

Introduction & Objectives

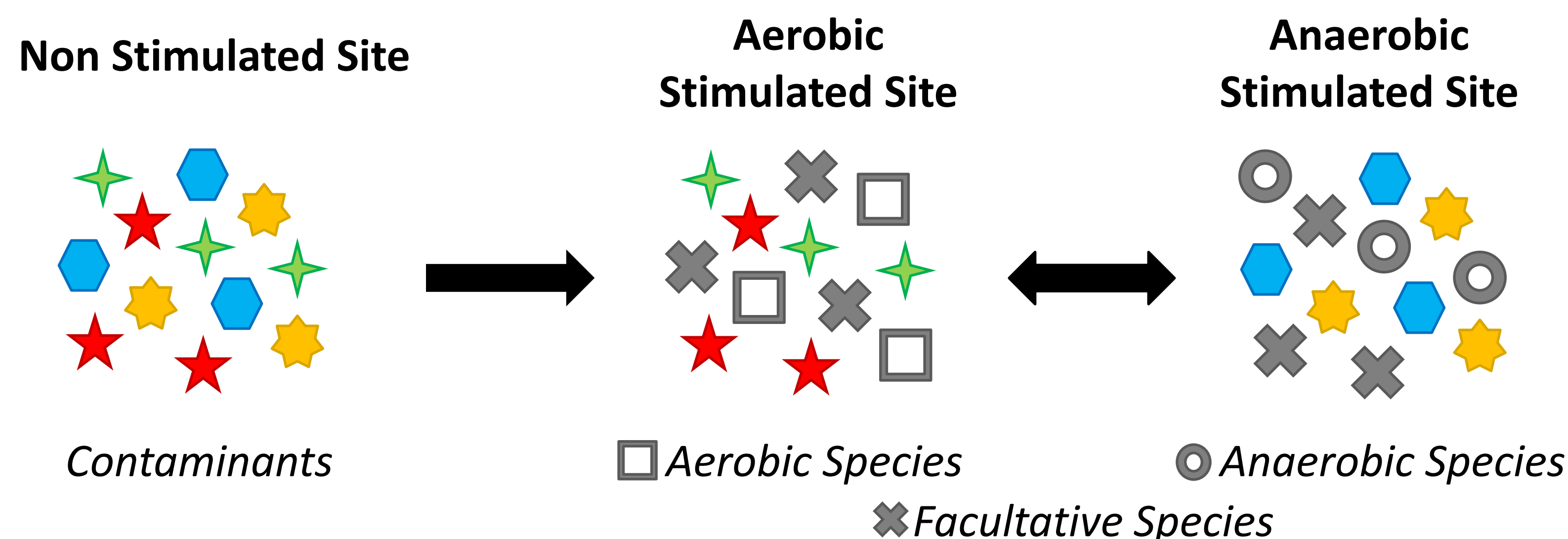
Moriah Ambiental, performed a full scale remediation treatment at a site with 3800 ft² area for 3,5 years. The soil non-saturated zone of the site was contaminated with the following compounds:

Main Contaminants	Concentration (mg/kg)
hexachlorobenzene	128
hexachlorobutadiene	23
pentachlorobenzene	16
1,2,3,5 - tetrachlorobenzene	9
others OCC	2
Total OCC (Organochlorides Compounds)	178

- Decrease the OCC concentration of 178 to < 1 mg/kg.
- Acquire the Rehabilitation Certificate for the site.

