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Realignment of Wellfield Operations at the Bennettsbridge PWS

IAH Irish Group Annual Conference

31 April 2019

CDM Smith

News

2 NOVEMBER 2018

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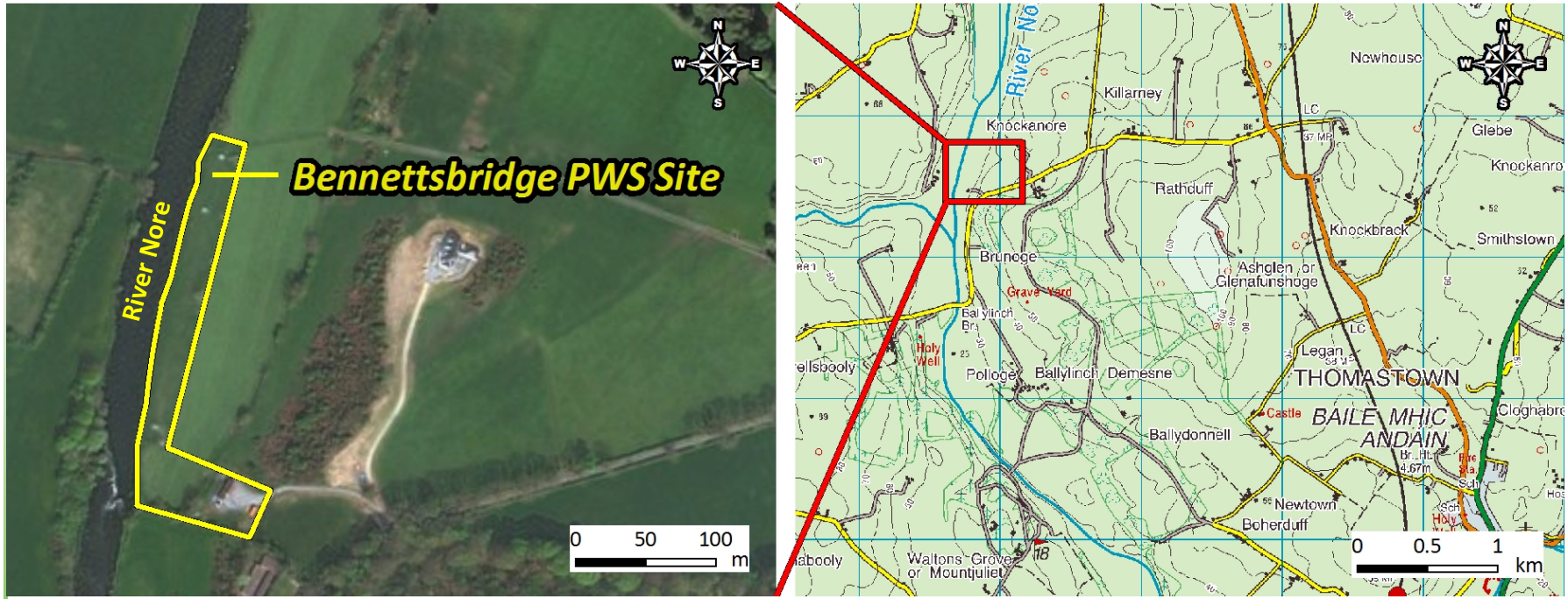
Bennettsbridge water scheme will continue on nightly restrictions due to water shortages

Restrictions will continue from 8pm until 6am each day

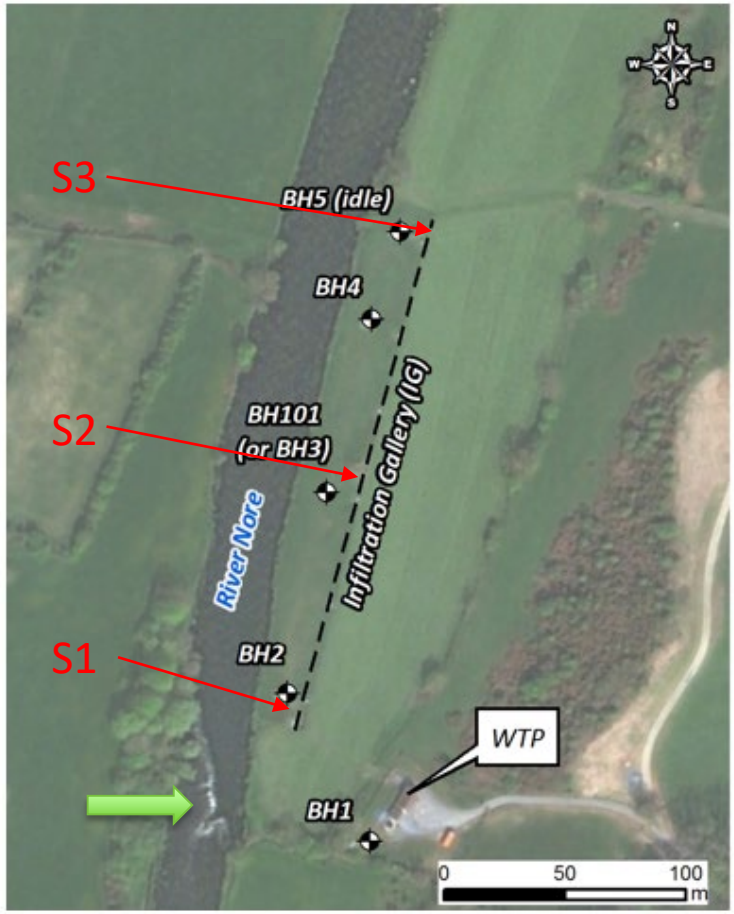
Irish Water wishes to remind customers that the Bennettsbridge water supply Scheme in Kilkenny will remain on nightly restrictions. These restrictions are being monitored and reviewed on an ongoing basis and will continue from 8pm until 6am each day.

