Commissioning Experience of te-cyc™ Plant at Hawkhurst South WwTW

European Wastewater Management Conference

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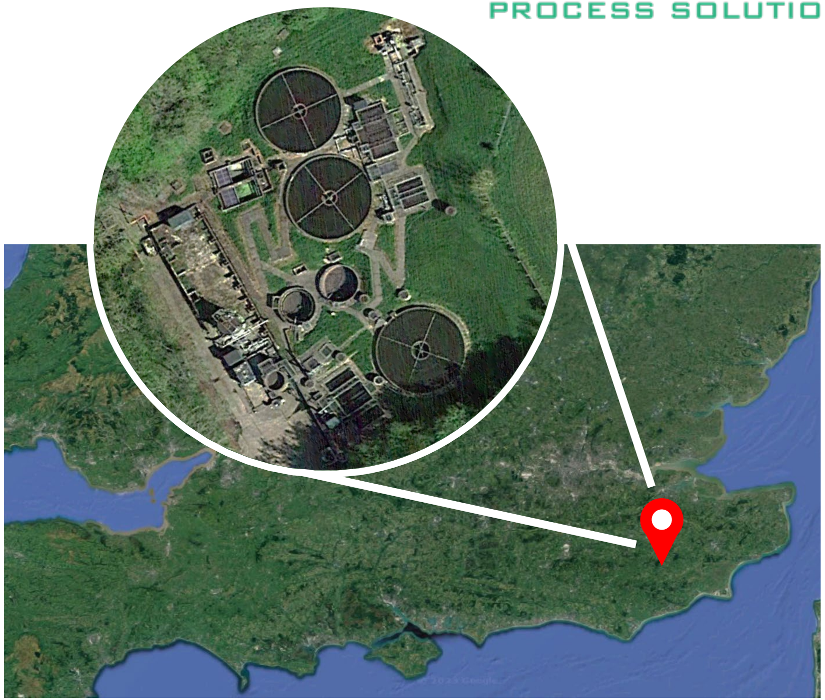
Hawkhurst South WwTW

TE TECH PROCESS SOLUTIONS®

Wastewater Treatment Works located in Kent

Project Drivers:

P	Total Phosphorus Consent:	0.3 mg/l
Fe	Total Iron Consent:	4 mg/l
H N H H	Tightened Ammonia Consent:	3 mg/l
	Population Growth:	1,976 to 2,285
	Increased FFT:	11 l/s to 15.8 l/s



