HR Wallingford
Working with water

Track record

Ship mooring

Selected ship mooring projects

Essar Hazira LNG vessel mooring studies

2018
Essar Bulk Terminal
India

HR Wallingford conducted wave, flow and sedimentation modelling, navigation and mooring studies to support the design of a proposed LNG import terminal at Hazira in Gujarat state on the West Coast of India.

Moheshkhali LNG marine feasibility study

2018
CCCC-FHDI Engineering Company
Bangladesh

Specialist hydrodynamic, sedimentation, morphology, navigation and mooring analysis were provided to support feasibility and pre-FEED design of an LNG import facility at Moheshkhali near Cox's Bazaar, Bangladesh.

GLNG mooring advice

2018
PETRONAS Gas Berhad
Australia

HR Wallingford providing mooring advice for GLNG based on a new class of LNGC expected to call at the facility.

Sharjah LNG mooring and navigation assessment

2018
Uniper Technologies
United Arab Emirates

HR Wallingford carried out a dynamic mooring and navigation assessments of the proposed LNG facility at Sharjah.

Wilhelmshaven LNG import terminal

2018
Uniper Technologies
Germany

HR Wallingford carried out an assessment of the proposed berth for an FSRU and STS operations at Wilhelmshaven which included dynamic mooring analysis.

Sri Lanka LNG terminal infrastructure project

2018
Sojitz Corporation
Sri Lanka

HR Wallingford carried out ship navigation and mooring studies for the assessment of the an LNG import facility at Colombo Port, Sri Lanka.

Port of Newcastle, Dyke 1 berth assessment and passing ship study

2017
GHD
Australia

HR Wallingford carried out a berth layout assessment for Dyke 1 berth at the Port of Newcastle to ship motions and mooring forces remained within the required limits when ships passed the berth.

Wheatstone LNG berth survivability assessment

2017
Chevron Australia
Australia

As part of the development of the Wheatstone LNG Marine Terminal, HR Wallingford carried out detailed dynamic ship mooring analysis which was used to assess the limiting criteria for safe ship mooring. These criteria were subsequently used to assist with operational decision making and management of the terminal.

Dhamra Port development

2017
Howe Engineering Projects (India)
India

Real time navigation simulation and mooring studies to support the development of new bulk carrier and LNG carrier berths as part of the continued development of the Port of Dhamra.

Sharjah LNG

2017
Uniper Technologies
United Arab Emirates

Operability assessment of a proposed LNG import terminal located in approximately 20m water depth offshore of Sharjah. The study involved review and analysis of metocean data, review of mooring and operating thresholds and an operability assessment based on metocean conditions.

Kinder Morgan, Ship Dock 3 passing vessel study

2017
Lanier & Associates
USA

Kinder Morgan have plans to install a new mooring dolphin at Ship Dock 3 at their Galena Park Facility on the Houston Ship Canal. The detailed design was completed by Lanier and a third party carried out a high level passing vessel study. HR Wallingford were asked to review and provide comment on the passing vessel study.

Dover Western Docks Revival dynamic mooring analysis

2017
Ramboll UK
United Kingdom

HR Wallingford carried out a dynamic mooring study to examine the design ships at the new berths as part of the Dover Western Docks Revival.

Jazan marine terminal hydraulic studies

2017
Six Construct
Saudi Arabia

HR Wallingford was commissioned to undertake a range of specialist Hydraulic/Marine Studies to support the design development of a major Refinery Marine Terminal facility on the Red Sea Coast of the Kingdom of Saudi Arabia. Specialist studies included metocean studies (to derive design data for winds, waves, water levels, currents), berth design studies (to derive layouts for various berth facilities), dynamic mooring analyses (to derive design loads and inform terminal operability assessment), assessment of the impact of construction dredging (sediment dispersion study), hydraulic design assessment for seawater (firewater) intake and a breakwater physical modelling study (to confirm the design of the terminal breakwater and confirm acceptable armour stability/overtopping).

