

Elizabethan source, 21st Century treatment...

a look into the past and future of Plymouth's
precious drinking water supply

Burrator Discovery Centre

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- Researcher/Scientist
- ‘Head of Water Quality’

‘Good safe drinking water that has the trust of our consumers’



Separated at birth..?



Agenda

- Brief look at the ancient history of water treatment from a global perspective
- More detail regarding the water supply in locally
- A glimpse of the future?



Water & Wine - 2000 BC Greece



- Greek & Sanskrit writings
- Heating, filtering, sieving
- Improve taste/smell and clarity of water

Hippocratic Sleeve (~500 BC)



Isca Dumnomiorum



Early settlements in Plymouth



- First settlement at Sutton Pool
- Springs and wells
- Corporation of Plymouth's 1495
- Plymouth, Devonport and Stonehouse
- William Hawkins, rapid growth and water scarcity to follow

Fresh water from the moor?

- Mr Forsland of Bovey undertook a preliminary survey (16s.10d)
- Plans shelved, financial constraints
- Spry's plot
- Bribery(?)...but Water Bill read within 3 weeks
- 1585 - 'An Acte for Presvacion of the Haven of Plymouth'



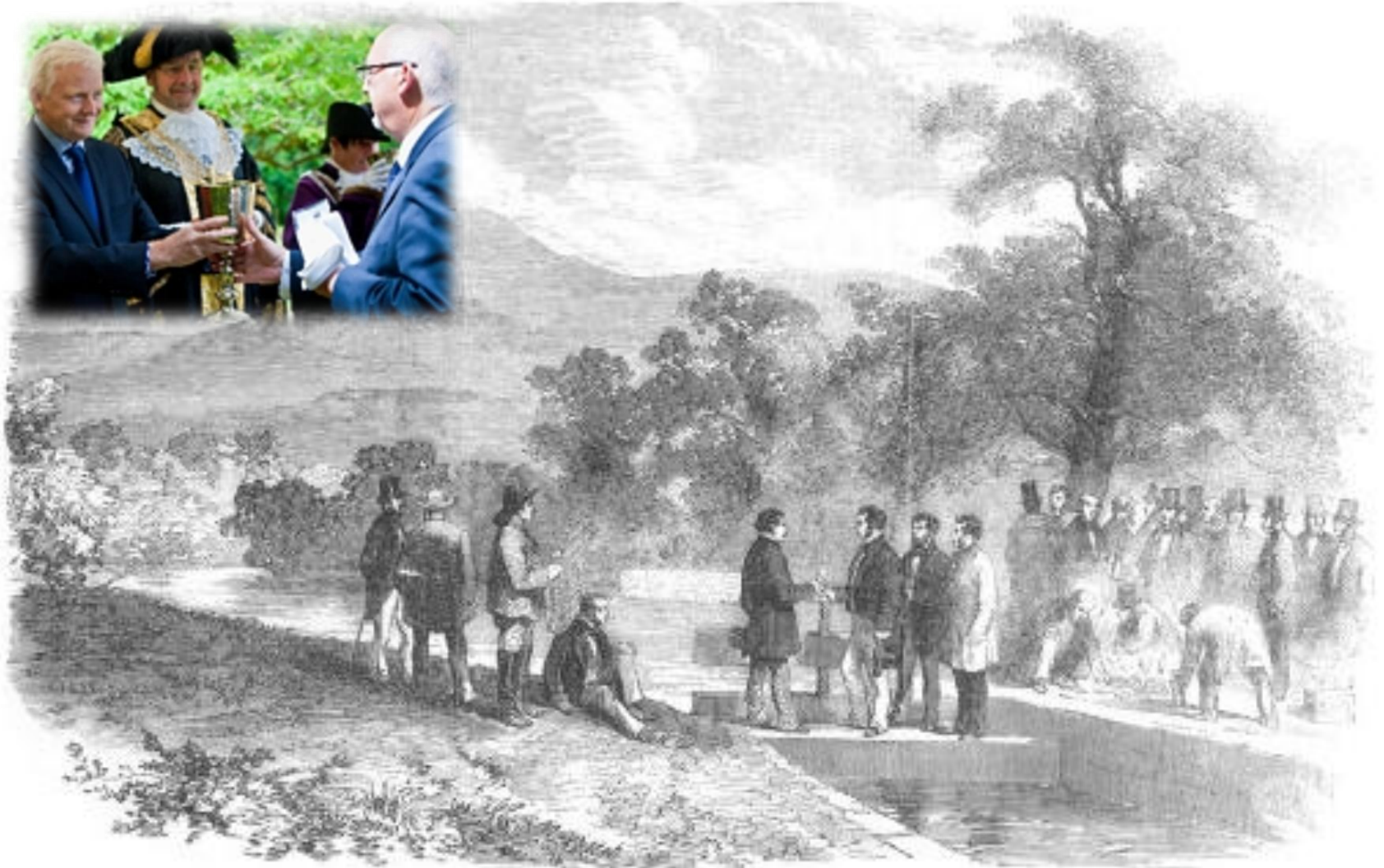
Drake's leat



THE BATTLE OF CADIZ

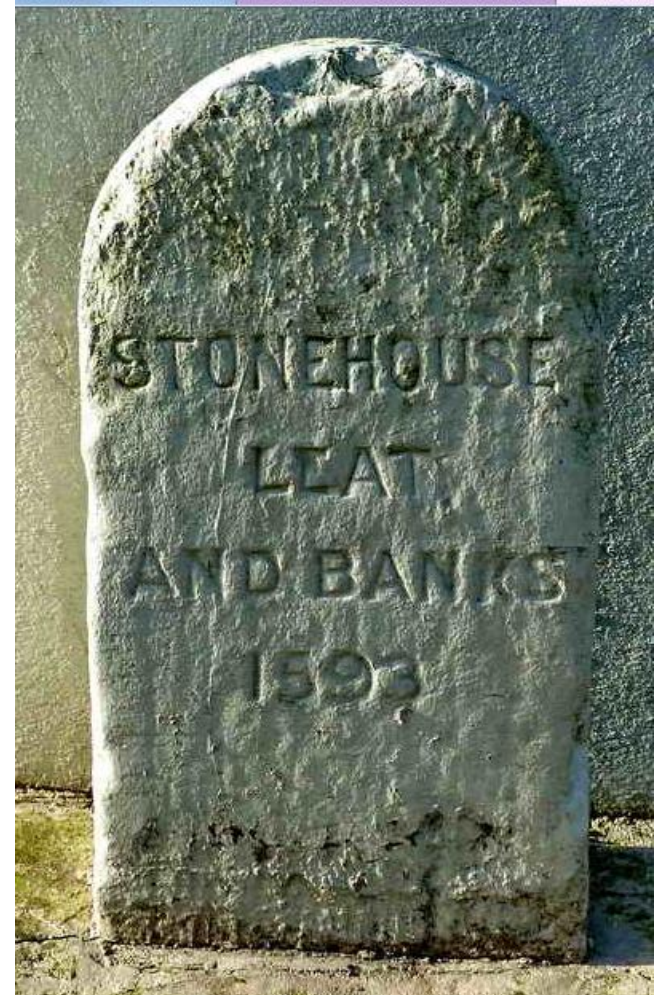
- Delays...due to lack of labour!
- 1589 Drake engaged in construction
- 17 miles, gentle drop of 675 feet into Sutton Pool
- 24 April 1591, great celebrations, quite right!
- News makes Spanish mainland, Drake given new superpowers / Legend

The fishing feast



Stonehouse leat

- Followed success of Plymouth Leat
- Headspring in the Torre area flowing to Stonehouse Millpool
- Plymouth leat regularly required as a back up





- 1696 Construction of the Navel Dockyard
- 1793 water from West Dart, Cowsic and Blackabrook
- Nuns Cross (tunnel), Raddick Hill (cascade), River Meavy (aquaduct)

'Water money'