WATER for LIFE

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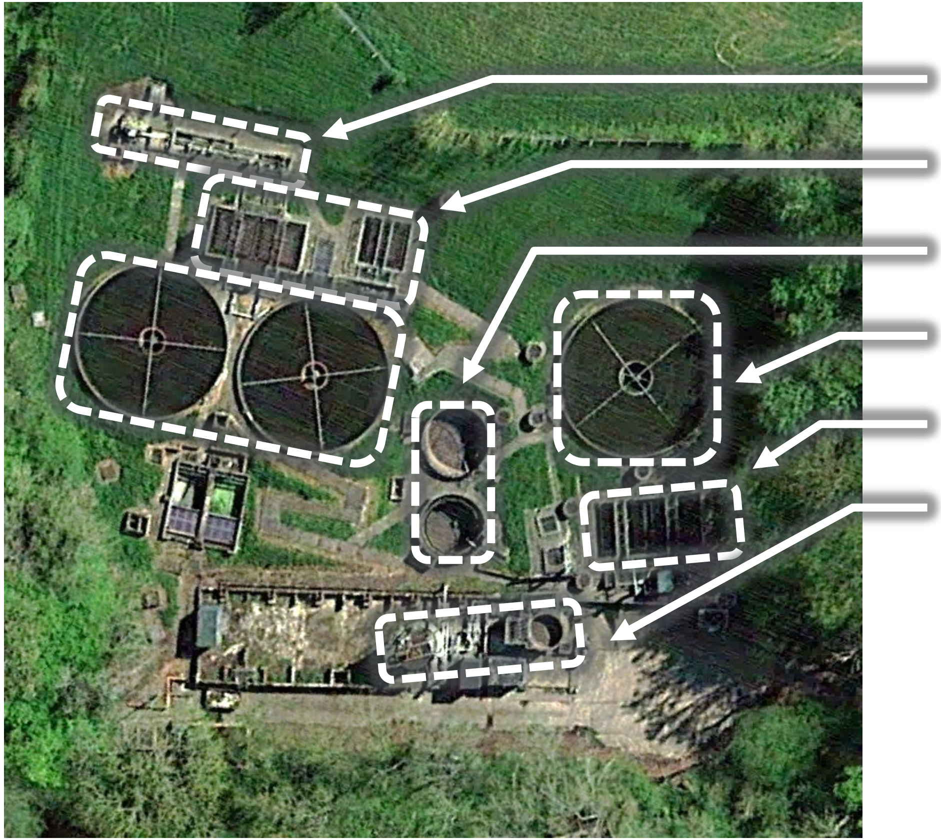
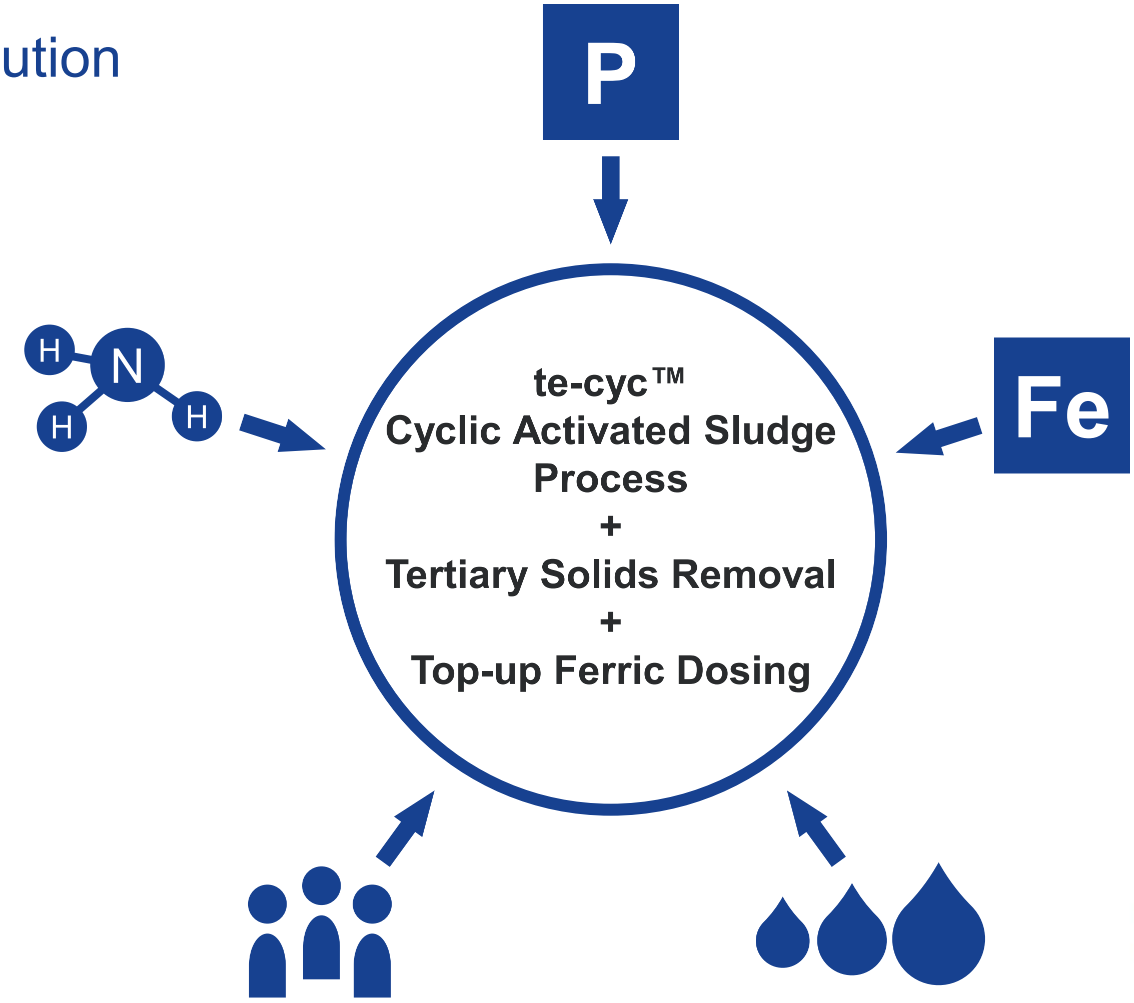
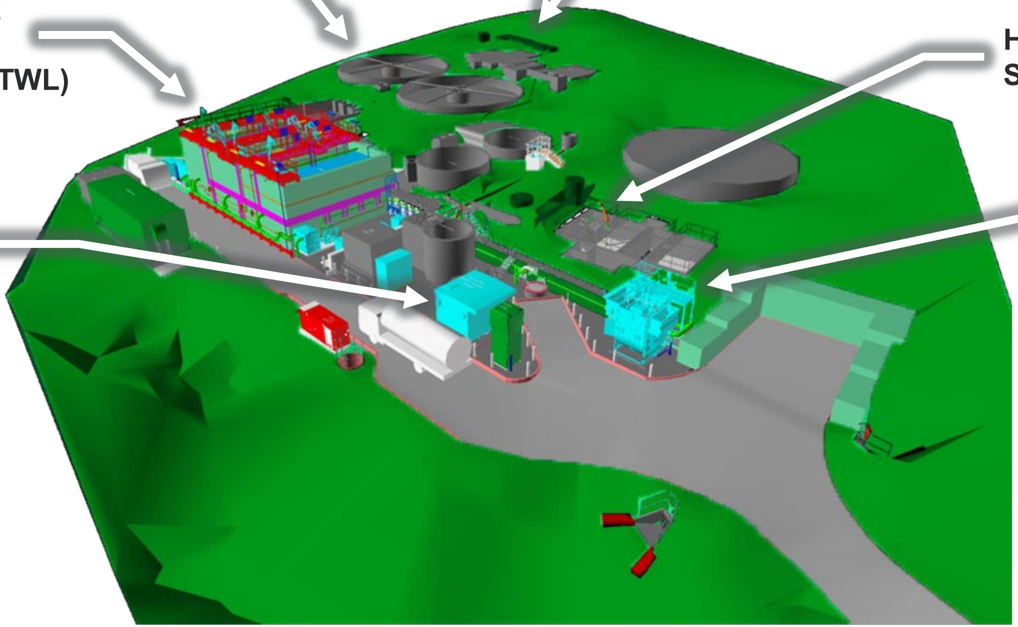
WwTW Prior to Scheme