RG Tanna Coal Terminal passing ship study

2017
Gladstone Ports Corporation
Australia

Gladstone Ports Corporation commissioned HR Wallingford to carry out a passing ship study to examine the ship passing moored vessels at the RG Tanna berth. The mooring analysis considered a range of passing ship speeds and separation distances to identify the limiting conditions for safe mooring.

Port of Felixstowe, Trinity Berths 6 & 7 mooring study

2017
Port of Felixstowe
United Kingdom

As part of developments related to the increasing ship sizes that visit the Port of Felixstowe, HR Wallingford were asked to examine the mooring arrangements and forces exerted on the bollards of Trinity Berths 6 and 7. These were used to assist in the identification of any remedial measures that may be necessary for ships to remain at berth safely in strong winds.

Ras Tanura West Pier

2017
KBR AMCDE
Saudi Arabia

HR Wallingford undertook a study to examine ship manoeuvrability, berthing and mooring at the Ras Tanura West Pier.

Ghana LNG feasibility study

2016
Quantum Power Operations
Ghana

Quantum Power are investigating the feasibility of importing LNG to Ghana to supplement the fuel supply available for power generation, which at present is predominantly from Light Crude Oil (LCO). The import of LNG is to provide a base load natural gas supply for eastern Ghana. Two mooring concepts were considered to station a FSRU nearshore Ghana to send high pressure gas into the local grid. The objective for the work is to identify a preferred mooring concept and evaluate the operability to a level adequate for Quantum Power to engage in commercial negotiations with LNG, gas and FSRU providers.

Dabhol LNG terminal mooring and navigation

2016
Engineers India
India

As part of the development of the Dabhol LNG Terminal, the owners wished to upgrade the existing jetty and associated marine facilities for handling vessel sizes of about 180,000m^3 capacity. Ship navigation and mooring studies were carried out, along with a downtime assessment, for the operations of the larger LNG carriers, which were larger than the original design ship for the terminal. This was completed for both the existing partially completed breakwater and the completed breakwater cases.

Gorgon marine terminal berth operating criteria

2016
Chevron Australia
Australia

As part of the development of the Gorgon LNG Marine Terminal, HR Wallingford carried out detailed dynamic ship mooring analysis which was used to assess the limiting criteria for safe ship mooring. These criteria were subsequently used to assist with operational decision making and management of the terminal.

Vessel repair yard deepwater berth

2016
Vessel Repair
USA

HR Wallingford carried out a passing ship study to determine the speeds and distances at which it was safe for ships passing the berth. The study used HR Wallingford's PASSHIP numerical model to assess mooring forces and motions of bulk carriers moored alongside the berth.

Ichthys LNG, OPTIMOOR studies for Bladin Point LPG carriers

2016
INPEX Browse
Australia

HR Wallingford undertook numerical modelling to confirm the suitability of mooring configurations for LPG carriers at the Bladin point berths.

KNPC sulphur handling facility project

2016
Daelim Industrial Company
Kuwait

Provide support to Daelim during the EPC phase with marine specialist studies including, EED design review, metocean, 2D physical model of shore protection, dynamic mooring analysis, navigation simulation and technical meeting support.

Louisiana (Mississippi River LNG)

2016
Bechtel Oil, Gas & Chemicals
USA

A logistics study, dynamic mooring analysis (for vessel passing) and hurricane design predictions were carried out as part of FEED for the proposed Mississippi River LNG project in Plaquemines Parish, Louisianna for the Parallax Energy. The marine logistics study used our dynamic throughput simulation model Port Ops, to validate the infrastructure design, in terms of the size and number of storage tanks and number of berths, and to confirm that the vessel size ranges are suitable for the intended operations. Extreme return period hurricane surge levels, waves and overtopping rates were also predicted for the proposed site.

Cruise terminal in the Port of Toulon

2016
Egis International - Egis Port
France

HR Wallingford completed preliminary navigation and mooring desk studies to assist a design and construct consortium with the preparation of their tender for a new cruise ship berth in the Port of Toulon. Particular challenges associated with the proposed site included the limited space available, the need to enable RoRo ferry operations to continue, the need to maintain leisure craft access whilst ensuring that sufficient space was available for cruise ships of up to “Oasis of the Seas” size to access the berth in a safe manner.

