Desalination
Introduction

GHD has played a significant role in the success of every large desalination plant in Australia and the USA to date and can provide the full suite of services related to the desalination of saline water such as sea, estuarine and brackish water for municipal and industrial applications.

Major water shortages are being faced throughout the world in both developed and developing countries. Desalination offers a reliable and sustainable source of water that is not climate dependent. As a result many utilities throughout the world are turning to desalination to improve the security of their water supplies and to avoid major social and economic disruption.

For more than 80 years, GHD has been at the forefront of the water industry, delivering sustainable water solutions across the globe, covering every element of the water cycle. GHD engineers, scientists and planners are committed to providing sustainable, cost-effective and innovative water solutions that meet our clients’ water needs now and into the future.

We have also been involved in the development of desalination plants across Asia and Africa.

Scope of services

GHD’s has experience in both small and large-scale desalination projects covering the full life cycle of services including:

- Feasibility studies, including site selection
- Pilot testing
- Detailed design
- Contract administration
- Construction phase services
- Commissioning
- Testing
- Operational optimisation and troubleshooting
Multidisciplinary skills

To be successful, desalination projects require a multidisciplinary approach. GHD is able to offer a multidisciplinary team to work with clients from conception to completion. Skills available include but are not limited to:

- Water quality assessment (feed and product)
- Intake and outfall marine infrastructure including hydrodynamic modelling to determine the fate of plumes, and prevention of recirculation
- Technology selection and design (including pre-treatment, desalination and post-treatment requirements)
- Site selection and investigations for suitability
- Materials selection and durability assessment to meet design life
- Environmental studies including impact assessment/statements and monitoring (including real time monitoring with a Slocum Seaglider)
- Community consultation
- Electrical and water supply connecting infrastructure
- Probable capital and operating cost estimates and procurement/contracting strategies
- Owner’s engineering services

Experience

GHD is helping clients deliver some of the most significant desalination projects in the world. The following is a list of projects GHD has been involved with in recent years as specialist advisor, as part of a team with other specialist companies or as part of an integrated team.

GHD has globally been involved with twenty nine desalination plants with a combined treatment capacity of 4815.5 ML/d
In association with Fichtner, GHD commenced their involvement in this project by undertaking a comprehensive evaluation of desalination technologies and sites for seawater desalination plants ranging in size from 100 to 500 ML/d.

GHD then prepared an EIS for the preferred site and managed the approvals process through to obtaining approval to execute the project.

GHD and Fichtner were then appointed Sydney Water’s Owners Engineer and undertook an advanced Concept Design termed the Blueprint Design. Concept designs for a plant of up to 500 ML/d were prepared based on RO technology. GHD then assisted Sydney Water with the preparation of tender documentation tendering and negotiation of the contract to build the plant.

Sydney Water then retained GHD and Fichtner to act as their technical advisor to review the design during construction, assist in construction supervision, and assess commissioning performance of the plant. This project has now been successfully completed, on time and under budget.

The 250 ML/d plant was completed on time and to budget in 2011.
Gold Coast Desalination Plant  
features study, technology review and Owner’s Engineering Services  
(133 ML/d, 35 MGD)

GHD was initially engaged to identify alternative seawater desalination technologies to develop a scheme to meet councils future water needs as part of its WaterFutures program. Following that review GHD undertook water quality analysis and developed preliminary concept designs for a 50–133 ML/d seawater desalination plant.

The continuation and severity of the drought resulted in the State government stepping in to bring the project forward, and implement the project under an Alliance. GHD was appointed to the Alliance to provide technical support and assist in the delivery of the project.

GHD was responsible for the owner’s interest in relation to the design, project management, durability, commissioning and testing of this $1.1 billion project. GHD undertook design review, durability reviews, construction supervision, water quality analysis, commissioning assistance, and operational assistance with monitoring of the environmental performance of the plant.

This project has now been successfully delivered.

Cape Lambert Desalination Plant – plant design  
Western Australia  
(120 ML/d, 32 MGD)

GHD completed the feasibility study for the plant. This included an options study to determine the preferred desalination plant concept, followed by the preparation of the concept design for the plant to form a basis to go to tender on the project.

Other works included the preparation of procurement data sheets for all major equipment and plant components, market engagement to obtain budget quotations for major process units and equipment items, capital and operating cost estimates to an accuracy of + 15%, risk assessment to identify major project risks and recommend risk mitigation measures, water quality investigations to characterize the seawater quality, desktop geotechnical investigations, management of marine bathymetry and geophysics surveys, environmental studies including near field and far field plume modeling for seawater concentrate discharge.
Perth Seawater Desalination project – specialist advisor and delivery system detailed design
(144 ML/d, 37 MGD)

GHD undertook the third party review of designs produced by the two consortium bidding for the contract to build the Perth Seawater Desalination Plant. The scope of the design review included mechanical, electrical, I&C, SCADA, civil, structural, buildings, durability, and security; together with reviewing the basis of design using RO technology.

GHD also provided independent peer review and technical evaluation of tenders for this major seawater desalination plant; the first major desalination facility to be built in Australia.

In addition, GHD completed concept and detailed designs of the product water delivery systems involving a major pump station (7 MW installed capacity) and pipelines up to 1500 mm diameter through built up areas of Perth.

