



Polytechnic University of Puerto Rico

Civil and Environmental Engineering Department

Environmental Engineering Senior Project Design II

SP-15



Expansion for the Vega Baja Municipal Landfill

Problem and Objective

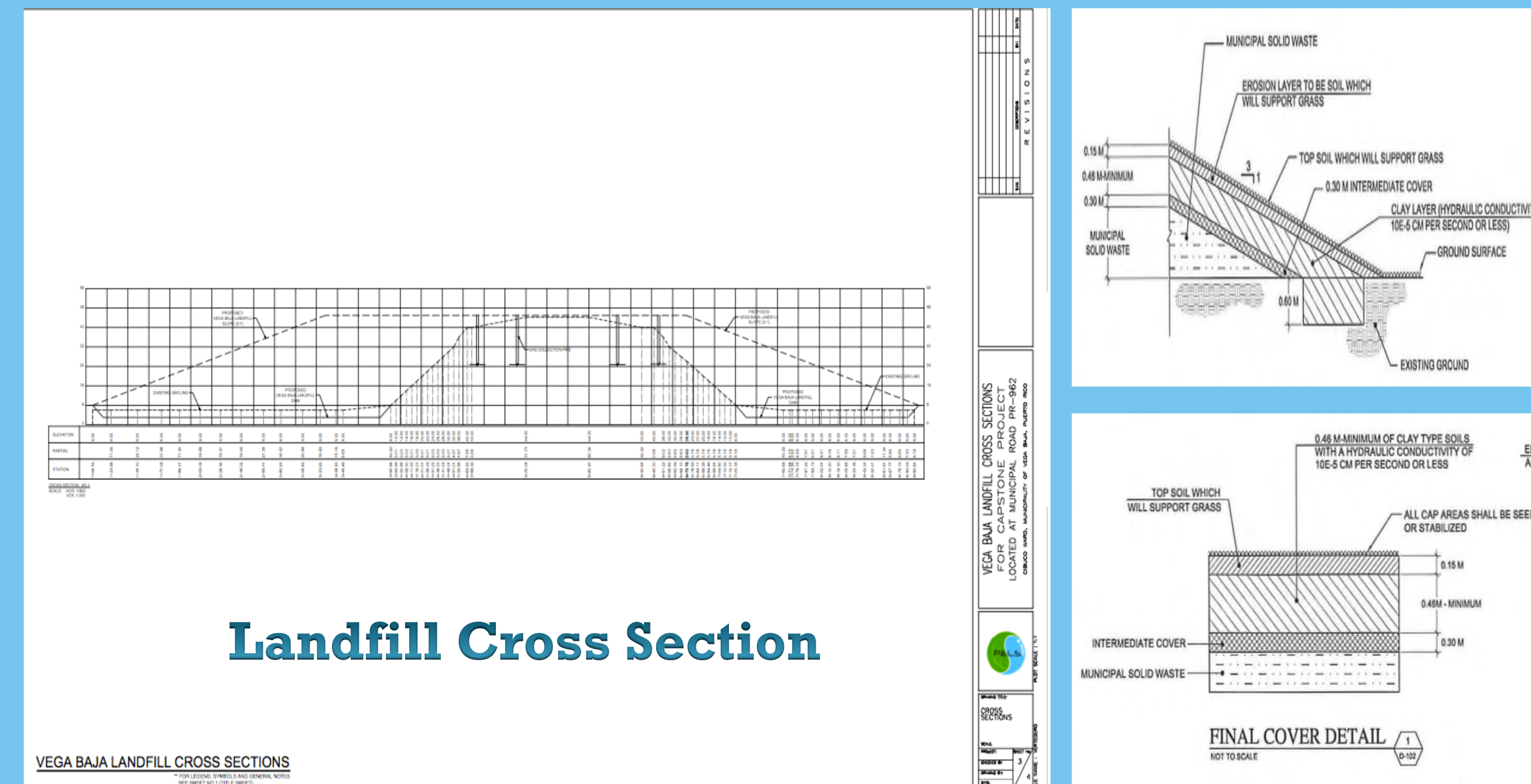
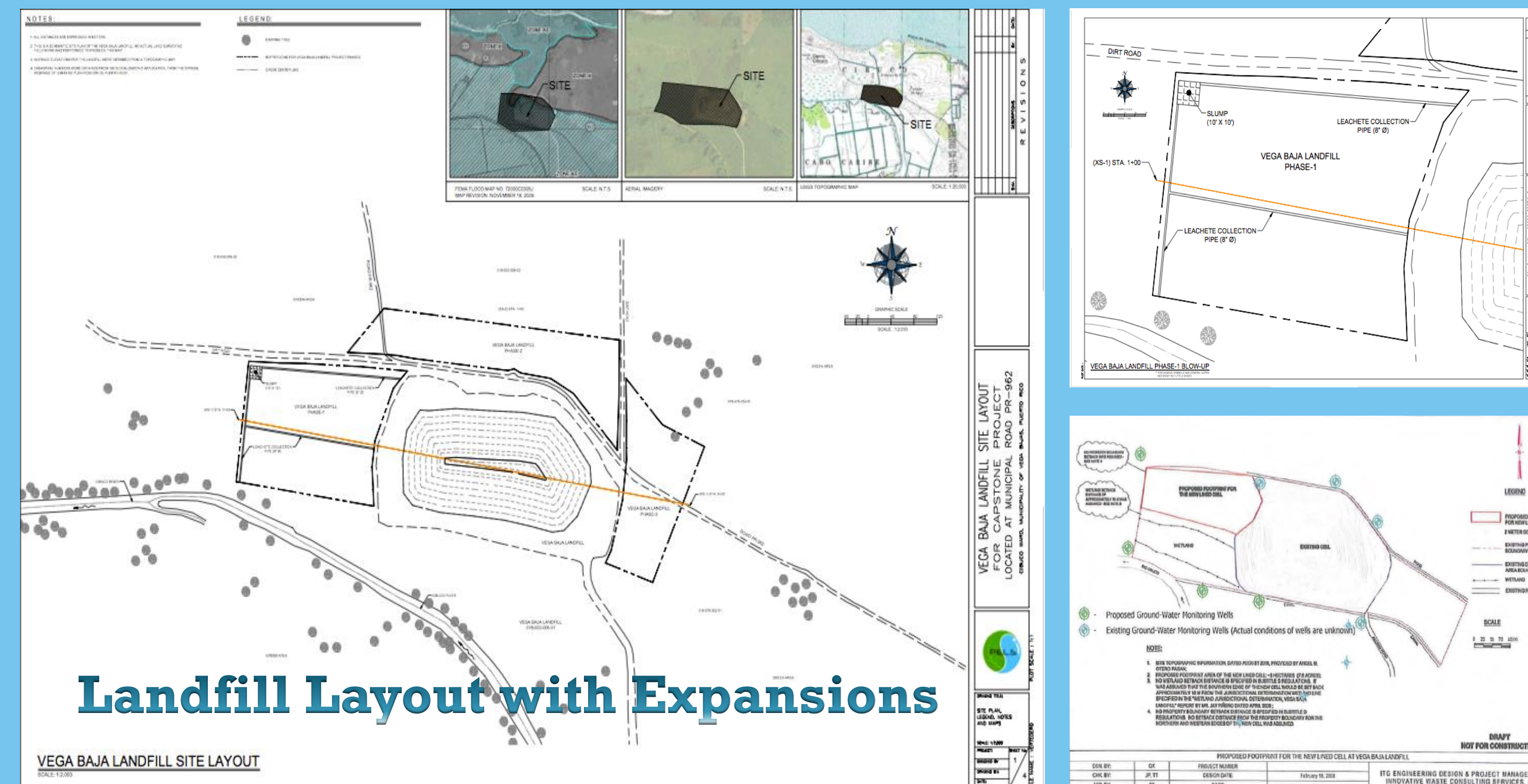
One of the main environmental problems in the island of Puerto Rico is the disposal of solid waste. In the island we have a total of 28 landfills. Most of the landfills in Puerto Rico were constructed before 1970, which means that they were created without any environmental conscience. The landfills in Puerto Rico are considered open dumps, meaning that the waste is collected in a designated area without any environmental control. All of the landfills in Puerto Rico are contaminating soils, water, air and impacting the environment. When we analyze this problem the solution that can come to mind could be the closure of the landfill, but this will create a worse scenario. If there are no landfills in the islands, people will begin to create clandestine landfill, and will throw their waste in any place they want. For this reason we are proposing the expansion and recollection of leachate of the Vega Baja Municipal Landfill. The expansion of the landfill will be designed with the requirements for compliance and financial resources.