Saqr Port (stage 2)

2016
Saqr Port Authority
United Arab Emirates

HR Wallingford undertook a masterplan assessment which provided a basis for the development of the port infrastructure and which also included a dynamic mooring analysis of the berths for 2 preferred options.

Valero barge dock upgrade

2016
Lanier & Associates
USA

A desk assessment was carried out to estimate passing vessel forces acting on barges moored at the Valero Meraux Refinery after a series of incidents resulting in mooring lines parting at the facility. Findings were used to support the engineering of upgrades to the facility being carried out by a third party.

Wärtsilä training in marine facilities design

2016
Wärtsilä Finland Oy
Finland

Training course on marine facilities design, the objective of which was to provide a level of awareness necessary to act as an intelligent buyer when dealing with consultants and suppliers. The course was wide ranging, dealing in most marine facilities design issues including site surveys, and data collection, marine access, fixed and floating facilities, dredging and disposal, breakwater design and construction, mooring design, transfer systems, pipeline landfalls, intakes and outfalls, marine safety and environmental considerations, budget costing and implementation.

Material offloading facility, Mozambique

2016
International NV Besix SA
Mozambique

Besix was undertaking feasibility and design for a temporary material offloading facility at an existing port and a new site along the open coast partly sheltered by the fringing reef. HR Wallingford was appointed to study the navigation approach and required jetty layout for RORO and LOLO operations. The mooring layout, fender design and berthing forces were studied to develop recommendations and inputs to the cost estimate.

Myanmar petroleum storage and distribution terminal

2015
Antara Koh
Myanmar

A mooring analysis was carried out for a proposed ship to ship operation.

Portland Harbour revisited

2015
Portland Port
United Kingdom

A mooring analysis was carried out for a proposed new mooring arrangement.

Jeddah South Power Plant, pumping station physical models

2015
Hyundai Heavy Industries
Saudi Arabia

HR Wallingford provided hydraulic and marine engineering design services to HHI who are carrying out the EPC for the Jeddah South Power Plant project (JSPP) south of Jeddah, on the Red Sea in Saudi Arabia. We carried out the verification of the hydraulic performance of the pumping station and of the outfall channel (Phase 1) as well as the performance of the intake head breakwater and causeway (all phases) by physical model testing. For the marine terminal which consist of two berths and an approach channel and manoeuvring basin, HR Wallingford carried out a real time navigation simulation to confirm the dimensions of the dredged areas as well as a dynamic mooring analysis to inform the design of the berths structures.

Corpus Christi LNG

2015
Bechtel Oil, Gas & Chemicals
USA

Static and dynamic mooring analyses using HR Wallingford's established and industry proven software SHIPMOOR, which is a time domain model. These analyses were used to obtain mooring forces and vessel movements and define the limiting conditions for safe vessel mooring.

New IMC berth in Ennore Port

2015
Ennore Tank Terminals
India

As part of the development of the Ennore Tank Terminal, at the Port of Ennore, to handle larger vessels, there was a need to examine the access, manoeuvrability and mooring of larger ships at the port. HR Wallingford carried our ship navigation simulation, under keel clearance and ship mooring studies to examine the design requirements for the port.

Louisiana LNG

2015
Lanier & Associates
USA

Specialist marine studies to support the detailed design of the LNG berth at Louisiana LNG, comprising storm surge and wave basis of design for the marine facility, berth geometric study including provision LNG barge bunkering, berthing analysis, dynamic mooring analysis including side by side LNGC and FSU mooring and a passing vessel mooring study.

GCPTCL Jetty Dahej, mooring studies

2014
Gujarat Chemical Port Terminal
India

Gujarat Chemical Port Terminal Co Ltd (GCPTCL) is a joint venture Port Operating Company which operates a single jetty located at Dahej that is dedicated to handling liquid and gaseous chemicals, including petroleum products. GCPTCL and its users intends to berth larger vessels than those presently handled. HR Wallingford was commissioned to carry out navigation and mooring studies to determine the maximum size vessel that could be handled with the proposed jetty modifications, and the adequacy of the modified jetty configuration for the maximum design vessels (petrochemical and gas tanker).