01 Perth Seawater Desalination Project
Aerial view of the award winning ‘GWI Membrane Desalination Plant of the Year 2007’
Photo kindly provided by Water Corporation

02 Victorian Desalination Plant
GHD undertook both the planning & environmental and the technical & engineering advisory roles for this project.

Victorian Desalination Plant – specialist advisor services Melbourne
(410 – 600 ML/d, 108 – 158 MGD)

GHD undertook both the planning & environmental and the technical & engineering advisory roles for this project.

We conducted land and marine based geotechnical and seawater quality investigations, prepared and submitted environmental permits for approvals, developed environmental and cultural heritage management plans.

We also produced the concept design for the desalination plant process, designed seawater intake and concentrate outlet and transfer pipelines, operated and evaluated the SWRO pilot plant, assessed existing electrical and water system interconnectivity, developed tender documentation and conducted tender evaluations, and developed a treatment plant reference design for public sector comparison.

GHD continues to act as the State government’s technical advisor through construction of this AUD$3.5 billion project.

01 Perth Seawater Desalination Project
Aerial view of the award winning ‘GWI Membrane Desalination Plant of the Year 2007’
Photo kindly provided by Water Corporation

02 Victorian Desalination Plant
GHD undertook both the planning & environmental and the technical & engineering advisory roles for this project.
Carlsbad SWRO Desalination Plant – Owner’s Engineering Services California
(190 ML/d, 50 MGD)

GHD in collaboration with Butier Engineering Inc. (Butier) was selected by Poseidon Resources to provide Owner’s Engineering services for the development, construction, and commissioning of the 50 MG/d (~190 ML/d) Carlsbad Seawater Desalination project.

As Owner’s Engineer, GHD and Butier continues to provide general oversight and independent assessment of the performance of the Engineering Procurement Construction (EPC) Contractor relative to the delivery of the Carlsbad project. Poseidon selected the team based on a combination of their technical capabilities and past experience in regard to seawater desalination and intimate knowledge of the Southern California water infrastructure market.

Adelaide Desalination project – Owner’s Engineer
(150 – 300 ML/d, 40 – 80 MGD)

GHD, as the Owner’s Engineer, provided the SA Water team with substantial support during the critical planning and development stage of the Adelaide Desalination project and which has played a part in its ultimate success. Our team also supported SA Water with Owner’s Engineer role for the transfer pipeline, power supply infrastructure and other site investigations during the construction phase as well as the environmental impact and options studies.

The Adelaide Desalination project reached the project handover milestone following successful completion of the process tests, operational tests, performance test and reliability run. The plant demonstrated outstanding energy efficiency and performance and the energy efficiency has set a new benchmark.

The desalination project has been completed within the original approved budget of $1.8 billion. This asset represents 50 percent of South Australia’s drinking water needs from a climate-independent source.
Southern Seawater Desalination Plant – tender design Perth
(300 ML/d, 80 MGD)

As part of the Aquamarine Alliance (Acciona Agua, United Utilities, and Clough) team, GHD’s main area of involvement was with the balance of Plant Engineering. These services included primarily design in the following plant areas:

- Standards and documentation applicable to the client and local design standards
- Off shore civil engineering for intake and outfall pipelines
- Raw water pumping station
- Product water supply storage and pump station, post treatment systems and associated infrastructure
- Chemical dosing systems
- Electrical design MV/ LV and associated infrastructure

Note: The Aquamarine Alliance was not the successful bidder for SSDP. However, this basic design went on to form the basis of the Adelaide Desalination Plant recently completed by Acciona Agua and United Unilities (now Trility).

Independent from the desalination plant design, GHD also undertook the design of the system integration pipelines and storage tanks.

The complete system went on to receive the WA Engineering Excellence Awards 2011. The SSDP also won GWI Desalination Plant of the Year in 2011.

Cape Riche Desalination Plant
(33 ML/d, 9 MGD)

Via a joint venture with Amec Minproc, GHD was engaged by the Southdown Joint Venture (SDJV) a joint venture between Grange Resources and Sojit Resources to undertake the preliminary and definitive feasibility studies for the water supply to a magnetite mine in the Great Southern Region of Western Australia. Services included selection, risk assessments and design for:

- Process (including seawater desalination, pre-treatment, post treatment and chemical systems)
- Off shore and onshore intake and outfall pipelines
- Seawater intake system and pumping station, including screening facility
- Site Layout
- Instrumentation and controls
- Electrical MV/ LV and associated infrastructure

GHD also undertook preparation of the EOI document and tender document for procurement of the desalination plant. Following the release of tender documents to the market, GHD was engaged by Brookfield Multiplex to undertake tender design for balance of plant works associated with the D&C contract for the desalination plant.
## Additional experience matrix

For more information please contact:
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<table>
<thead>
<tr>
<th>Project</th>
<th>Role</th>
<th>Capacity</th>
<th>Client</th>
<th>Status</th>
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<tr>
<td>Agnes Water</td>
<td>Detailed design</td>
<td>2.5 ML/d</td>
<td>United Water</td>
<td>Completed</td>
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<td></td>
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<td>0.66 MGD</td>
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<td>Hydraulic, civil and building design</td>
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<td>PAL Technology, for Dubai Electricity and Water Authority</td>
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<td></td>
<td>75 MGD</td>
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<tr>
<td></td>
<td></td>
<td>0.66 MGD</td>
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