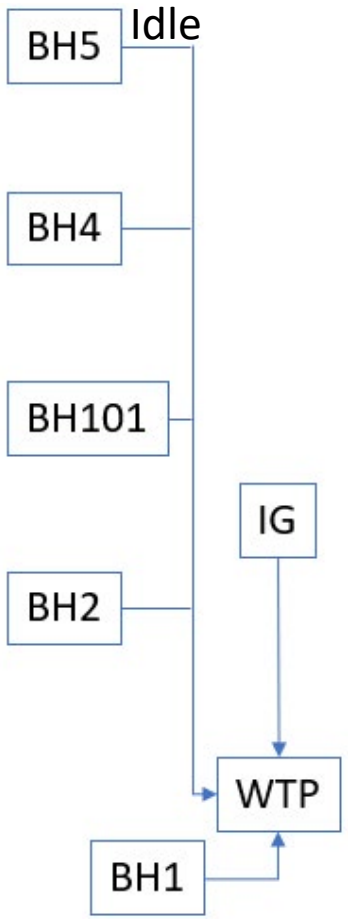
Bennettsbridge PWS



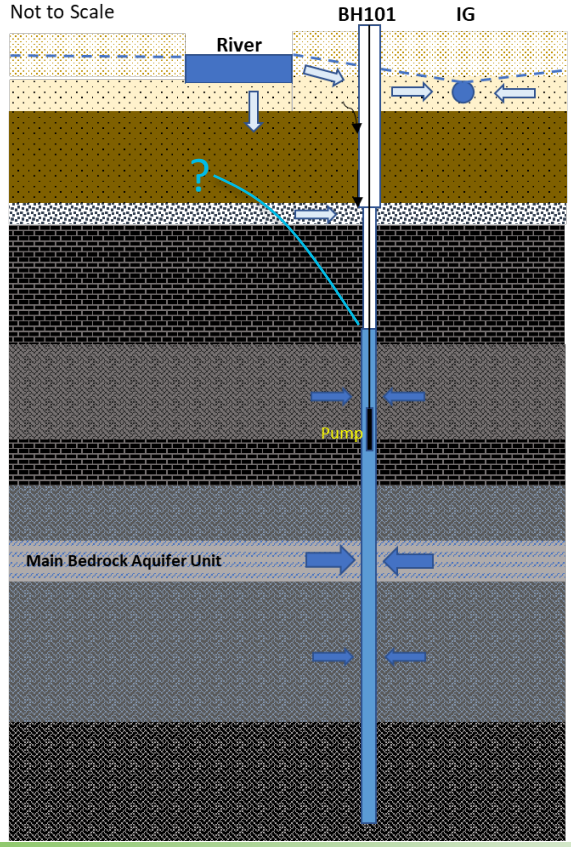
Bennettsbridge PWS

- G3 Boreholes
- Well depths: 80-108 m
- IG length: 250 m
- Few operational details historically
- WTP = sand filters, chlorine disinfection
- Offsite reservoir





Bennettsbridge PWS – Conceptual Model



0m Poorly sorted f-c SAND

3m Poorly sorted f-c GRAVEL

5m Clayey gravel to CLAY

10.2m
12m LIMESTONE, weathered and fractured Transition Zone

LIMESTONE, black, shaley

26m DOLOMITE, dark grey

39m LIMESTONE, black, shaley

46m DOLOMITE, dark greyish-blue, crystalline, calcite veining

51.5m
53.5m DOLOMITE, dark greyish-blue, extensively fractured

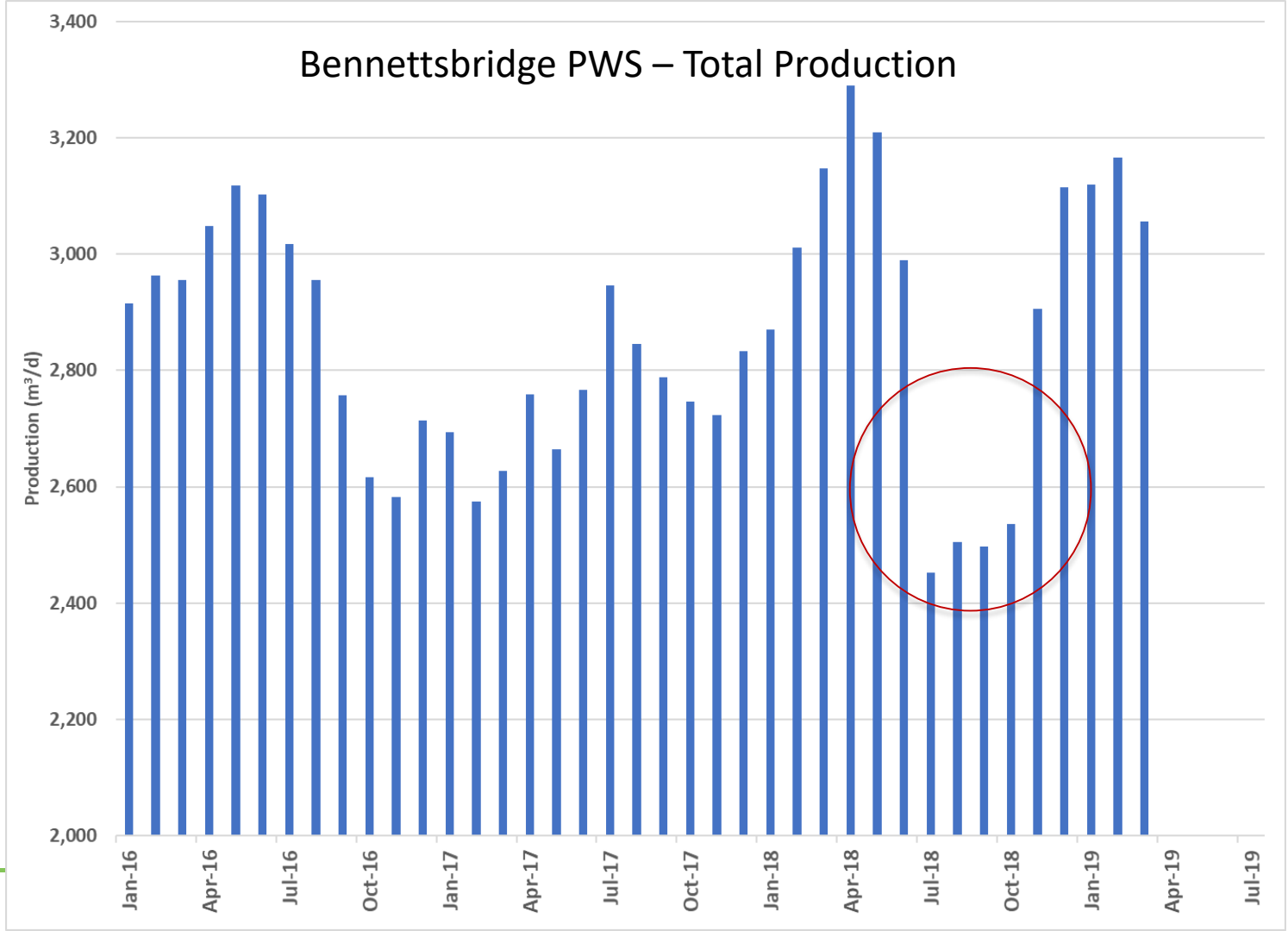
DOLOMITE, dark greyish-blue, crystalline, calcite veining

