

# Waterbeach WRC Growth (Design only) SEW-11239 DM2 Submission

**TIG Date:** 26<sup>th</sup> Mar 19

**Presented By:** [REDACTED] IMW Alliance, [REDACTED] AW

**Primary Driver:** 200.51 Supply Demand/Growth, Non-Infra

# Background and Overview

A new Town is being proposed at the site of a former airfield north of Waterbeach. The MoD vacated the site in March 2013. The site between the A10 and the mainline between Ely and Cambridge.

TIF states: the Two Developers (Urban & Civic and RLW) have signed underwritings for a combined total of 10,000 new properties in the Waterbeach catchment. The existing Waterbeach WRC accepts and treats flow up to 6,600 PE and cannot accept this additional Growth. The Developers are working with AWS to build a new WRC to accommodate the increased flow and load.

The proposed strategy is to develop the design of a WRC to treat 31,000 PE along with associated infrastructure, and install in phases to provide capacity in time for the emerging growth.

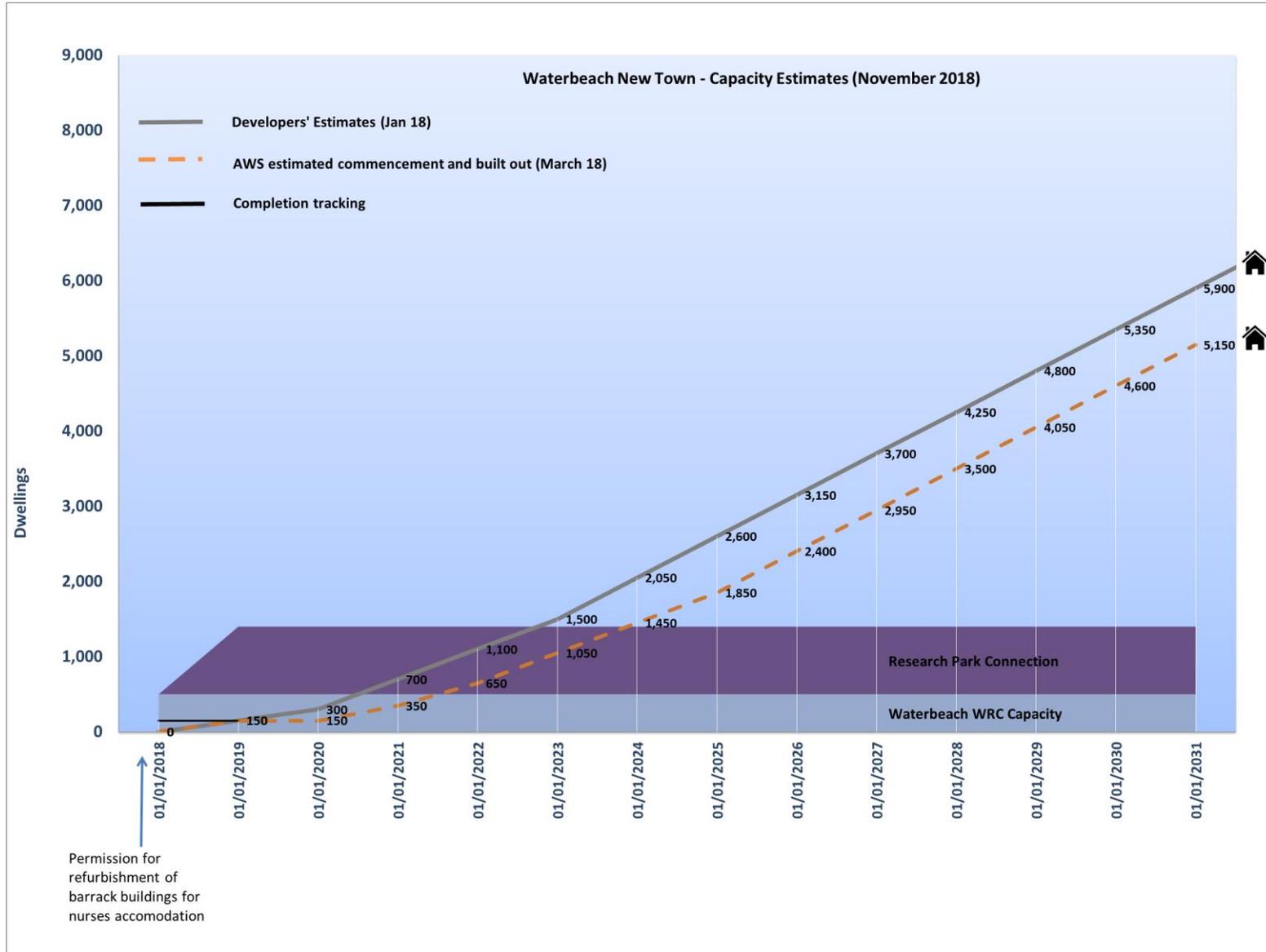
DM1 strategy: Carry out design and enabling activities upto DM3 to enable infrastructure and treatment assets to treat wastewater from 19000pe. The design should allow for a total ultimate capacity of 31,000pe.



