

BIOXISOIL (LIFE11 ENV/ES/505)

New approach on soil remediation by combination of biological and chemical processes

Nuevo enfoque en la recuperación de suelos mediante la combinación de procesos biológicos y de oxidación química

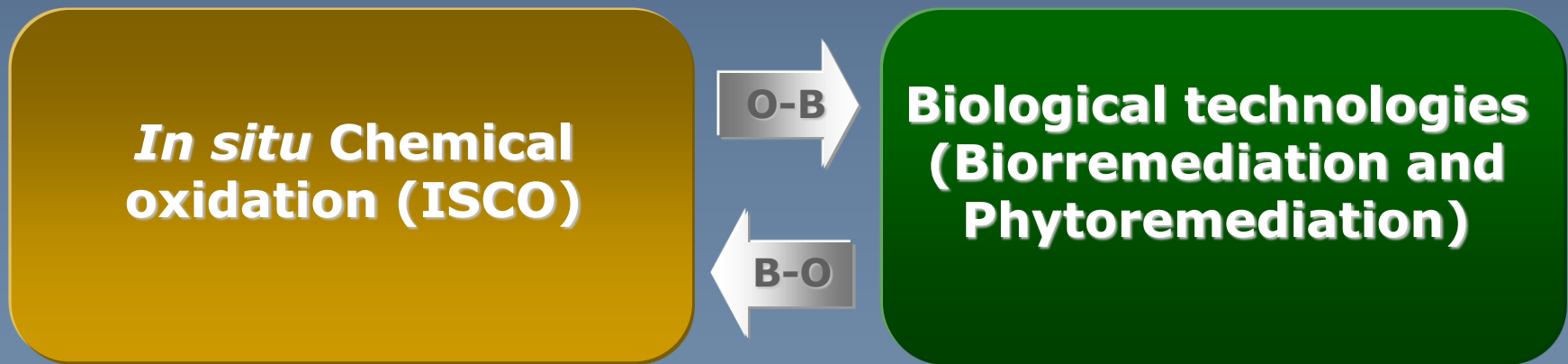
Participants

 <p>MINISTERIO DE DEFENSA</p>		
 <p>GOBIERNO DE ESPAÑA</p>	 <p>MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD</p>	 <p>Ciemat Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas</p>
 <p>POLITÉCNICA "Ingeniamos el futuro"</p>	 <p>CAMPUS DE EXCELENCIA INTERNACIONAL</p>	 <p>CBGP</p>
	 <p>Aitemin Centro Tecnológico</p>	

Objective

To conduct a **real-scale** soil decontamination experience by combination of chemical and biological technologies.

To develop a **protocol** to be used for decision makers, regulators, researchers and industry based on data from a real situation.



Schedule (01/09/2012–01/09/2016)

2012 2013 2014 2015 2016

Preparation actions

ISCO

Phytoremediation

Biorremediation

Restaur.

Monitoring and control

Financial support

Total: 2,671,553 €.

- ✓ **AITEMIN** – 820,861 € (30,73 %)
- ✓ **CIEMAT** – 770,496 € (28,84 %)
- ✓ **UPM-CBGP** – 645,134 € (24,15 %)
- ✓ **JAL-DIN** – 435,062 € (16,28 %)

UE: 1,335,237 € (49,98%)

Activities

Preparatory works : aimed at setting up the baseline and selecting the most adequate areas, plant species and bioremediation and oxidant agents as well as protocols

