



# NATURE-BASED SOLUTIONS

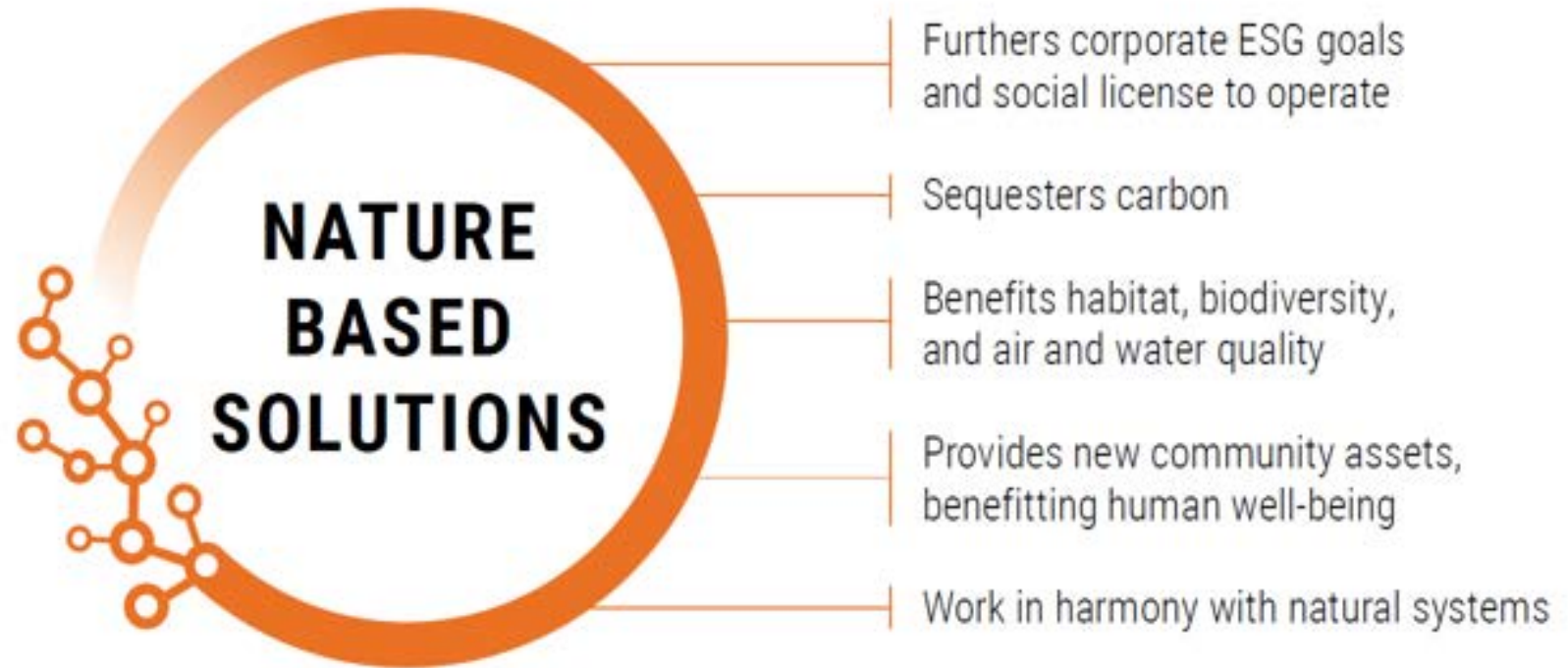


# Nature-based Solutions & Stantec

For more than 30 years, Stantec has proactively planned, designed, funded, and implemented Nature-based Solutions to support ecosystem recovery and enhancement, flood risk management, water quality, biodiversity, coastal resilience, and ESG goal attainment.

# What are Nature-based Solutions (NbS)?

The European Commission's definition of NbS states that these solutions are "inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social, and economic benefits, and help build resilience."

