Water NZ Conference 2019

Tauranga City Council: WWTP Energy and Carbon Assessment

SARAH BURGESS

Opportunities

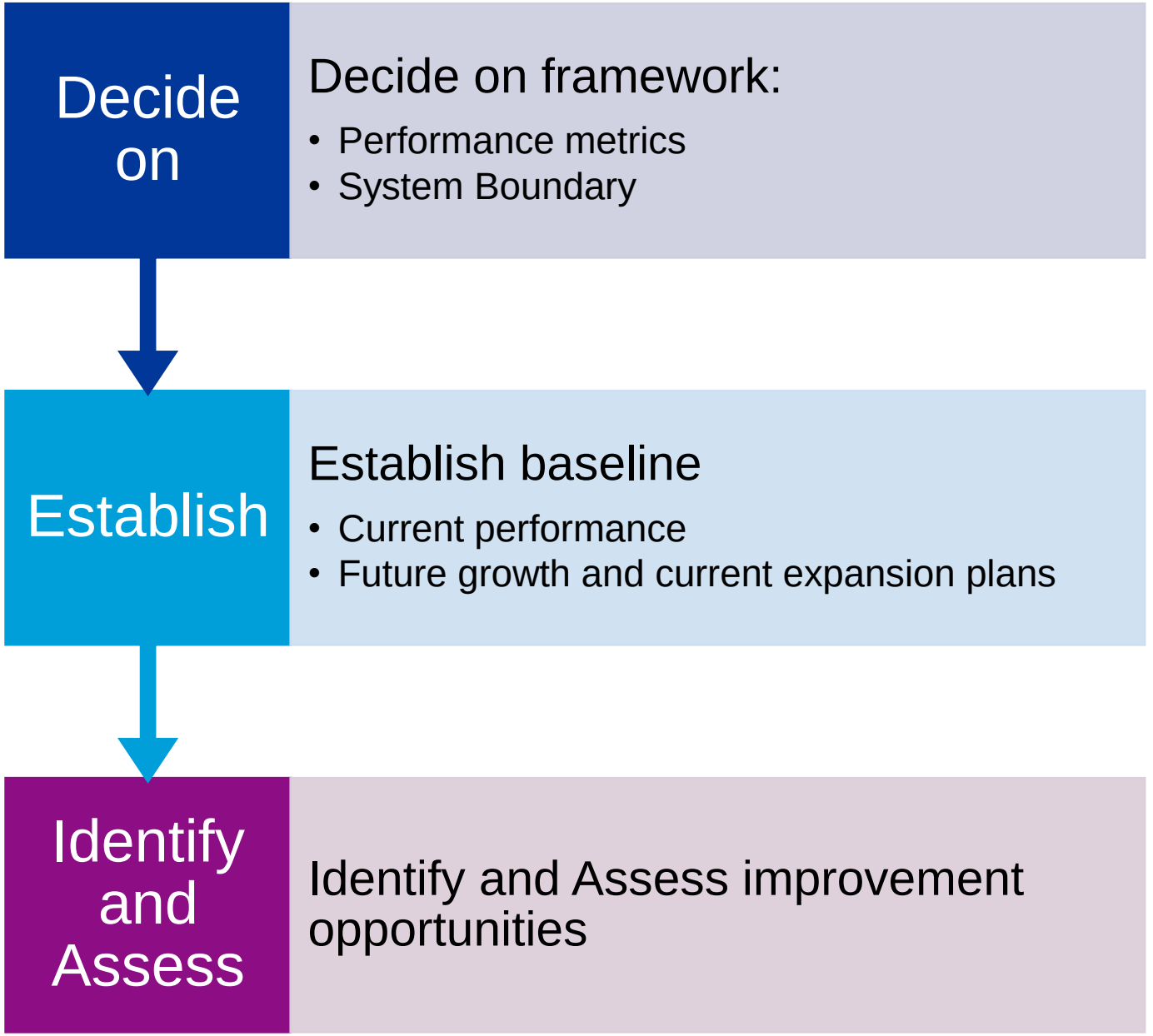
Make the most of existing assets

Identify upgrades which provide a net benefit

Build efficiency in to expansion or growth plans

Avoid over-capitalisation

Assessment Steps



Framework Development

System boundaries

Performance metrics

The goal of the assessment

Any constraints on the system.