Jamnagar Berths D and C ship mooring study

2014
Reliance Ports & Terminals
India

HR Wallingford were commissioned to undertake a dynamic mooring study to explore practical solutions for safe mooring at Berths D and C.

Tuas Mega Port

2014
Antara Koh
Singapore

Static and dynamic mooring studies were performed for a range of moored ships at 3 berths in wind waves currents to confirm mooring arrangements in the design wave condition.

US Virgin Islands LPG conversion project, navigation and mooring studies

2013
VTTI
US Virgin Islands

HR Wallingford carried out real time navigation simulation and mooring studies in support of proposals to import LPG using existing port facilities at two separate sites on the islands of Saint Thomas and Saint Croix in the US Virgin Islands.

Falklands ECMP upgrade

2013
Ramboll UK
Falkland Islands

As part of the development of the RoRo facilities at the East Cove (Mare Harbour) Military Port, HR Wallingford provided expert advice on the metocean conditions, ship navigation and the mooring related aspects of the proposed operations.

Northport Container Terminal 4, Port Klang, ship mooring and passing ship study

2013
Muhibbah
Malaysia

As part of the development of Container Terminal 4 at Northport, Port Klang, there was a need to undertake a ship mooring and passing ship study. This was used to examine the proposed mooring arrangements and to ensure that they were adequate for the anticipated conditions and passing ships.

Ras AL Khair, metocean and ship studies

2013
China Harbour Engineering Company
Saudi Arabia

As part of the Phase 2 development of the Ras Al Khair Port, HR Wallingford carried out a range of metocean and ship related studies. These comprised current and wave modelling to define the conditions in the area of the new berths. In addition, navigation and ship mooring studies were undertaken to identify the thresholds for safe ship manoeuvring, ship mooring and cargo handling, from which the likely downtime at the new berths was identified.

Barney Point ship mooring study

2013
Gladstone Ports Corporation
Australia

Barney Point Ship Mooring Study Gladstone Ports Corporation commissioned HR Wallingford to carry out a vessel mooring study to examine the current effects on moored vessels at Barney Point wharf. The mooring analysis considered current flow speeds and patterns for a single design ship for a range of tidal conditions and vessel draughts/under keel clearances. An assessment of the optimum mooring configuration was made.

Singapore LNG, mooring analysis for secondary and tertiary berths

2012
Antara Koh
Singapore

The development of the Singapore LNG import terminal on Jurong Island required the construction of three berths. As part of the engineering, procurement and construction phase for the Secondary and Tertiary Berths, a detailed ship mooring analysis was carried out to provide structural design load and operational data.

Dahej second jetty ship studies

2012
PROES Consultant
India

As part of the development of the second jetty at the Dahej LNG terminal, HR Wallingford undertook a navigation simulation study, based on previous work carried out for the initial jetty. This was used to evaluate the limiting conditions for safe navigation and the tug requirements.

Dahej Port further expansion

2011
Sterling Port
India

Following earlier metocean modelling, Sterling Port commissioned HR Wallingford to carry out dynamic modelling of moored ships to predict mooring loads and environmental operability limits for their planned berths at Dahej Port.Other work included an assessment of navigation access for large (Capesize) vessels and an assessment of scour in the vicinity of the jetty head and access trestle. A preliminary assessment of berth downtime was also provided.

Singapore LNG primary berth mooring study

2011
Antara Koh
Singapore

The development of the Singapore LNG import terminal on Jurong Island required the construction of a primary berth to service a wide range of LNG carriers. As part of the engineering, procurement and construction phase a detailed ship mooring analysis was carried out by HR Wallingford to provide structural design load and operational data.

Dahej Birla Copper expansion

2011
Hindalco Industries
India

The proposed development of the Birla Copper marine facilites at Dahej, India, included an extension to the existing jetty to provide additional berths. The proposed design was assessed in terms of the ship navigation, ship mooring, coastal impact and the potential for scour around the new structure. HR Wallingford performed these studies using advanced computational models and drawing on our extensive knowledge of conditions at or near the site from previous work.