Chosen Solution

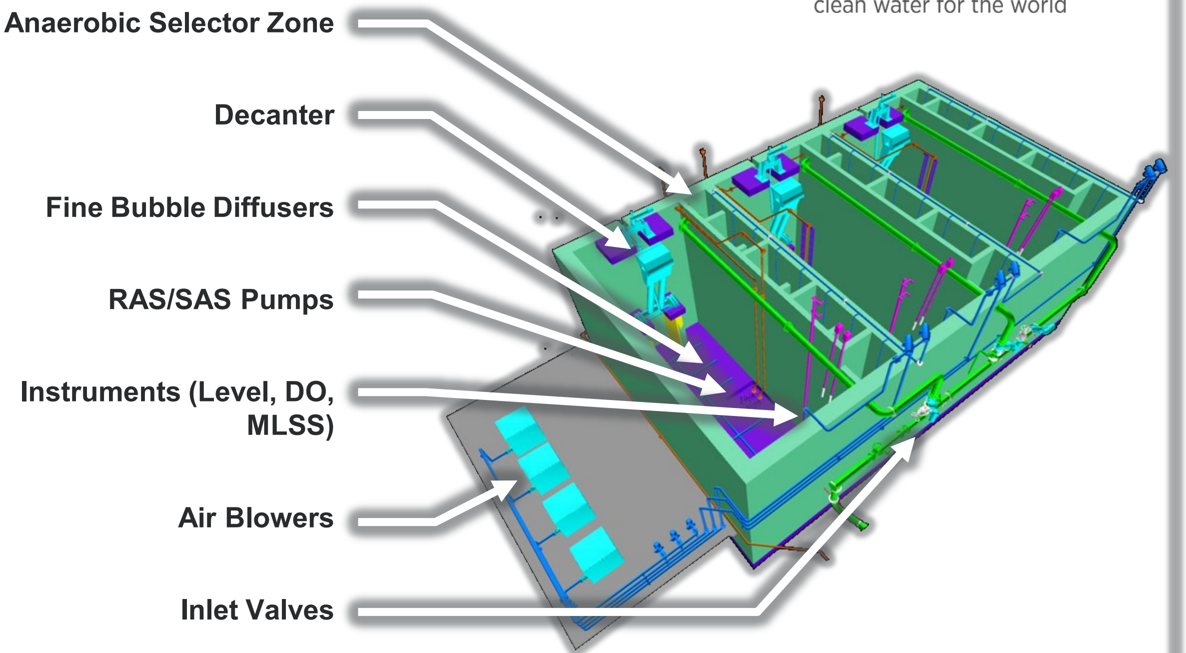


Design Basis



te-cyc™ Process

SFC Umwelttechnik
clean water for the world



Time (h)		1.33	1.67	2.66		4
Time (mins)		80	100	160		240
Basin 1	Fill/Aerate		Aerate	Settle	Decant	
Basin 2	Aerate	Settle	Decant		Fill/Aerate	
Basin 3	Decant		Fill/Aerate		Aerate	Settle

Construction

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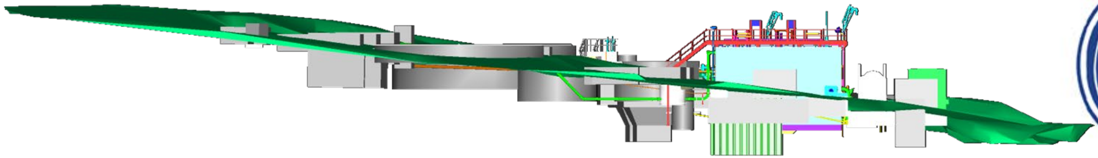