- 1593 – first payments to the corporation (outsiders!)
- 1600 – 'The collectors' - £4.2s.
- 1800 – unreliable supply, increased charges and attempts to control theft
- 1820's – c800 'holding leases of the water' for 12 to 24s.
- 1830's charges of up to £10 levied

Borough of Plymouth,



£20 Pounds
REWARD.

WHEREAS repeated Complaints have

lately been made to the MAYOR, that the BANKS of the TOWN'S LEAT, between *Jump* and the *Head Weir*, have been broken down, and the Waters thereof diverted and used for Mining and other Purposes;—And that the free Passage of the Water has also been obstructed at various Places, between the Town of Plymouth and the source of the Leat on *Dartmoor*, as well by Stones placed in the bed of the Leat, for making Passage across the same, as also by Farmers and others throwing Woods, and other Vegetable Matter, from their Leasls into the Leat, whereby, not only the Mills on the Stream have often been prevented from working, but the Inhabitants of the Town and Borough of Plymouth deprived of a due and proper Supply of Water:—In order, therefore, to suppress such illegal Practices,

A REWARD OF

Twenty Pounds

Is hereby offered, to any Person or Persons who shall give such Information to the Corporation of the Borough of Plymouth, or their Receiver, as may be the means of convicting the Offender or Offenders, to be paid upon Conviction.

The Mayor thinks it also necessary to give this PUBLIC NOTICE, that proper Persons have been appointed to inspect the Leat, from its source to the Town of Plymouth, with authority to apprehend every Person who shall be found diverting the Waters thereof, or obstructing the free Passage of the same, under any pretence what-so-ever; and particularly those, who by fishing with Nets in the Leat, shall break or injure the bed or banks thereof, in order to their being prosecuted and punished as the Law directs.

RICHARD ARTHUR, Mayor.