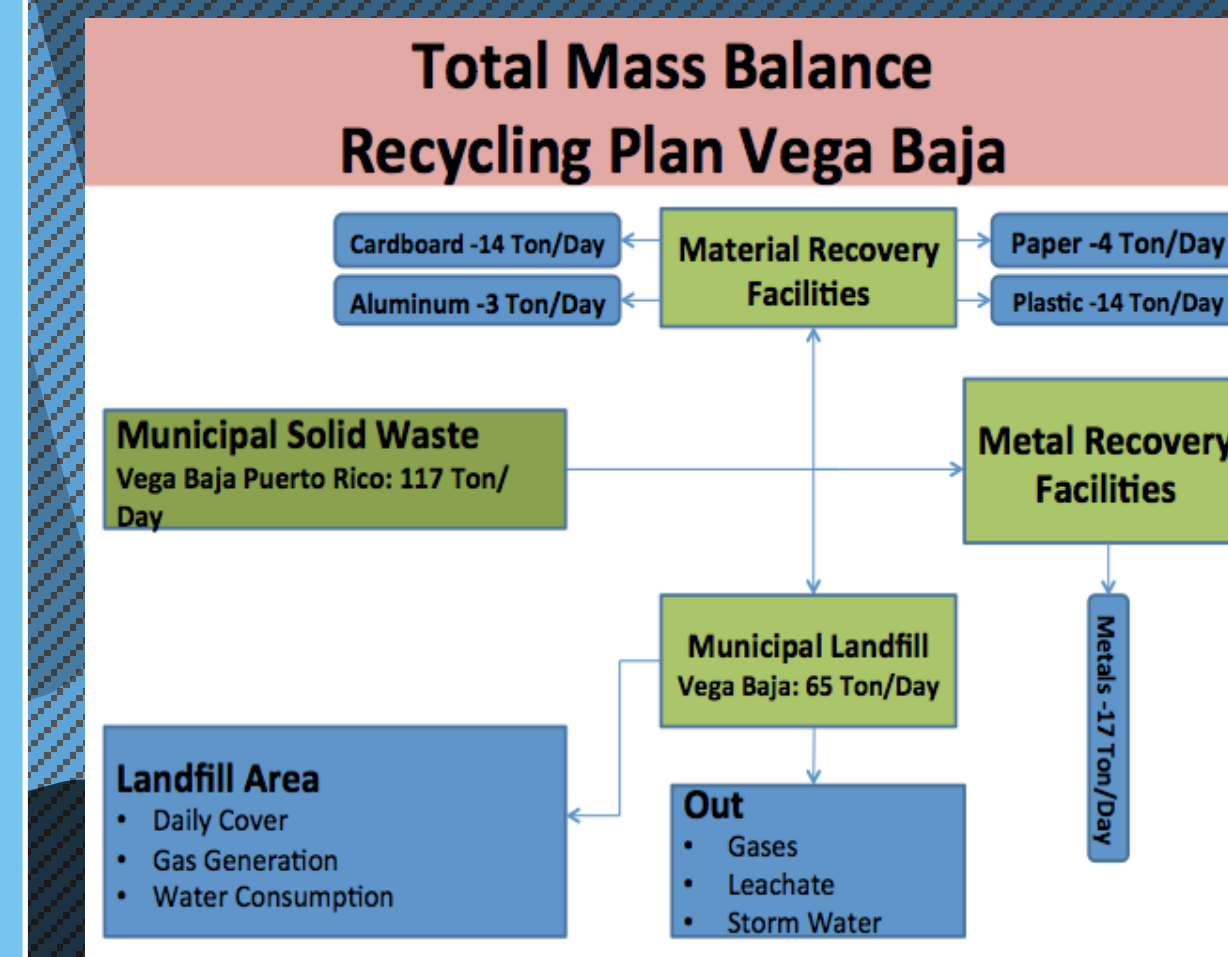
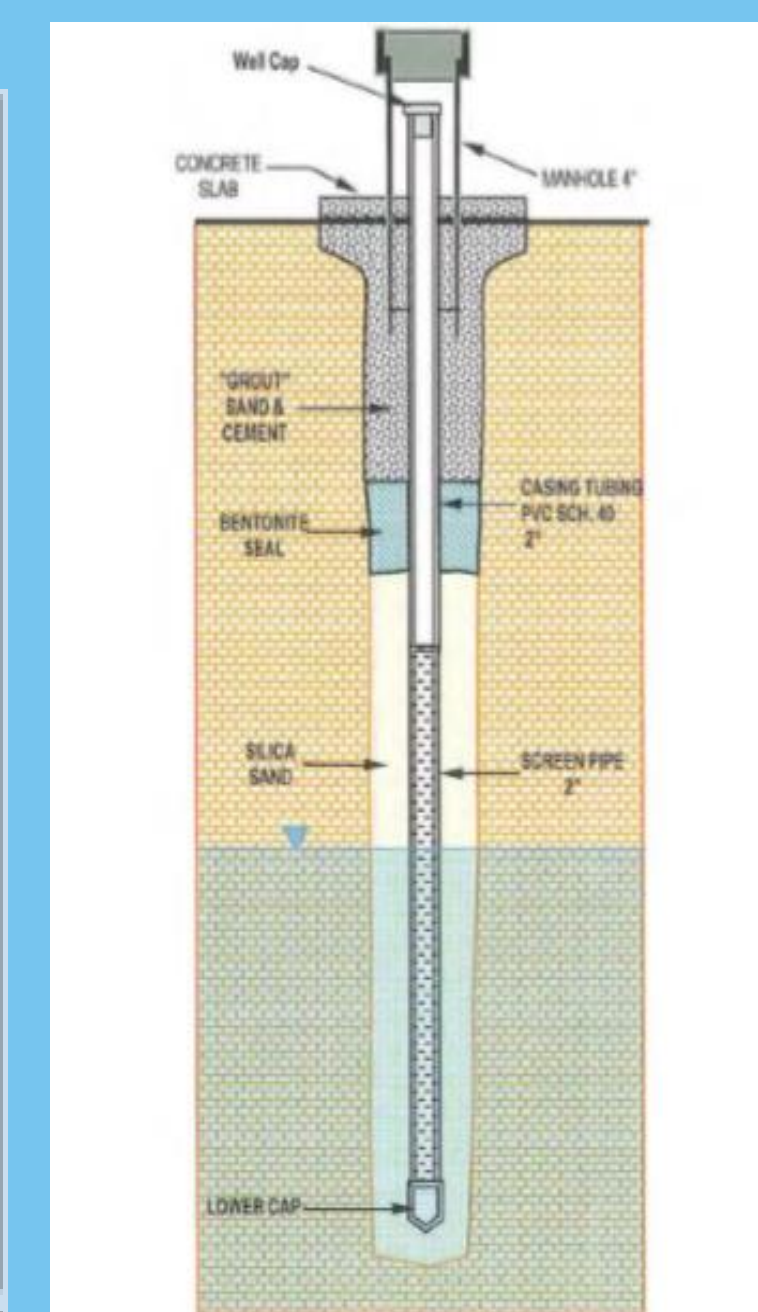
