

Tagus River Operation – 2018

W-SMART Workshop on Climate CARE Management

Liège, 06th November 2019

- Tagus River is the longest river in the [Iberian Peninsula](#). It is 1,007 km long, 716 km, 47 km along the border between Portugal and Spain and 275 km in [Portugal](#), where it empties into the Atlantic Ocean near [Lisbon](#).
- It drains an area of 80,100 km² of which [24 800 km²](#) ($\approx 30\%$) is in Portugal.
- An integrated water management is applied under a Portuguese-Spanish Convention.





JANUARY – FEBRUARY 2018

- Peak of pollution in the Tagus River;
- Significant degradation of water quality;
- Decay of Dissolved Oxygen levels, intense lack of oxygen, with values of less than 5 mg O₂/l on several parts of the river.





JANUARY – FEBRUARY 2018

- Taking into account the importance of the river, the situation was subject of significant focus by the Portuguese media.



Rio Tejo: Poluição vem da indústria

SOCIEDADE | 01.02.2018 às 17h14



Poluição no Tejo: Partidos em uníssono pedem mais controlo e maior fiscalização

PORTUGAL | 06.02.2018 às 13h02

Há consenso no Parlamento em torno da questão da poluição no Tejo. Todos os partidos defendem que haja uma fiscalização mais rigorosa da atividade das empresas que descarregam efluentes no rio. Divergem, no entanto, na forma de controlar essas descargas. O que defende, afinal, cada partido?



JOSÉ PEDRO NEVES
Jornalista

No parlamento, a unanimidade nem sempre é fácil de alcançar. Há, no entanto, temas em que os partidos se colocam todos do mesmo lado. Este é o cenário que começa a definir-se como o mais provável no que diz respeito às medidas que devem ser tomadas para combater a crescente poluição do Tejo. O caso tem vindo a ganhar mediatismo. Várias empresas descarregam efluentes (resíduos formados pelos processos industriais) no rio, diminuindo a qualidade da água. Os partidos com assento parlamentar reconhecem a existência do problema e convergem na solução de rever as licenças ambientais das empresas responsáveis e de aumentar a fiscalização. Como noticia o Público na edição desta terça-feira, destoam apenas na forma como se propõem a fazê-lo.

O PAN é o partido que defende a medida mais drástica. André Silva, deputado único, exige que a atividade das empresas poluidoras seja imediatamente suspensa para proteger o Tejo e critica a atuação do Ministério do Ambiente até ao momento. Defende o encerramento, com caráter de urgência, das empresas Cetejo, Navigator e Paper Prime.

O Bloco de Esquerda lembra que já tinha proposto anteriormente as medidas que foram agora adotadas pelo ministério comandado por João Pedro Matos Fernandes: a diminuição da produção da Cetejo e o encerramento da Fabrilício. O PCP, até ao momento, defendeu apenas o reforço da fiscalização mas espera-se que no rescaldo das jornadas parlamentares, que decorrem desde ontem em Portalegre e terminam hoje, haja novidades sobre esta temática, dado que parte do programa passava por visitar as zonas do rio atingidas pelas descargas. O PEV segue a mesma linha e propõe que seja feita diariamente uma avaliação do controlo da qualidade da água. Ainda à esquerda, o PS avança com três propostas: limpar o fundo das albufeiras, rever as licenças ambientais das empresas em causa e impor limites às descargas de efluentes.

Expresso

ÚLTIMAS - OPINIÃO - ECONOMIA - EXPRESSO CURTO - PODCASTS - TRIBUNA

REVISTA DE IMPRENSA

Poluição no Tejo. O mistério das amostras desaparecidas

04.02.2018 às 10h02







JANUARY – FEBRUARY 2018

- Lessen the visual impact and remove foam from the river;
- Daily monitoring of the main water quality indicator parameters in seven strategically selected sampling points;
- Initial evaluation of the riverbed and sludge sample collection in critical or representative areas in order to **try to understand what was going on.**





Tagus River Operation 2018

-  Intervention Area 1 – Arneiro/ Conchal pier
-  Intervention Area 2 – In front of the Vila Velha de Ródão pier



JANUARY – FEBRUARY 2018

- Riverbed evaluation along sections between Vila Velha de Ródão to Fratel dam and Fratel dam to Belver dam;
- Preliminary assessment of local conditions of the riverbed, using divers teams;
- Analytical characterization of the sludge collected.