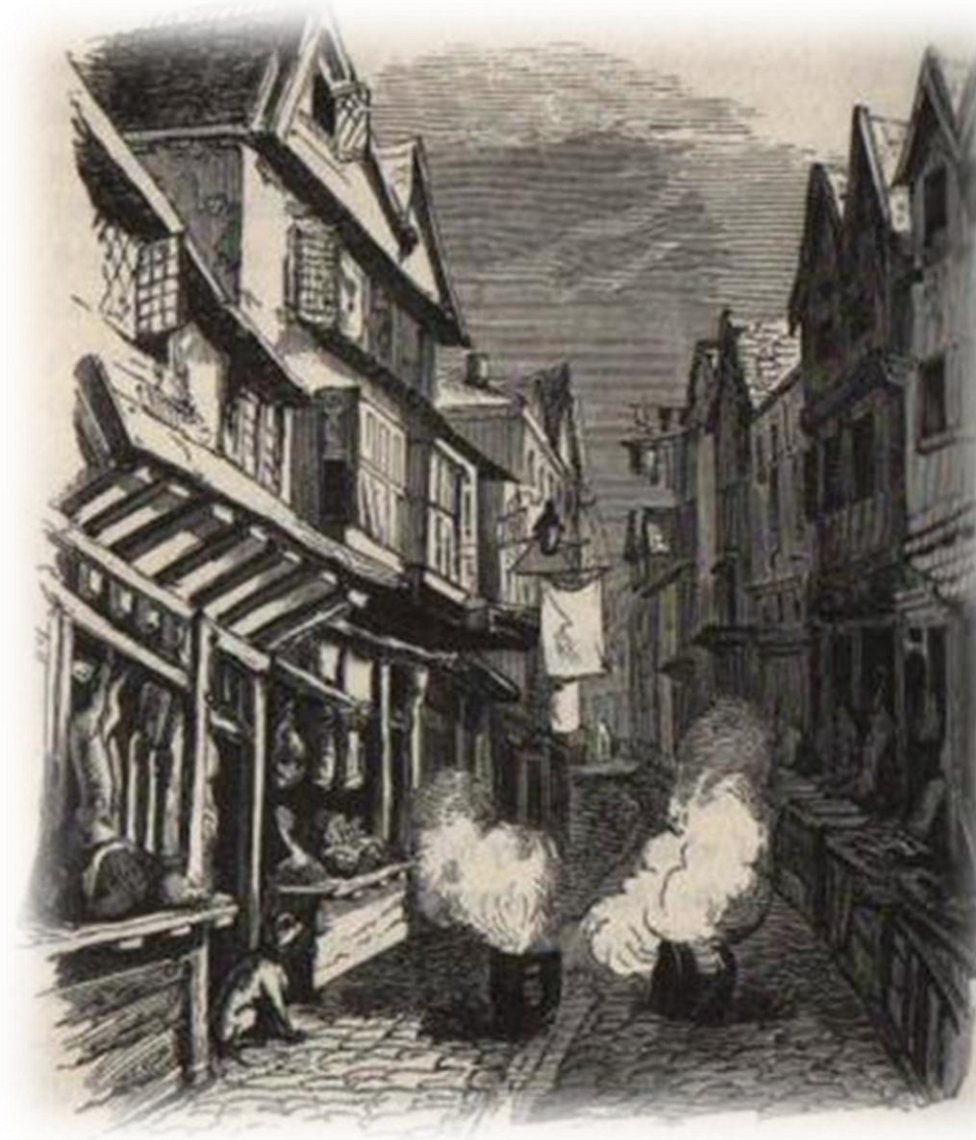
Iron pipes and service reservoirs

- Droughts, freezing and pollution
- New pipes and service reservoirs
- Much of the supply flowing under the streets of the growing towns

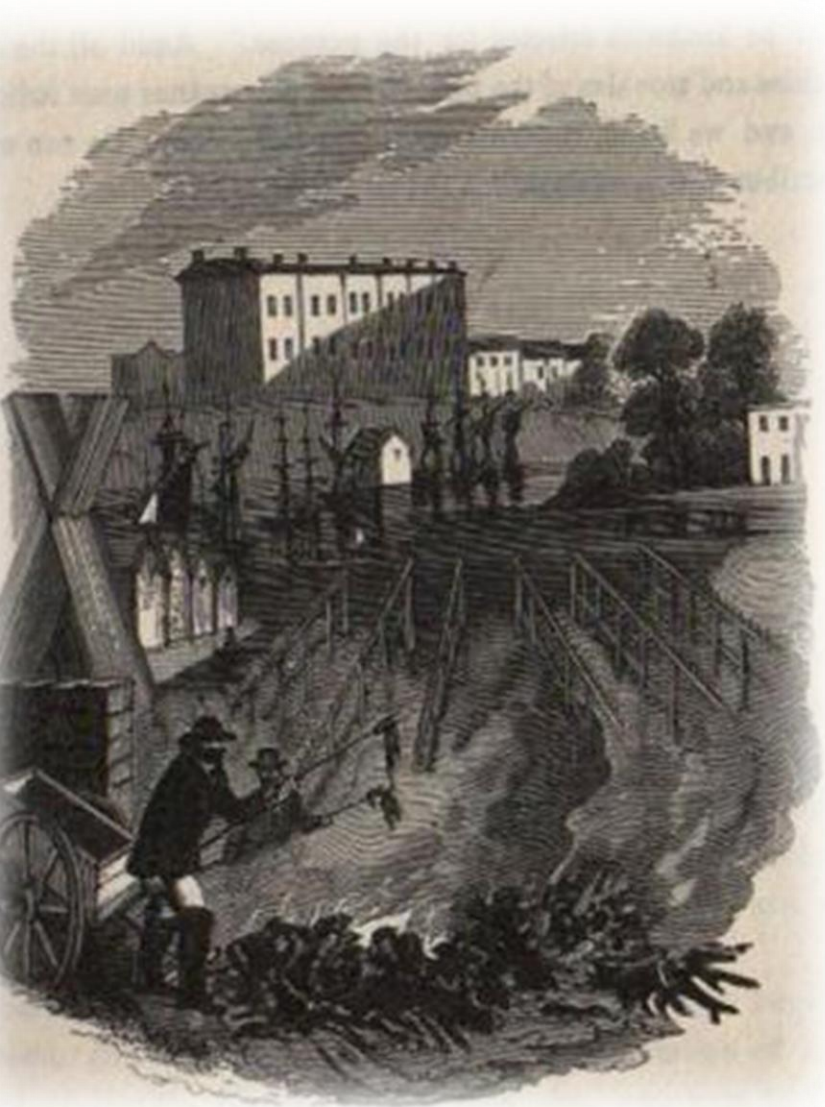


Cholera and public health

- Spring 1818 news of an outbreak in India the previous autumn
- 1822 Russia – very cold winter halts the spread
- 1831 British Doctors sent to St Petersburg



