2001).

Language Skills:

Language:	Speaking:	Reading:	Writing:
Portuguese	Excellent	Excellent	Excellent
English	Excellent	Excellent	Good
French	Good	Good	Fair

Adequacy for the Assignment:

(References to Prior Work/Assignments that Best Illustrate Capability to Handle Similar Tasks)

- TECHNICAL, ECONOMIC, SOCIAL AND ENVIRONMENTAL FEASIBILITY STUDY FOR THE CONSTRUCTION OF FISHING PORTS IN NAMPULA (Memba and Moma), ZAMBÉZIA (Pebane) AND SOFALA (Praia Nova/Beira) PROVINCES, for CONSULGAL (www.consulgal.pt), including technical feasibility study, preliminary design and final design of the maritime components, which include dredging, protection works, landfills, berth structures, equipment & services, etc. (2019/...);
- TAVIRA FISHING PORT FLOATING PONTOONS AND THEIR ACCESS BRIDGES DESIGN, for DOCAPESCA (www.docapesca.pt), having as main objective the preparation of a preliminary study, preliminary & final designs, and of other technical elements for contracting the construction of the floating piers and of their access bridges (2019).
- RIA DE AVEIRO LAGOON DREDGING PROJECT, in NORTHERN PORTUGAL, for POLIS RIA DE AVEIRO (www.polisriadeaveiro.pt), in which I coordinated and co-designed a €17M project for the dredging of the main and secondary channels of Ria de Aveiro (Ovar, Aveiro, Ílhavo, Mira and Lagoa do Paraíso), Pateira de Fermentelos and the Mira coastal bar (2012/18);
- MARITIME HYDRAULICS STUDIES AND PORT-COASTAL ENGINEERING OF THE ST. MARIA ILHÉU CASINO-RESORT PROJECT, IN SANTIAGO, CAPE VERDE, for Macau Legend Development (www.macaulegend.com), comprising study of the nautical layout, validation and design of marina solutions, artificial beach and slope protections, hydrodynamic and sediment impact analysis, namely related to the port of Praia, based on studies by Portuguese laboratory LNEC (2016/17);
- TECHNICAL, ECONOMIC, FINANCIAL AND ENVIRONMENTAL FEASIBILITY STUDIES FOR PORT OF FIGUEIRA DA FOZ, for APFF-Administration of Figueira da Foz Port (www.portofigueiradafoz.pt), aiming at to identify the medium / long term solution of greater economic and environmental sustainability for the expansion of the maritime access and berthing facilities update for 10,000 TDW container vessels, with length of up to 140m and maximum draft of 8.0m (2015/16);
- PORT OF SETÚBAL NAVIGATION CHANNEL DESIGN AND ENVIRONMENTAL ASSESSMENT STUDY, for APSS (www.portodesetubal.pt), comprising the design of the navigation channel for 4000 TEU container vessels, preliminary design and sensitivity analysis with KUBLA PORTS software, including participation in the environmental studies (2015/16);