***In situ* Chemical oxidation (ISCO)**: as the main soil treatment of the area

Biorremediation: enhanced natural attenuation

Phytotechnologies: phytostabilization / phytobarrier

Environmental remediation: landscape reclamation

Monitoring and control

Information of the affected area



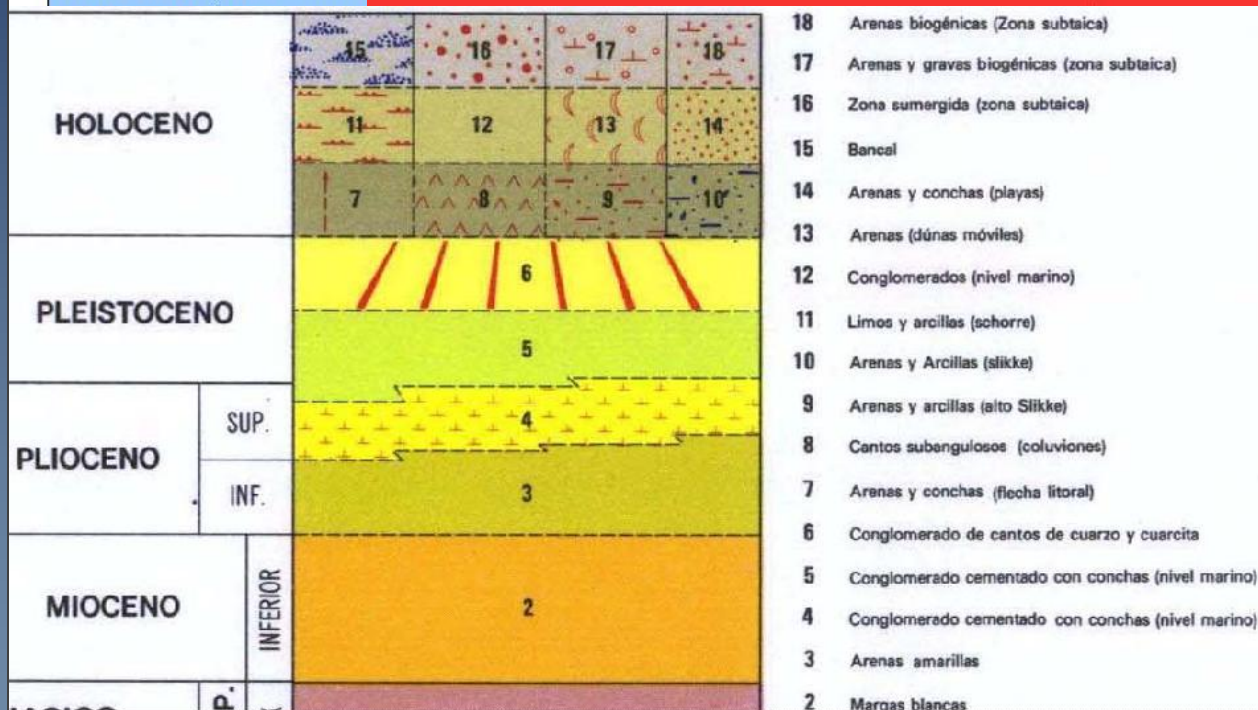
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INSTITUTO GEOLOGICO DE ESPAÑA