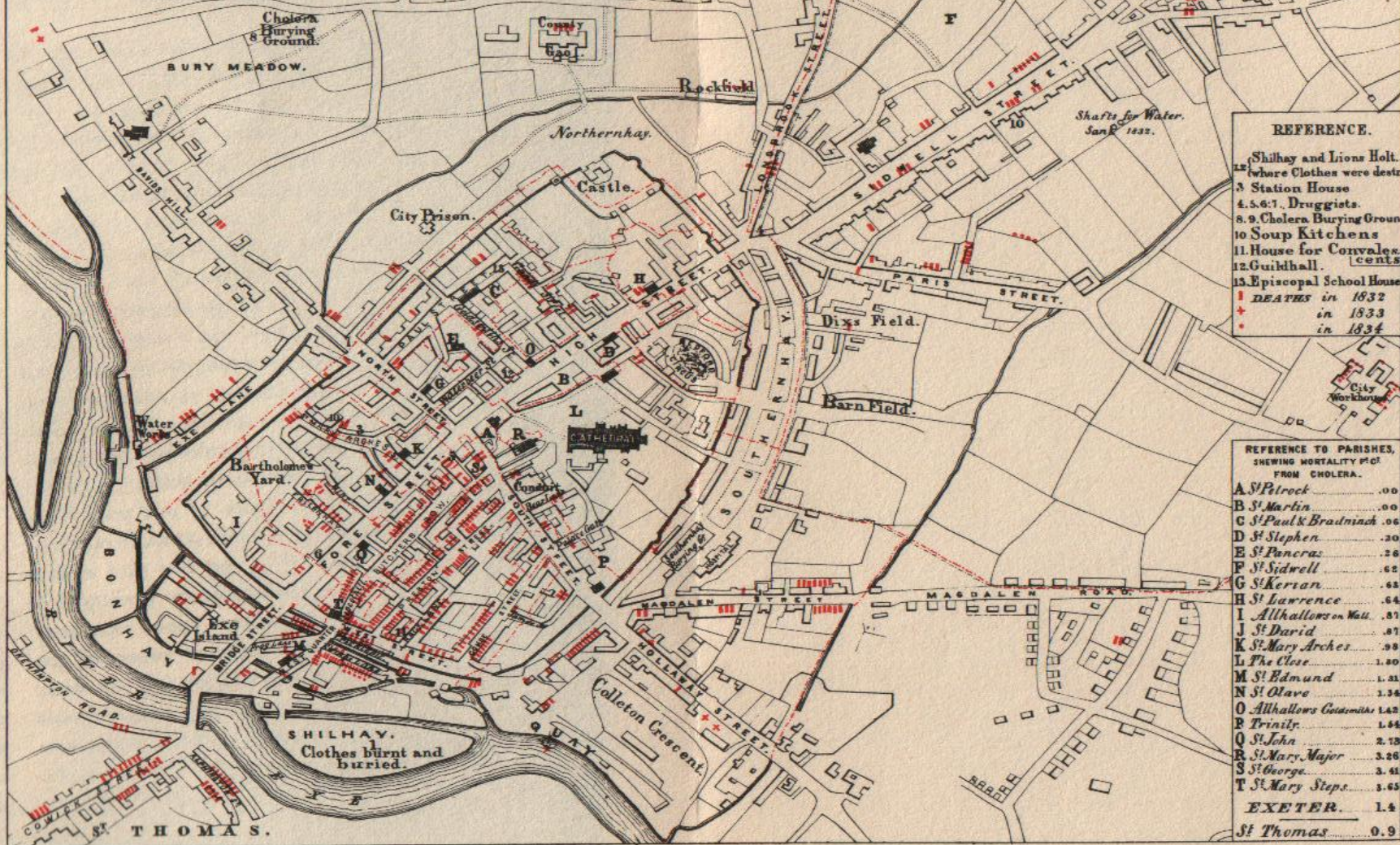
Bury Meadow...



‘In Asia the fiend
was contemplated
with curiosity, in
the wilds of Russia
with suspicion, in
Germany with
Alarm...but on
English soil with
TERROR’

Map of
EXETER
in
1832

Shewing the localities where the Deaths caused by
Pestilential Cholera occurred in the years
1832, 1833 & 1834



REFERENCE.

1. Shilhay and Lions Holt, where Clothes were destroyed.
2. Station House
3. 4, 5, 6, 7. Druggists.
- 8, 9. Cholera Burying Grounds.
10. Soup Kitchens
11. House for Convalescents
12. Guildhall.
13. Episcopal School House

. DEATHS in 1832
 + in 1833
 x in 1834

REFERENCE TO PARISHES, SHEWING MORTALITY PER CENT FROM CHOLERA.