Baseline Assessment

Reference point for assessing proposed changes against

Typically based on current operational performance

- Most recent year
- 3-5 years

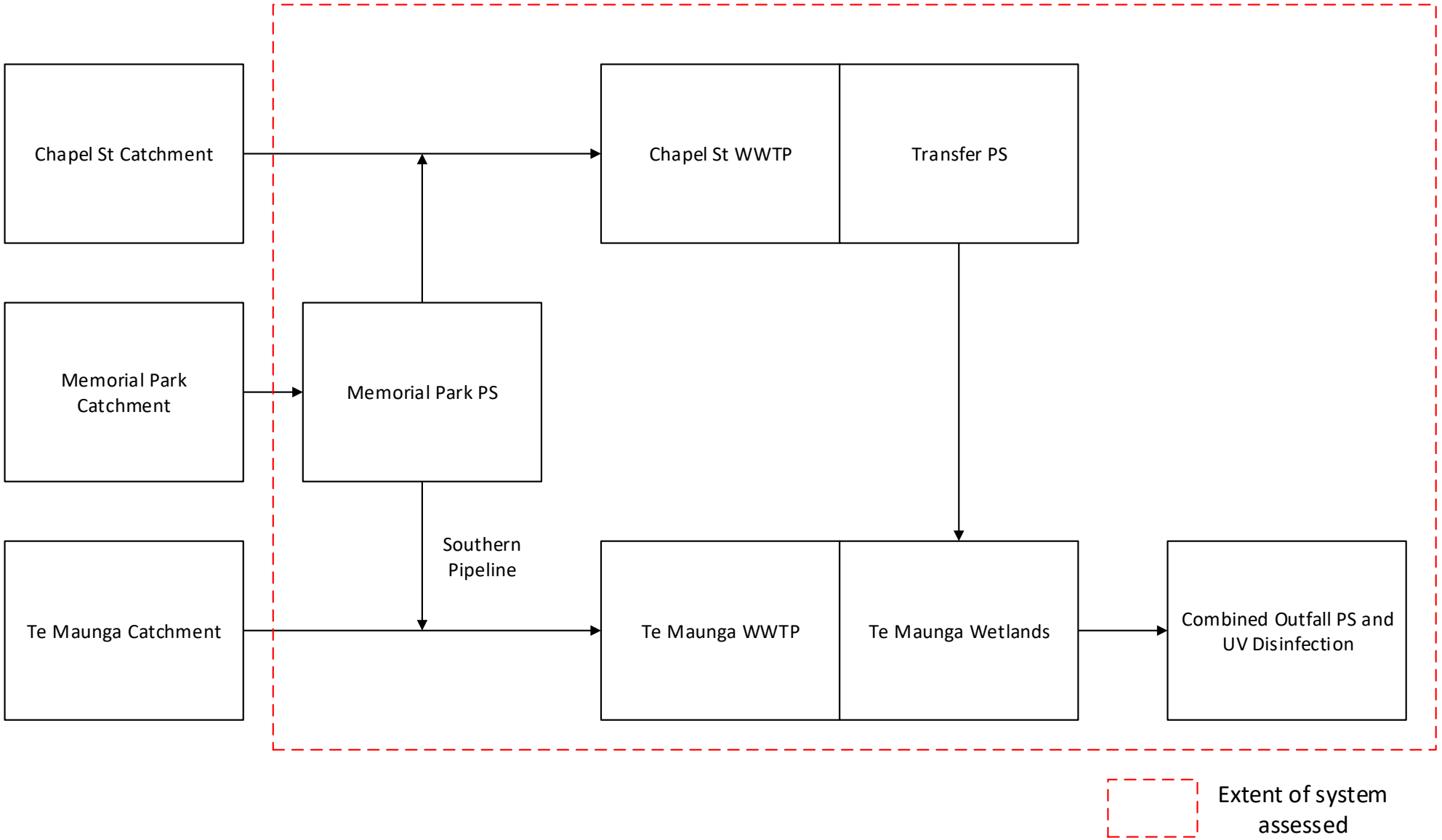
Can incorporate future growth and planned upgrades

Chapel St

- Conventional treatment
  - Primary sedimentation
  - Secondary solids contact
  - Digesters and sludge handling
  - Biogas-powered cogeneration
- Space constrained
- Sensitive neighbours

Te Maunga

- Secondary-only process
  - Extended aeration system
  - Aerated/anoxic zones for nitrogen removal
  - Polishing ponds
  - New sludge handling system
- More space for expansion
- Poor ground conditions


Chapel St Catchment
Chapel St WWTP
Transfer PS
Memorial Park Catchment
Memorial Park PS
Southern Pipeline
Te Maunga Catchment
Te Maunga WWTP
Te Maunga Wetlands
Combined Outfall PS and UV Disinfection
Extent of system assessed

Strategic Review

- What should the plant be treating?
- Are the right unit processes in place

Performance Review

- Big power users?
- Inefficient processes?
- Energy production potential?