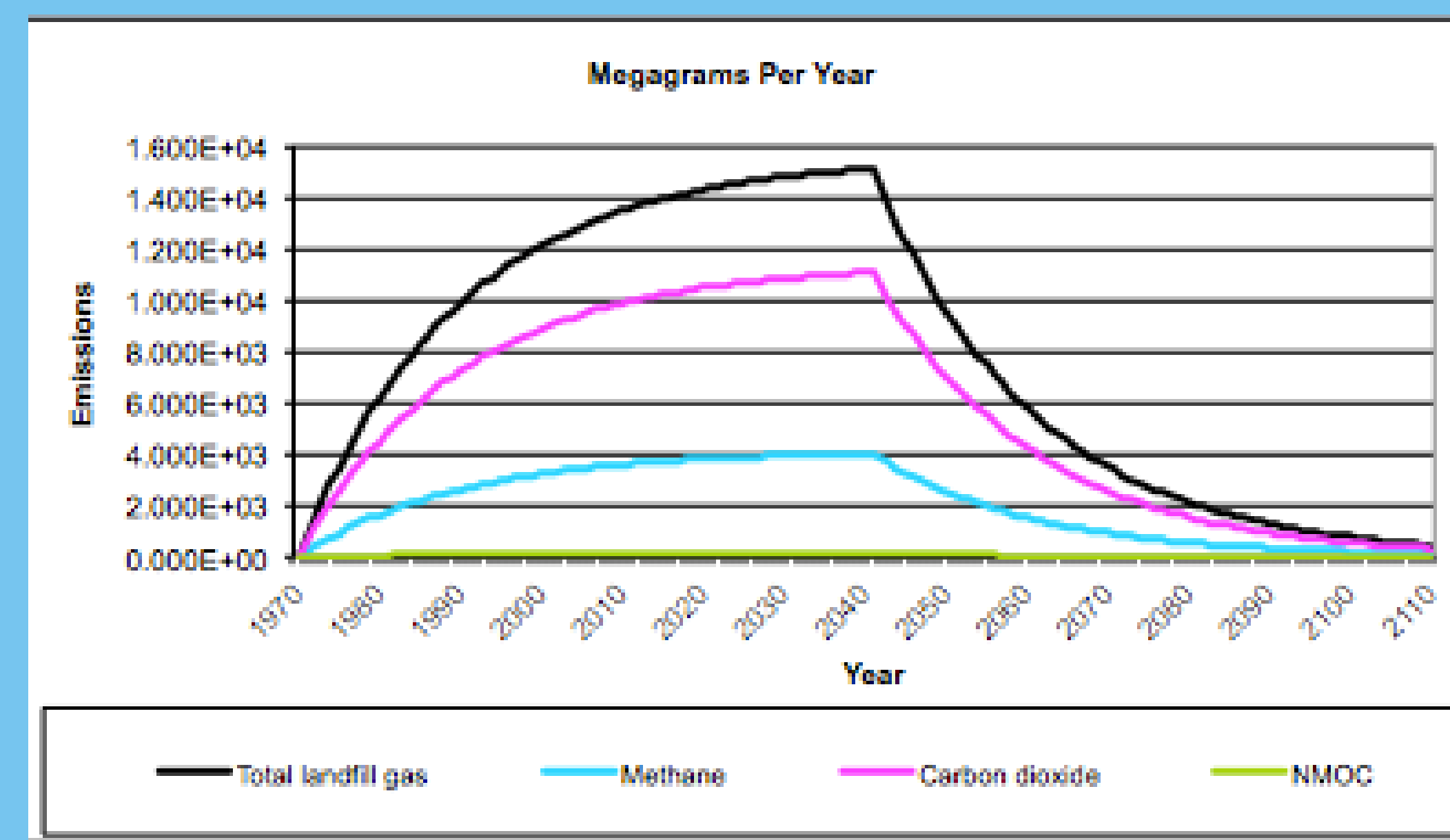
Introduction