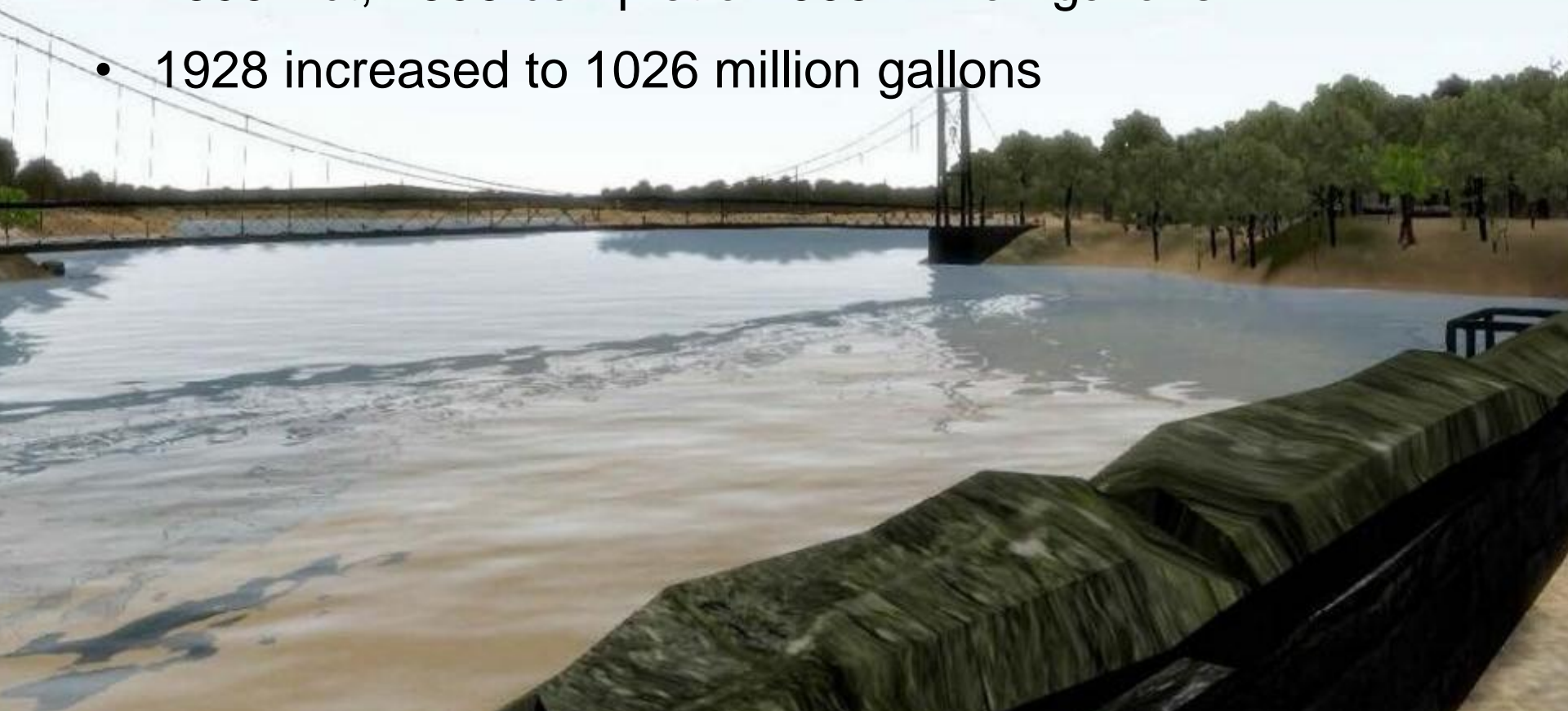
A St Petroc	0.00
B St Martin	0.00
C St Paul & Bradninch	0.06
D St Stephen	0.20
E St Pancras	0.26
F St Sidwell	0.62
G St Kerian	0.62
H St Lawrence	0.64
I Allhallows on Wall	0.87
J St David	0.87
K St Mary Arches	0.98
L The Close	1.80
M St Edmund	1.31
N St Olave	1.34
O Allhallows Costarmeth	1.42
P Trinity	1.44
Q St John	2.13
R St Mary Major	3.26
S St George	3.41
T St Mary Steps	3.63
EXETER.	1.4
St Thomas	0.9



- First municipal water treatment works
- 1804 Scotland
- Slow sand filtration
- Horse and cart deliveries for first 3 years
- ‘Everyone should have access to safe water’

Burrator brings everyone together

- First suggested in the 1840's rows over need and the site
- Water famines of 1881 and 1891 established the need
- 1893 Act, 1898 completion 668 million gallons
- 1928 increased to 1026 million gallons



1930's to 80's

- Plymouth badly bombed
- Wartime water workers keep the water flowing
- Post war expansion - new source?
- River Tavy - weir and intake at Lopwell
- New treatment works at Crownhill



Good time to retire Crownhill



- New treatment goals
- Chemicals/sludge
- Expensive operations and maintenance
- Growing risks
- Exploit the latest innovations

The future...