E. 1:50.000

SAN FERNANDO

Segunda serie - Primera edición



S-238. Caracterización de suelos en Arsenal de

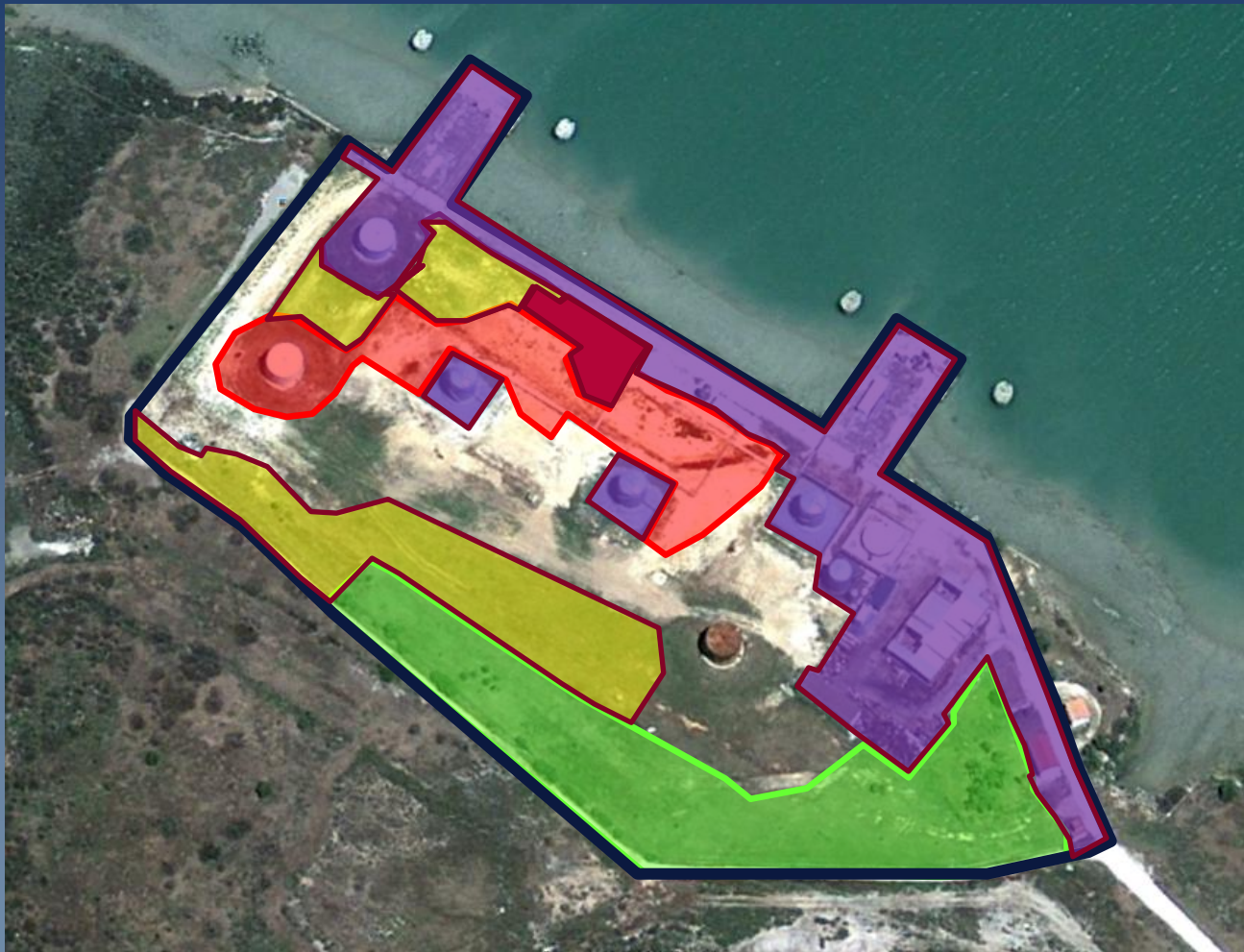
Centro de Publicaciones
Ministerio de Industria y Energía



