

Executed project report

Naturalization work of the Falgar pond in Franqueses del Vallès (Barcelona)

Stakeholder of the project: GESA **Modification of the project and execution:** Naturalea
Client: BARNASFALT **Starting/Finishing:** January – March 2019

BEFORE



AFTER



INTRODUCTION

The work done in the Falgar pond consisted, at first, of the technical rethinking of the functioning of the water pond with the redaction of a technical memory, and then of the naturalization of the pond with autochthone helophytic species.

Plurispecific herbaceous communities were installed in the main pond, and monospecific herbaceous communities were placed into the two other lagoons.

In the water inlet channel in the lake, helophytes were planted in forest canopy format.

In the main pond we installed three floating vegetated islands.



R-EXE-19_03_O805

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Some years ago, the construction of the lake create a leisure zone in a protected area. The works stops and this lake keeps in the area without any intervention because no water available. Decades later the council town decide to use this space and create a real lake with water from Waste Water Tretnment Plant. A special design was done to improve the que quality of this water to create a wetland area.

Naturalization work in Falgar pond in Franqueses del Vallès

Background

The original project "Project of finalization of the Falgar Pond and a zone with common alder of the Municipal term of Les Franqueses" was redacted by GESA. Nevertheless, Barnasfalt, the executor of the project, contracted Naturalea to modify the initial project, because they needed an easier construction and management system in the pond and to make possible water from WWTP. The objective was to create a model with a lower energetic cost, with the lower maintenance effort possible, and using the more natural materials possible.

The initial project contemplated a complex water recirculation system to avoid water accumulation problems, based on the concept of natural pool.

The first step for the new design started from the idea that to have water availability, the pond was connected to the effluent of the WWTP (Waste Water Treatment Plant) of La Garriga, increasing the availability of water, and therefore reducing the renewal rhythm of the circulation system. This has the advantage that the WWTP uses the pond as a tertiary treatment (due to the biodegradation capacity of the pond) to improve the quality of the effluent that is pour into the environment.

Two ponds were designed with a natural superficial flow depuration system connected by a vegetated stone canal. The presence of mature communities of macrophytes on the banks of the pond, especially helophytes reinforced by floating islands, was maximized.

The philosophy of the original project was respected but with the introduction of variations in the final executive project that have allowed to simplify the work, guarantee the results and reduce the maintenance costs.

Prior to the proposal of alternatives, an exhaustive diagnosis of the current state was made to analyze the necessary parameters for the evaluation of possibilities that the pond had.

Study of water circulation, calculation of evapotranspiration and hydraulic residence and analysis dominant winds.