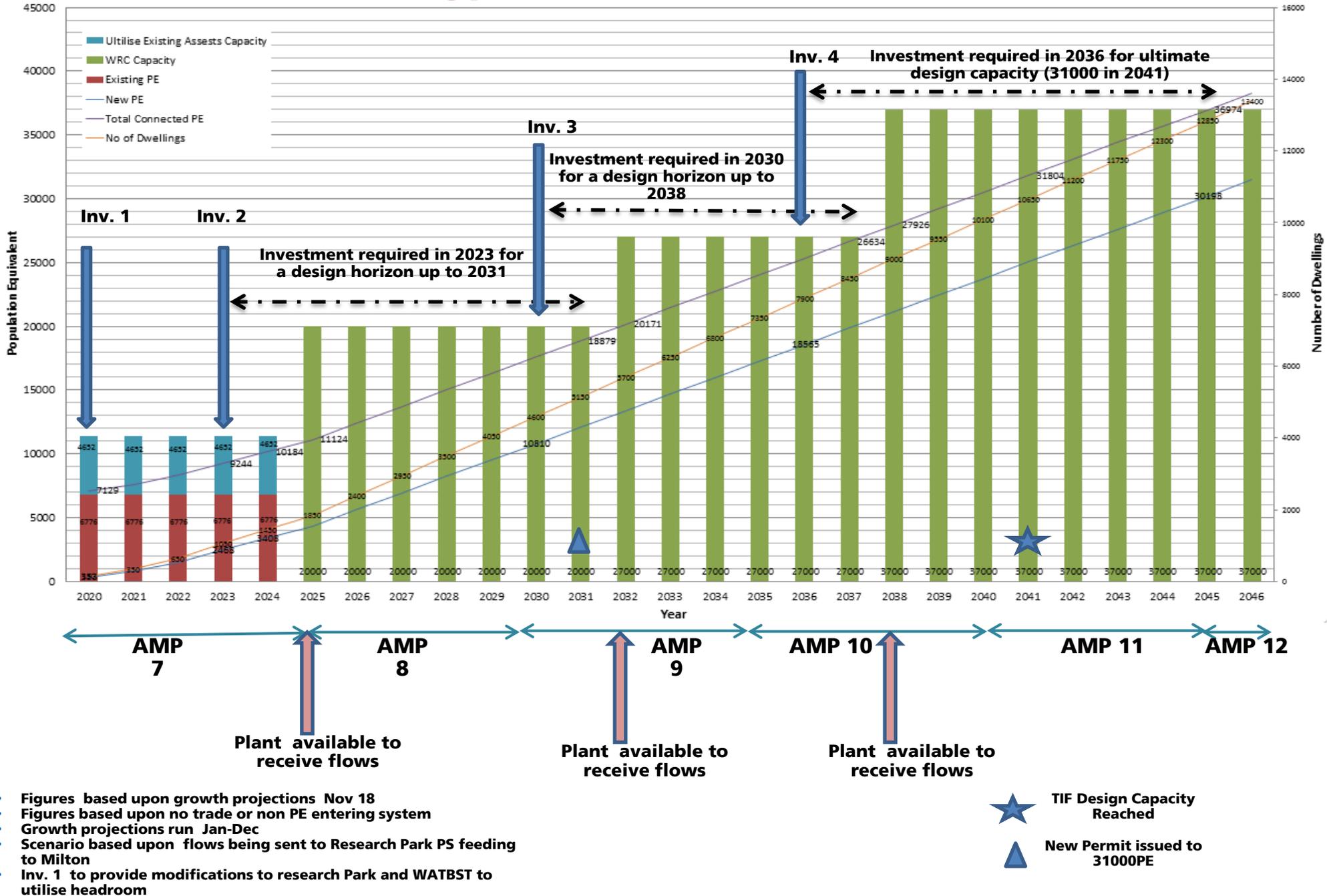
**(Design only)**



# Growth Profile



# Investment Strategy



- Figures based upon growth projections Nov 18
- Figures based upon no trade or non PE entering system
- Growth projections run Jan-Dec
- Scenario based upon flows being sent to Research Park PS feeding to Milton
- Inv. 1 to provide modifications to research Park and WATBST to utilise headroom

- ★ TIF Design Capacity Reached
- ▲ New Permit issued to 31000PE

# DM2 Proposed Strategy

PHASE 1 (**AMP7**) - As per the growth profile the phase 1 works can support development to Jan 2025 without installation of a new FE pipe mains from existing Waterbeach WRC to river Cam.

- Investment Required in 2020 to upgrade the existing Research Park & Cottenham P/Stn
- Pump flows for 1350 properties to the existing Milton Works through existing Research Park P/Stn (across A10 opposite to Waterbeach town)
- Utilising headroom at existing Waterbeach WRC to accommodate growth of 500 properties

PHASE 2 (**AMP7**)- Construct a new Waterbeach WRC 20,000 PE to take additional flows (modular design) to Design horizon of 2031

- Investment required in 2023 to enable assembly and commissioning of new works to receive flows in Jan 2025
- Modular ASP Bio P streams

PHASE 3 (**AMP9**) - Extend the new WRC for a design capacity of 27,000 PE to take additional flows (modular design) to Design horizon of 2038

- Investment required in 2030 to enable assembly and commissioning of new works to receive flows in Jan 2032

PHASE 4 (**AMP10 or later**) - Extend the new WRC for design capacity of 37,000 PE to take additional flows (modular design) to Design horizon of 2045

- Investment required in 2036 to enable assembly and commissioning of new works to receive flows in Jan 2038



# Key Assumptions & Exclusions

- **Flood Risk mitigation measures and associated costs not included**
