

# Baird

Profile

## Innovation, Excellence & Service *Oceans, Lakes & Rivers*

Baird provides professional engineering and technical services related to the design of coastal structures and facilities that interact with the world's oceans, lakes and rivers. The company provides scientific analyses of coastal processes including studies of waves, water levels, currents and sediment transport. Baird is recognized for the successful completion of innovative and practical projects throughout North and South America, the Caribbean, the Middle East, Africa and Southeast Asia.

The company consists of a unique association of scientists, engineers, geomorphologists and planners committed to excellence in analysis, design, engineering and construction. Our senior professional staff is internationally recognized for technical solutions founded on science, practicality and economics. This is the basis of our success.

Baird is supported by a network of strategic alliances with professionals in related consulting, academic and scientific communities. These alliances are available to provide qualified expertise to unique projects. Baird is very experienced in the assembly and management of multi-disciplined project teams.

Baird recognizes that while technical expertise is the foundation of excellence, client relationships and effective management systems make successful projects. We strive to provide outstanding service and urge you to contact our past clients to discuss our performance.

Baird is committed to our mission of providing a high degree of technical expertise, technology and service to our clients. Our staff is dedicated to provide this service to you with energy and enthusiasm. We look forward to the opportunity to assist you with the development of your project.

Visit our website at [www.baird.com](http://www.baird.com)  
E-mail address: [info@baird.com](mailto:info@baird.com)



### Principal Services:

- Coastal, Riverine & Ocean Engineering
- Numerical & Physical Modeling
- Design of Breakwaters, Jetties & Groins
- Beach Nourishment
- Sediment Transport & Shoreline Evolution
- Waterfront Planning & Design
- Marinas & Harbors
- Hydrographic Surveying & Field Investigations
- Environmental Analyses
- Construction Observation & Administration
- Geographic Information Systems (GIS)
- Monitoring of Coastal Structures
- Coastal Zone Management

### Offices to Serve You:

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# Baird

Capabilities

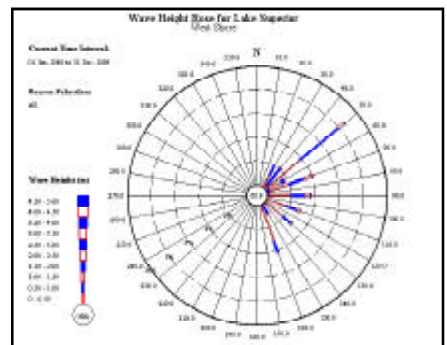
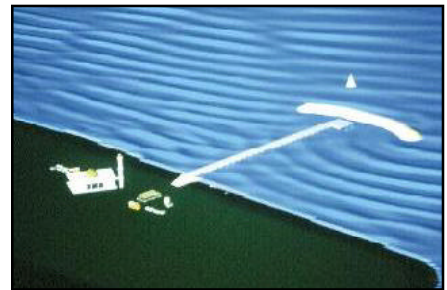
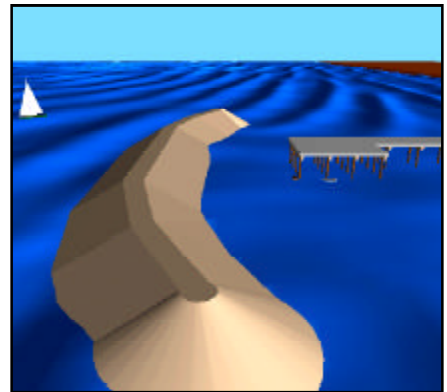
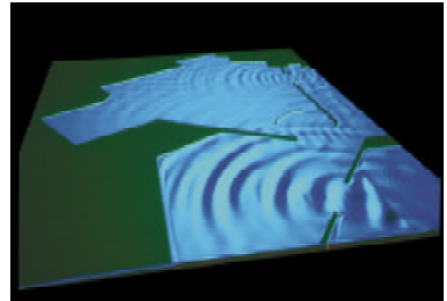
## Numerical Modeling Wind & Waves

The evaluation of wind and wave climates is an essential first step in most coastal engineering projects. Wind and waves are basic physical forces that shape our shorelines and often govern the design of coastal structures. Establishing a reliable estimate of the severity and frequency of occurrence of the wave climate at a project site is critical aspect of most waterfront projects.

To avoid the limitations and high costs associated with the collection of field data, an engineer may use computer models designed to reproduce the wind and wave generation processes at a specific location. Wave dynamics are complex and highly variable, and Baird employs a suite of sophisticated modeling tools to address the range of problems that may be encountered. These models have been thoroughly tested against both field and laboratory data, and the accuracy and reliability of the models have been demonstrated on hundreds of projects worldwide.