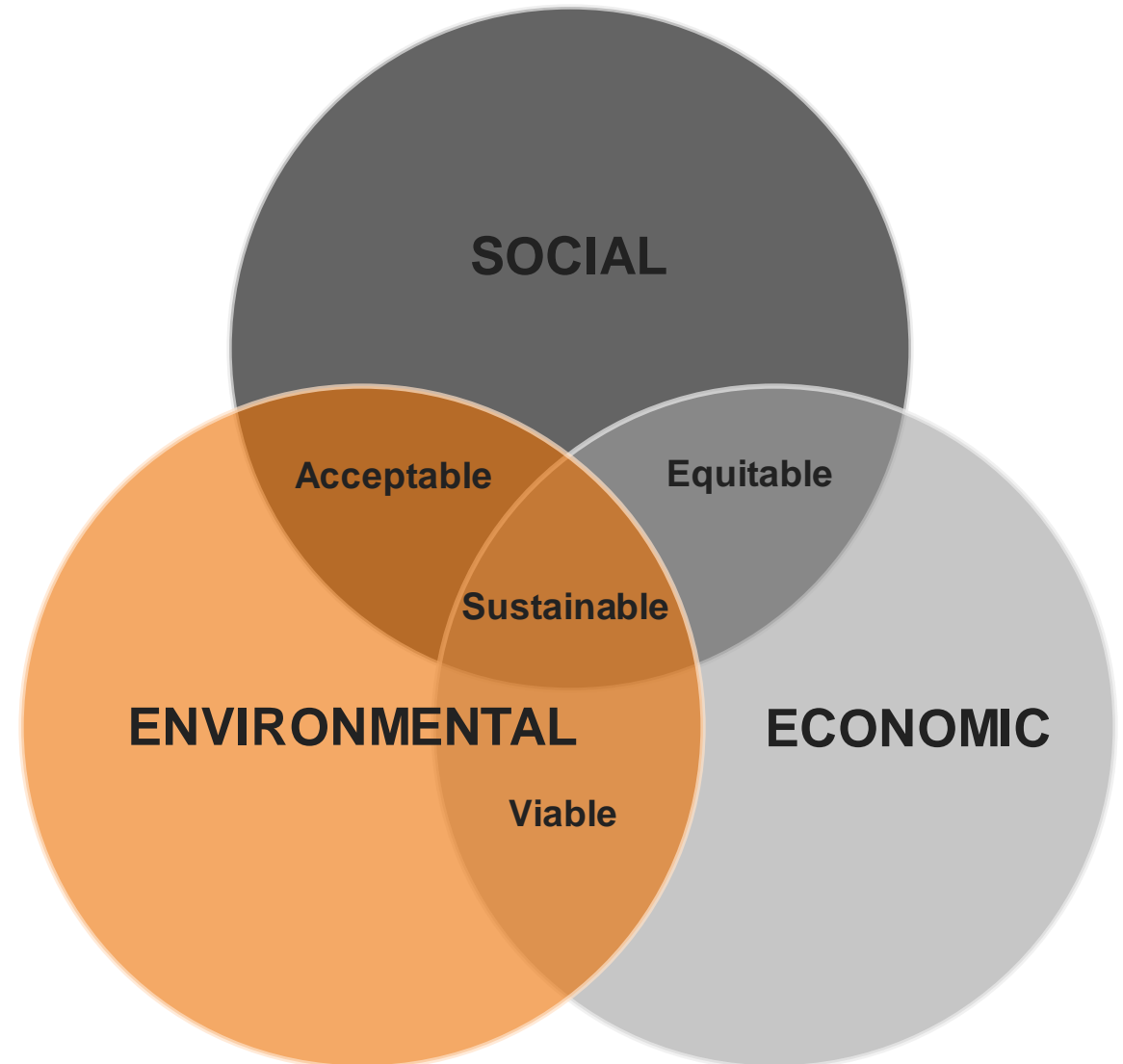




# Nature-based Solutions: Engineering with Nature

Triple-win outcomes are achieved throughout Engineering with Nature (EWN) by systematically integrating social, environmental, and economic considerations at every phase of a project.

The results are **innovative and resilient solutions** that are more socially acceptable, viable and equitable, and, ultimately, more sustainable.





# Clifton WwTW ICW

Clifton Wastewater Treatment Works (WwTW) is a new, integrated constructed wetland (ICW).