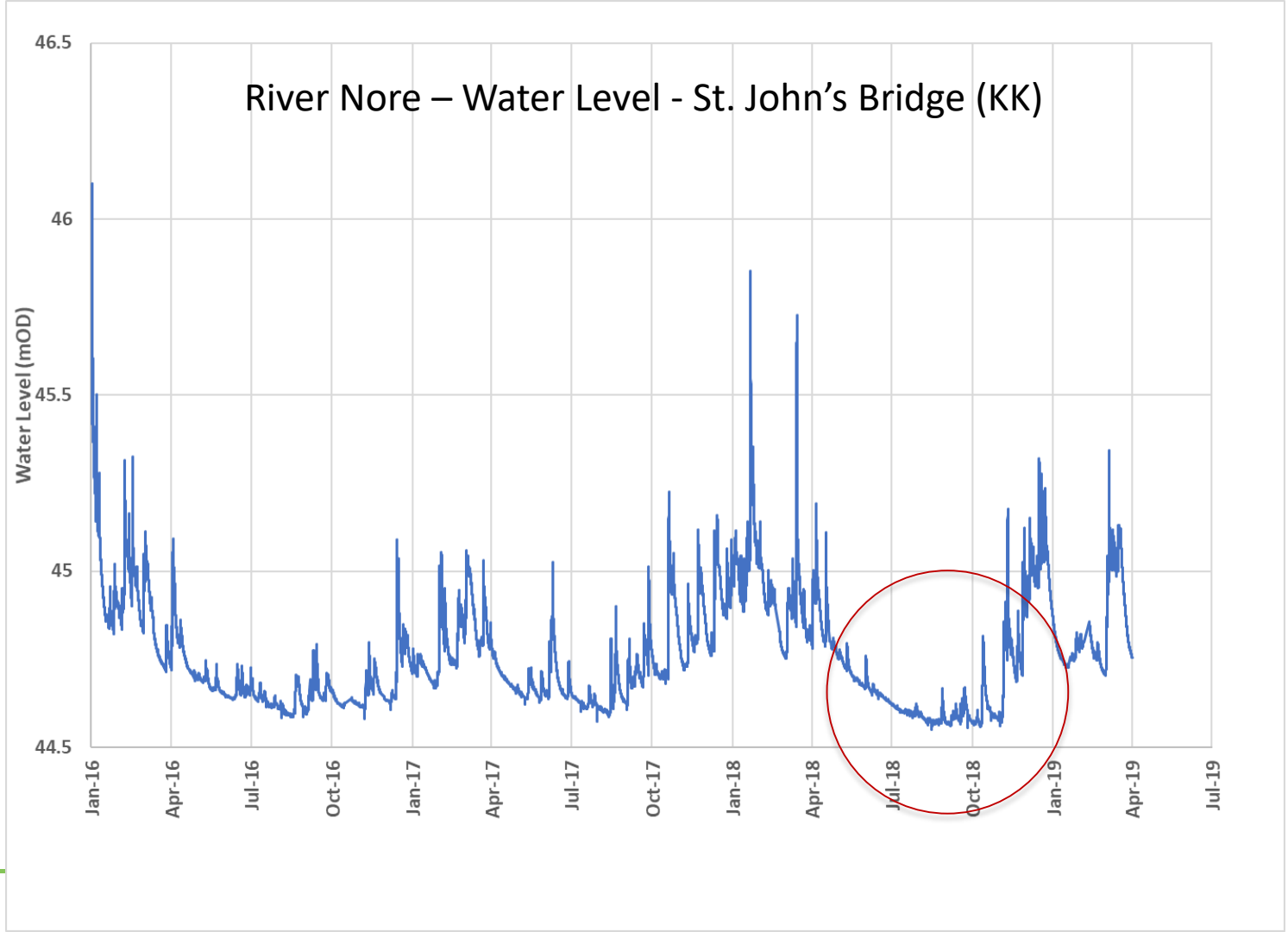
73m DOLOMITE, greyish black, calcite veining

84m (Total Drilled Depth)

