Water

Wastewater

Client
Public Utilities Board

Location
Singapore

Changi Water Reclamation Plant

Project Highlights

Full detailed design of state-of-the-art 800,000 m3/daytreatment plant

- Design and construction activities programming for an 8 year project
- Construction management of 20 individual construction and equipment procurement contracts

Project Description

CH2M HILL was retained in 1998 to complete a feasibility study and preliminary design for the Changi Water Reclamation Plant (CWRP), the integral part of the Singapore Deep Tunnel Sewerage System (DTSS). CH2M HILL completed the detailed design, in full 3D + database, for this state-of-the art plant in mid-2002. The CWRP is designed to produce treated effluent of 10:10 (BOD:SS) quality. It treats used water generated by homes, local shops, and industries, is in its fourth year of construction and is scheduled for completion by the end of 2007.

Constructing the CWRP on the eastern edge of the island on reclaimed land, frees up land currently occupied in central Singapore by other reclamation plants and pumping stations. The design developed for the 800,000 cubic meters per day (CMD) Changi WRP Phase I is partially underground and stacked, maximizing the use of the 54 hectare of land, which is about one third the land required for a conventional plant. The CWRP is planned to accommodate growth on a phased basis and will ultimately have a treatment capacity of 2,400,000 CMD.

The CWRP detailed design by CH2M HILL included the following state-of-the-art technology:

- Influent Pumping Stations (IPS)—The 60m deep IPS receives wastewater from a newly constructed 48km, 6m-(max) diameter sewerage tunnel. The IPS comprised of one 30m-diameter coarse screen shaft and two 50m-diameter pumping stations, each installed with 5 nos. 400,000 CMD influent pumps.
- Liquids Process—CWRP Phase I preliminary treatment includes fine screening, oil & grease removal and concentration, and a 2-stage degritting process. Primary and secondary sedimentation are achieved through stacked rectangular tanks fitting with chain and flight scraper mechanism. A 6-pass anoxic step feed bioreactor design is adopted as the secondary treatment process.
- Solids Processing—Primary and waste-activated sludge is thickened through thickening centrifuges before being treated in anaerobic digesters. The biogas produced is used as a fuel to feed the sludge dryer. Digested sludge is dewatered through dewatering centrifuges, and further volume and weight reduction is achieved through rotary drum dryers.

- Outfall—A twin 3m diameter outfall pipe is used to convey treated effluent to the sea. The outfall is about 5-km long and 35m below sea level.

CH2M HILL and a local partner (CPG Consultants) provided all detailed design and tendering services for the CWRP. The detailed design of all structural, mechanical, electrical, instrumentation & control facilities for the 800,000 CMD plant was successfully delivered according to a carefully planned design development & construction schedule, and took full advantage of advances in technology over the duration of design development. The team also evaluated all tenders and assisted PUB in awarding the final tenders.

The CH2M HILL team is now providing construction management services for the 20 individual WRP multi-disciplinary construction contracts. The CH2M HILL team is the overall SO for the entire construction phase. Management of these contracts involves phasing and coordination of a complicated array of cross-disciplinary activities, performed by contractors of each of these 20 construction and equipment procurement contracts.