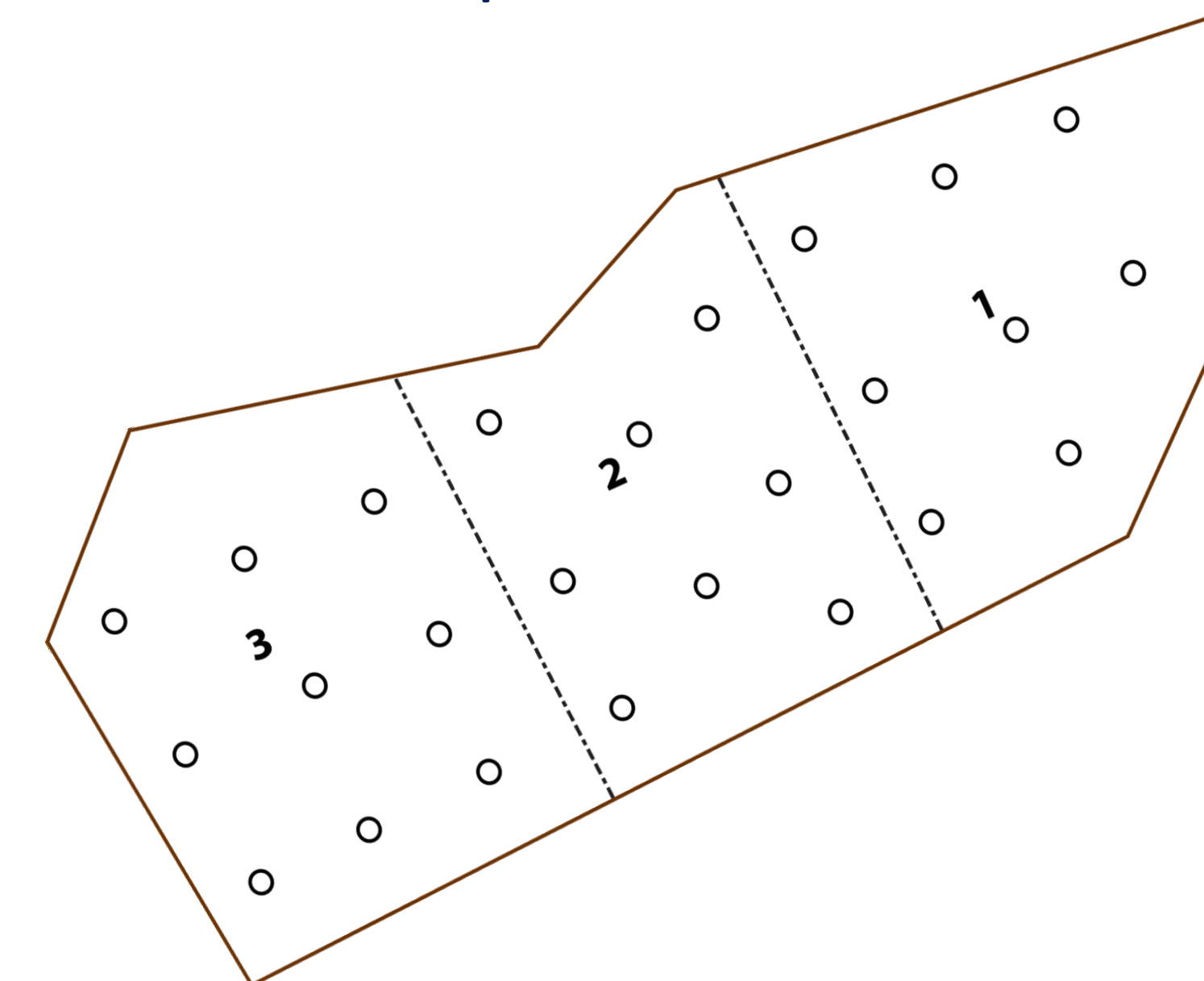
Theory

This bioremediation consists in stimulate the indigenous microorganisms through the nutrients within the Organic Substrate. Intercalate between the aerobic and anaerobic environments selects species with specific metabolism routs for different contaminants.



Methodology

The Organic Substrate (OS) was mixed with soil until reaching 17% of organic matter dry base. When less than 12% were reached, a reinforcement of more OS would be done. In the total process, it was done only 2 extra additions of OS (≈ 1 /year). The mixture between OS and the contaminated soil was done through an excavator machinery until 1 m depth.