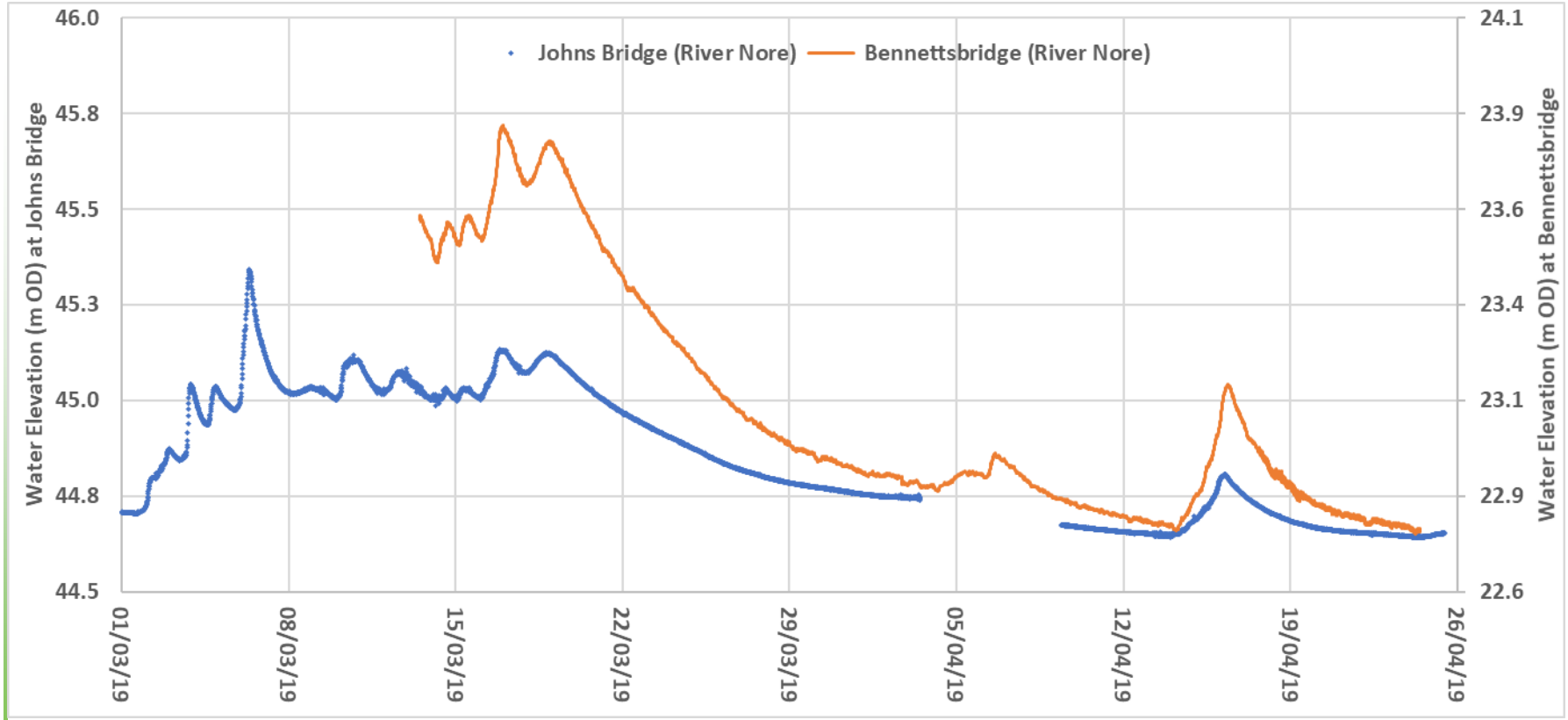
Bennettsbridge PWS – Summer 2018

- Demand: Summer 2018 – 3,300+ m^3/d
- Supply: Summer 2018 – 2,500 m^3/d
- Current Production – 3,000 m^3/d (<1% of Q_{95} of River Nore)

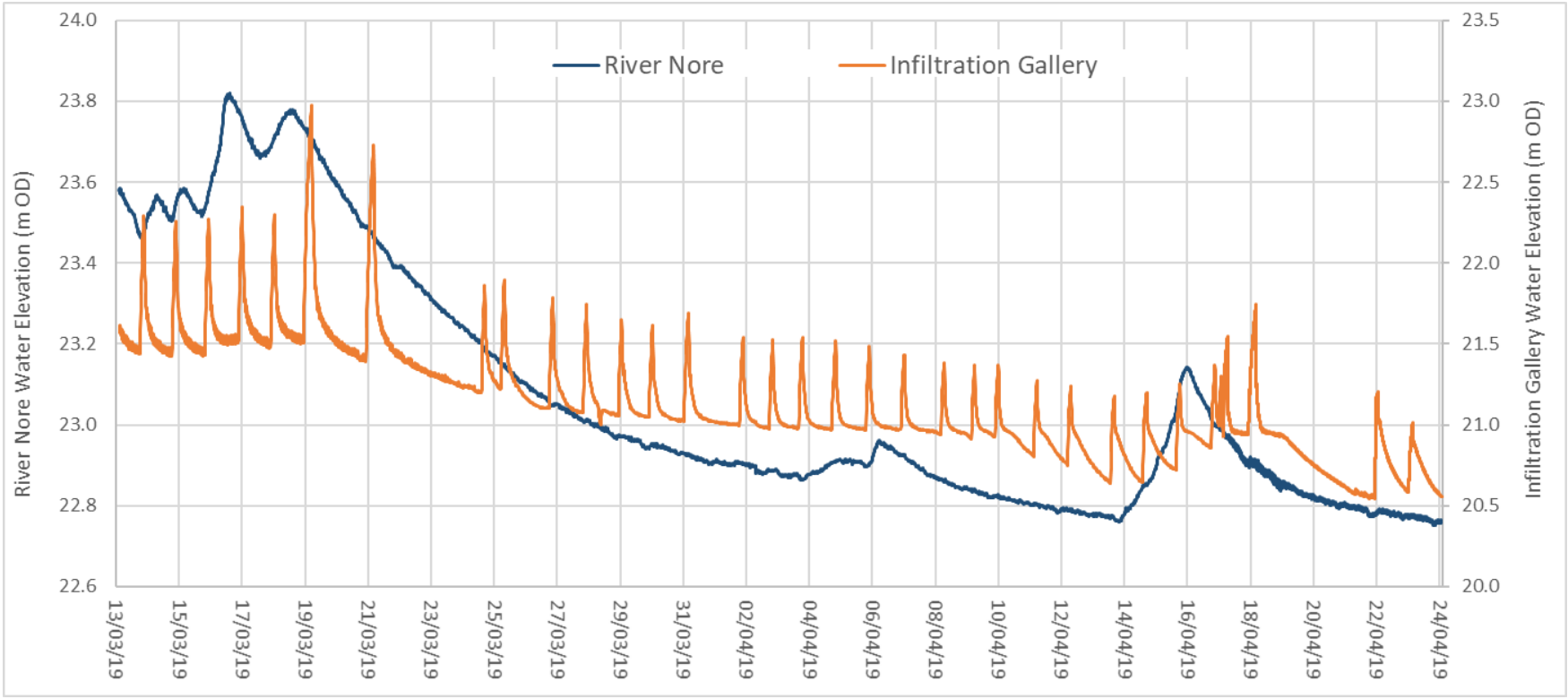

Bennettsbridge PWS – Total Production
Production (m³/d)
3,400
3,200
3,000
2,800
2,600
2,400
2,200
2,000
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19


River Nore – Water Level - St. John's Bridge (KK)
Water Level (mOD)
46.5
46
45.5
45
44.5
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19