Jamnagar Terminal expansion

2010
Reliance Industries
India

With the construction of another refinery at Jamnagar there was a need to expand the marine facilities to include an additional berth and two further SPMs. As part of the design process for these developments, navigation simulation studies were undertaken, along with ship mooring and risk analyses to ensure the safe operation of the facilities, and to optimise dredged area requirements. A morphological assessment was also undertaken for the capital dredging disposal.

Kalimantan wave and berthing assessment

2010
Surmas Perunding
Indonesia

HR Wallingford undertook a series of studies to examine the development of a marine terminal. In particular, metocean studies were done to support the assessment of ship navigation, ship mooring, berth operability and downtime of two potential locations for the jetty. The results of the work were used to establish the best location and orientation of the berth to minimise downtime.

Krishnapatnam ship mooring and manoeuvring

2009
Krishnapatnam Port
India

Krishnapatnam Port Company Limited is developing a new port at Krishnapatnam in Andhra Pradesh which will predominately deal with bulk cargo. These studies were to investigate approach and departure manoeuvres for bulk carriers in one of HR Wallingford's ship navigation simulators. In addition the SHIPMOOR suite of computational ship mooring models were used to examine ship motion at berth and the associated forces in mooring lines and fenders to assist with the berth design.

Cape Lambert ship mooring study

2008
Australian Maritime College
Australia

HR Wallingford were commissioned to undertaken a ship mooring study for a proposed berth extension at Cape Lamberth, Western Australia. This allowed the likely downtime for the terminal to be determined.

Hydraulic design of intake and outfall system, Shuqaiq IWPP

2008
Zelan Construction Arabia
Saudi Arabia

HR Wallingford was commissioned to provide Hydraulic Studies associated with the design and performance validation of the Sea Water Intake and Outfall Structures for the Shuqaiq Phase 2 power and desalination plant, Saudi Arabia. Studies included: Intake, towers, box culverts and stilling basin Hydraulic Design, Outfall discharge channel and discharge point Hydraulic design, Sedimentation into the Intake system, Wave loading on the towers, Physical modelling of the outfall discharge, Scour assessment, Thermal Dispersion and fine sediment dispersion Modelling. In addition to the hydraulic studies, a Navigation simulation and a ship mooring analysis will be carried out.

Dahej MPT additional ship mooring assessment

2008
Adani Petronet (Dahej) Port
India

HR Wallingford undertook additional ship mooring analysis to assist with the design of a bulk cargo jetty.

Dahbol additional mooring analysis

2007
Scott Wilson
India

HR Wallingford has carried out a wide range of studies to support the completion of the revitalised LNG Terminal at Dabhol. This study used computational ship mooring models to investigate the mooring design and evaluate downtime for moored LNG Carriers.

Dholera Port studies, phase III navigation studies

2007
Gujarat Adani Port
India

Real time navigation simulation and ship mooring studies to consider ship-related issues at proposed expanded port facilities and approach channel for Dholera Port.

Gorgon LNG

2007
Chevron Australia
Australia

LNG export is part of the Gorgon Development Project in Western Australia. The Marine Facilities are to be located on Barrow Island. HR Wallingford carried out a ship mooring study of a LNG carrier at berth using computational modelling.

Freeport LNG passing ship study

2006
Sandwell Engineers Corp.
USA

HR Wallingford was commissioned to undertake a desk based review of ship mooring and potential passing ship effects at a proposed LNG terminal. This was used to determine if the passing ship effects were likely to be a significant issue, and therefore to identify if more detailed passing ship modelling was required.

Mahshahr Port liquid terminal

2006
TNA Consulting
Iran

HR Wallingford was commissioned by TNA Consultants to examine the implications of developing the approaches to the Port of Mahshahr to accommodate larger vessels than those that presently use this port. This work concentrated on the design of the approach channel and manoeuvring areas, and included studies on ship navigation, ship mooring, sedimentation and dredging and port operations simulation.