- Demolition of existing Waterbeach WRC not included
- Location of TPS, rising main and new WRC location in accordance with current developer plans (yet to achieve planning)
- No provision for connecting pipework between research park PS and new TPS
- No provision made for FE pipeline from existing Waterbeach WRC to river Cam
- In absence of any catchment modelling, the modular assembly phases are based on last growth profile from Developer/ AW
- The assembly phases have been defined on the basis of the Growth profile from Developer's data Jan 2018
- Outfall pipe assumed crossing through the existing river protection bund (engagement with **EA** has been challenging)
- Risks and Opportunities for phases 3 and 4 are based on a percentage of the respective estimated cost.



# Progress to Date

- Collaboration meetings with wider stakeholders and setup Steering Group with representatives from EA, Network Rail, WSP (designer for RLW), Developers (U&C + RLW), County Council as well as District Council and AW
- Developed and revised scenarios and investment strategies in line with growth projections from Developer
- Single solution for both Infrastructure element as well as Non-Infra works agreed with stakeholders through various interventions and meetings
- Solution developed using 3D design with scheme setup using BIMDocs and having intelligent P&IDs
- Trained entire project team to use 3D model for both technical and commercial discussions, as well as BIMDocs management system
- Undertaken Ground Investigation, Randall , Ecology and other enabling surveys
- Initial engagement done for BAPA for under track tunnel
- Flood Risk Assessment modelling with feedback from Environment Agency
- Budget quotations for majority of Plant & Equipment required for the DM2 project estimate