ESTAT ACTUAL - SENSE VEGETACIÓ

Font Informació	EMA	Factor	Utl.	Invierno			Primavera			Verano			Otoño			Anual
				Enero	Febrero	Marzo	Abril	Mayo	Junio	Julio	Agosto	Septiembre	Octubre	Noviembre	Diciembre	
Meteocat	Parets del Valls (2009-2017)	Pluviometria	mm	20.58	13.56	66.66	49.98	51.42	35.72	46.06	34.68	65.16	55.08	86.30	8.48	533.68
RuralCAT	Parets del Valls (2015-2017)	Evapotranspiració	mm	34.33	48.15	78.55	14.04	6.91	147.25	172.91	148.93	104.91	58.49	41.98	27.02	863.44
Aproximació	/	Constante del cultiu (Kc)	/	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Calcul	/	ETC	mm	51.49	72.22	117.83	21.07	10.36	220.67	259.37	223.39	157.37	87.73	62.97	40.53	1326.17
Calcul	/	Evaporación (Víscenti)	mm	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91	98.91	1186.88
Calcul	/	Evaporación (Víscenti) ponderat segons temperatura	mm	47.63	49.13	71.75	90.88	110.38	137.38	152.63	152.75	132.88	110.88	78.25	52.38	1186.88
Meteocat	Parets del Valls (2009-2017)	Temperatura mitjana mensual	°C	7.62	7.86	11.48	14.54	17.66	21.98	24.42	24.44	21.26	17.74	12.52	8.38	15.83
Pèrdues zones vegetades																
			Lm2	78.53	107.78	122.52	61.96	69.31	322.52	365.93	341.46	225.08	143.52	54.92	84.43	1978.36
			Lm2	27.05	38.57	5.09	40.90	88.96	101.66	106.57	118.07	67.72	58.90	-4.08	43.90	653.30
			m2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			m2	21430.00	21430.00	21430.00	21430.00	21430.00	21430.00	21430.00	21430.00	21430.00	21430.00	21430.00	21430.00	21430.00
			Limes	579574.35	762157.95	109078.70	876379.65	1263405.65	2178466.65	2283687.55	2530240.10	1451132.45	1195686.85	-172511.50	940669.85	13997968.85
			m3/mes	579.57	762.16	109.08	876.38	1263.41	2178.47	2283.69	2530.24	1451.13	1195.69	-172.51	940.67	13997.97
			Lm2	18695.95	27219.93	3518.67	29212.66	40755.02	72615.56	73667.35	81620.65	48371.08	38570.54	-5750.38	30344.19	38350.60
			Lm2	779.00	1134.16	146.61	1217.19	1698.13	3025.65	3069.47	3400.86	2015.46	1607.11	-239.60	1264.34	1593.20
			Lm2	8294400.00	8294400.00	8294400.00	8294400.00	8294400.00	8294400.00	8294400.00	8294400.00	8294400.00	8294400.00	8294400.00	8294400.00	9952860.00
			Lm2	345600.00	345600.00	345600.00	345600.00	345600.00	345600.00	345600.00	345600.00	345600.00	345600.00	345600.00	345600.00	4147200.00
			Lm2	89.50	89.41	89.65	89.38	89.25	88.92	88.91	88.82	89.16	89.28	89.78	89.37	89.29
			Lm2	3.729015942	3.725342225	3.731816178	3.72434375	3.719184978	3.70204784	3.704519092	3.701041497	3.715791753	3.720161916	3.740054343	3.73283815	3.720347441

Aplicació de Víscenti:

Evaporació per a llacs (anual)

$$E = 75 + t \quad (\text{para llacs o embalses con cota inferior a 200 msnm})$$

$$E = 90 + t \quad (\text{para llacs o embalses con cota entre 200 y 500 msnm})$$

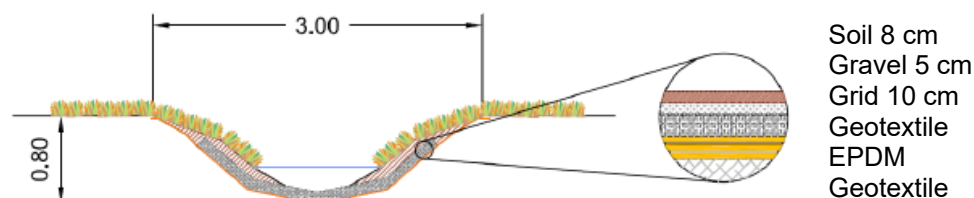
$$E = 90 + t + 300 \quad (\text{para llacs o embalses con cota superior a 500 msnm})$$

En aquest càlcul no es tenen en compte les pèrdues per infiltració i per l'activitat ja que està impermeabilitzat.