River Nore – Water Levels - St. John's Bridge and Site



River Nore affects WLs and Q from IG



Irish Water Response - Scope 2018

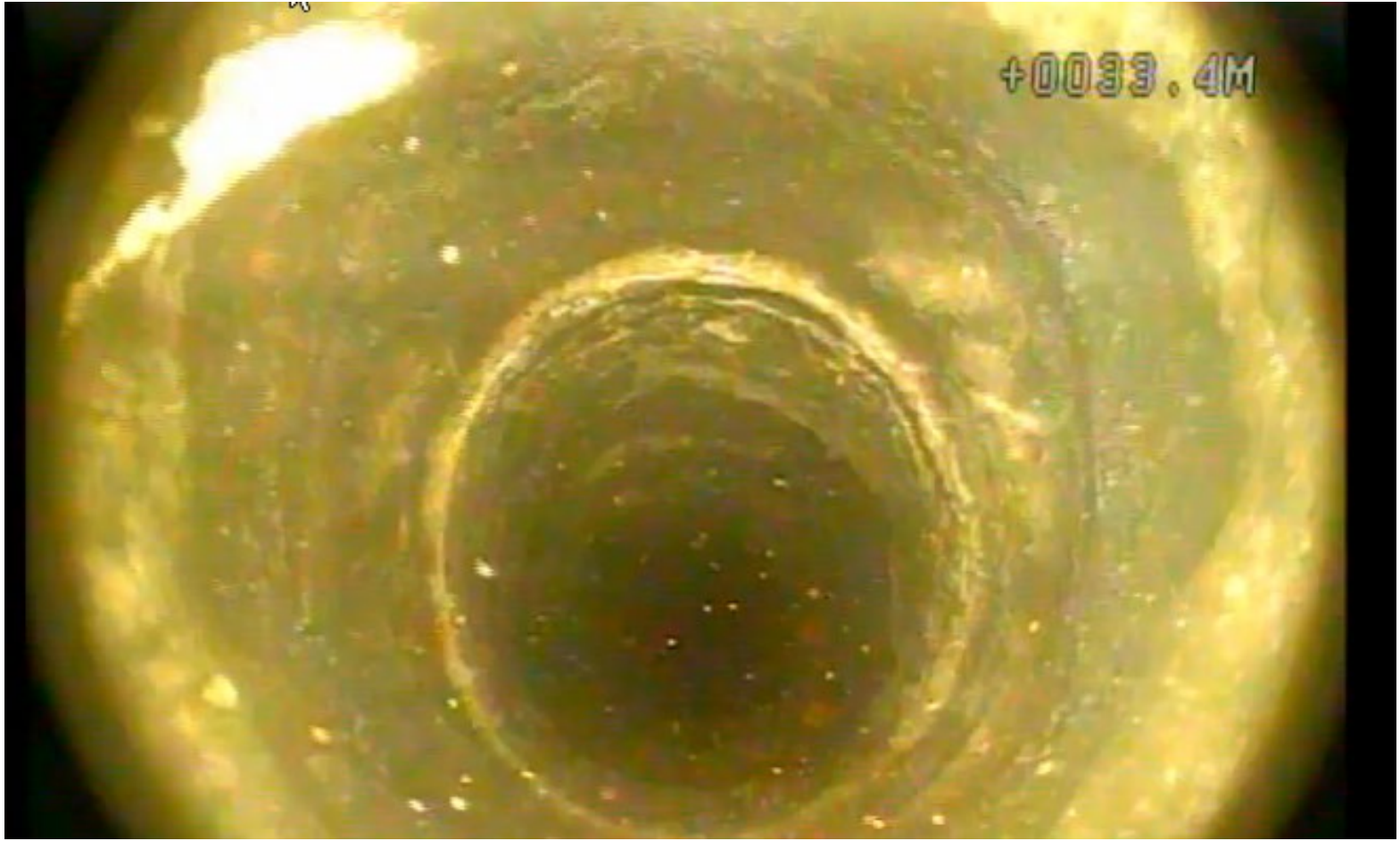
- Immediate Action
- Preparing for the “next drought”

Drought Response – Trial Well

- 80 m deep
- Indicative Q >40 m^3/hr
- NO_3 = 20 mg/L as NO_3
- Elevated Fe, Mn
- Turbidity

Immediate Action

- Turbid water at 47 m^3/hr (left); sediment-free water at 21 m^3/hr (right)


+0033.4M

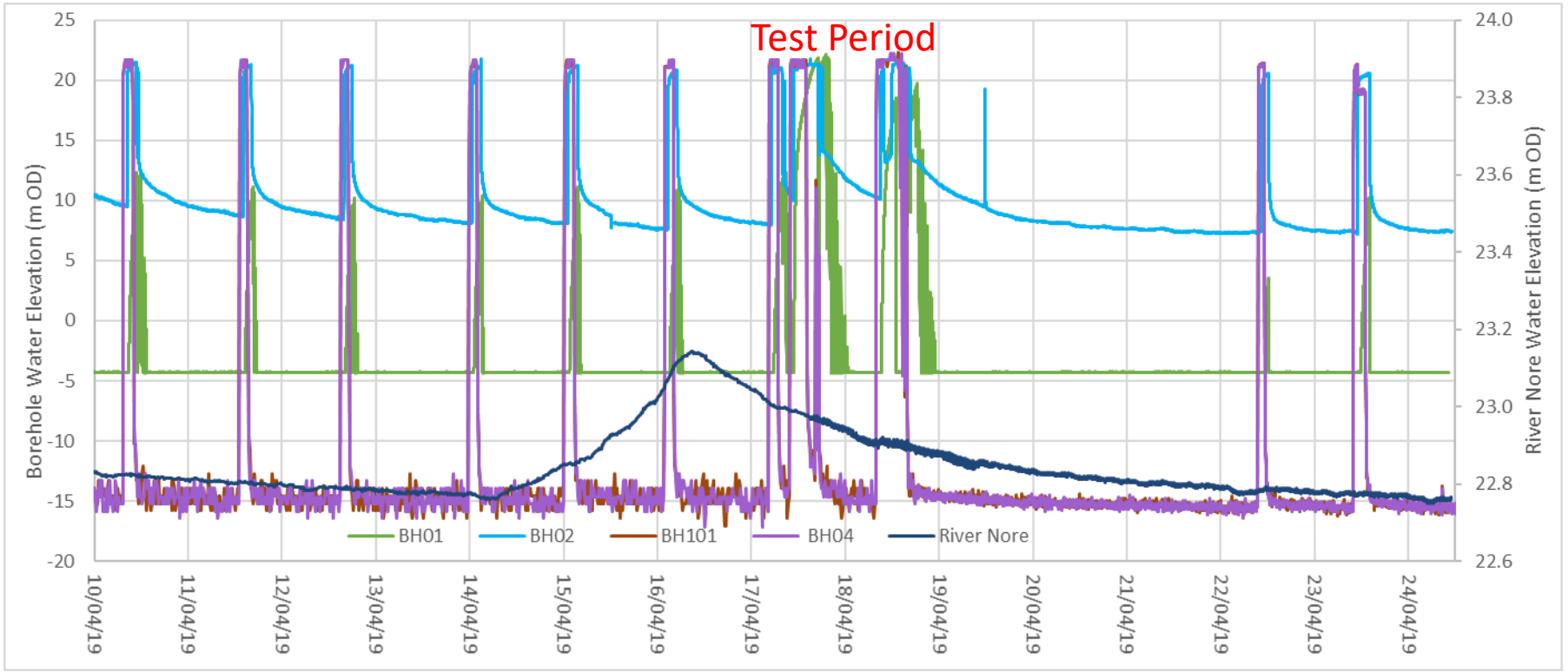
Prepare for the “Next Drought”