# Project Context – Waterbeach

Phase	1	2	3	4
<b>AMP Investment Year (Assembly Start)</b>	<b>7 2020</b>	<b>7 2022</b>	<b>9 2030</b>	<b>10 2036</b>
Scope	<ul style="list-style-type: none"> <li>Maximise WATBST headroom</li> <li>Additional flows to research park p/s</li> </ul>	<ul style="list-style-type: none"> <li>New inlet works p/s on existing WATBST WRC</li> <li>Rising main with rail crossing tunnel</li> <li>New WRC ASP BioP process plant</li> </ul>	<ul style="list-style-type: none"> <li>Extension to inlet works p/s volume &amp; pumps</li> <li>Additional rising main through existing tunnel</li> <li>Additional ASPBioP stream, FST, RAS p/s &amp; SAS thickener</li> </ul>	<ul style="list-style-type: none"> <li>Extend existing ASP BioP stream</li> <li>Additional ASP BioP stream</li> <li>Additional sludge tank</li> </ul>
New WRC Capacity PE (Cumulative)	n/a	20,000	27,000	37,000
New Inlet works PS & Rising main Capacity PE (Cumulative)	n/a	19,500	31,000	31,000
Permit Regulation sized on PE (Cumulative)	6,600 (Existing WTBST)	18,000	31,000	31,000
<b>Predicted Costs £</b>				

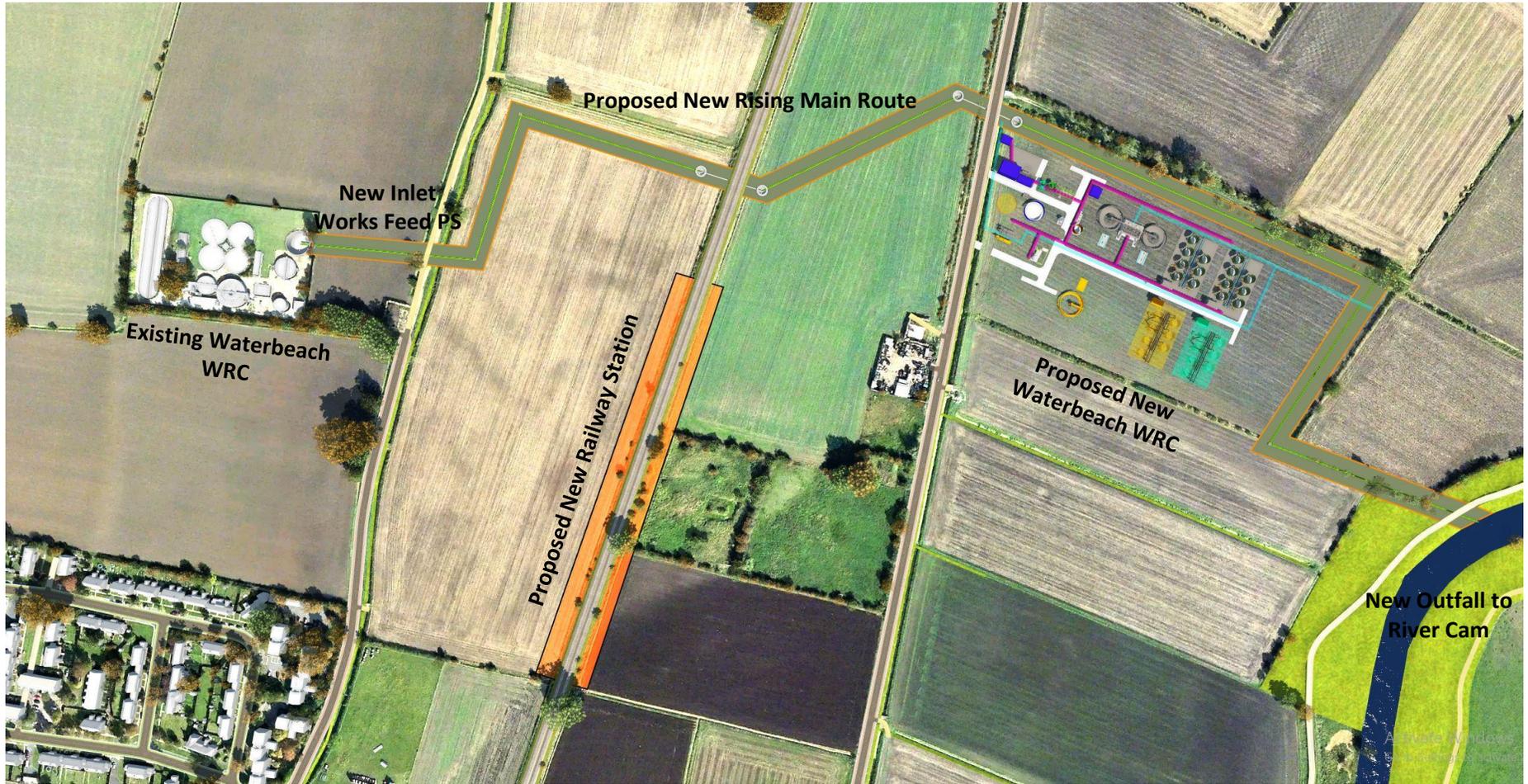
- No flood mitigation measures included in the solution as cannot be quantified
- Demolition of existing Waterbeach WRC not included
- Estimates are based on current costs and Inflation cost not included