It is a ground-breaking project that replaces conventional wastewater treatment processes with a natural, sustainable and low-carbon alternative.

**20x**

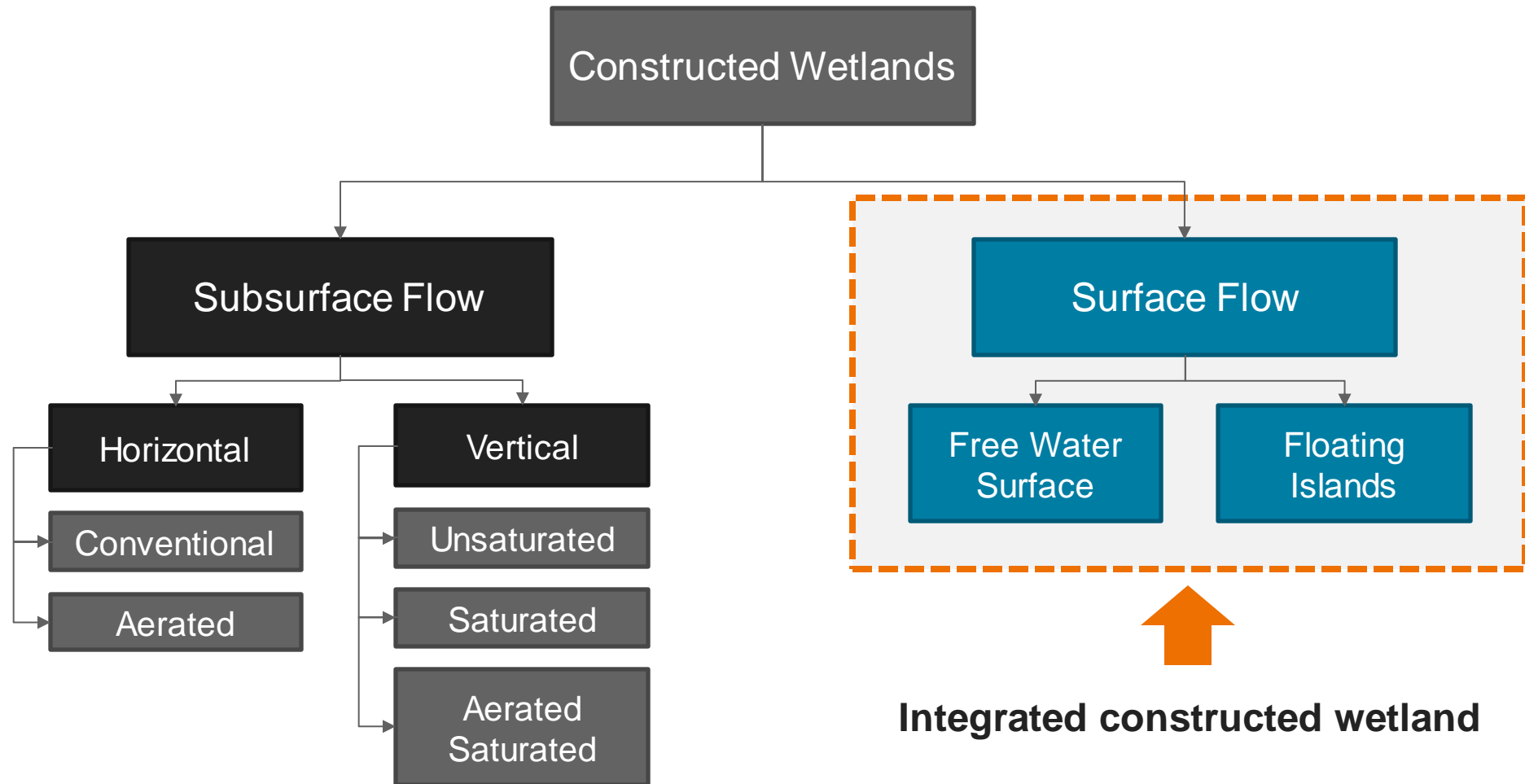
more energy  
efficient than  
conventional  
wastewater  
treatment