Two areas with greatest concentration of sludge:

1. Arneiro/ Conhal pier
2. In front of the Vila Velha de Ródão pier

Total Area $\approx 30.000 \text{ m}^2$

Sludge Volume $\approx 15.000 \text{ m}^3$

"Non-Hazardous" waste

PROTOCOL BETWEEN APA AND EPAL

- Given that EPAL is a water public company, with the right knowledge's and skills, a protocol was signed between the company and the **Portuguese Environment Agency (APA)** to define and outline EPAL's intervention within the scope of the Tagus River operation.
- A functional organization and general coordination of the operation was undertaken by the **Ministry of the Environment**, being implemented on the ground by **EPAL teams**, in liaison with **APA**.



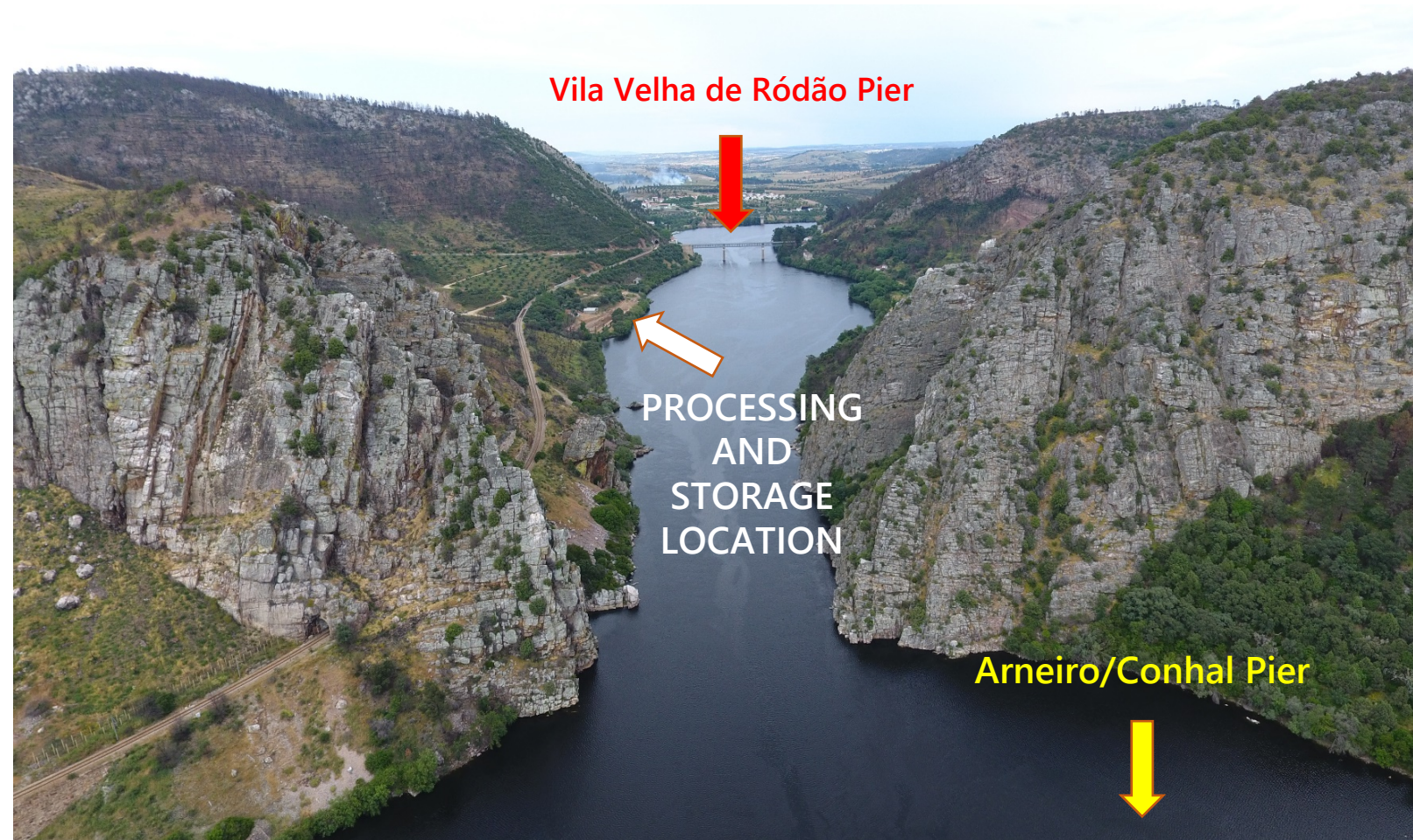
PROTOCOL BETWEEN APA AND EPAL

- EPAL has an important water extraction system in the Tagus River, which is part of Lisbon's water supply system – a region with 3 million inhabitants.
- It is fundamental for EPAL to identify changes in the river water quality and accordingly, to adjust treatment processes to be applied to water abstracted downstream of any event.



SITE SELECTION FOR SLUDGE PROCESSING AND STORAGE

- Former sand extraction site located between the two intervention zones, away from residential areas;
- Slight slop, enough for gravity operation of the system;
- Discontinuous vegetation cover, with little natural value, in contrast to the surrounding area.



