

Changing Times Around the World, The Galapagos Islands

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When Charles Darwin first visited the Galapagos Islands of Ecuador, South America in 1835 they were occupied by many varieties of sea birds, sea mammals, giant tortoises, and of course, his “finches”. I suspect that if he could revisit the same islands today he would be in for quite a shock. Today there are contaminated beaches and drinking water supplies, sewage discharging untreated into the groundwater, deforestation, and of course ever-increasing numbers of tourists every year.



Figure 1. Native species of the Galapagos Islands, Giant Tortoise and Marine Iguana .



Figure 2. Puerto Ayora and Academy Bay from the air.

Puerto Ayora on the island of Santa Cruz is the largest municipality of the archipelago and home of the world famous Darwin National Park. The current resident population of 13,000 makes its living from fishing, or from providing tourist services to a regular visiting population of 6,000. There are 1500 hotel rooms in the village and another 1500 rooms on the tour boats that shuttle scuba divers, wildlife enthusiasts and others from island to island. Of course, the boats dump their wastewater into the sea, hoping that the “solution to pollution is dilution”. Municipal sewage is disposed of in seepage pits that emulate the cesspools of past use in the USA. Being volcanic in origin, the islands have little more than a thin skin of topsoil underlain by very porous volcanic basalt. There are no surface water impoundments on the Galapagos, so 100% of the “potable” water supply comes from groundwater wells, the largest of which are now contaminated with saltwater intrusion and cesspool infiltration with nitrogen and fecal coliform bacteria. Refuse is disposed of in an open dump several miles out of Puerto Ayora center, which of course is up gradient of the limited groundwater supplies.



Figure 3. Basalt rocks at the Artificial Wetland site, Puerto Ayora, Galapagos Islands.

Hope for the Future?

In July of this year, New England Waste Systems (NEWS) constructed the first wastewater treatment facility on Isla Santa Cruz. It is designed to treat 100 m³ (26,417 gallons) per day of fish processing and slaughterhouse wastewater using a unique green technology generally called Vegetated Sand Beds (VSBs) or Pantanos Secos Artificiales (PSAs) in Spanish. Multiple articles about VSBs constructed in the Hudson River Valley have been published in Boating on the Hudson over the past several years. Simply put, a lined sand bed about 3 feet deep is planted to a variety of native wetland plant species that provide oxygen to the sand matrix while simultaneously absorbing nutrients and other minerals into their plant tissue. The only energy involved in the aeration process is provided by the sun. A large population of bacteria attached to the sand grains subsequently convert organic wastes (BOD in wastewater treatment jargon) to carbon dioxide (CO₂) and water. The green plants absorb or utilize all of the CO₂ produced from

the wastewater in plant growth, so that there is no net production of this greenhouse gas. No other wastewater treatment process can boast a “zero carbon footprint”.



Figure 4. Early Construcion on the Artificial Wetland System for Puerta Ayora.



Figure 5. Engineers and workers survey the construction site.



Figure 6. Finished platform for Artificial Wetland, Puerta Ayora, Galapagos Islands.



Figure 7. Pipe laying in the Artificial Wetland cell, Puerta Ayora.



Figure 8. Planting of finished Artificial Wetland, Puerta Ayora.

In September and October of this year, NEWS will construct a similar facility at the Puerta Ayora Industrial Park where more than 100 manufacturing facilities produce cement blocks, furniture, and a variety of construction materials. It is the hope of Puerta Ayora Mayor Lepoldo Buccelli and others on the island that international financial assistance might provide a 20 acre VSB facility to treat the wastewater of the 20,000 residents and tourists, they have set aside enough land area to accomplish this. In the meantime, however, there continues to be an increasing human burden on the Galapagos environment as more and more tourists flock to see the wonders encountered by naturalist Charles Darwin more than 150 years ago.

Editor's Note: The cost of sewerage Puerto Ayora and treating the wastewater using green and sustainable technology is estimated to be 20 million dollars. If you'd like a personal tour of Isla Santa Cruz, you can contact Dr. Ronald Lavigne at (413) 584-7793. As president of NEWS-USA and NEWS-ECUADOR Dr. Lavigne has constructed more than 100 treatment facilities around the world including the countries of China, Argentina, the USA, and of course, Ecuador. NEWS-ECUADOR is currently the principal wastewater treatment consultant for the Island and has a close working relationship with municipal authorities including the Mayor and Commissioner of Public Works. If you choose to visit Puerto Ayora, Isla Santa Cruz, it would be nice if you brought your checkbook!