The Vega Baja Solid Waste Disposal site is a 72-acre, active, unlined, and uncapped solid waste disposal facility located in the Rio Abajo Ward area known as Brisas del Rosario. This landfill currently receives solid waste from Vega Baja, Vega Alta, Morovis, Manati, Dorado, Ciales, Utuado, Barceloneta and Orocovis. The solid wastes generated from these municipalities reach approximately 546 tons of solid waste per day. Additional expansions will be made along the landfill, which can add up to 20 years in the life of the landfill. In the new cell, a gas collection system would be designed to collect the gases generated from the closed cell. As part of the expansion of the landfill, new leachate systems have to be developed. One of the main problems the facility has is the lack of pluvial or sewer systems. There are no sewer systems available in the area. Approximately the gas generation from the landfill would keep up to 70 years after the landfill has been closed. These gases could be used as fuel and as a green energy source. A passive drainage system will be the responsible for suctioning the gases.

Final Design



Gas Production and Recollection System



- 1- Entrance
- 2- Landfill Road
- 3- Administration Area
- 4- Ciasco River
- 5- Closure Cell (25 acre)
- 6- First Expansion Cell (Active Area 9.55 acre)
- 7- Second Expansion Cell (8 acre)
- 8- Third Expansion Cell (7.45 acre)
- 9- Material Vegetative Area
- 10- Leachate Tank
- 11- Stormwater Lagoon
- 12- Wet Lands

The recycling plan of the Vega Baja Landfill will deviate 14 tons of cardboard, 4 tons of paper, 3 tons of aluminum, 14 tons of plastics and 17 tons of ferrous materials per day. This will represent 1,092 tons of recycled waste per month. This amount of waste represents 2,184 yards per year that will not be filled in the Vega Baja landfill. The Landfill Cross Section shows the slope stabilization design and how the landfill should be designed for closure. With the implementation of this design and the recycling plan the lifespan of the landfill will increase up to 50 years, jobs will be created and state and federal laws will be complied.

Conclusion

The design of the new cells will comply with 3:1 slopes according to federal regulations. New cells must be constructed based on 40 Code of Federal Regulations Subtitle D requirements. Gas collection system will collect approximately 1,438,224 tons of landfill gas per year (based on LandGEM version 3.02). With the implementation of this design the lifespan of the landfill will increase up to 50 years. The implementation of these type of projects should help Puerto Rico to improve the protection of the environmental and health conditions.

We would like to thank Professor Eduardo Gonzalez, PE, Juan Mercado, PE & La Vega Eco-Park for their time, dedication and guidance during this project.

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