STORAGE SITE

1. Initial Conditions at the former sand extraction site



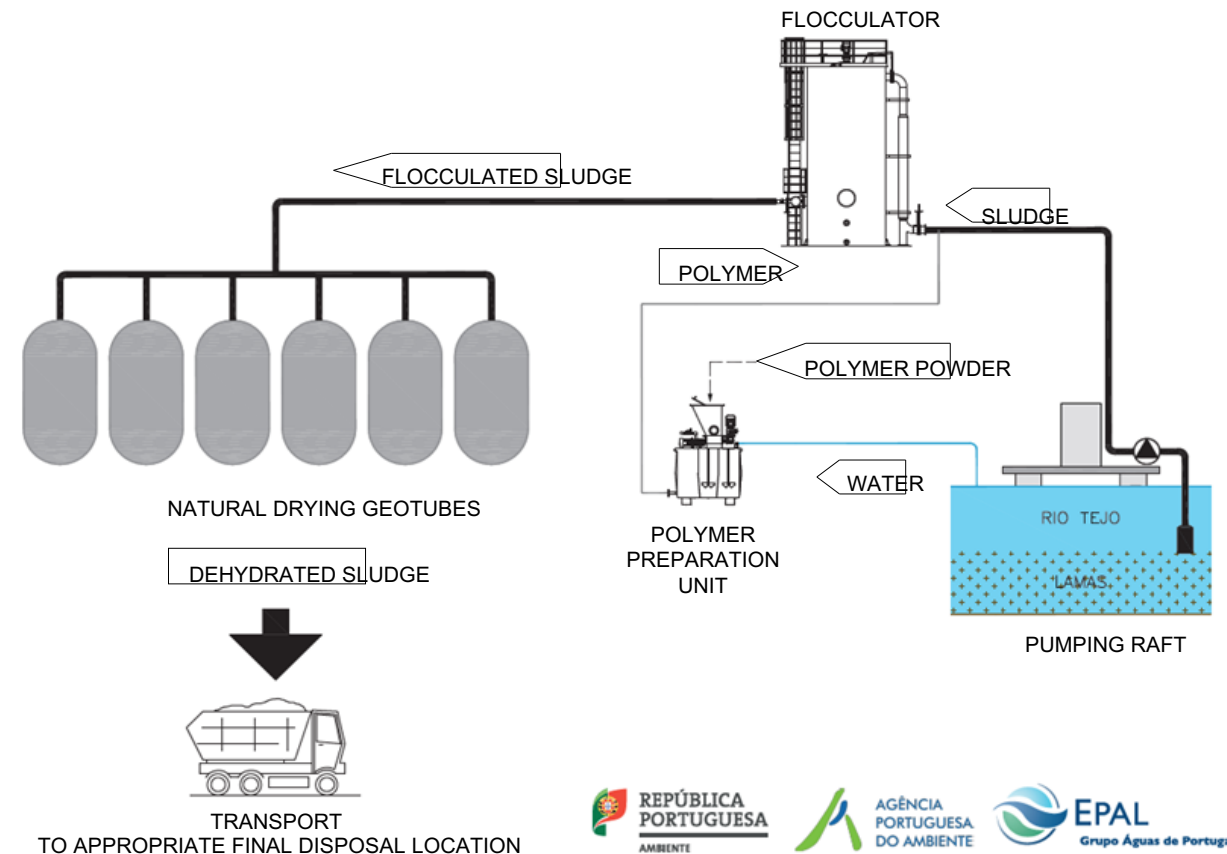
2. Site Remodelling and Tree Relocation



SLUDGE REMOVAL AND PROCESSING

After evaluating several options, it was chosen a process that:

- Allowed to treat large volumes of water with relatively low concentrations of solids;
- Was low-cost and fast to implement;
- Used basic technology;
- Was easy to implement;
- Had a low energy consumption.