# Project Context – Waterbeach

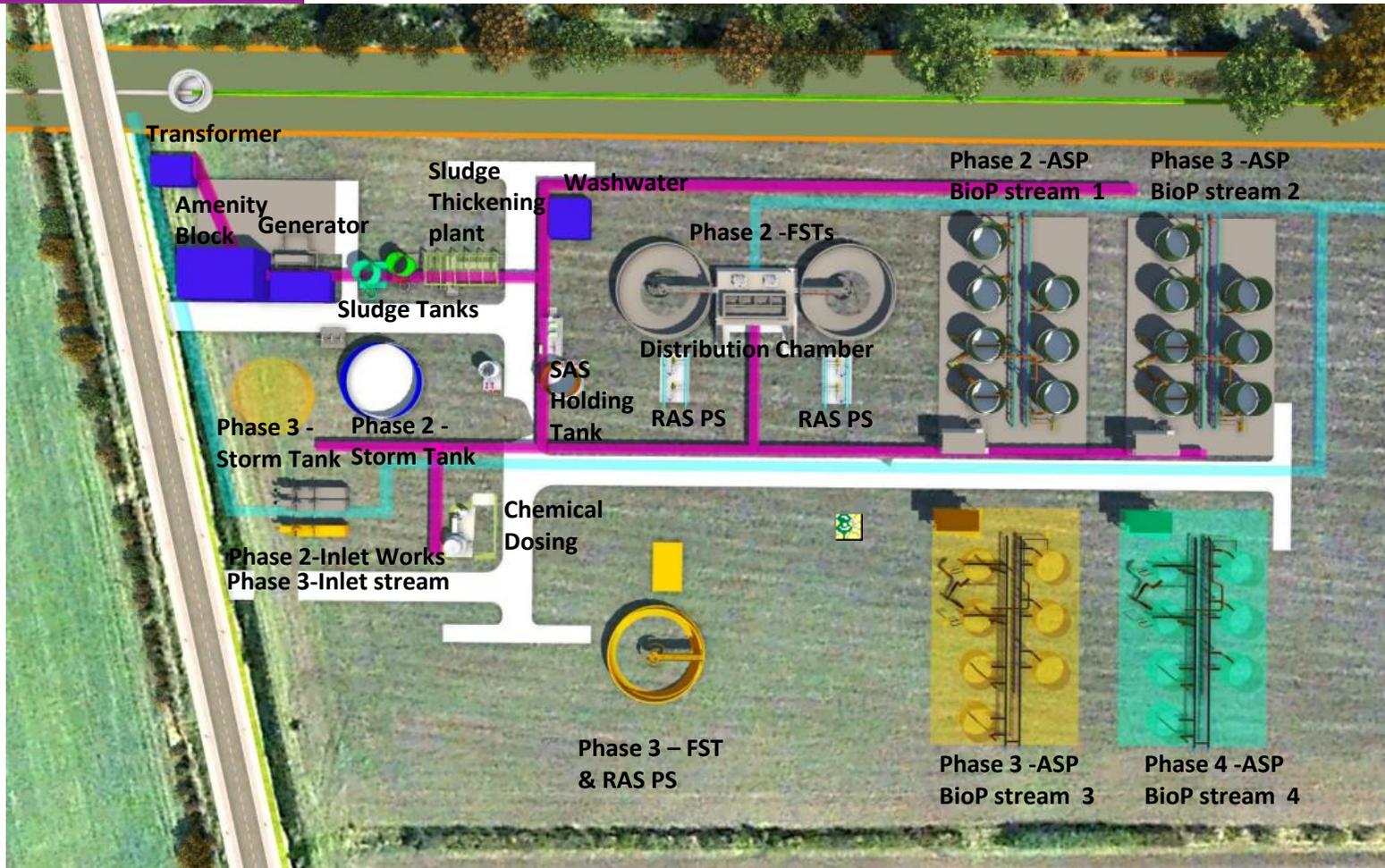
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<b>Predicted Costs £</b>				
RICS £				
Carbon - Capital T CO2	Total: 13 (13) Infra: 13	Total: 2167 (2180) Infra: 965 Non Infra: 1202	Total: 918 (3098) Infra: 420 Non Infra: 498	Total: 180 (3278) Non Infra: 180
Carbon - Operational TCO2	Total 45 (45) Infra: 45	Total: 534 (579) Infra: 132 Non Infra: 402	Total: 265 (844) Infra: 64 Non Infra: 201	Total: 108 (952) Non Infra: 108