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Process Commissioning

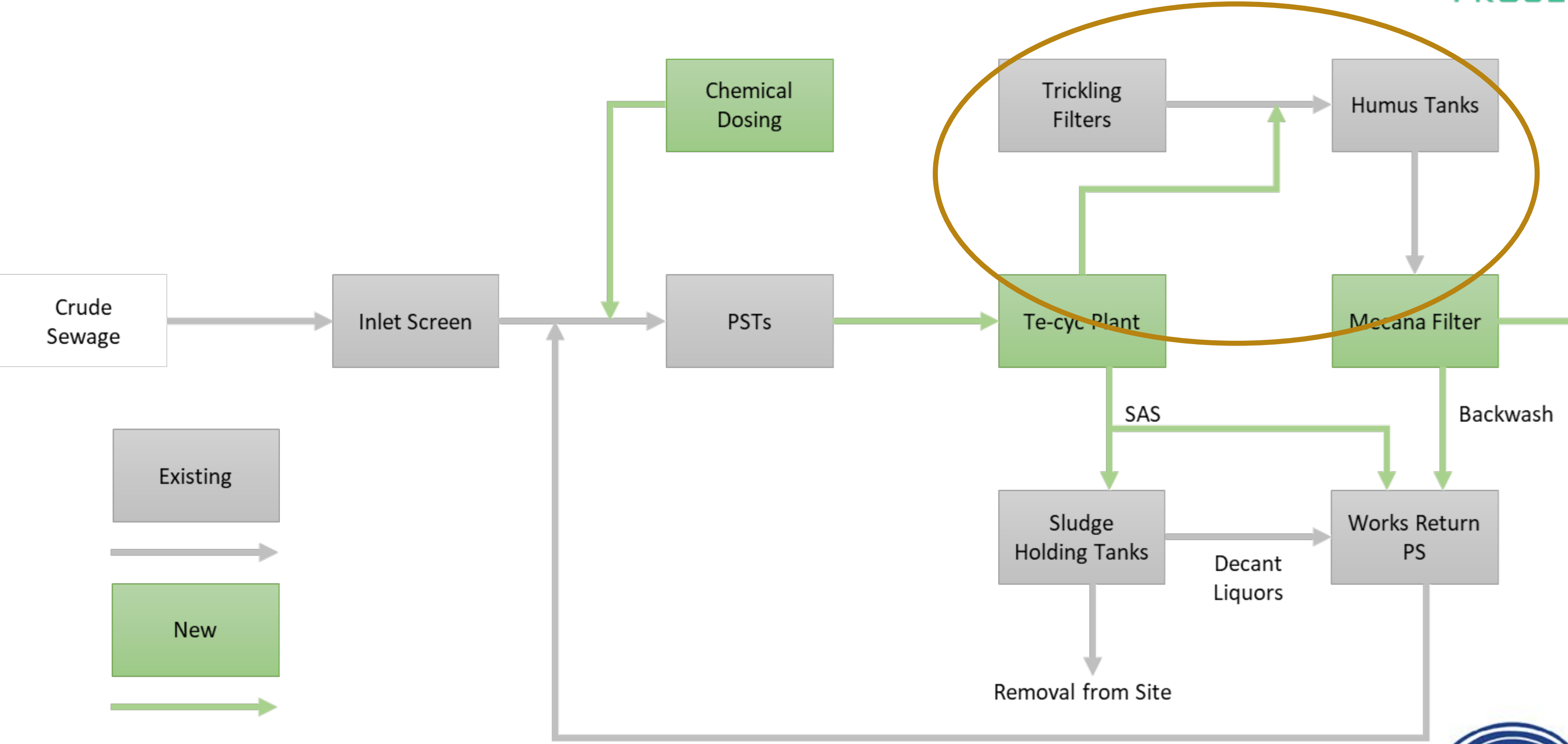
Process Commissioning

- The te-cyc™ plant was commissioned with the new Low TP permit already in force
- Initial commissioning undertaken in winter / higher flow period
- Biological load currently accepted by the plant is less than Design load.
- Site is currently treating an FFT of 11 l/s, with the future FFT of 15.8 l/s being implemented soon
- te-cyc™ designed to treat future FFT (15.8 l/s) and will be receiving these flows subject to completion of hydraulic modifications to inlet works

Seeding the Basins

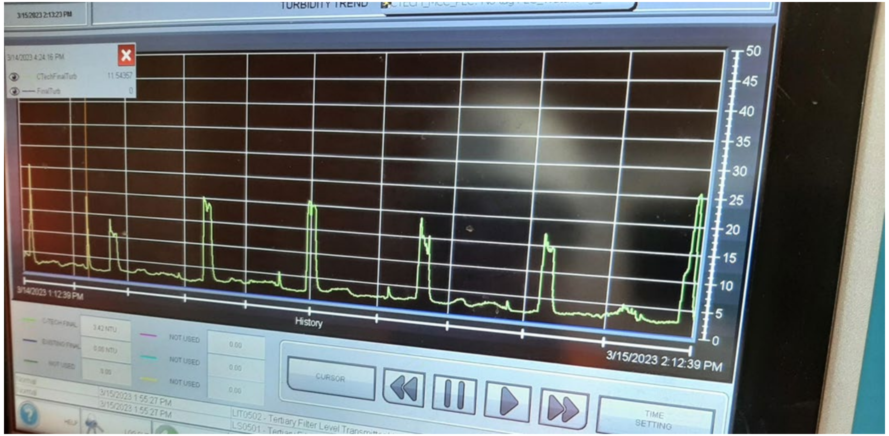
- Seed sludge taken from another SBR achieving significant Bio-P removal to help speed up commission
- Initial Operating MLSS 3 – 4 g/l
- te-cyc™ effluent was initially returned through the trickling filters to safeguard compliance during commissioning