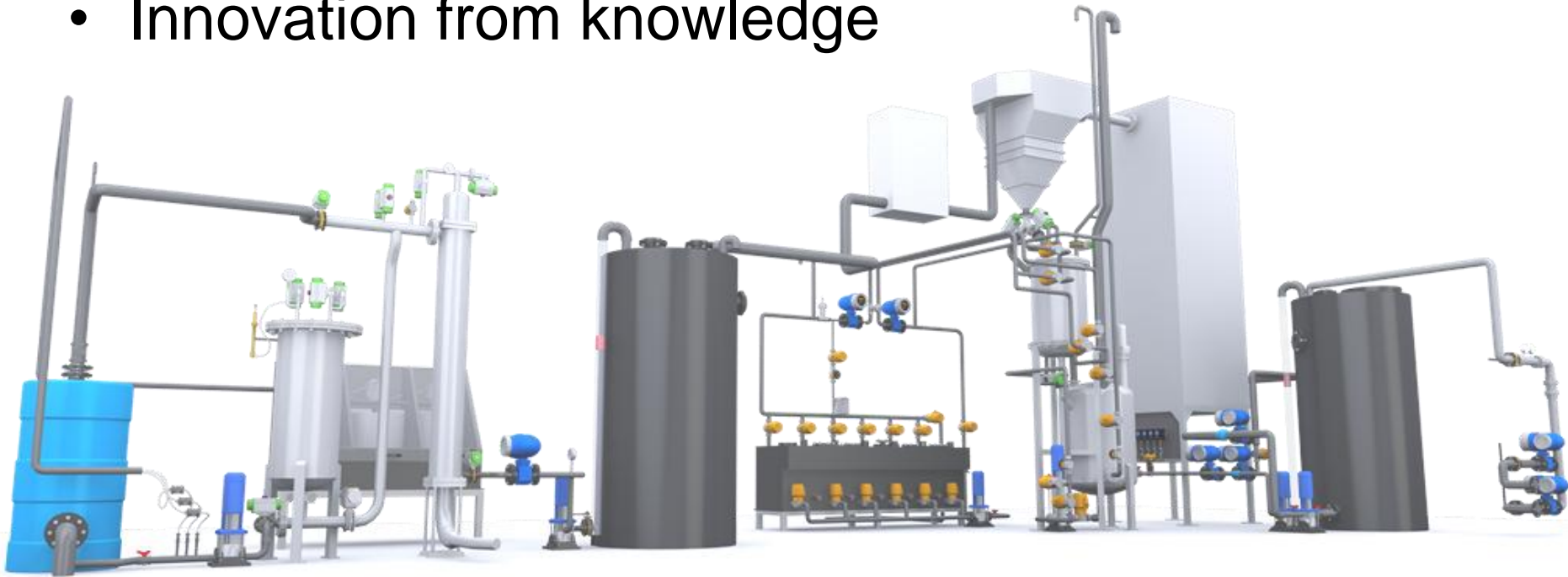


SIX/CeraMac advantages for SWW

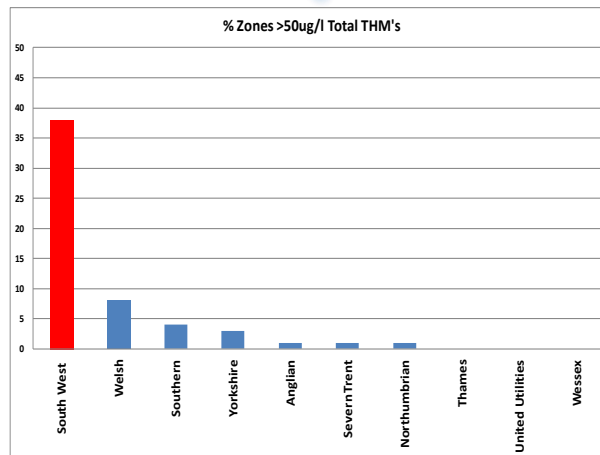
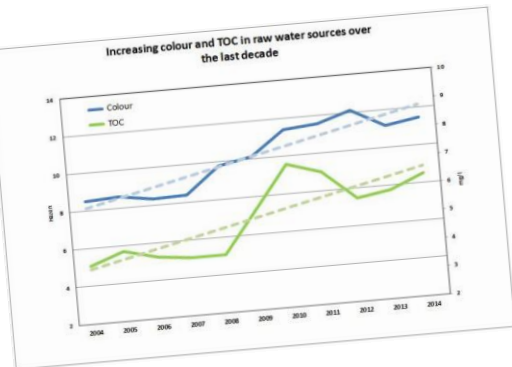
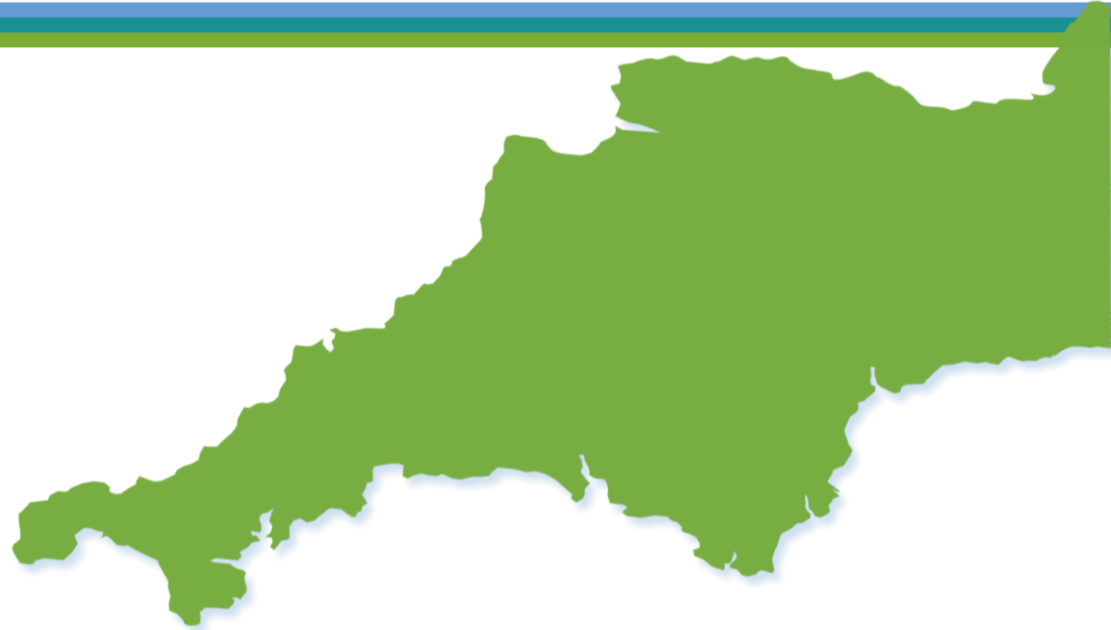