Clifton uses the  
same amount of  
energy as

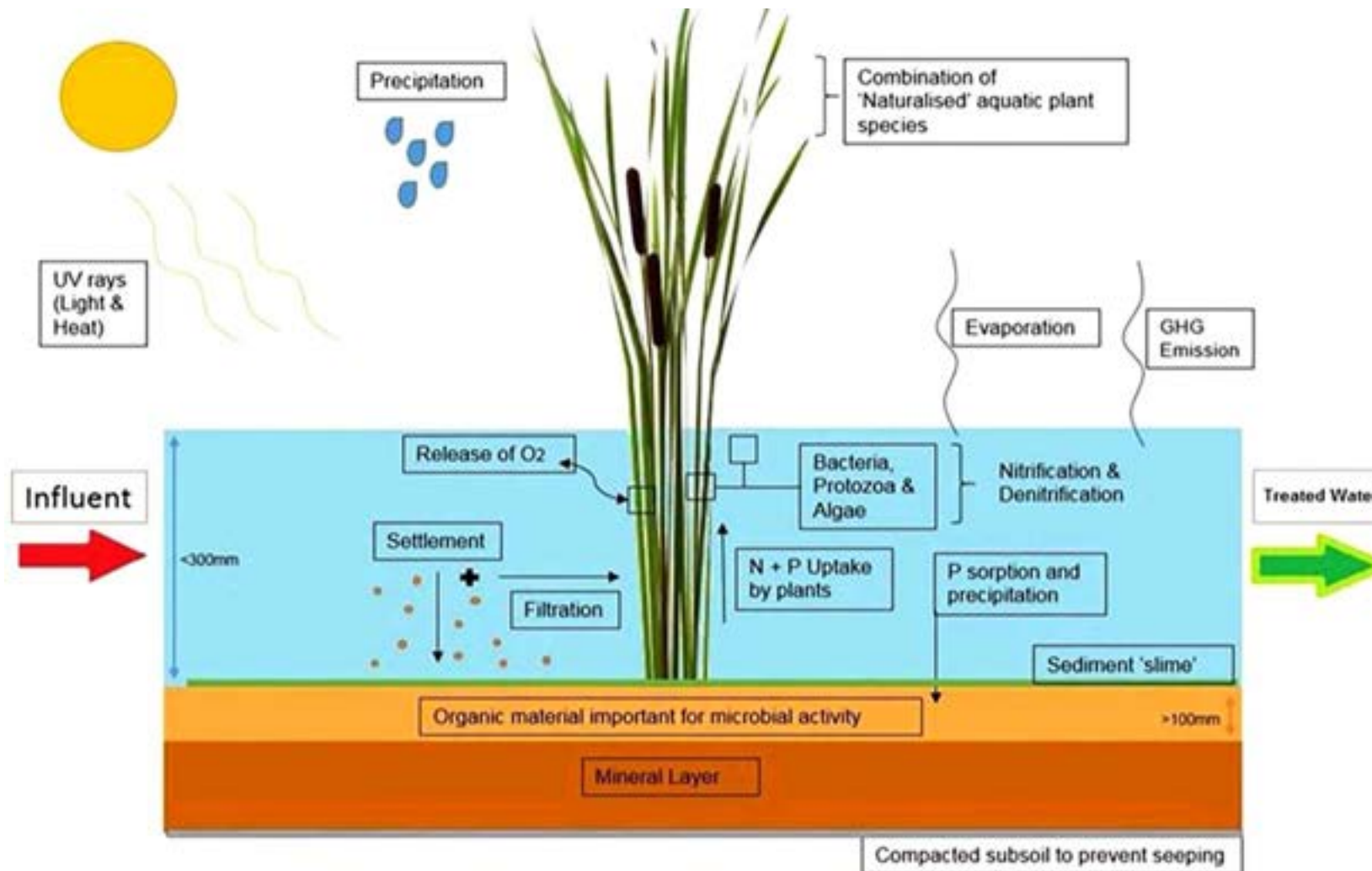
**2** fridges



# What is an integrated constructed wetland?



# What is an integrated constructed wetland?





# Outcomes

1. First Nature-based Solution Wetland for treatment of all wastewater flows in England
2. First Operating Technical Agreement in the UK
3. Collaboration (see figure 1)







# A Unique Way

## Traditional Approach

Process engineering has traditionally looked to intensify and automate natural processes with the addition of energy and chemicals.