Initial Compliance Safeguard



Commissioning Issue

- Turbidity Spikes from Basin No.2 started to develop
- Turbidity would increase from ~2 NTU to over 30 NTU at the onset of a decant
- No solids or scum carry over witnessed when the spikes occurred…



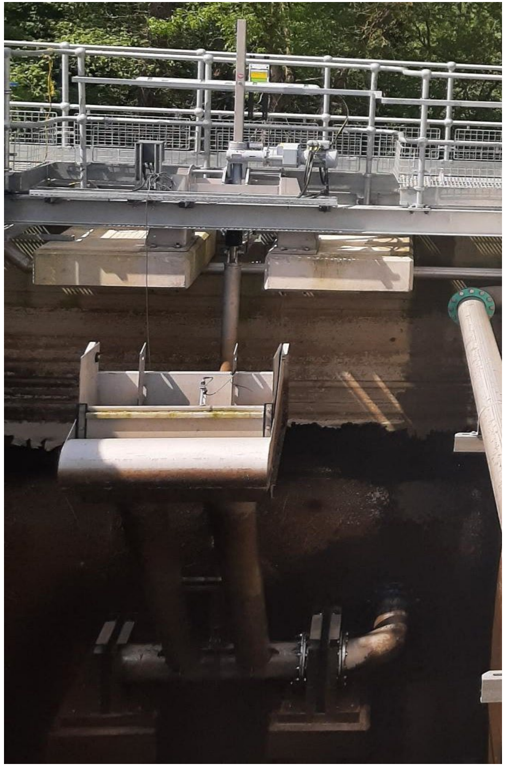
Tank drain and inspection required

Tank Drain and Inspection

What did we learn?

- Where and what the turbidity spikes were coming from…
- A better idea of how "best" to remove the sludge and reseed the basin

But what about the operation of the remaining basins?



Operating with 1 No. Basin OOS

- Operating MLSS ~2.5 – 3.0 g/L ensured plenty of biological treatment capacity
- However, shorter cycle times means there was more sludge with less time for Settlement/Decant phase

Time (h)		1.33	1.67	2.66		4
Basin 1	Fill/Aerate		Aerate	Settle	Decant	
Basin 2	Aerate	Settle	Decant		Fill/Aerate	
Basin 3	Decant		Fill/Aerate		Aerate	Settle

Time (h)		1.5	2.25	3
Basin 1	Fill/Aerate		Settle	Decant
Basin 2	OOS			
Basin 3	Settle	Decant	Fill/Aerate	

This resulted in sludge blanket carry over

What did this teach us?

MLSS Control – Striking The Balance

Lower Operating MLSS limit

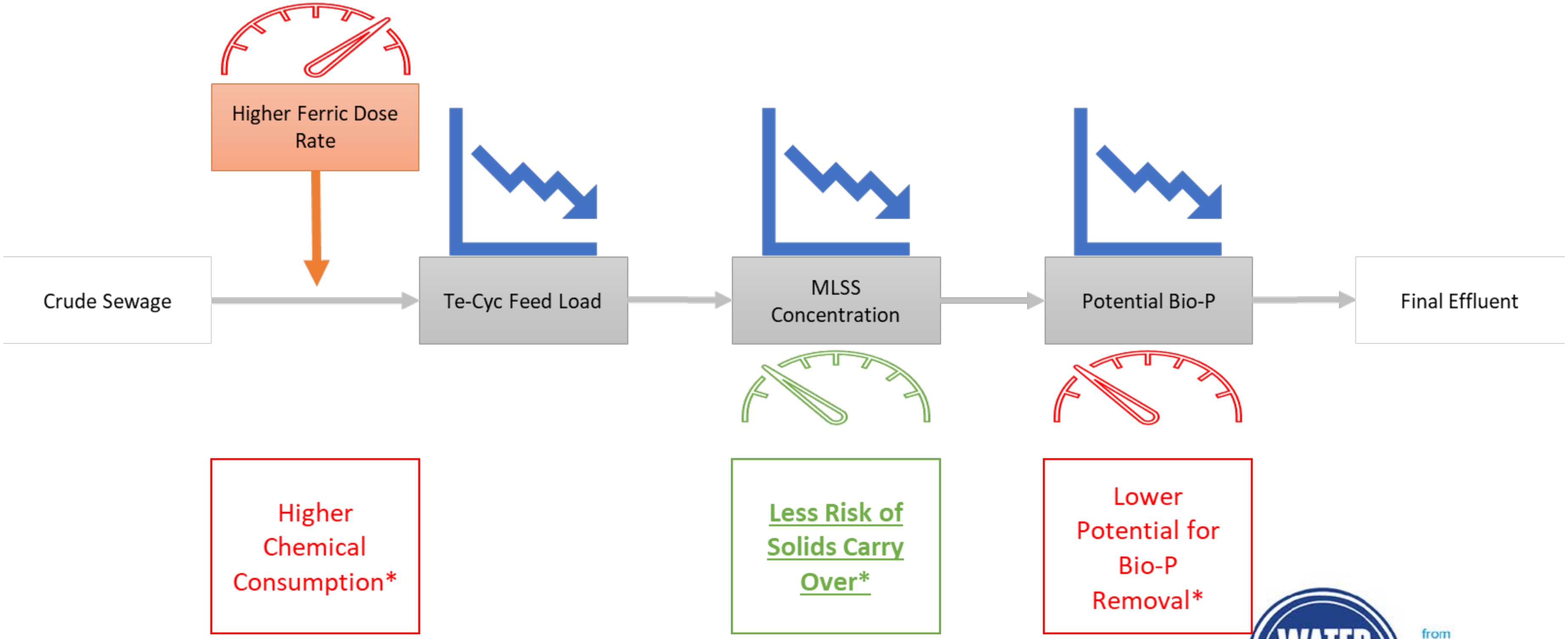
- Less biological capacity - Potentially limits ammonia, BOD and P performance
- Less sludge to handle