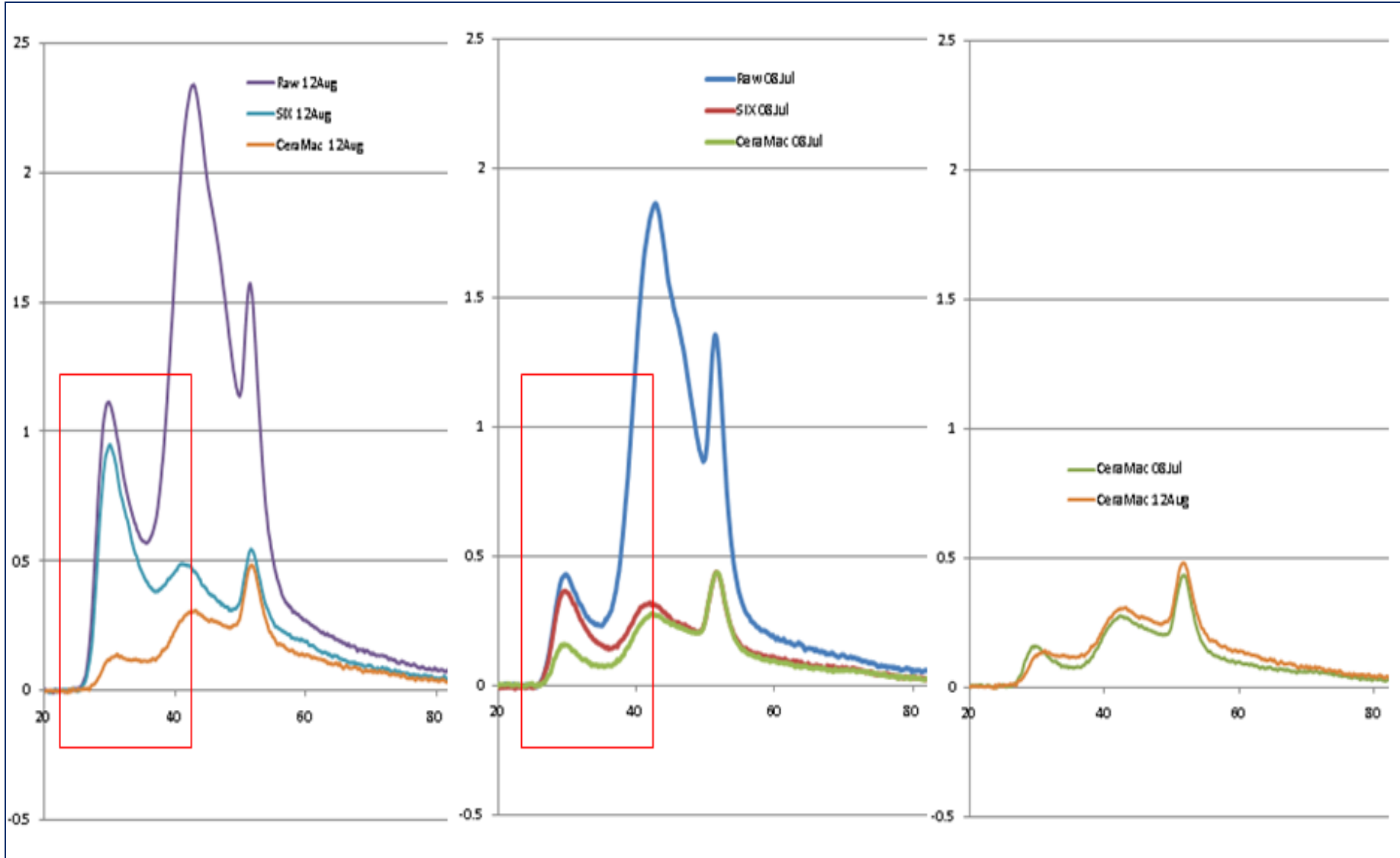
Proving the benefits...

- 3 party collaboration
- 18 months detailed evaluation
- Innovation from knowledge



Wider collaboration - DOC2C's







- NOTES:
- DO NOT SCALE FROM THIS DRAWING. ALL DIMENSIONS IN ALL LETTERS UNLESS OTHERWISE.
 - ALL DIMENSIONS IN ALL LETTERS UNLESS OTHERWISE.
 - ALL LEVELS IN METRES RELATIVE TO ODN DATUM UNLESS STATED.