These intensified processes have a proven track record but have very little benefit above that of performance.

Process operates within controlled parameters

## Nature-based Solution Approach

NbS operates in an entirely different way to intensification and automation of natural processes.

BIG footprint

'Open' process

Wider benefits

Low/no chemical and low energy

Requires more 'open' regulation

Flexible Process



# NBS vs. Traditional Treatment



Traditional treatment design

- Can handle 500 L/day/person
- 70 L/day/person is stored
- 300 L/day/person shortfall

Nature based Solution (NbS)

- Provide 'Secondary Treatment'
- Can be installed 'in catchment'
- Can handle required flow

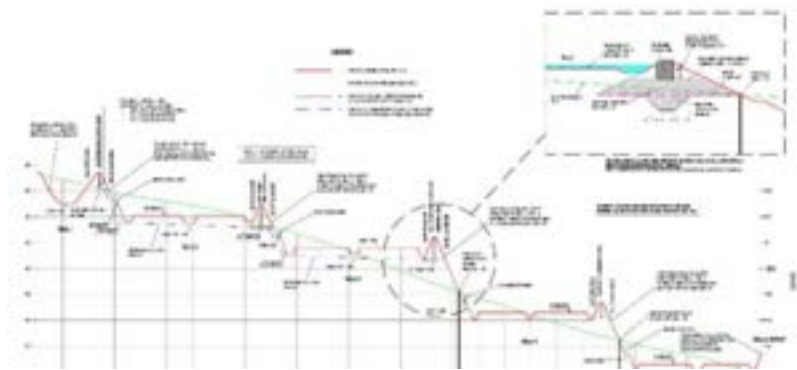
# Working with Existing Environment



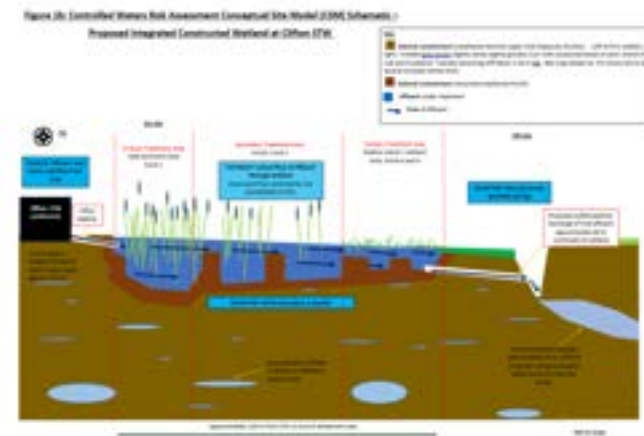
# Working with Existing Environment



**REUSE OF  
NUTRIENT  
RICH SOIL**

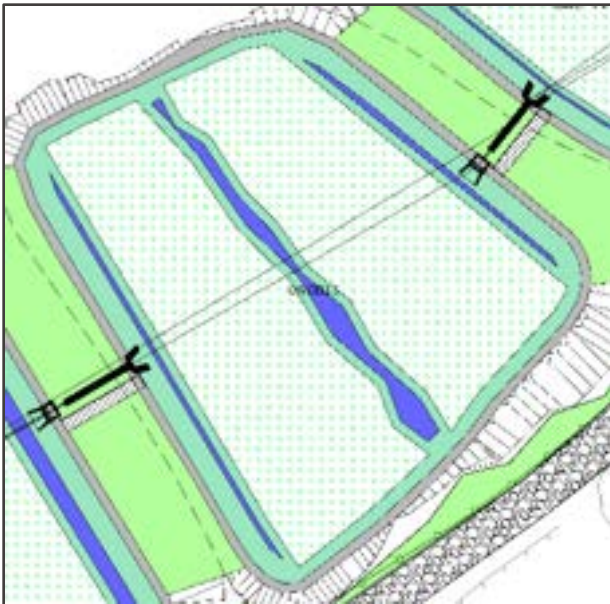


**NATURAL FALL**

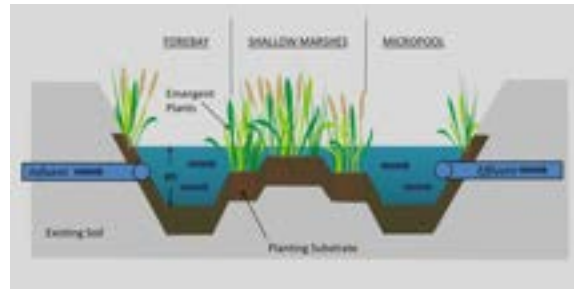


**CLAY LINER**

# Engineered to be Successful



Design for optimum contact time and flow distribution













20 Plant Species

6 Plant Species






# Summary

|   |                      |                          |
|---|----------------------|--------------------------|
|    | Population           | <b>180</b>               |
|    | Site Area            | <b>3000m<sup>2</sup></b> |
|    | No. of Ponds         | <b>5</b>                 |
|    | No. of Plants        | <b>24000</b>             |
|  | No. of plant species | <b>25</b>                |
|  | Effluent quality     | <b>0.9mg/l</b>           |

|   |                       |               |
|---|-----------------------|---------------|
|  | Construction Duration | <b>4mnths</b> |
|  | Carbon saving CAPEX   | <b>50%</b>    |
|  | Carbon saving OPEX    | <b>79%</b>    |