Higher Operating MLSS limit

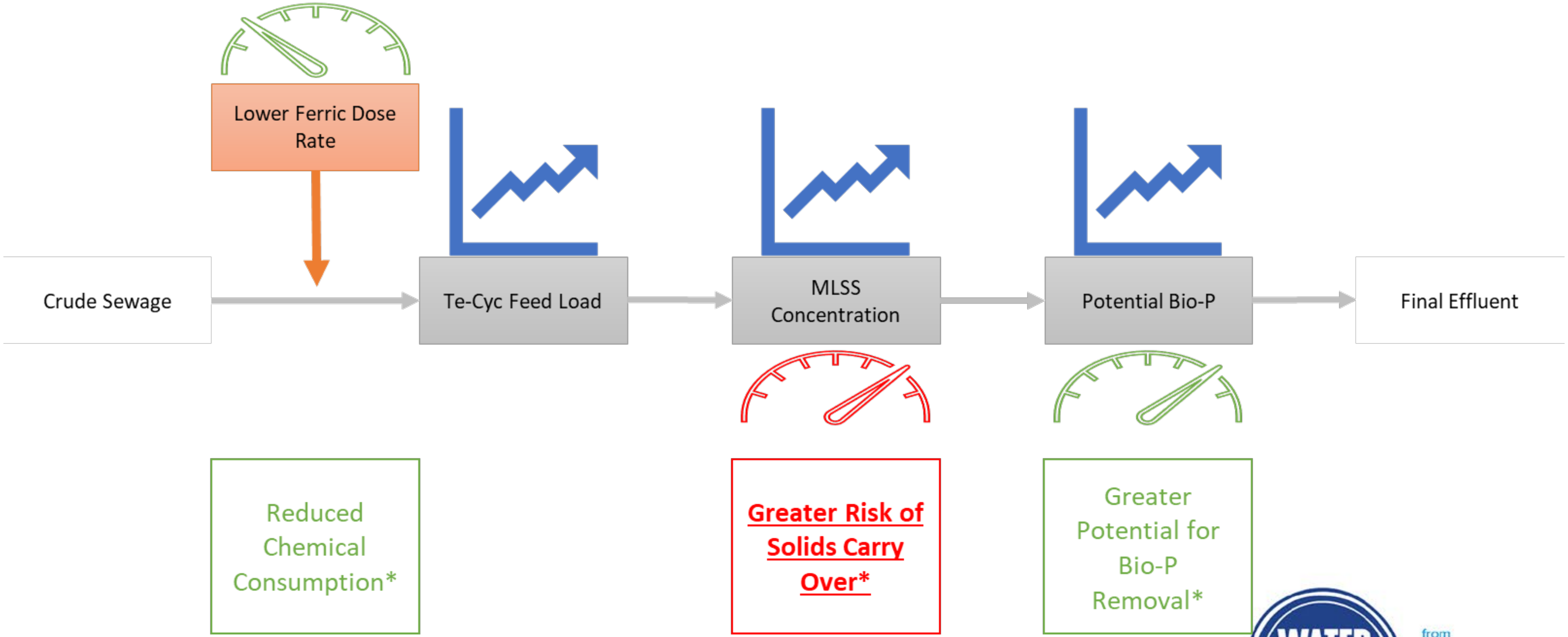
- More biological capacity - Enhanced ammonia, BOD and potentially P removal
- More sludge to handle

Better control of the operating MLSS is required when one basin is out of service.
Higher Operating MLSS carries the risk of blanket washout