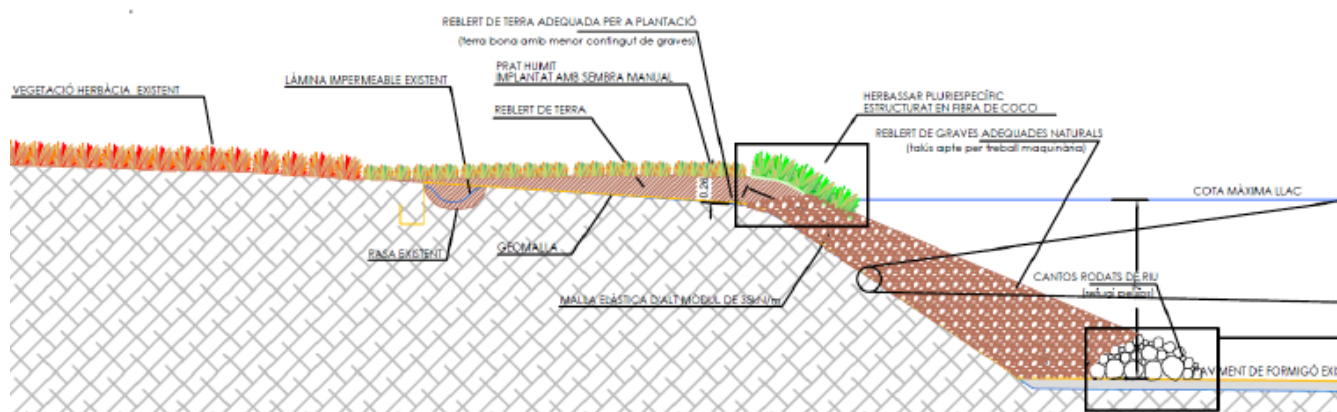
Study table of the evapotranspiration

In relation the design, it was done in detail, including all the construction phases that affected the creation of the pond. During the execution the necessary advice was given to Barnasfalt during the construction process, until the last phase, the revegetation, where the work was directly done in the pond.

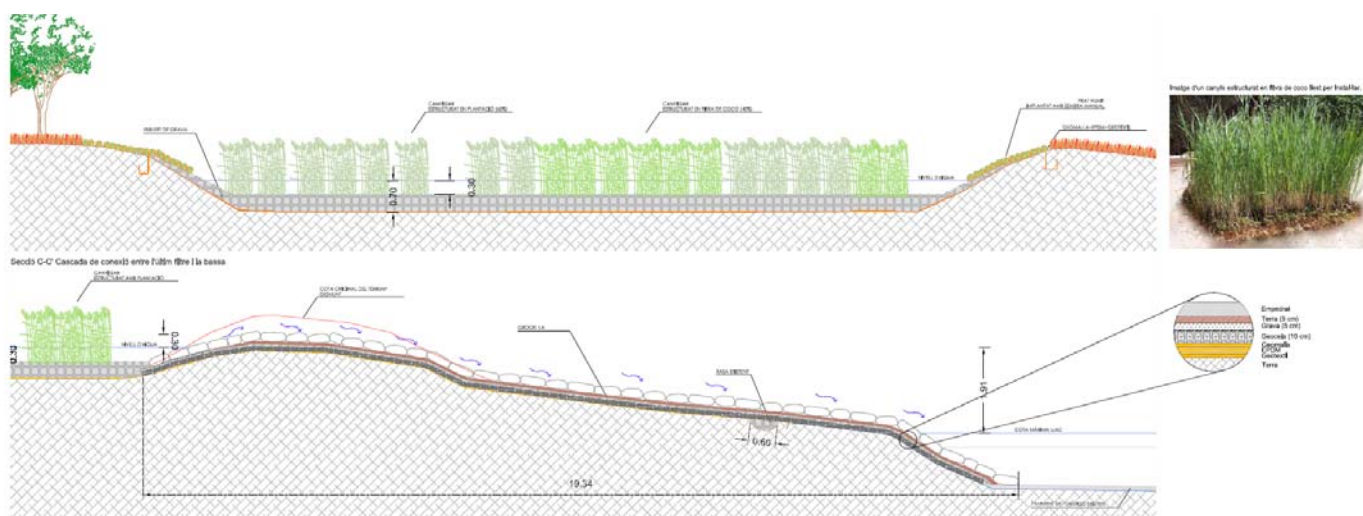
Images of the constructive details of the project:



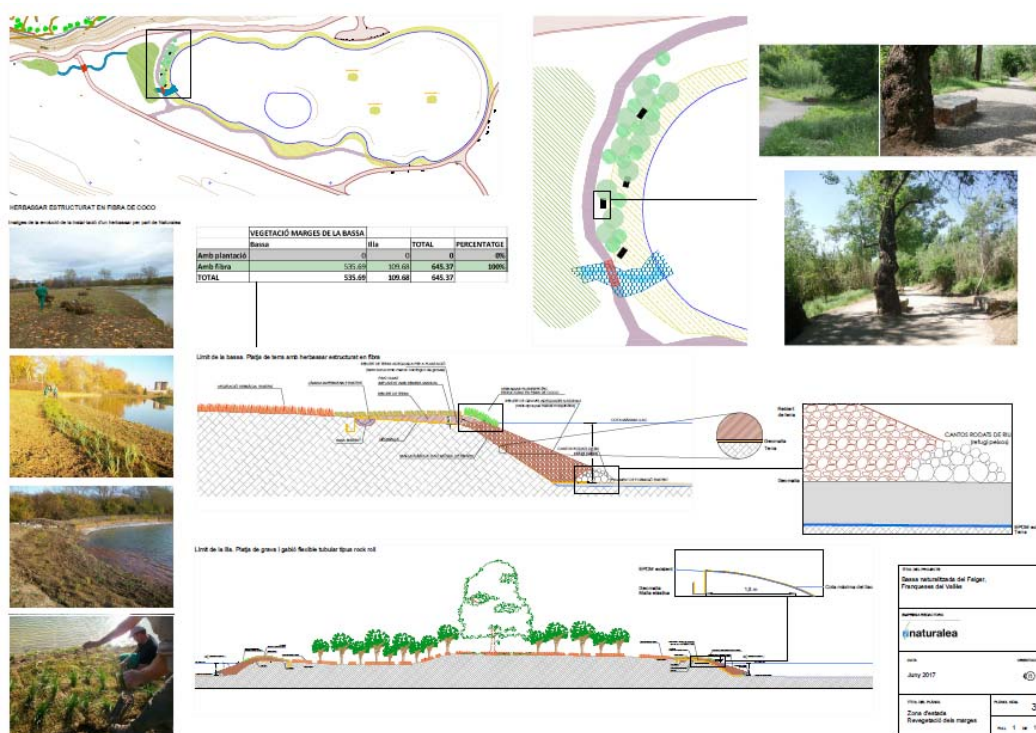
Channel scheme



Margins of the pond

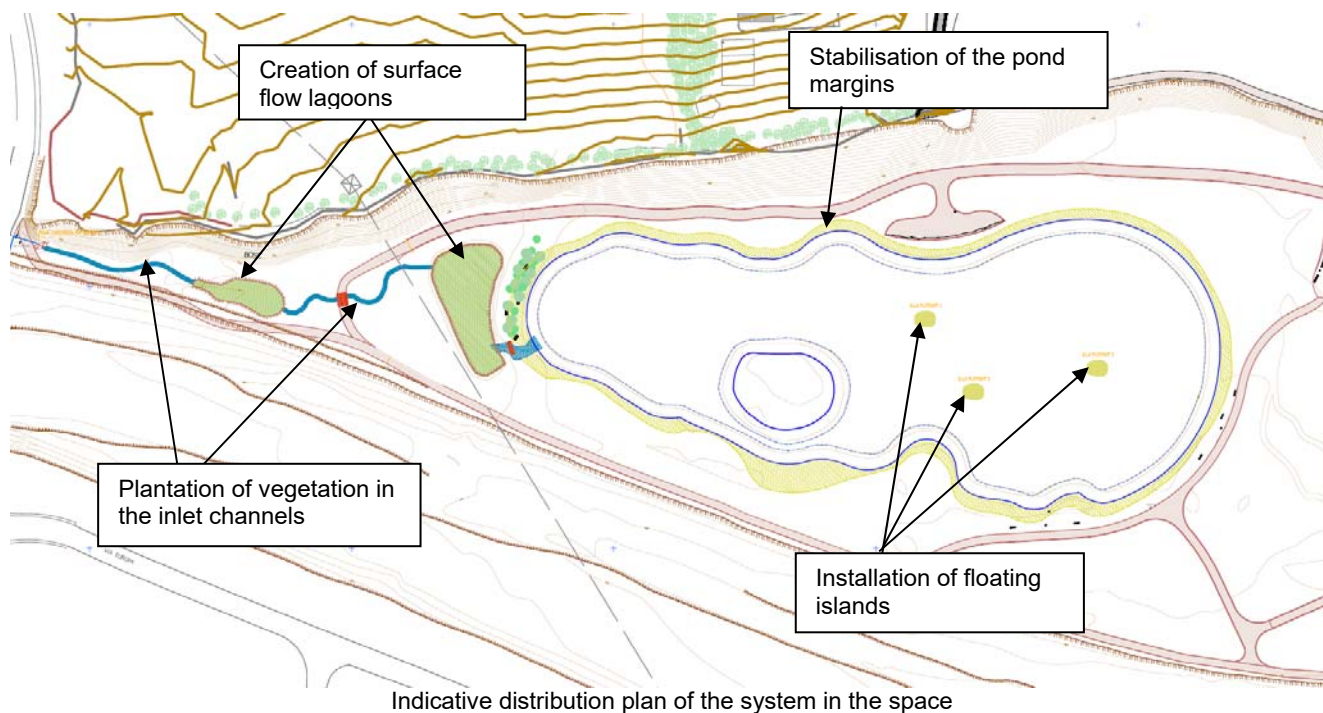


Tertiary system (above image) and water jump HSF (below image)



Actions

The actions carried out in the Falgar pond were aimed at naturalizing the system by replanting it. The spaces are distributed in: water inlet channels, two surface flow lagoons and the main pond.



Plantation of vegetation in the inlet channels

In the water intake channel to the system, helophytes have been planted between the gravels to favor the colonization of the spaces and improve the quality of the water. In this way, the margins, instead of being colonized only by the herbaceous grass planted in the terrain they delimit, will have more biodiversity with autochthonous species that will help to form a more mature system.

A total of 1.400 unites have been planted between the channels and the reinforcement of the margins of the different sheets of water in the system.

The species planted in the channel are: *Iris pseudacorus*, *Mentha aquatic*, *Juncus effusus*, *Juncus inflexus*, *Carex riparia*, *Lythrum salicaria* and *Veronica beccabunga*



Plantation process in the channels / Finalized plantation



State of the channels – follow-up visit May 2019

Creation of surface flow lagoons

The objective of surface flow lagoon is to reduce the water velocity, and also reduce suspended solids and BOD.

In these systems the treatment and purification of the water during the flow of the same takes place through the stems and roots of the emergent vegetation and the entrance in contact of the water in the biofilm generated in these surfaces. In addition, they suppose new habitats of fauna and flora.

Installation of 134m² of monospecific herbaceous reeds (*Phragmites australis*) in the first lagoon and 317m² in the second.