- Operational monitoring – learn how system works
- Assess capacity of the new wellfield configuration

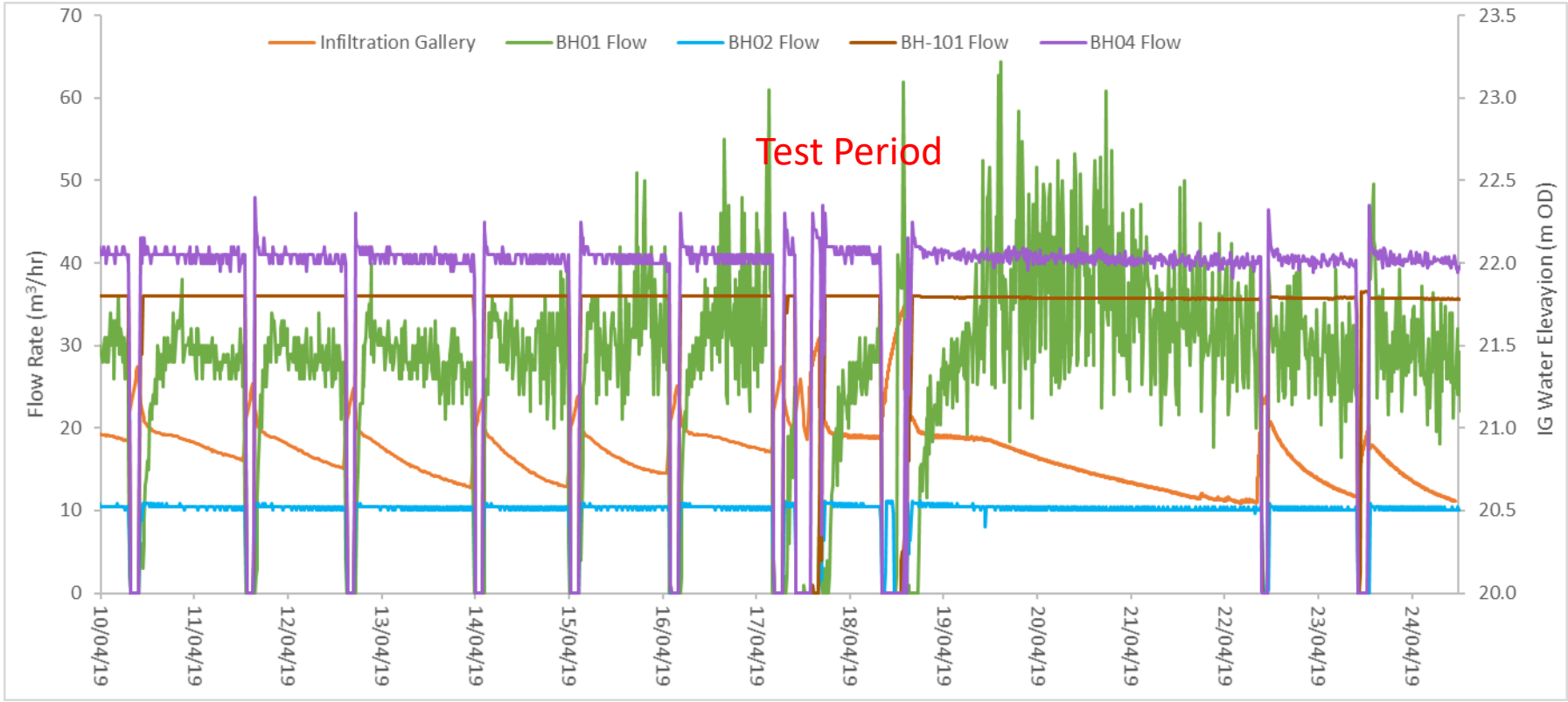
Preparing for the “Next Drought”

- Instrumentation (loggers) to measure:
  - Dynamic water levels in each well
  - Water level of River Nore at site
  - Water level in sumps of Infiltration Gallery (IG)
  - Total outflow from WTP
  - Pumping rates for each well
  - By inference, discharge from IG = Total Q WTP – Total Q from wells