LEGEND

BUILDING STRUCTURES KEY:

RWA	RAW WATER TANK
SCB	SEX AND CERAMIC BUILDING
GAC	GAC BUILDING
CBT	CLEAR BACKWASH WATER TANK
GEN	GENERATOR BUILDING
TUR	HOUSEHOLD PUMPING STATION
WPD	WASTEWATER POWER DISTRIBUTION
TWB	OLD TREATED WATER RESERVOIR
CSB	CHEMICAL STORE BUILDING
OFF	NEW TREATED WATER RESERVOIR
TUR	CHEMICAL STORE BUILDING
CSB	SURMATOR TURBINE
OFF	OFFICE BUILDING
LVR	ULTRA-HIGH TREATMENT
SCB	SCREENING
LVA	LABELLA BUILDING

- SITE BOUNDARY
- PROPOSED DRAINAGE

RE	UPDATED
RE	UPDATED
PI	FOR INFORMATION
W	Design

DATE: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

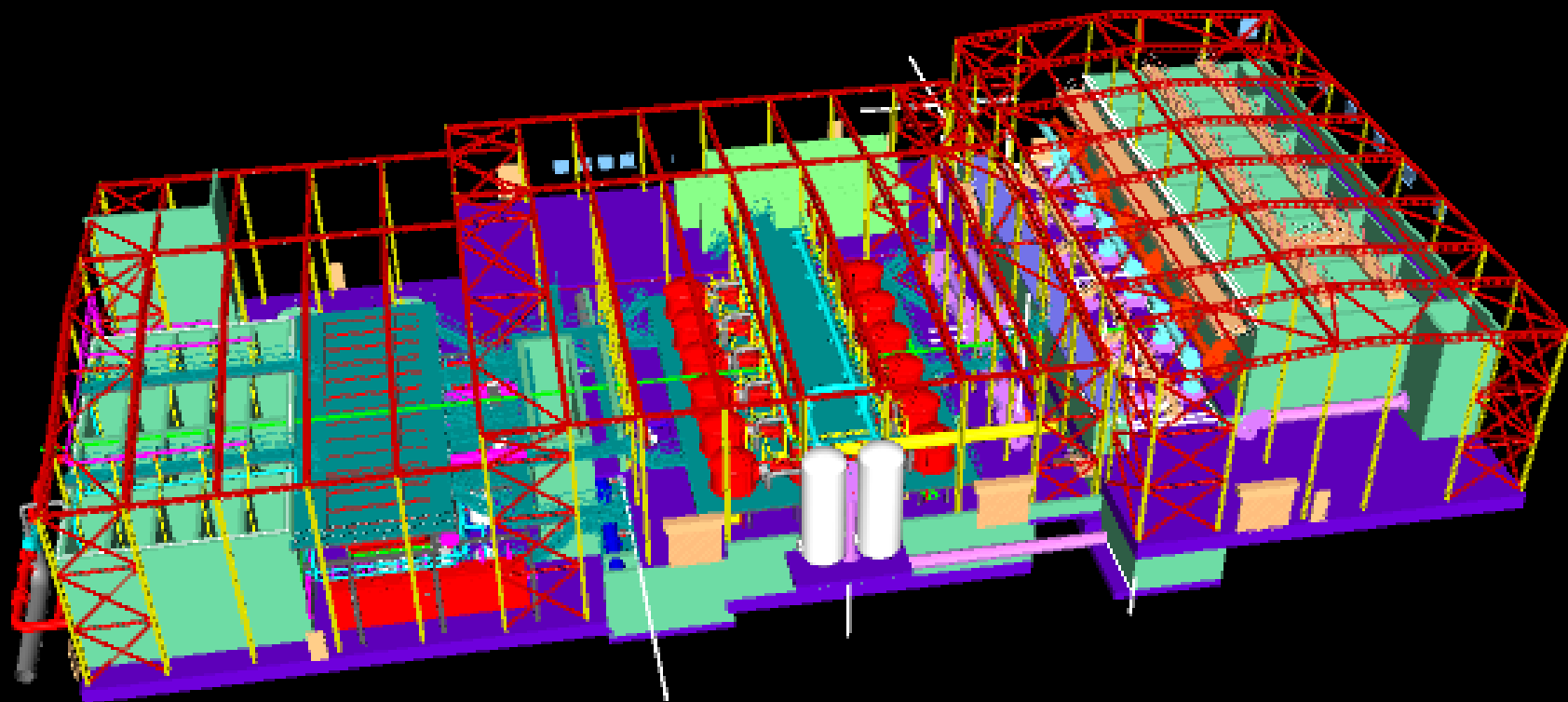
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Original Size	A1	Client	South West Water
Date	NEWLYN	Approved By	[Signature]
Drawn	CS	Checked	[Signature]
Drawn	[Signature]	Checked	[Signature]

Project: SOUTH WEST WATER
K6 PROGRAMME
NORTH PLYMOUTH

Title: NORTH PLYMOUTH WATER TREATMENT WORKS
PROPOSED SITE LAYOUT

Document Reference: NPLY-ARC-ROW-XX-OR-C-10120
0000 Project Number: 30006373





Nothing new...?

1919 Exeter

Vessels filled with sand

900m³ per day



2019 Plymouth

Vessels filled with ceramic membranes

9000m³ per day



Acknowledgments...



Thank you



Good safe drinking
water that has the
trust of our
customers