Prioritisation

- Alignment with study goals?
- Potential for significant savings?

Shortlist

- Identify shortlist for further evaluation

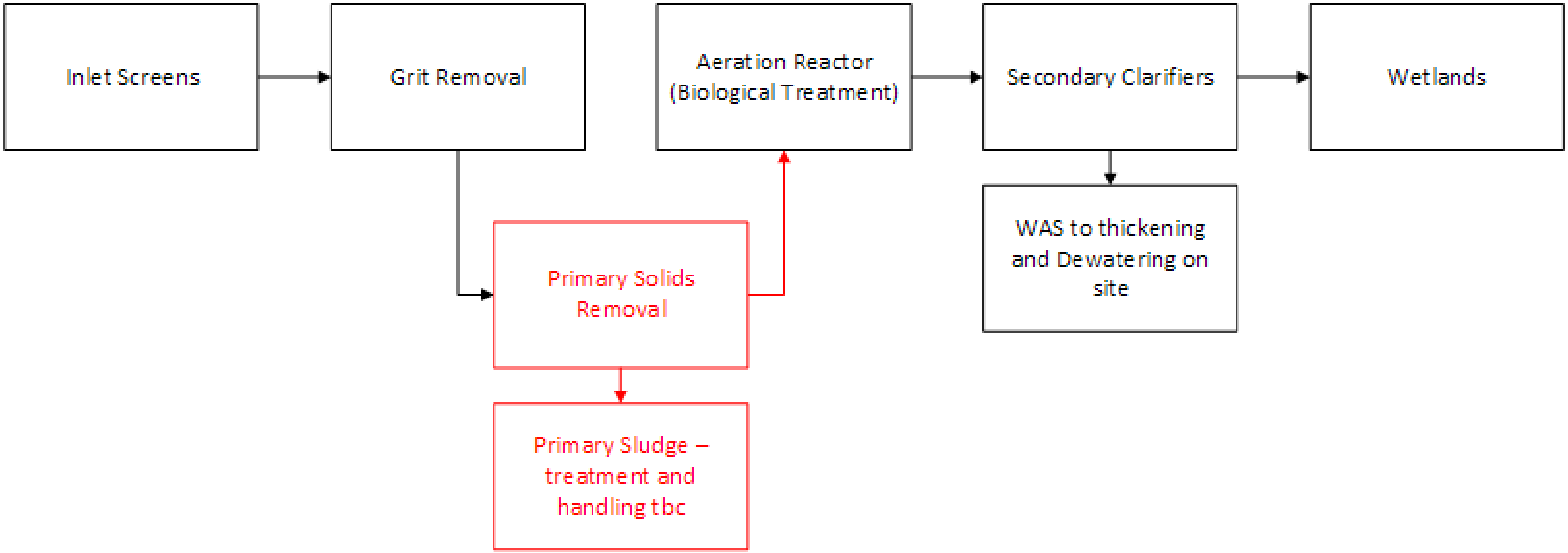
Option	Description	Sub Options	Focus Ranking
Energy Efficiency Improvements			
Primary Solids removal at Te Maunga	Use either sedimentation or another primary solids removal process (such as Salsnes filters) to reduce secondary treatment BOD load and hence aeration demand.	▪ PSTs (gravity only or enhanced) ▪ Salsnes Filters ▪ Digesters at Te Maunga ▪ Sludge transferred to Chapel St	▪ Medium ▪ High ▪ Low ▪ Medium
Bioreactor re-configuration	Optimise aeration requirements to meet consent discharge requirements	▪ Decrease nitrification ▪ Cease nitrification	▪ Medium ▪ Medium
Energy Production Improvements			
Increase Existing Digester SRT	Improve digester gas production by increasing the time sludge spends digesting without adding significant additional processes	▪ Recuperative Thickening ▪ Improve GBT performance ▪ Upgrade WAS thickening	▪ High ▪ Low ▪ Low
Increase Primary sludge input to digesters	Primary sludge is more readily digestible, gives more stable digester performance. This can be done by improving performance and/or increasing throughput	▪ Enhance CS PST performance ▪ Convert Chapel St to primary only ▪ Primary sludge from Te Maunga ▪ Import high strength trade waste	▪ High ▪ High ▪ Medium ▪ Very low
WAS conditioning	Improve digestibility of secondary sludge, improving gas production and digester stability	▪ THP Chapel St WAS only ▪ THP Chapel St WAS + TM WAS ▪ Other sludge conditioning processes	▪ High ▪ Medium ▪ Low
Emissions Improvements (other than effects of above)			
Minimise transportation fuel use	Reduce the mass of sludge to be transported and/or the distance travelled. To reduce the latter an alternative disposal route would be required.	▪ Bring forward installation of sludge dryer ▪ [illegible] travelled ▪ Use alternative fuel	▪ High ▪ High