|  | Biodiversity net gain | <b>2.28</b>   |

\*compared against a conventional ferric dosing solution

**First Operating Techniques Agreement in the UK**

|   |          |   |
|---|----------|---|
|  | <b>4</b> | Number of wetlands under construction since Clifton |
|  | <b>0</b> | Chemical usage                                      |
|  | Energy   | <b>Solar Power</b>                                  |

**First Nature Based Solution for Treatment of all flows**

# Southwaite Integrated Constructed Wetland

Southwaite is a hybrid Wastewater Treatment Works (WwTW) solution combining the best features of conventional treatment and Nature-based Solutions (NbS).

WwTW is a 'treat all' flow works; it treats the flow and load from Southwaite, including the M6 Motorway Services. Improvements are required under the Water Industry National Environment Programme (WINEP) to meet water quality objectives for nutrient reduction. Nearly all the existing infrastructure has been replaced to provide innovative secondary treatment.



## Fast Facts

**1<sup>st</sup>**

hybrid solution

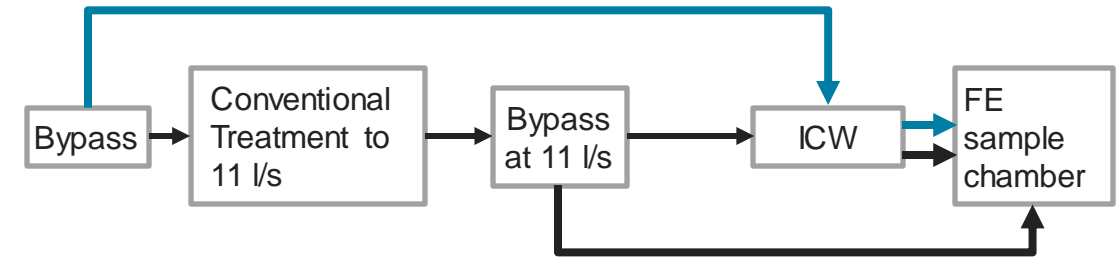
**26<sub>x</sub>DWF**

secondary  
treatment

**15<sub>l/s</sub>**

maximum flows  
treated by NbS

# Peak Flow Equivalent Treatment -Treat all flows



Tertiary ICW under normal conditions (<11l/s).

Meets requirement of the consent “1.4.1 The discharge shall consist solely of secondary treated sewage effluent“.

Treated flow from the conventional treatment would be diverted directly to FE sample chamber under flow conditions greater than 11 l/s.

Significant additional benefit associated with nature-based solutions – including reduction in carbon emissions, increasing biodiversity, improved natural capital

Potential zero discharge during summer low flow periods (Evapotranspiration).







**Questions?**