### Typical Applications

- Wind and wave climate statistical analyses
- Wind-wave forecasts/hindcasts
- Wave propagation and transformation
- Harbor oscillation
- Ship wave generation
- Wave interaction with structures
- Wind and wave forces
- Risk assessment
- Wave runup and overtopping



# Baird

Capabilities

## Numerical Modeling Hydrodynamics

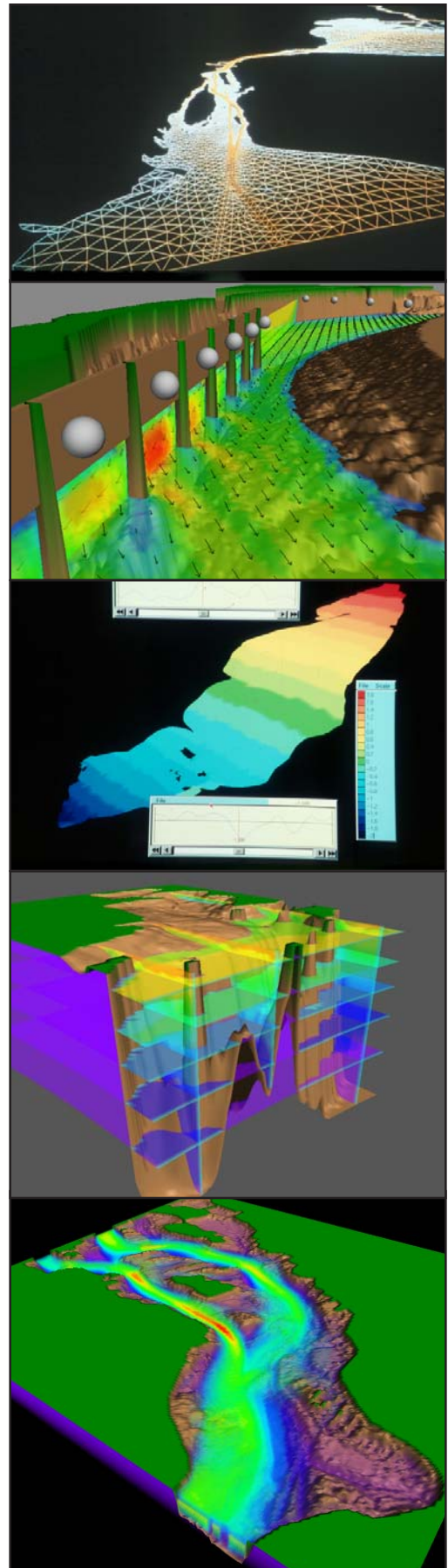
Hydrodynamics, the movement of water, is an essential element that must be examined in most studies of surface waters. It is the driving mechanism behind many of the processes of interest, including the movement of sediments and contaminants.

Numerical modeling tools are often utilized to define the hydrodynamics of waterbodies. The Baird team has a full complement of such models that may be utilized to address a wide range of problems and design scenarios. The models have varying levels of sophistication and detail with model selection depending strongly on the region of interest, the physical characteristics of the waterbody and the phenomena to be examined. Either finite difference or finite element technology is employed; the emphasis is on the development of practical solutions for the problem at hand using the best available tools.

Baird has an extensive track record in applying numerical models to a diverse range of problems. Close contacts are also maintained with researchers and other modelers in order to stay current with new developments in the modeling field.

### Typical Applications

- Circulation and currents in rivers, lakes, estuaries, and coastal regions
- Tides, storm surge and seiche
- Harbor oscillation and resonance
- River floodplain and coastal flooding
- Wetland hydraulics
- Channel and river hydraulics
- Current interaction with structures
- Statistical and tidal analyses





# Baird

Projects

## Mejillones Port Complex Chile

### Client

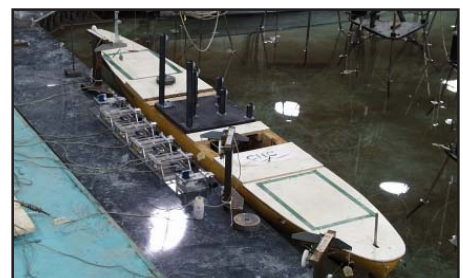
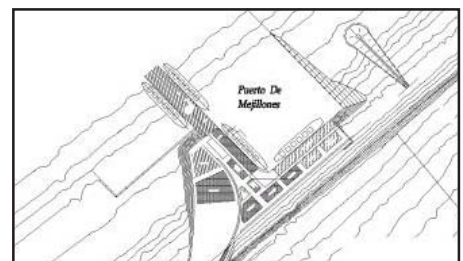
Compania Portuaria de Mejillones (Belfi and Ultramar)

