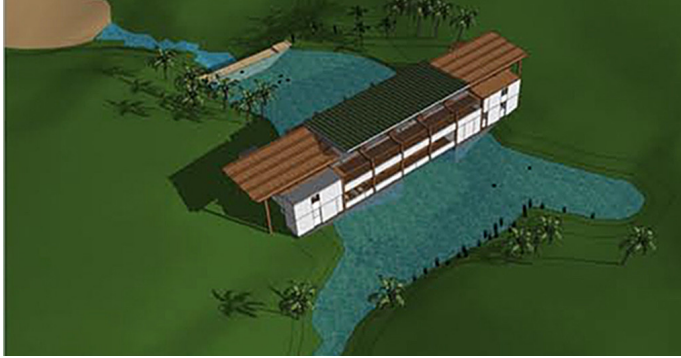


# Panamaes Resort Natural Wastewater Treatment & Reuse

Pedasi, Panama



Reception area with stormwater pond

The Panamaes Resort and Spa is a 200-room resort and spa with 75 estate lots planned for Panama's southwestern coast. The property consists of over 700 acres with two rivers and several spectacular sand beaches. The goal was to create a "green" development and simultaneously return the overgrazed, dry pasture site to a tropical dry rain forest.

The project was led by a talented design team that included Lacroze Miguens Prati, Cresolus, Edwina Von Gal and Richard Hebert. Biohabitats was asked to provide planning and preliminary

design services for wastewater collection, treatment, and reuse; stormwater management and reuse; water supply and fire protection; estuary protection; and storm surge protection for the beach front.

The Biohabitats' design approach to wastewater required a decentralized collection system that was paired with superior on-site treatment systems. The treatment technology relies on the applied ecologies of the pond (septic), marsh (constructed wetland), river (recirculating sand filter), and woodland (irrigation). The system must remove wastewater contaminants to protect

*Combining estuary restoration, delicate site development strategies, and natural wastewater treatment and reuse strategies, this beachside resort looks to be light on the land.*

fragile rivers and beaches on the site. The natural-based treatment system selected for the site is low-energy and simple to operate, and uses many materials that are locally available (versus wholly imported as a package system). After final treatment has been completed, wastewater becomes an important resource for irrigation.

The stormwater design relies on a combination of on-lot techniques and development-level approaches. Biohabitats developed a set of site guidelines that included a requirement that stormwater be retained on-site to minimize erosion, support existing vegetation, recharge the aquifer, and irrigate gardens. Because of the size of the site, Biohabitats selected primarily land-based green infrastructure strategies including vernal ponds, rain gardens, swales, check dams, and stormwater wetlands.

The resort had challenging water demands which fluctuated seasonally. Biohabitats worked with a Panamanian well driller to create a well field capable of providing an adequate supply of pure drinking water from the underlying aquifer. Water tables were close to the surface because of the site's proximity to the sea. As part of the watershed restoration design in the estuary and beach front, Biohabitats proposed several approaches to stabilize river banks and beaches. Working with marine consultants, Biohabitats designed a beach protection system proposing geo-tubes and gabions that were to be used in conjunction with a living shoreline concept. The gabions provided a skeleton for bank restoration and mangrove regeneration and created an aesthetically pleasing and structurally sound system.

*conservation planning  
ecological restoration  
regenerative design*



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