Information of the affected area



Selection of the areas to be treated



Sampling points and soil profiles

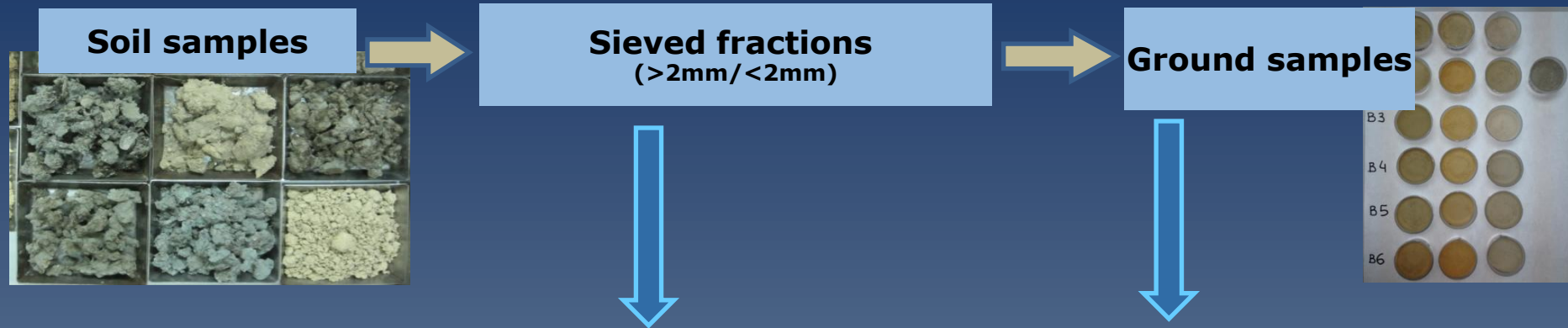


25 soil profiles

Soil and water sampling area



150 soil samples and 10 water samples

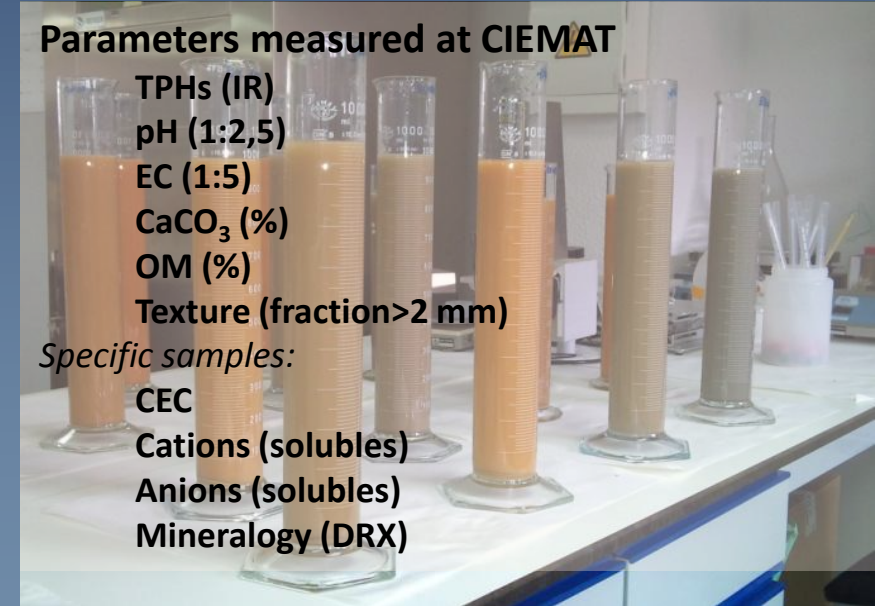


Parameters measured at CIEMAT

- TPHs (IR)
- pH (1:2,5)
- EC (1:5)
- CaCO₃ (%)
- OM (%)
- Texture (fraction >2 mm)

Specific samples:

- CEC
- Cations (solubles)
- Anions (solubles)
- Mineralogy (DRX)