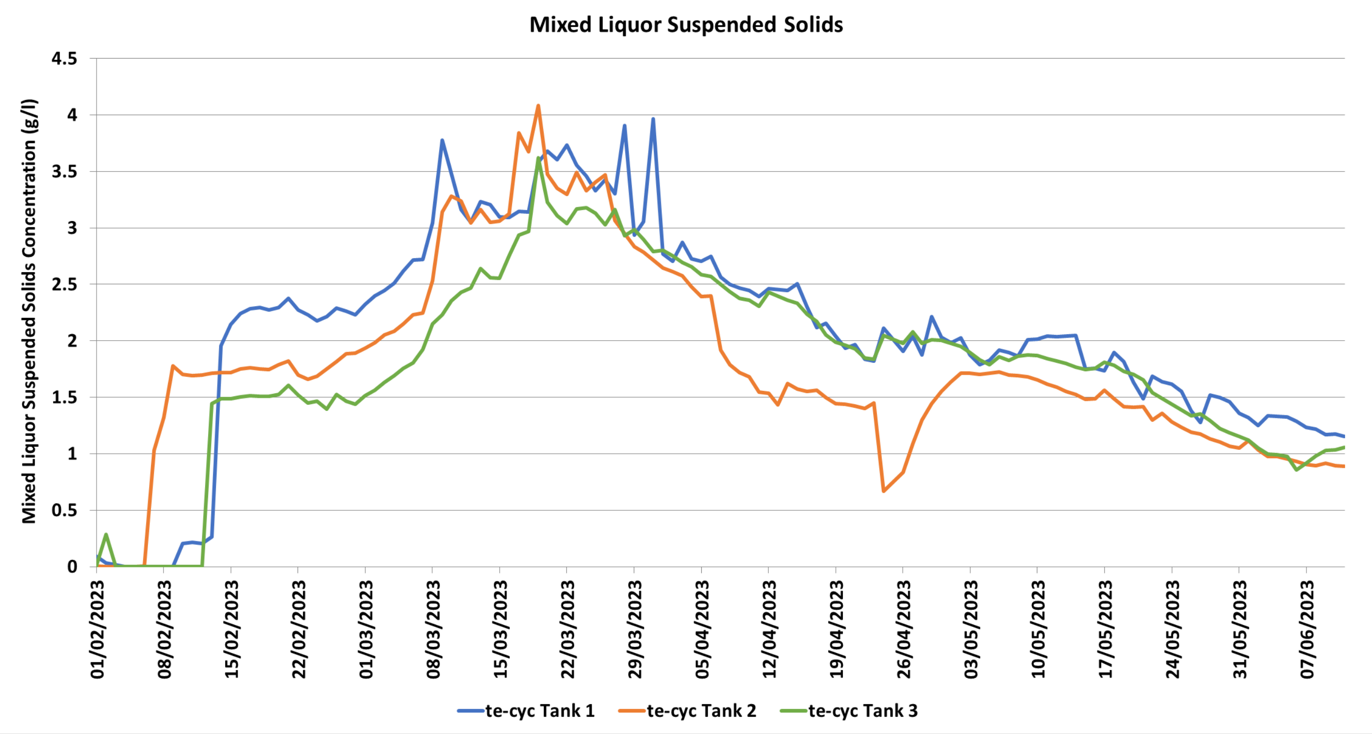
MLSS Control – Impact of Ferric Dosing



MLSS Control – Impact of Ferric Dosing



MLSS Control – The Key Variable For Performance



- Primary ferric dosing reduces the required MLSS and seems to improve settleability of sludge from improved co-settlement
- Reduced MLSS potentially limits the capacity for bio-P removal

More work is required to strike the balance between ferric dosing, operating MLSS and settleability.
New low total P permit is LIVE!

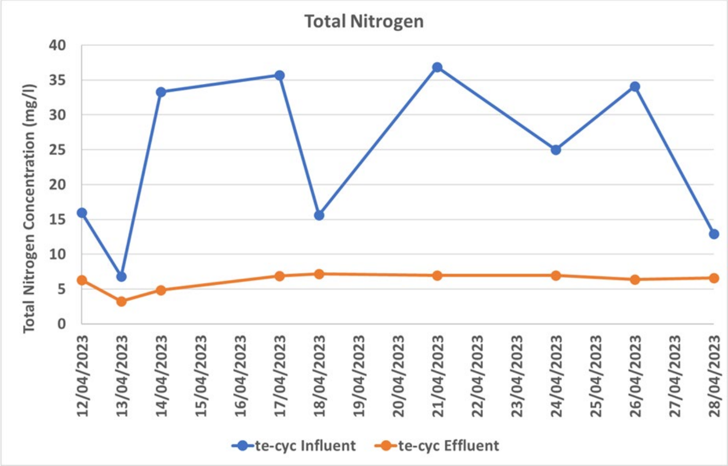
Realised Benefits

- Hawkhurst is a soft water area. This is known to require higher ferric dosing rates and alkalinity supplementation – usually caustic dosing. Had we designed a conventional attached growth process a new caustic dosing system would have been required.
  Caustic dosing was part of the interim process and required ~5 m^3 per month