First surface flow lagoon



Material unloaded / Oat Straw base construction process for interior lines



Installation in the margins finalized / Installation process in the interior lines



First lagoon finalized

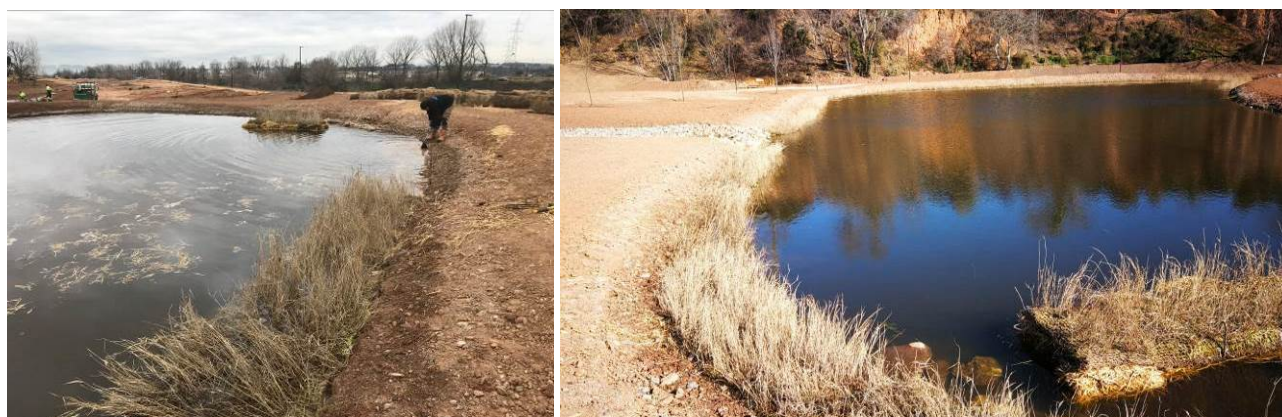


State of the first lagoon – Follow-up visit May 2019

Second Surface flow lagoon



Test of installation of the interior lines with Straw of oats to adjust the height / Preparation of the margins for the installation of the herbaceous layer



Installation of material on the margins of second lagoon



Construction of the interior lines with reed / Installation of structures with oat straw that provide height to the plant material
Although the reed can be drunk 50 cm below the water, adaptation with straw bales allows them to be initially at the water level and as the straw is degraded, the root system adapts



Second lagoon finalized



State of the second lagoon - Follow-up visit May 2019

Stabilization of the margins of the pond

In order to favor an equilibrium functioning in a natural way of the main pond, monospecific grasslands have been installed around the perimeter of the same and of the existing island in it. The fact of having vegetation with an advanced development, with the structures prevegetated in the plant nursery, favors the rapid colonization of the helophytes in the margins of the pond working for its the naturalization.

660m² of plurispecific grasslands have been installed on the margin of the main pond and 110m² on the existing island.



Distribution of the material in the margin of the main pond / Installation of grassland and control with the level of the water



Preparation of the terrain in the margins to install the grasslands / Installation of the grasslands finished



State of the grassland in development - Follow-up visit May 2019

Currently, the water that arrives to the lake is provisional, with less quantity and quality that the one that should arrive. That provokes water blooms as we can see in the images. They are improving the Waste Water Treatment Plant (WWTP) to enhance their output water and avoid the actual problems.

Installation of vegetated floating islands

To create vegetated points isolated from the pressure that may be on the margins of the pond and to improve water quality, increasing the vegetated surface, 120m² of floating islands have been installed in three structures of 40m² each.



Installation process of the floating islands



State of the vegetated floating islands - Follow-up visit May 2019

Construction of a refugee construction

To diversify the margins of the pond, it has been considered important to build a point that can serve as a refuge structure for fauna. It has been built with chestnut wood logs linked with corrugated bar and that enter into the water to connect the margin with the pond.



Constructive process of the fauna refugee construction



Structure finalized



State of the structure – Follow-up visit May 2019

General images of the area before and after

Channel zone



Surface flow lagoon zone



Main pond



KEY WORDS: Naturalisation, diversification of habitats, natural depuration, helophytes, autochthonous vegetation.

APPLIED TECHNIQUES: Installation of monospecific and plurispecifics grasslands, installation of floating islands, plantation of helophytes in forest alveolus