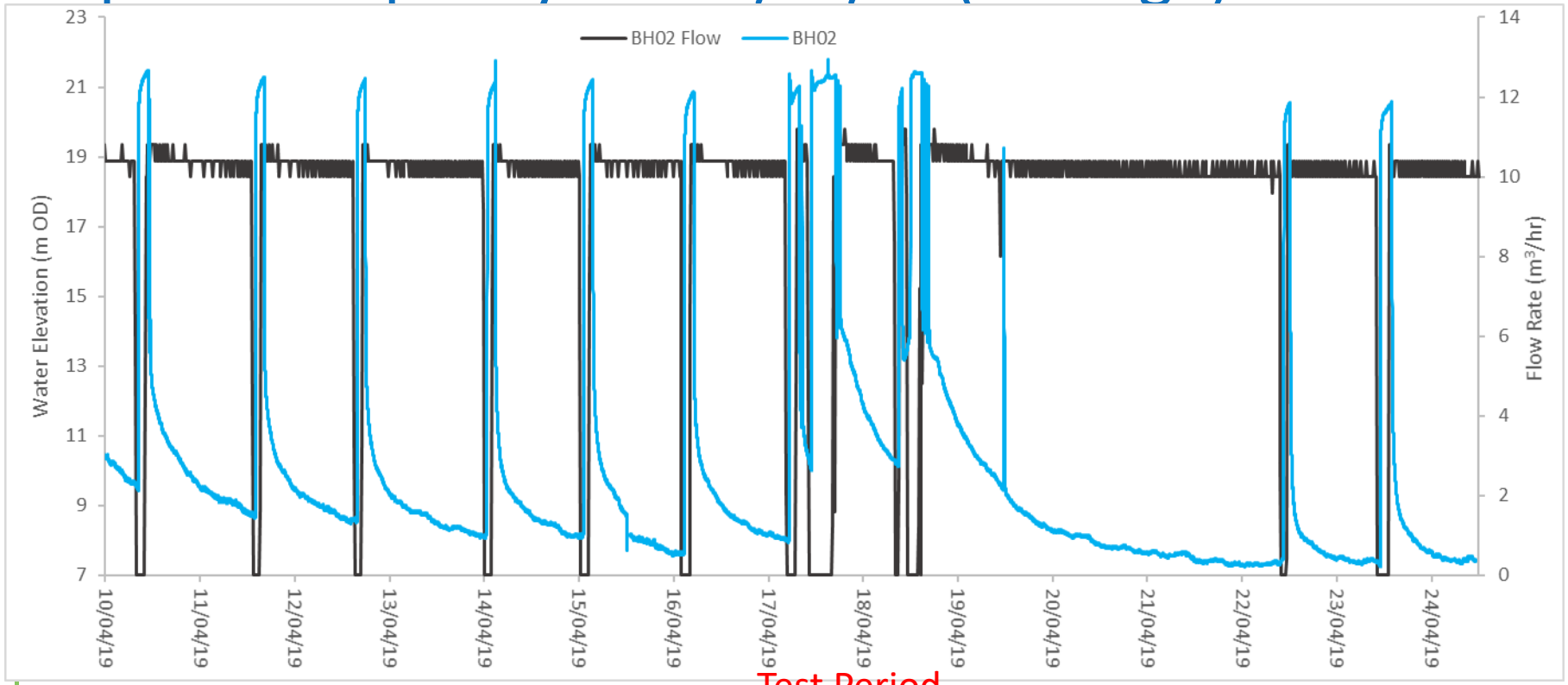
River Nore and Well Interaction = Minor



Confirm Pump Cycling

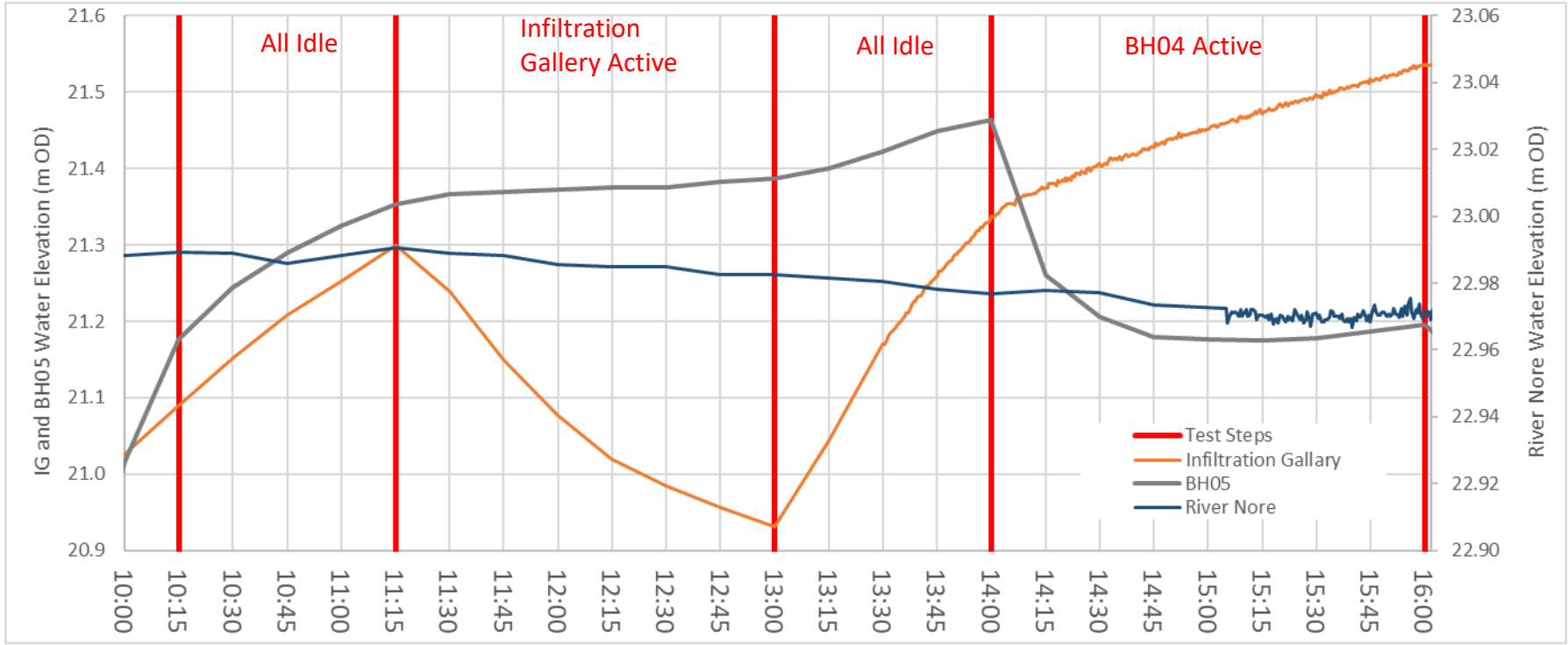


Specific Capacity ~ 1m³/hr/m (average)

