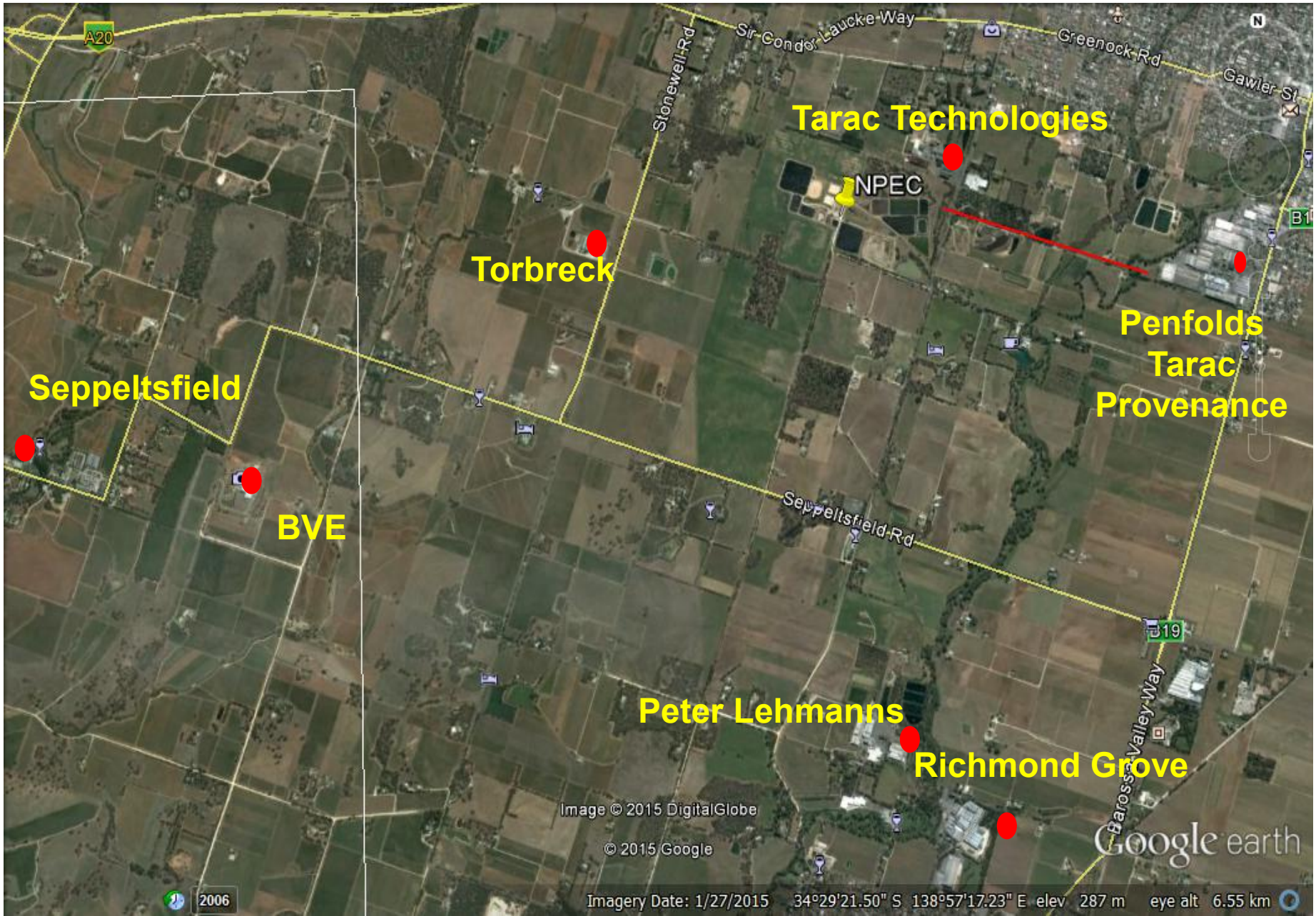
NPEC
Winery Wastewater Treatment And Reuse

By
John Constable
JJC Group

NPEC Project

- North Para Environment Control Pty Ltd
  - Since 1975.
  - Owned today by Treasury Wine Estates & Tarac.
  - Water Recycling plant started 2003.
    - BOOT by Cleanaway for Southcorp & Tarac
    - Designer & Project Manager – JJC Engineering
    - Operator Since 2004 – JJC Operations
  - Beneficial Reuse – Reduces take from Murray River.