Energy Improvements

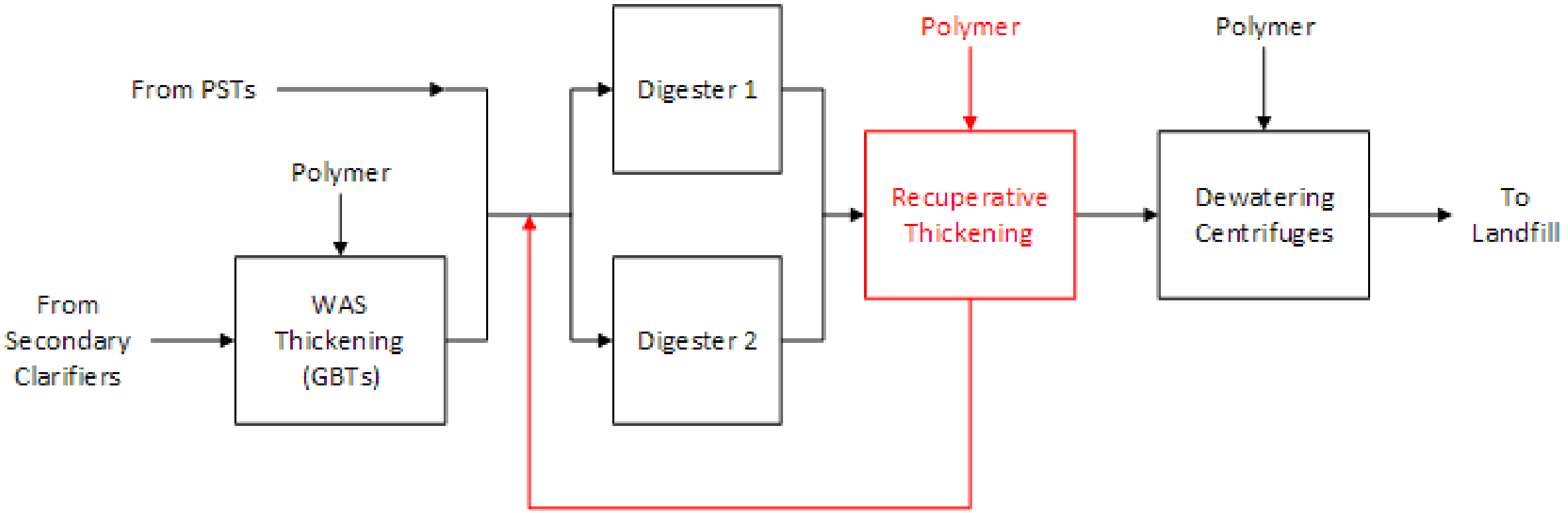
Primary Filtration at Te Maunga

Chapel Street Digesters Recuperative Thickening

Te Maunga – Primary Solids



Chapel St – Recuperative Thickening



Emissions Improvements

REDUCING VOLUMES OF SLUDGE TRANSPORTED

SWITCHING TO LOWER CARBON EMISSION TRANSPORT FUELS

TCC Outcomes

Option	Description	TM Works NPV	CS Works NPV	Total NPV	Energy Savings
1	Status quo	$42.5M	$8M	$50.5M	-
2	Implement standard primary filtration at Te Maunga only	NPV $40.1M (with dryer) - $52.2M (without dryer)	$8M	$48.1M - $60.2M	479,000 (2018) – 1,190,000 (2053)
3	Implement RT at Chapel St only	$42.5M	$8.8M	$51.3M	1,800,000
4	Implement primary filtration at TM, implement RT at CS, digest TM primary sludge at CS	$41M (without dryer) - $43.3M (with dryer)	$8.8M	$49.8M - $52.1M	CS: 479,000 (2018) – 1,190,000 (2053) TM: 1,809,000 (2018) - 1,818,000 (2053)
5	Implement standard primary filtration at TM, implement RT at CS, treat TM primary sludge on site	NPV $40.1M (with dryer) - $52.2M (without dryer)	$8.8M	$48.8M - $61.0M	CS: 479,000 (2018) – 1,190,000 (2053) TM: 1,800,000

In Conclusion

Tool to identify and realise energy savings in the short and long term

Biggest carbon reduction benefit is in reducing transport diesel use

Reducing mass	Changing fuel

make
everyday
better.