**Operating costs for the existing Waterbeach WRC has been requested from Ops for deduction when Phase 2 is commissioned**

# Waterbeach Schematic



## Layout: ASP Bio-P



1. Inlet Screens and Screenings Handling
2. Grit Removal + Classifier
3. Storm Tank
4. Inter process Pumping Stations

5. ASP – Bio P
6. FSTs
7. Sludge Thickening Plant
8. Sludge Storage Tanks

# Stage 3 Strategy

- Engage with the EA to resolve the issue of WRC location within **flood zone 3B** and agree mitigation measures. Use the opportunity to agree the strategy for crossing the bund and the new outfall design
- Submit Screening Opinion for the pipeline and the WRC works to formally engage with the stakeholders
- Progress the submittal of BAPA for constructing a tunnel below an existing rail line
- Integrated approach of infrastructure and non-infrastructure based from lessons learnt on Dereham Growth, utilising a core team, whilst the design strategy enhances upon the concepts initiated in Whitlingham Growth and P-Dosing Programme of works
- Use standard designs/products where options are available
- Utilise digital capture tools to enhance the production of a fully integrated 3D model
- Have all design documentation and model hosted through BIMDocs management tool to help drive efficiency in stream lining the data management
- Drive and promote carbon efficient solutions (minimising the use of concrete, creation of piping and cabling corridors to reduce cross site dig)
- Apply innovative solutions to electrical design, embracing remote I/O and intelligent drives
- Risk & Opportunities will be reviewed regularly with team members allocated to actively mitigate risks and realise opportunities



# Challenge

- Formal EA objection to Developer's (Urban & Civic) Planning Application received 8<sup>th</sup> Jan 2019 as the submission does not provide adequate assessment of environmental effects for preferred wastewater option and assessment of alternate fall-back options.
  - ❖ Location for new WRC within **Flood Zone 3** besides raised soft defences on River Cam while these defences do not have a long term maintenance strategy/ funding.
  - ❖ Proposed WRC land falls in zone 3b, potentially having a highly significant impact on flood risk and biodiversity.
  - ❖ Alternatives to proposed new WRC location i.e. pump away to Cottenham and/ or Uttonsdrove are identified as having fundamental capacity issues (besides distance from Waterbeach)
  - ❖ Suggests pump away to existing Milton Works (6km away) as only credible alternative existing WRC.
- Flood Risk Assessment: The solution cost currently does not include any cost for **flood mitigation measures** as cannot be quantified. EA have been challenging to engage with regards to the following and want the WRC site selection resolved prior to further engagement
  - ❖ the solution to cross existing river protection bund (screening opinion cannot be finalised)
  - ❖ Flood risk mitigation for constructing on current location cannot be quantified