Dahej multipurpose berth ship mooring study

2006
Adani Petronet (Dahej) Port
India

Adani Petronet Port (Dahej) Pvt. Ltd are proposing to develop a multipurpose terminal at Dahej. This terminal located to the north of the Petronet LNG terminal, will take general cargo. HR Wallingford conducted a review of the planned design and computational modelling of moored ship motion using the SHIPMOOR suite to finalise the design of the mooring configuration.

Caucedo ship mooring study

2006
Mouchel Parkman UK
Dominican Republic

HR Wallingford were commissioned to undertake a ship mooring study to examine the likely downtime for a proposed container development at the Port of Caucedo. The study results were used to assist in defining the required breakwater protection.

Dahej LNG terminal ship mooring

2005
Petronet LNG
India

HR Wallingford was commissioned by Petronet LNG Ltd to examine the ship mooring aspects associated with the recently constructed Dahej LNG Terminal. A computational ship mooring study was undertaken to replicate the conditions experienced during the Monsoon of 2004 and to optimise the mooring arrangement to assess if the berth was operatble without the construction of a breakwater. The study found that, in general, the berth was operable without the construction of a breakwater. The study was also extended to look at future operation of the Terminal with increased capacity. Again it was found that this was viable with some modifications to the mooring configuration.

UltraTech Cements Jetty (Pipavav) ship mooring study

2006
UltraTech Cement
India

Ship motion modelling was carried out to optimise the mooring configuration for an extension to an existing jetty. The proposed mooring configuration was shown to lead to minimal downtime at the jetty for Handymax and other vessels throughout the year.

Mundra, Navinal Creek, approach channel design

2004
Gujarat Adani Port
India

HR Wallingford has been commissioned to undertake hydraulic studies at Navinal Creek at Mundra [Gulf of Kachchh] including navigation desk study, flow modelling, navigation simulations, sedimentation studies as well as a ship mooring study. These studies consider a revised configuration for the approach channel that will serve both Terminal1 [container ships] and Terminal2 [bulk carriers] developments, and considers the ship mooring arrangements on Terminal2.

Jeddah, main berth 1 ship mooring analysis

2003
Hyder Consulting
Saudi Arabia

HR Wallingford was commissioned to undertake a computational ship mooring study of two proposed berth improvement schemes at Jeddah, Saudi Arabia. The study involved the testing of four design vessels, examining the moored vessel movements, mooring line and fender loads to achieve optimum designs for each berth.

Jamnagar Marine Terminal ship simulation studies

2001
Reliance Ports and Terminals
India

HR Wallingford was commissioned by Reliance Ports and Terminals Ltd to undertake ship mooring and manoeuvring simulation studies to examine the possibility of berthing larger vessels at the Reliance Jamnagar Marine Terminal. The studies enabled the proposed manoeuvring area and mooring arrangement designs to be assessed and confirmed.

Reliance Jamnagar marine terminal supplementary mooring analysis

2000
Reliance Engineering Associates
India

HR Wallingford was commissioned to undertake a computational ship mooring study to determine the movements and mooring forces of vessels berthed at the Jamnagar Marine Terminal.

Dahej ship mooring study (phase 4)

1999
Birla Copper
India

A computational modelling study of ship mooring forces and motions was carried out to evaluate the proposed mooring system for a 5000dwt tanker at the exposed jetty at Dahej and to predict the likely jetty downtime.

Dahej ship mooring study (phase 3)

1998
Birla Copper
India

A computational modelling study of ship mooring forces and motions was carried out to evaluate the proposed shore based mooring system for an exposed jetty at Dahej and predict the likely jetty downtime. The proposed mooring system for a ship unloader carrying vessel was also evaluated.

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HR Wallingford is an independent engineering and environmental hydraulics organisation. We deliver practical solutions to the complex water-related challenges faced by our international clients. A dynamic research programme underpins all that we do and keeps us at the leading edge. Our unique mix of know-how, assets and facilities includes state of the art physical modelling laboratories, a full range of numerical modelling tools and, above all, enthusiastic people with world-renowned skills and expertise.