- Multiple drivers:
  New TP permit
  Tightened Ammonia Permit
  Increased FFT

- Technology able to fit on an already constrained site

- TN removal achieved would benefit if TN permit is applied in the future



Performance Data So Far – te-cyc™ Effluent (Apr–Jun 2023)

The following data is based on te-cyc™ treating an FFT of 11 l/s, not its designed FFT of 15.8 l/s which will be tested once the inlet modifications are completed

- Total Phosphorus results show large range showcasing the various changes and challenges seen through commissioning – Site Final Effluent is in compliance with the average TP permit to date

te-cyc™ Effluent	Ammonia (mg/l)	BOD (mg/l)	Total Iron (mg/l)	Total Phosphorus (mg/l)	Solids (mg/l)
Max	2.29	7.79	0.58	1.40	16.10
95%ile	**1.15**	**5.84**	**0.37**	**1.32**	**12.76**
50%ile	0.01	2.96	0.20	0.79	6.40
Ave	**0.24**	**3.24**	**0.22**	**0.75**	**7.29**
10%ile	0.01	1.00	0.11	0.15	2.00
Min	0.01	1.00	0.08	0.12	2.00
Count	29	28	28	28	29

- Total Nitrogen removal approximately 70% on average
- Alkalinity residual 65 mg/l (minimum sampled at 40 mg/l) without caustic dosing

Above results are samples taken directly from the SBR effluent pipe

What Happens Next

- Inlet modification to allow 15.8 l/s FFT to te-cyc^{TM} plant

- Continue with MLSS control finding a suitable concentration for inlet BOD in conjugation with ferric dosing changes

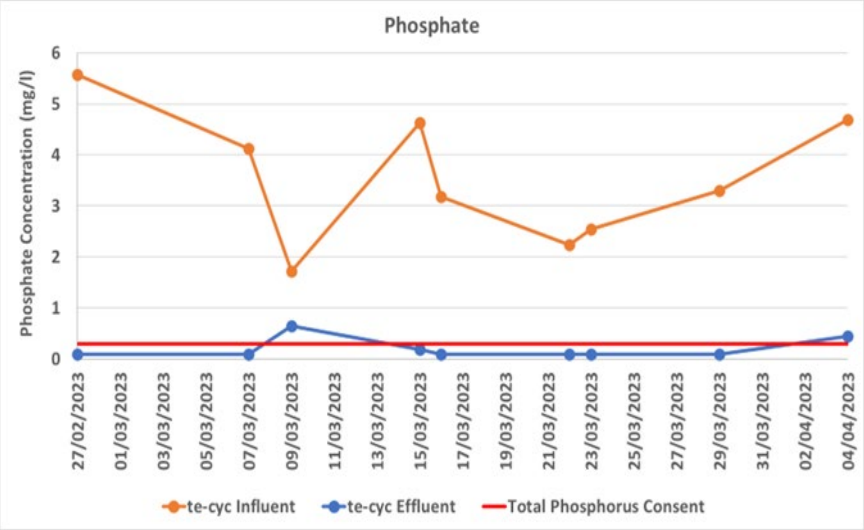
- Introduce secondary trim dose

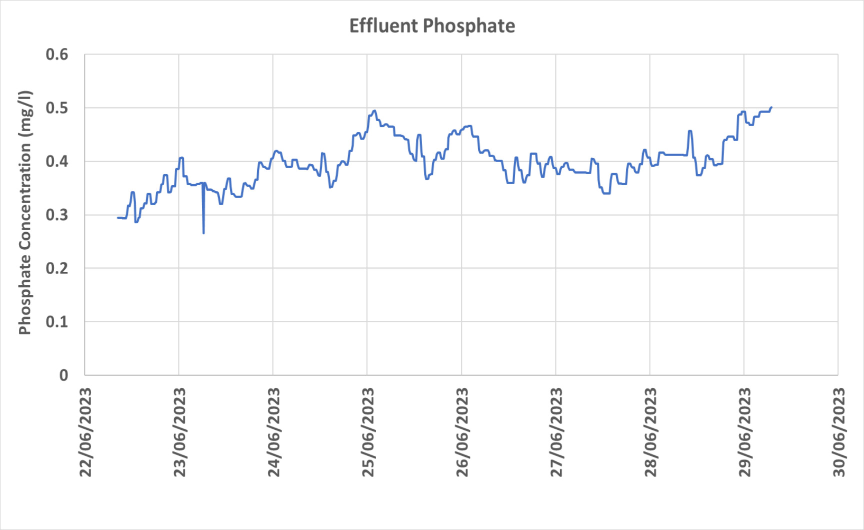
- Work to be undertaken to old Humus Tank for additional sludge storage

- When above is complete – Trial to separate SAS and move away from co-settlement

What Happens Next

- Early period of commissioning showing good Bio-P removal





- Recent 14 days o-P performance

Thanks for listening– Any questions?