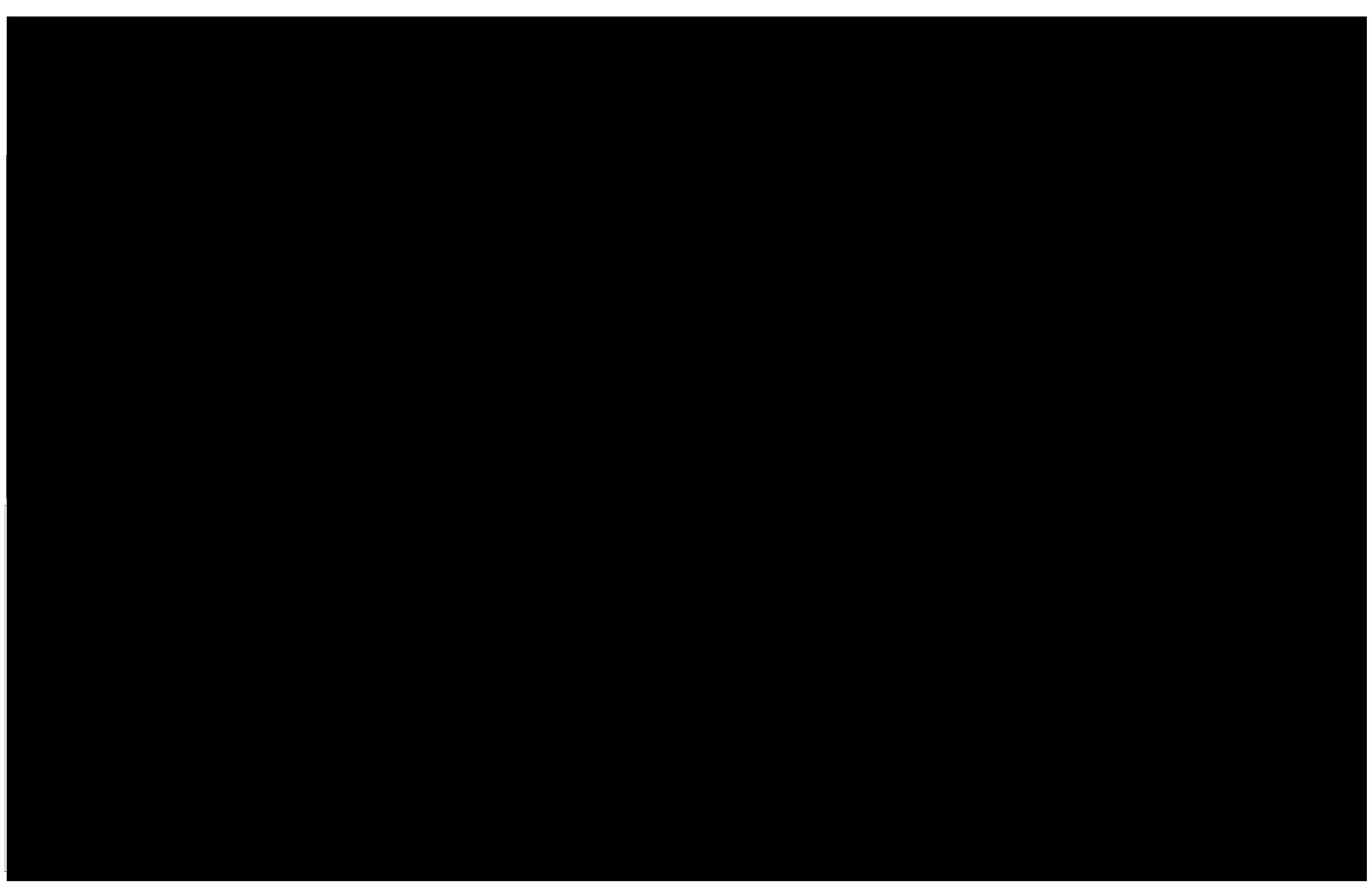


# Climate Change



	Carbon Reduction	Comments	Cost Impact
	Operational	<p>New technologies used such as new pump models which contain an integrated intelligence system as an example Flygt Concertor which senses the operating conditions of its environment and adapts its performance in real time therefore saving power consumption.</p> <p>Opportunity to use solar panels to supply power for WRC as there is land that could be used.</p> <p>Fine bubble diffused aeration system to enable higher blower efficiency.</p>	Cost reduction
30%	Embodied / Capital	<p>No concrete but glass fused steel tanks (Hayes) used for new Bio-P aeration system, Toro glass fibre tank for final settlement tanks, use of pipework/ cable corridors for reducing excavation.</p> <p>Opportunity to use fibrecrete to reduce the usage of steel reinforcement to reduce embodied carbon.</p>	Cost reduction