- EXPANSION OF THE MULTIPURPOSE TERMINAL OF THE PORT OF SINES AND EXTENSION OF THE SERVICES PORT BREAKWATER, for APS (www.portodesines.pt), preliminary study including the supervision of mathematical studies, comparative analysis of alternative locations, quay wall with 150m length and -12mZH depth and terminal landfill area with 4 ha (2014/15);
- PALMEIRA PORT EXPANSION AND MODERNIZATION, SAL ISLAND, CAPE VERDE, for contractor MOTA ENGIL (www.mota-engil.pt), 2nd phase port expansion in which I collaborated in the design of a new breakwater with 150m quay wall and dredging works for the access channel and maneuvering basin, also technical supervision of the 3D physical model studies of the breakwater at ARTELIA/SOGREAH (2015);
- FEASIBILITY STUDY OF DREDGED NAVIGATION CHANNEL IN TAGUS ESTUARY, form cement company CIMPOR (www.cimpor.pt), which included the study of a new dredged channel to allow navigation of medium sized cement vessels, which would eliminate the current need for using small draft barges for cement transport, taking into account technical (port, navigational, dredging), economic (works of initial establishment and regular maintenance) and environmental aspects (2013);
- PRELIMINARY STUDY OF A NEW PORT IN THE ZAMBEZIA COSTAL ZONE, in Macuse/MOZAMBIQUE, for PORTUCEL (www.portucelsoporcel.com), which included a comparative analysis of several port alternative locations, in the old port of Macuse, near the coast or offshore structure, in order to establish a port for paper pulp, including IT infrastructure and navigation (dredged channel), with wave climate mathematical modelling (2013);
- DESIGN OF PORT OF VALE DE CAVALEIROS (FOGO ISLAND), in Cape Verde, for CPTP (www.cptp.pt), in which I was responsible namely for the design of the maritime protection and north breakwater, including the preparation of the technical specifications and supervision of the physical model tests performed at SOGREAH, Grenoble/France (2010/11);
- DESIGN AND REHABILITATION OF THE MARINA LUGAR DE BAIXO, (MADEIRA), for SDPO-Society for the Development of Western Madeira, comprising the design of a new breakwater for the rehabilitation of infrastructures damaged during the storm of March 2005, which included the preparation of tender documents for the works, as well as the preparation of specifications for the physical model tests (2010);
- 1ST PHASE EXPANSION AND MODERNISATION OF THE PORT OF PALMEIRA (BOAVISTA ISLAND), IN CABO VERDE, for CPTP, in which I collaborated in the design of the maritime works, Accropode breakwater and slope protections, and supervised the physical modeling at portuguese laboratory LNEC (2009);
- TECHNICAL ASSISTANCE TO THE EXPASION OF THE PORT OF BATA, IN EQUATORIAL GUINEA, for ETERMAR (www.etermar.pt), which included the design of a breakwater and technical support for the definition of the berthing structures layout (2007);
- CRUISE TERMINAL AND LEISURE PORT OF LEIXÕES, for APDL-Administração dos Portos do Douro e Leixões (www.apdl.pt), in which I participated as hydraulics' and marina expert in the designs of the new quay wall for cruise ships up to 300m, and leisure port for 170 boats and a new 600m diameter maneuvering basin (2007/08);
- DESIGN OF 2ND PHASE EXPANSION OF THE EAST BREAKWATER OF THE PORT OF SINES, for APS-Administração do Porto de Sines (www.portodesines.pt), a €23.0M project comprising the extension of the existing Sines East Breakwater in two alternatives, 350 or 400m extension, with an offshore inflection of 25° (2008);
- DESIGN OF THE REHABILITATION OF MARINA PARQUE DAS NAÇÕES, IN LISBON, for Sociedade Marina Parque das Nações, based on an innovative solution of a semi-closed basin, by a pair of double gates, including accessory works for the complete water proofing of the north and south breakwaters' perimeter and of the Cabo Ruivo quaywall, aiming the reduction of the existing strong siltation inside the marina basin (2006/07);
- PRELIMINARY STUDY FOR THE EXPANSION OF THE SINES CONTAINER TERMINAL, for APS, which includes the expansion of the existing quaywall and breakwater for sheltering and navigation improvement including the definition of several layouts for mathematical modelling purposes and definition of the breakwater cross section (2006);
- STUDY FOR THE ENVIRONMENTAL AND FUNCTIONAL REHABILITATION OF THE EUROMINAS TERMINAL, at the port of Setúbal, for the port administration APSS (www.portodesetubal.pt), which includes soil decontamination studies, rehabilitation, reinforcement and extension of the existing quay wall, and also of other structures, new port layout study to accommodate future products, road and rail accesses and internal port security (2005/07);
- STUDY FOR THE EXPANSION OF THE PORT OF SETÚBAL RO-RO TERMINAL, for APSS, aiming to increase the capacity of the port of Setúbal in the roll-on roll-off category, where, among other works, a 300m quay-wall at -12,5mCD, a paved landfill 70m wide and a railway platform, also required for the expansion of the Autoeuropa's Terminal, are planned and though shall be designed; In this study I am responsible for the hydrodynamic and sediment transport modelling, for the design of slope protections and I also assist in the project management (2004);
- BASIC DESIGN OF MARINA DE OEIRAS, IN THE TAGUS ESTUARY, LISBON, for a bidding consortium led by SOMAGUE; It included the complete maritime and terrestrial master planning of a €6.0M marina project for 250 boats, the selection of floating and mechanical equipment and the preliminary design of the buildings networks (water, electricity, communications, etc.), as well as the analysis of architectural and urban aspects; I was the main responsible for establishing the layout and for the design of the marina floating structures (2003);



- ENVIRONMENTAL REHABILITATION OF THE OLHÃO FISHING PORT, IN THE ALGARVE, for IPTM, a €7.0M project for the environmental improvement of the port of Olhão, namely through the rehabilitation of old and/or degraded fishing infrastructures, the master planning of the port and, finally, the implementation of environmental management measures; In this study I contributed to the project management, helped to the definition of the new fishing port layout, and I'm also responsible for the design of the new floating pontoons area, able to shelter 300 small fishing/traditional boats, nearby the entrance of the existing fishing port (2002);
- DESIGN OF THE EXPANSION OF THE COMMERCIAL PORT OF VIANA DO CASTELO, for IPTM-Norte (www.ipnorte.pt), involving dredging and landfills, quaywalls and slope protections, gantry crane services, road accesses, landscape design downstream of the commercial port, hydrographical and geotechnical surveys, maritime aids and environmental studies; I had a minor intervention in this study - I was responsible for analysing the dredging and navigation conditions and also for evaluating the river flooding risks of the terminal pavement (2002);
- IMPROVEMENT OF NAVIGATION at THE RIVER DOURO (DOURO BREAKWATERS), promoted by IPTM-Douro (www.iptm.pt), for the technical proposal of consortium OFM / Teixeira Duarte / Soares da Costa / Monte & Monte / CPTP, a €15.0M project that included the design of the breakwaters and navigation channel, environmental studies and landscape architecture, and technical coordination of HR Wallingford's mathematical modelling studies (2000/01);
- DESIGN OF SINES EAST BREAKWATER EXTENSION, for APS, in which I had a significant contribution in the adaptation and drafting of the design and tender process which already existed for the construction of the breakwater; I collaborated to all aspects of this 1.100m breakwater project (1999);
- DESIGN OF THE SINES TRANSHIPMENT CONTAINER TERMINAL (TERMINAL XXI), for APS, a €45.0M project built in 2003, in which I participated mainly in the maritime works design (breakwater), which included the characterization of local conditions, the breakwater layout and design, the mathematical modelling of sea waves with help of MIKE21NSW, the drafting of small scale model testing conditions, and the drafting of tender process documents for the construction works (1998/1999).

Expert's contact information: E-mail: ricardo.carvalho@oceaning.pt ; phone: +351 217 780 088

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, th is CV correctly describes myself, my qualifications, and my experience, and I am available, as and when necessary, to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal by the Client, and/or sanctions by the Financiers.

Ricardo dos Reis
Benoliel de Carvalho

Name of Expert	Signature	Date	01/01/2020
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Name of authorized Representative of the Consultant (the same who signs the Proposal)	Signature	Date	
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