SLUDGE REMOVAL AND PROCESSING

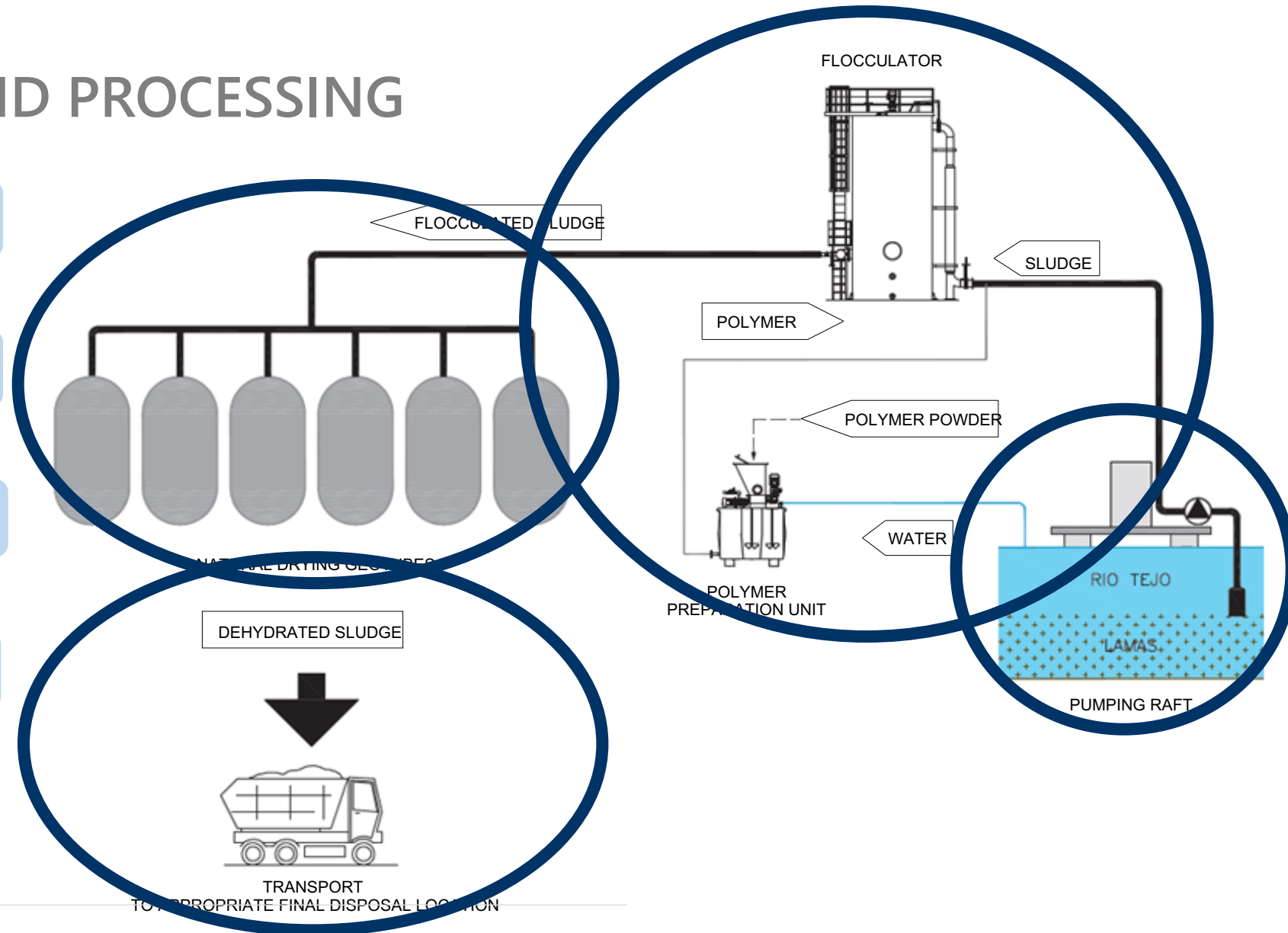
Sludge removal from riverbed

Polymer injection and sludge flocculation

Sludge filtration in Geotubes®

Sludge storage and dehydration in Geotubes®

Transportation to final disposal location



SLUDGE PROCESSING AND STORAGE SITE

3. Waterproofing with Geomembrane

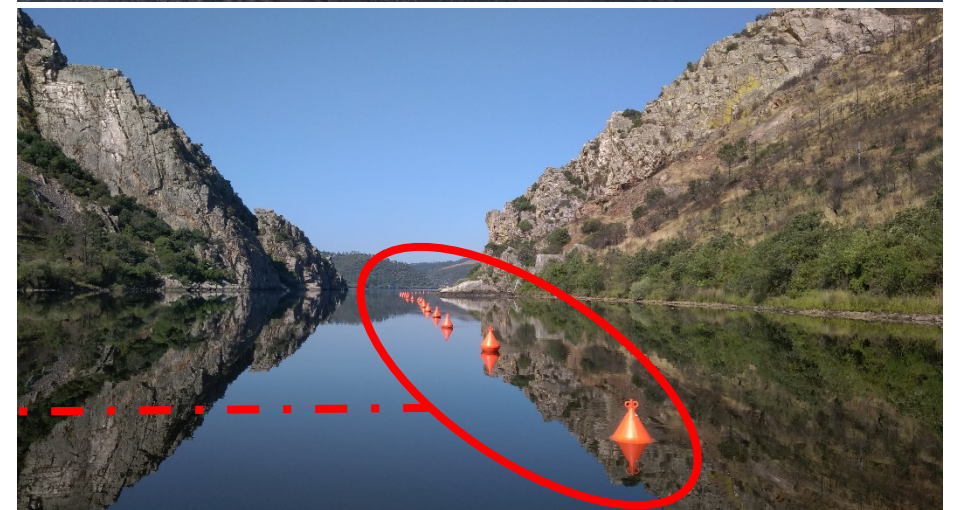


4. Installation of Filtration Bags (Geotube®)



SLUDGE REMOVAL

- **Sludge removal** was coordinated from a **floating platform** equipped with a submersible pumping system. The positioning and displacement of the **pump on the riverbed** was accompanied by **divers**;
- **Continuous and stable pumping profiles** were used in order to avoid agitation of material on the riverbed and minimize drawing of fine material;
- **Signaling and positioning of the hydraulic pumping circuit** in the river was **ensured by means of buoys**.



SLUDGE FILTRATION

- The sludge pumped from the river was transported to a **settling and control tank (flocculator)**, after being injected with a solution of polyelectrolyte;
- The flocculator ensured **continuous mixing** between the flocculent and **pumped sludge**;
- Afterwards, the **flocculated sludge flowed gravitically** through six DN100 pipes that distributed it through the filter bags being used, known as **Geotubes®**.



SLUDGE SEPARATION AND DRYING

- The physical separation between the solid and liquid phases occurred in the Geotubes®;
- The processed/ cleaned water passed through the geo-synthetic "mesh" and returned to the river with quality levels superior to the average water quality of the river;
- The solid component was retained within the Geotubes® until its maximum volume was reached, after which **natural dehydration** took place.