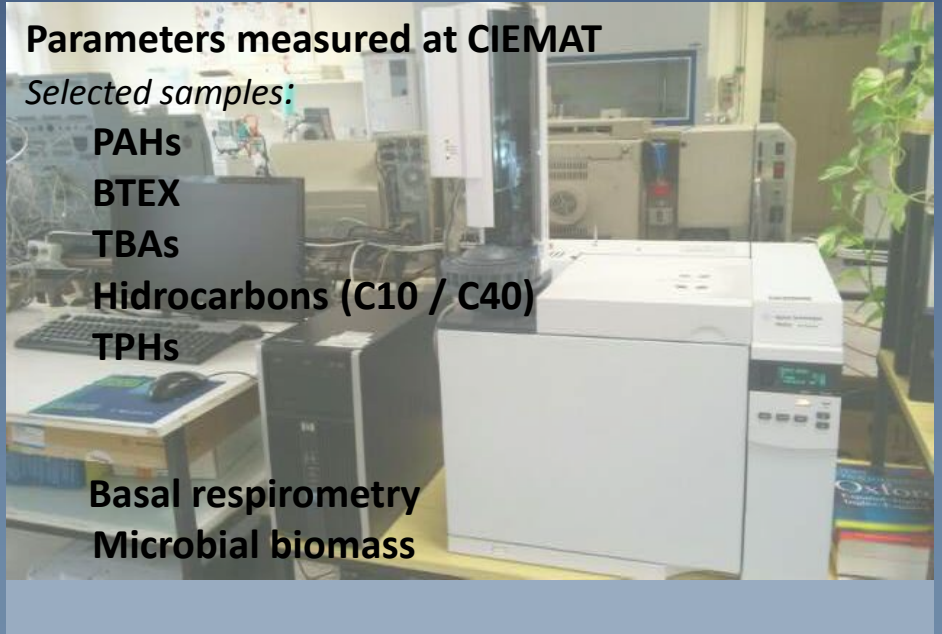


Parameters measured at CIEMAT

Selected samples:

- PAHs
- BTEX
- TBAs
- Hydrocarbons (C10 / C40)
- TPHs

- Basal respirometry
- Microbial biomass



Preliminary soil contamination of the area

Ref. LAB	REF. MUESTRA	Profundidad [cm]	constituyentes horizonte	profundidad hasta cochas	espesor cochas (REVISAR CAMPO)	Ref. LAB	parámetros básicos (CIEMAT / LAB. Edif. 20)										
							TPHs (mg.kg ⁻¹)	pH	CE (t.5) (μS.cm ⁻¹)	CaCO3 (t)	C orgánica (t)	textura fracción <2mm			fracción >2mm	h _m cm	
							BX_1001	120	8.1	123	16	0.5	42	14	44	14	
BX_1001	B1 A ₁	0 - 5/15	areno-arcilloso			BX_1001											
BX_1002	B1 C	5/15 - 20/25	areno-arcilloso														
BX_1003	B1 C ₁	> 20/25	conchas-arcilloso														
BX_1004	B2 A ₁	0 - 15	areno-arcilloso														
BX_1005	B2 C	15 - 30	areno-arcilloso														
BX_1006	B2 C ₁	30 - 110	conchas-arcilloso														
BX_1007	B2 C ₂	> 110	fangos														
BX_1008	B3 A ₁	0 - 5	areno-arcilloso														
BX_1009	B3 C	5 - 15	areno-arcilloso														
BX_1010	B3 C ₁	> 15	conchas-arcilloso														
BX_1011	B4 A ₁	0 - 8/10	areno-arcilloso														
BX_1012	B4 C	8/10 - 28	areno-arcilloso														
BX_1013	B4 C ₁	> 28	conchas-arcilloso														
BX_1014	B5 A ₁	0 - 6	areno-arcilloso														
BX_1015	B5 C	6 - 20	areno-arcilloso														
BX_1016	B5 C ₁	> 20	conchas-arcilloso														
BX_1017	B6 A ₁	0 - 8/10	areno-arcilloso														
BX_1018	B6 C ₁	8/10 - 22	areno-arcilloso														
BX_1019	B6 C	> 22	conchas-arcilloso														
BX_1020	B7 A ₁	0 - 3	areno-arcilloso														
BX_1021	B7 C	3 - 20	areno-arcilloso														
BX_1022	B7 C ₁	20 - 50	conchas-arenoso														
BX_1023	B7 C ₂	> 50	conchas-arcilloso														
BX_1024	B7 C ₃	comprobar campo	areno-arcilloso														
BX_1025	B8 A ₁	0 - 12	areno-arcilloso														
BX_1026	B8 C ₁	12 - 27	areno-arcilloso														
BX_1027	B8 C ₂	27 - 29	conchas-arenoso														
BX_1028	B8 C ₃	> 29	conchas-arcilloso														
BX_1029	B9 A ₁	0 - 5	areno-arcilloso														
BX_1030	B9 C ₁	8 - 16	areno-arcilloso														
BX_1031	B9 C ₂	16 - 36	conchas-arenoso														
BX_1032	B9 C ₃	> 36	conchas-arenoso														
BX_1033	B9 (segro)	comprobar campo	fangos														
BX_1034	B10 A	0 - 10	areno-arcilloso														



Preliminary ISCO experience



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