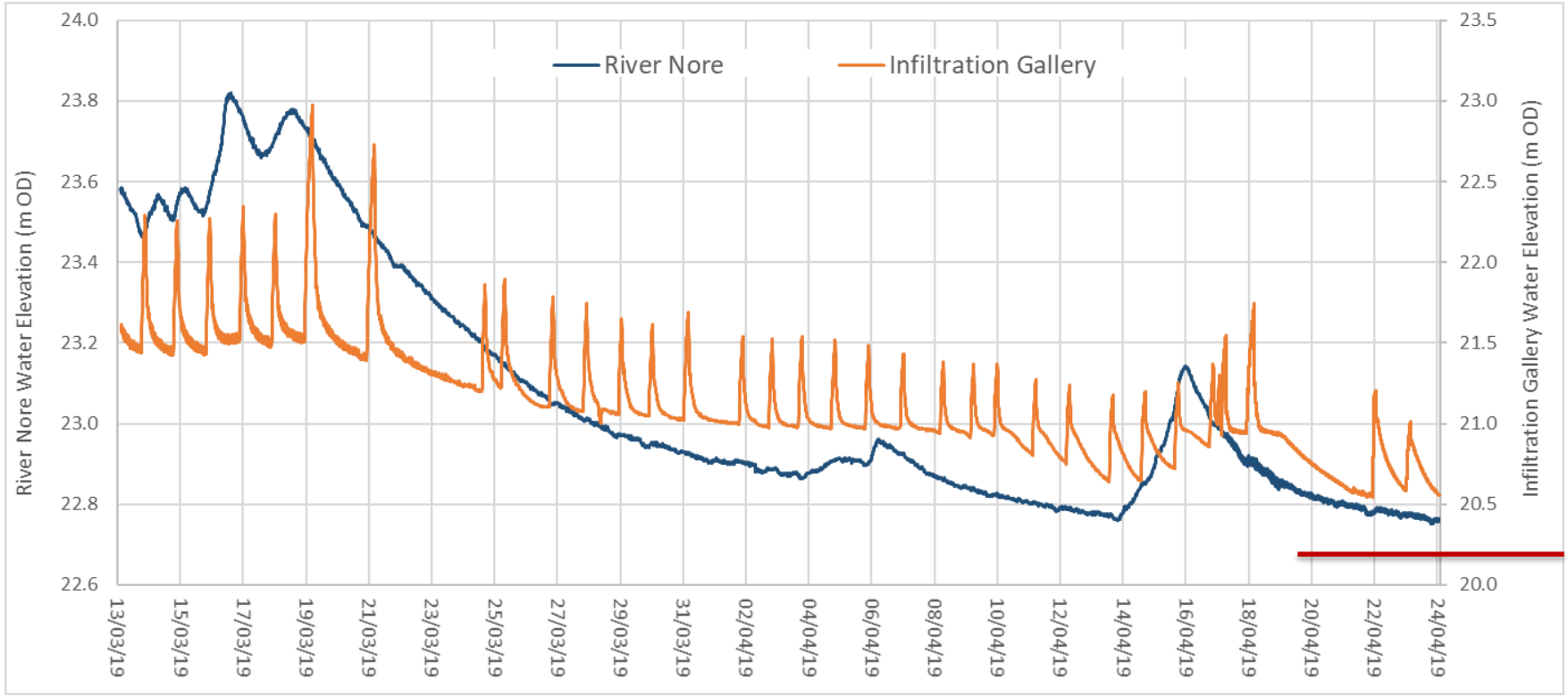


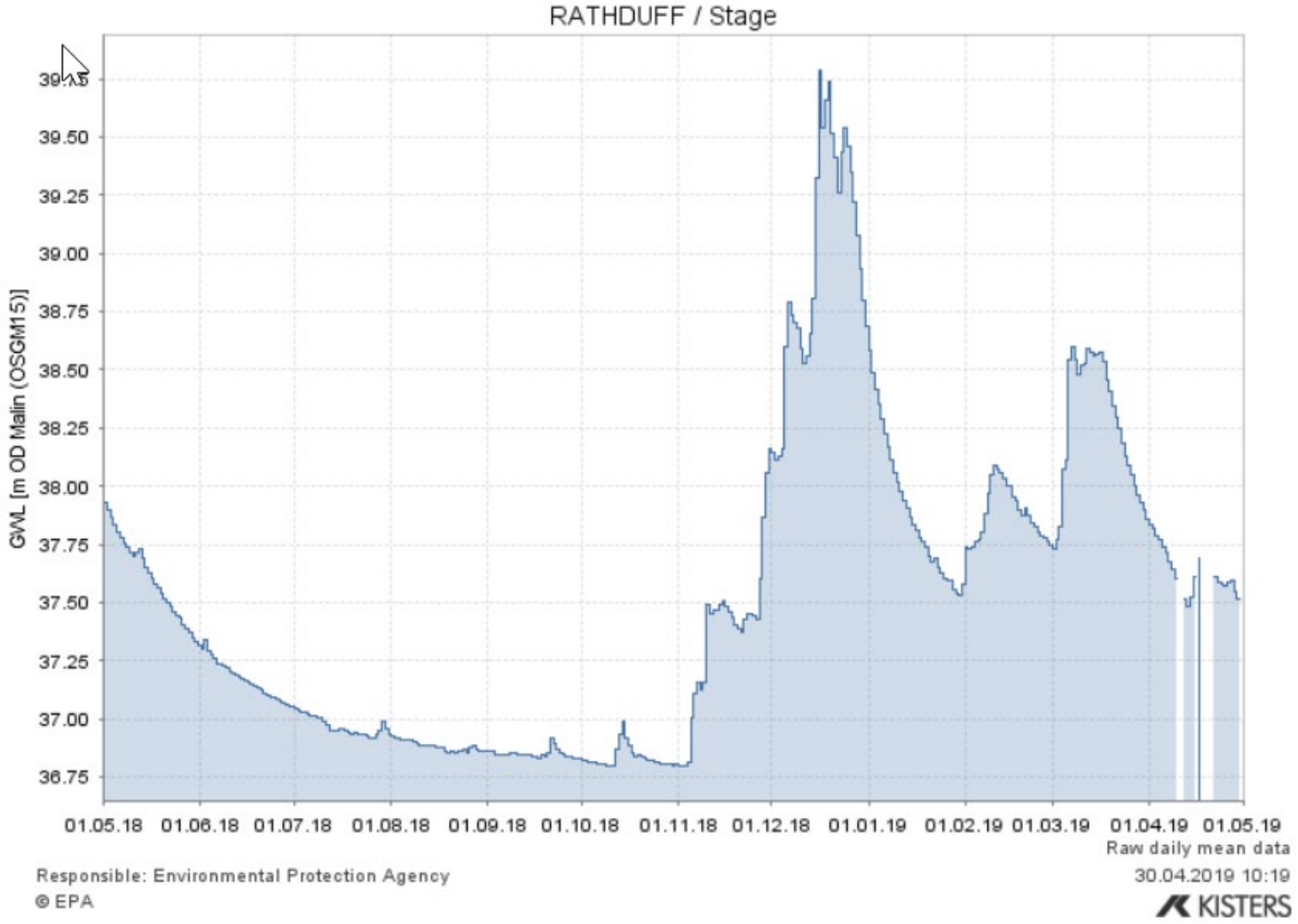
Test Period

Well/IG Interference – Test Period - slight



Preparing for the “Next Drought”




RATHDUFF / Stage
GWL [m OD Malin (OSGM15)]
39.50
39.25
39.00
38.75
38.50
38.25
38.00
37.75
37.50
37.25
37.00
36.75
01.05.18
01.06.18
01.07.18
01.08.18
01.09.18
01.10.18
01.11.18
01.12.18
01.01.19
01.02.19
01.03.19
01.04.19
01.05.19
Raw daily mean data
Responsible: Environmental Protection Agency
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Preparing for the “Next Drought”

- Limited scope for operational improvements if the IG drops out:
  - Low Q/s
  - Well interference
- Scope options:
  - Optimizing pump settings and pumping characteristics
  - If WTP sump was larger, pumps could run continuously (10% supply enhancement)
  - Expand wellfield (requires broader assessment with test and observation wells)
  - Alternatively, assess feasibility of commissioning trial wells at Bawsheenmore (2,300 m^3/d)
- Observation:
  - Enhanced well pumping from the limestone aquifer along the river is not expected to significantly impact the River Nore.