Pre	Post	Climate Resilience	Comments	Cost Impact
		Hotter & Drier	<p>Cross site communication control via use of local mounted panels mitigating the need for one major MCC building.</p> <p>Blowers planned to be located under rain canopy.</p>	Cost Reduction
		Heavy rain & flooding	<p>Allowed 25% infiltration for flow estimation; WRC located in <b>Flood Zone 3B</b>, the existing natural bund defence does not have any long term maintenance strategy/funding from the <b>EA</b> and on all the above information the <b>EA</b> have objected to the Developer's Planning Application.</p>	
		Rising sea levels	Not applicable.	
		Wind & storms	<p>Inlet works approximate 7 to 9m high – steel platform design to incorporate wind loadings.</p> <p>Aeration tanks approximate 7m high therefore need to be designed taking into consideration wind loadings into account.</p>	
		Other		



# Main Risks & Opportunities

## Business risks



No	Risk
1	Current WRC location in <b>Flood Zone 3B</b> and no mitigation solution from <b>EA</b> . Formal Screening Opinion / Planning Application is likely to be challenged
2	Access to existing Waterbeach WRC is changed by Developer in future impacting access to proposed TPS
3	Change to the Developers build rate
4	Damage to new rising main from existing site to proposed new WRC by Developer while constructing new train station/ houses in the area
5	Assumptions regarding crossing the existing bund/ outfall change (No <b>EA</b> engagement possible to date)

# Main Risks & Opportunities

Project risk: [REDACTED] for complete project



Risk	Mitigation	Risk Allowance (£k)
<b><u>Phase 1</u></b>	Review during detailed design	[REDACTED]
<b><u>Phase 2</u></b>		[REDACTED]
Additional Piling requirements	Detailed design review	[REDACTED]
Demolition of additional unknown underground structures required	Carry out trial holes pre-assembly	[REDACTED]
Access to new WRC site across the rail level crossing	Engage with Network rail in Detailed design	[REDACTED]
Economic Uncertainty for Tier2	Review during detailed design	[REDACTED]
Historical finds on the pipe route	Carry necessary study/ surveys	[REDACTED]
Unknown power supply constraints from UKPN	Engage further in detailed design	[REDACTED]
<b><u>Phase 3</u></b>	Review during detailed design	[REDACTED]
<b><u>Phase 4</u></b>	Review during detailed design	[REDACTED]

# Main Risks & Opportunities

Project opportunity: [REDACTED]



Opportunity	Plan to Realise	Opportunity (£k) max	
<b><u>Phase 1</u></b>			
<b><u>Phase 2</u></b>			
Optimise Tier 2 costs	Engage detailed design stage		
Reduce site resource requirement	Utilise Tier2 experts		
Final Effluent P/Stn no longer reqd at new WRC	Detailed design of outfall		
Optimise construction materials	Detailed design		
Research Park/ Cottenham P/Stn upgrade scope optimised	Detailed surveys/ design		
Use site welfare set-up at end of phase2 as final Ops building as permanent install	Agree during detailed design		
<b><u>Phase 3</u></b>			
<b><u>Phase 4</u></b>			

# Recommendations



## Approval is requested for the following:

- Approval to commence Stage 3 detail design for the scheme
- Approval of DM3 Date of 28<sup>th</sup> Jan 2020
- Approval of stage 3 Cumulative Ceiling of [REDACTED]

Item	[REDACTED]
Cost to Date	[REDACTED]
Design	[REDACTED]
Non Design / Non Construction	[REDACTED]
AW Staff	[REDACTED]
Planning	[REDACTED]
Trial holes & pits	[REDACTED]

- Intend to come back later in Stage 3 to request approval for early design orders to specialist suppliers