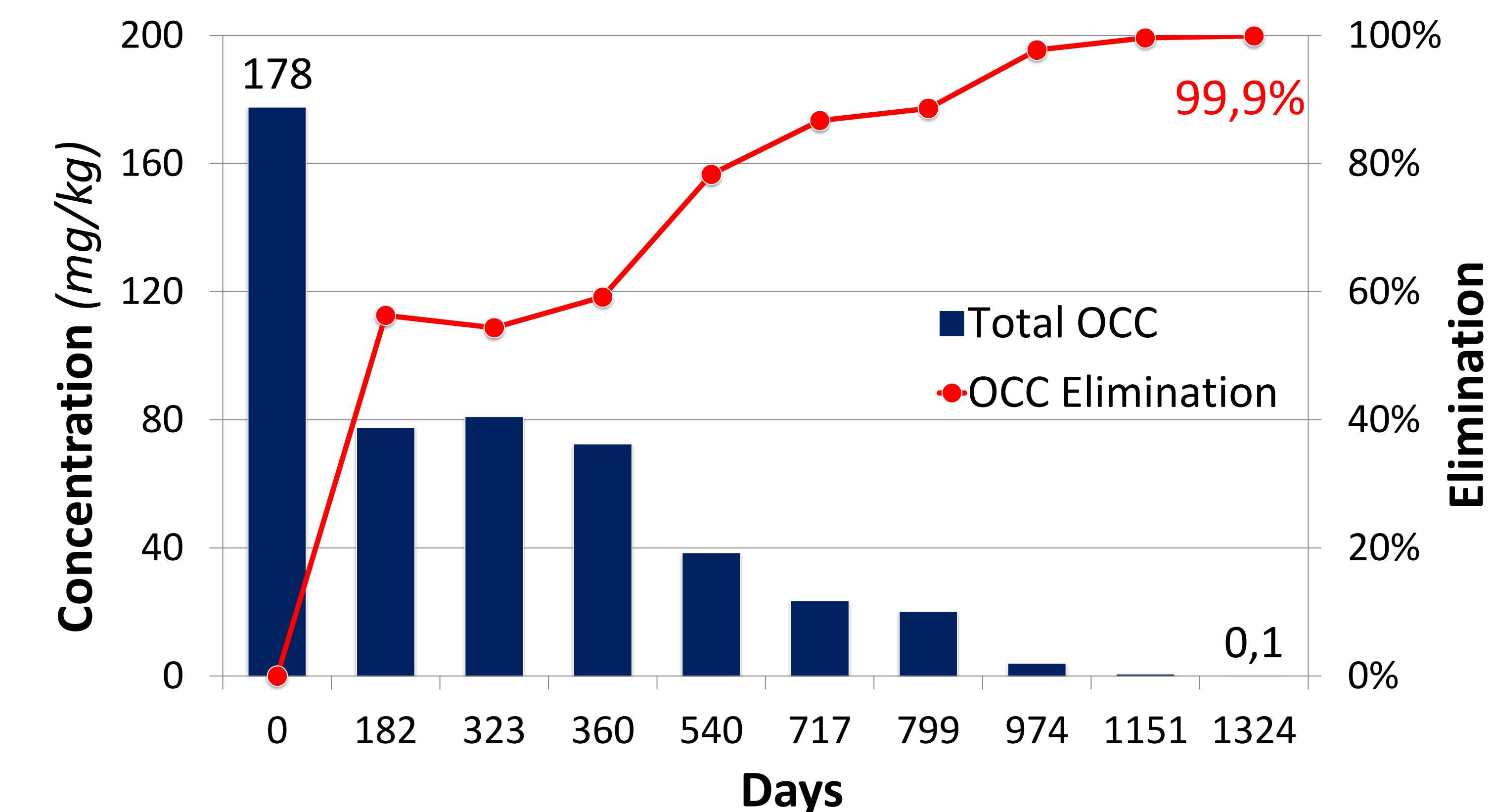
- The intercalation between the environments was done at every 3 months.
- The aerobic environment was made without covering, and total exposure to the sun, with no addition of water besides the natural rain. Moisture: 15-27%.
 - The anaerobic environment was made with an addition of water until Field Capacity >120%, also covering the whole area from the sun with tarpaulin. Moisture: 27-40%.



The Area was divided in 3 virtual cells. The sampling of 8-9 points of each cell generated one composed sample, therefore three samples for the whole site could be obtained. This monitoring was made at every 6 months during the 3,5 years treatment. Each sample would be analyzed through VOC, physical-chemical parameters, moisture, ashes and organic matter.

Discussion & Results

The OS is an improved and matured form derived from chicken manure. The nutrients within the OS can exponentially multiply the indigenous microorganisms, which in this environment, usually belongs to the species of *dehalobacter*, *dehalococcoides*, and other types of bacteria that act as a synergic consortia.



Conclusion

All the contaminants concentrations decreased below the target laws, therefore the Rehabilitation Certificate was requested. The reaction is clean and also do not generate any hazardous metabolites or subproducts. Bioremediation of organochlorides compounds usually convert these products into free chloride, and very low weight compounds like CO₂. Biostimulation OS has shown as one of the best cost and yield treatment. Moreover it is an in situ technology, with low cost products, machinery and manpower.