### Project Scope

The Complejo Portuario de Mejillones (CPM) consists of a new port infrastructure which was built in the north of Chile near Antofagasta between 1999 and 2003, by Complejo Portuario de Mejillones S.A. (CMP SA), a subsidiary of Codelco. The project creates a multipurpose port that meets the needs of the local mining industry and the neighboring regions of Perú, Bolivia, Brasil and Argentina. The first stage of design and construction (Terminal 1) concession was awarded to the Compañía Portuaria de Mejillones S.A., a consortium formed by two partners: Ultramar Ltda. (Ultramar) y Empresa Constructora Belfi S.A. (Belfi). Belfi was responsible for the design and construction of the first terminal, and contracted with Baird & Associates for all coastal engineering and port planning services. This included all the studies related to the definition of the wave climate in Mejillones, which was achieved by means of a 30 wave hindcast using the spectral ocean wave model WAVAD, currents, sediment transport and other coastal engineering design parameters. In addition, two physical model studies were undertaken in 3D wave basins, the first to simulate moored ship response, the second to study wave forces on the coastal structures and the stability of the coastal protection works.

### Services Provided

- Wave Climate Study: Development of a 30-year oceanographic spectral 2D hindcast of waves in the Pacific Ocean with subsequent propagation to the project site. The wave climate was verified against in-situ nearshore wave measurements.
- Currents and Sediment Transport: Modeling of tidal currents and sediment transport due to waves and currents.
- Numerical and Physical Modeling of Moored Ship Response.
- Numerical Modeling of wave forces on coastal structures
- Physical Modeling of coastal structures
- Preparation of Final Designs, Plans and Construction Specifications.



# Baird

Projects

## Costa Azul LNG Terminal *Baja California, Mexico*

### Client

Sempra Global LNG and Shell International Gas

### Project Scope

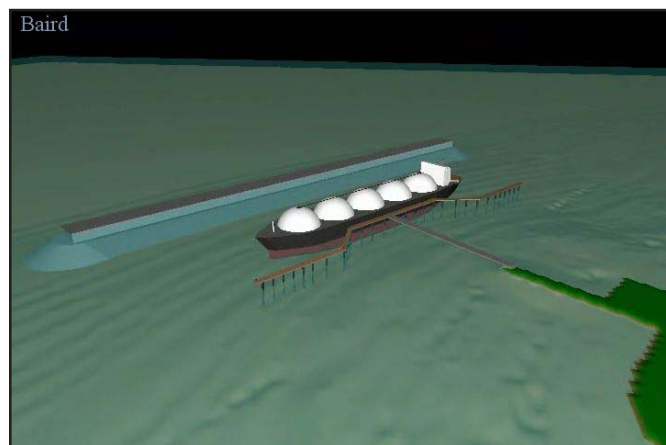
Sempra LNG are constructing a Liquefied Natural Gas (LNG) receiving terminal to be located on the Pacific Ocean coastline of Baja California, Mexico at Costa Azul.

It will begin commercial operations in early 2008, and will process approximately 1 billion cubic feet of gas per day. The terminal will consist of a single berth protected by an offshore breakwater, and is designed to accommodate the next generation of LNG carriers.

The site is exposed to wave conditions on the Pacific Ocean, and a significant challenge in the project was the development of protection for the vessel berth from the persistent long-period swells characteristics of this area. These swells, which can significantly affect moored vessel motions and result in berth downtime, are highly correlated to El Nino climatic conditions.

### Services Provided

Baird & Associates was responsible for definition of the meteorological and oceanographic conditions at the project site, and for completion of marine operability assessments for the proposed LNG receiving terminal.



Project activities included:

- Analyses of recorded metocean data at the project site, including waves, long waves, tides, water levels, surge, currents and meteorological data.
- Completion of a long-term wave hindcast for the Pacific Ocean to define offshore wave conditions.
- Wave transformation / disturbance modeling.
- Moored ship response modeling using AQWA .
- Hydrodynamic modeling of ocean currents.
- Definition of wave and current conditions for physical models of the breakwater and for ship maneuvering models.
- Estimation of berth availability.
- Sediment transport and deposition studies.

### Project Highlights

- Development and application of a comprehensive marine operability model that simulates LNG carrier operations and considers the complex metocean conditions at this site.
- Working in association with Arup Energy of Houston, Texas, investigated various vessel mooring alternatives and LNG unloading technologies in order to optimize berth availability.
- Completion of a detailed geomorphic assessment of sediment movement along the Baja coastline.