João Matos Fernandes, Minister of Environment, with samples of sludge and permeate drained from the Geotubes®.

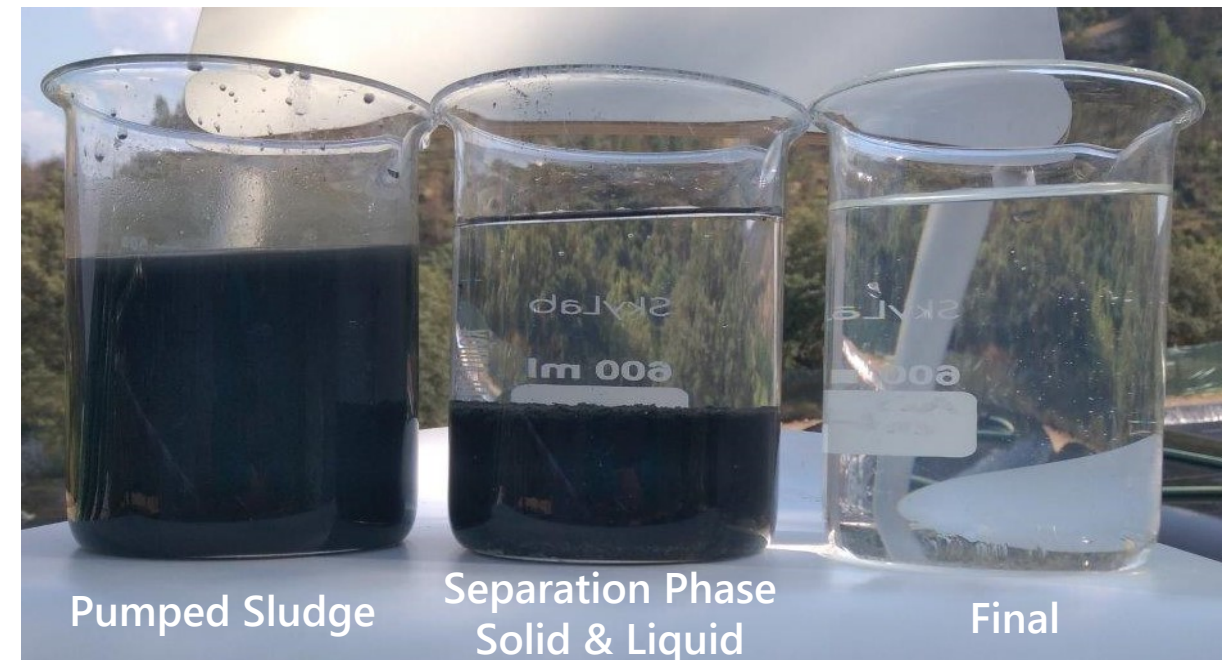
SLUDGE REMOVAL AND TRANSPORT TO SUITABLE FINAL DESTINATION

- After the drying period, the dehydrated sludge contained in the Geotubes® was removed and transported to an appropriate final destination;
- The sludge removal process took place, as planned, in early autumn;
- 2.576 tons of sludge were removed and transported to the appropriate final destination, enabling their reuse for agricultural purposes after a combustion process.



RESULTS

In general terms, the water was returned to the river with a higher quality than the river water by itself!



ADDITIONAL ACTIONS

→ To ensure the long-term sustainability of the river water quality:

New studies to determine the impact of the pressures on critical parts of the river.

Reevaluate discharge licenses, aiming to adjust their requirements with the receiving medium.

Recovery of the ancient "River Guardian" concept, which involves people who will undertake **monitoring and surveillance of the river**, in order to identify any new pollution events and, should this happen, to facilitate a **rapid and planned response**.

→ Other Actions:

Establishment of a clear and open channel of communication with the public, in particular the local population, through the development of awareness and information activities.



FINAL CONSIDERATIONS

Low energy consumption solution, able to process large water volumes with high sludge concentrations, assuring a processed water with high quality.

The combination of human resources and appropriate technologies made possible to act quickly, and effectively, in what regards environmental protection.

The strategy developed is an example of emergency action to respond to similar episodes that may occur anywhere in the world.





Thank You