NPEC Pipelines

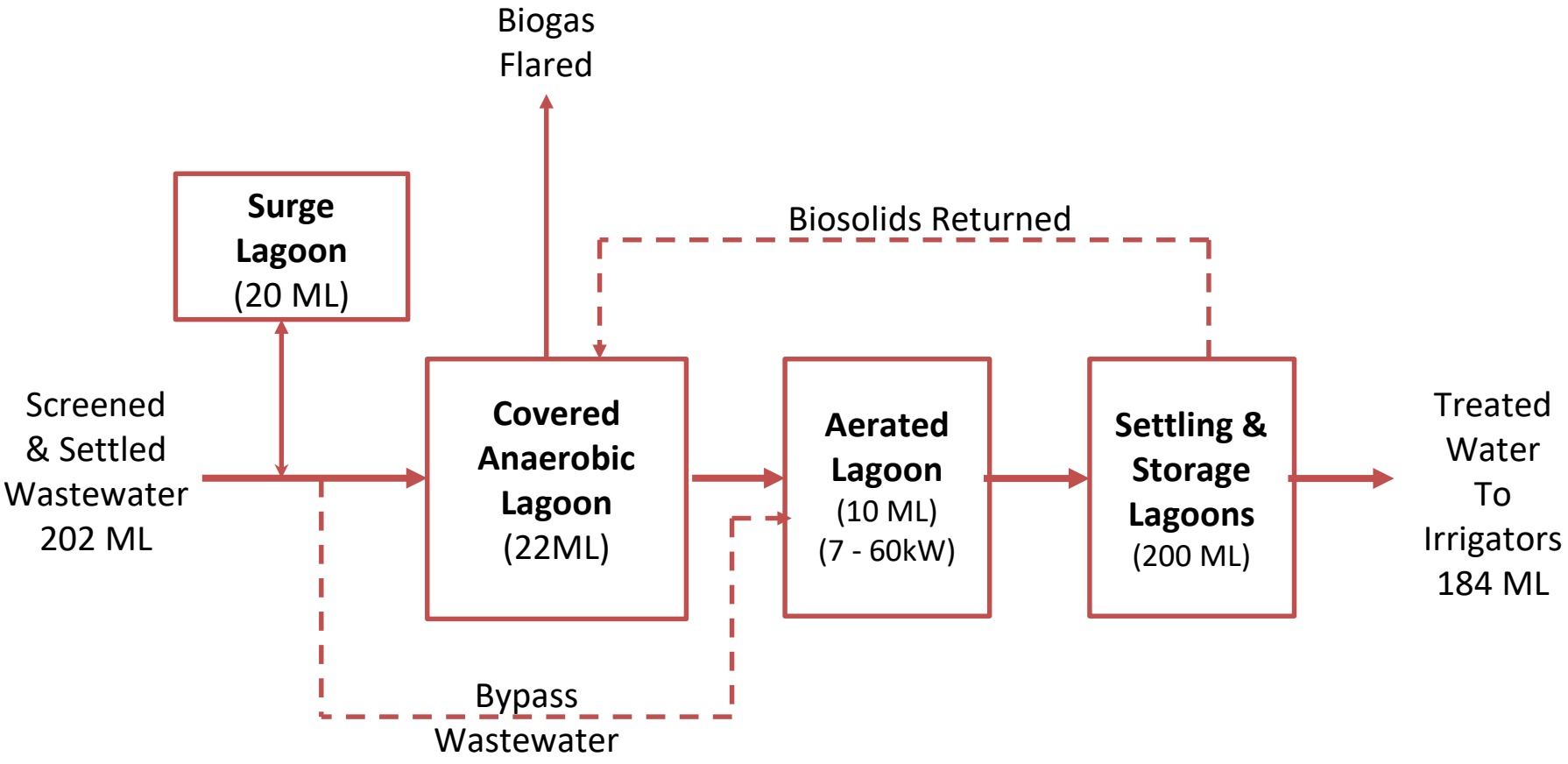


NPEC Treatment Plant

NPEC Project

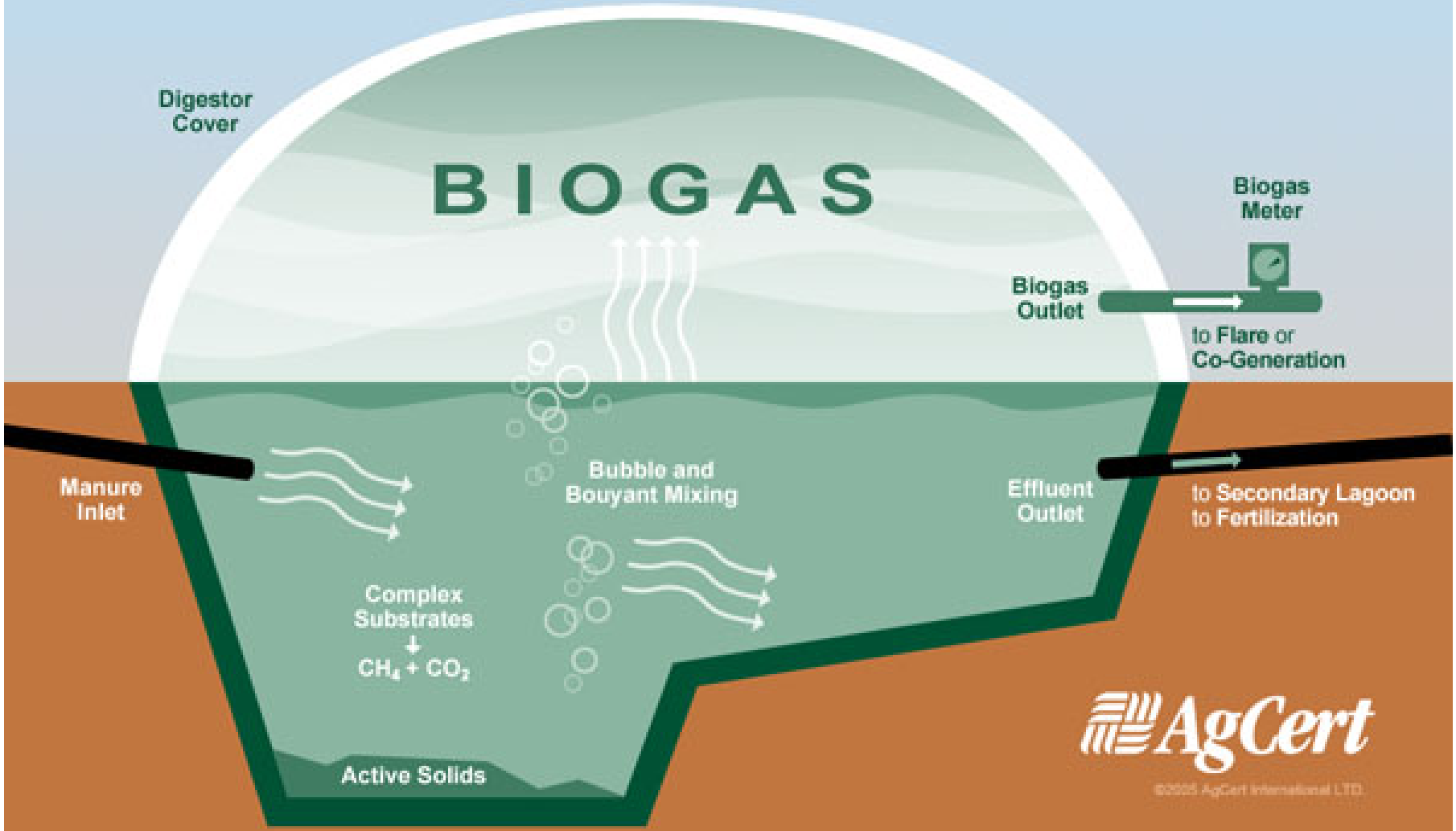
- In 2018/19:
  - Received 200 ML wastewater from 8 wineries &distilleries
  - Sold 184 ML of treated water to 12 vineyards.
  - Substitute for Murray River water.
  - Treated water quality (Average 12 mths to Apr 19)
    - BOD 7 mg/L
    - SS 9 mg/L
    - Salt (EC) 1265 us/cm
    - Total N 4 mg/L
    - P 8 mg/L
  - Power Used 50kW (2018, 365/24 basis)
  - Biogas Energy Value 260 kW (2018, 365/24 basis)

NPEC Wastewater Process



Microbiology Provides “pH Correction”.
“No Added Salt”
No Biosolids Removed From Process (SINCE 2003)

Anaerobic Digestion



Digesters are designed by optimizing the retention time (typically between 22-28 days) to maximize CH_4 capture.

Anaerobic Process

- Three reactions occur:
  - Hydrolysis – Conversion of solids, complex organics to simple monomers,
  - Acid Forming – Production of Volatile Fatty Acids (VFA)
  - Methanogenesis – Conversion to Acids to Methane

Organics > VFA > CH_4 + CO_2

- Issue Is Methanogens are inhibited by low pH.
  - Need to keep pH above 6.5.
  - Winery wastewater is pH 4 to 5.
  - And VFA production drives pH down.
- Challenge Is To Correct pH using Microbiology.

Winery CAL – Jan to June 2019

Into CAL		
Volume Feed	95	ML
Average Feed	523	kL/day
March Feed	995	kL/day
Average COD	4778	mg/L
COD Loading Rate (Ave)	0.11	kgCOD/m3/day
Out of CAL		
Average CODf	102	mg/L
Average SS	214	mg/L
Biogas Produced		
Total Volume	147,457	m3
Calorific Value	22	MJ/m3
Average Energy Value	206	kW

CAL pH - Then

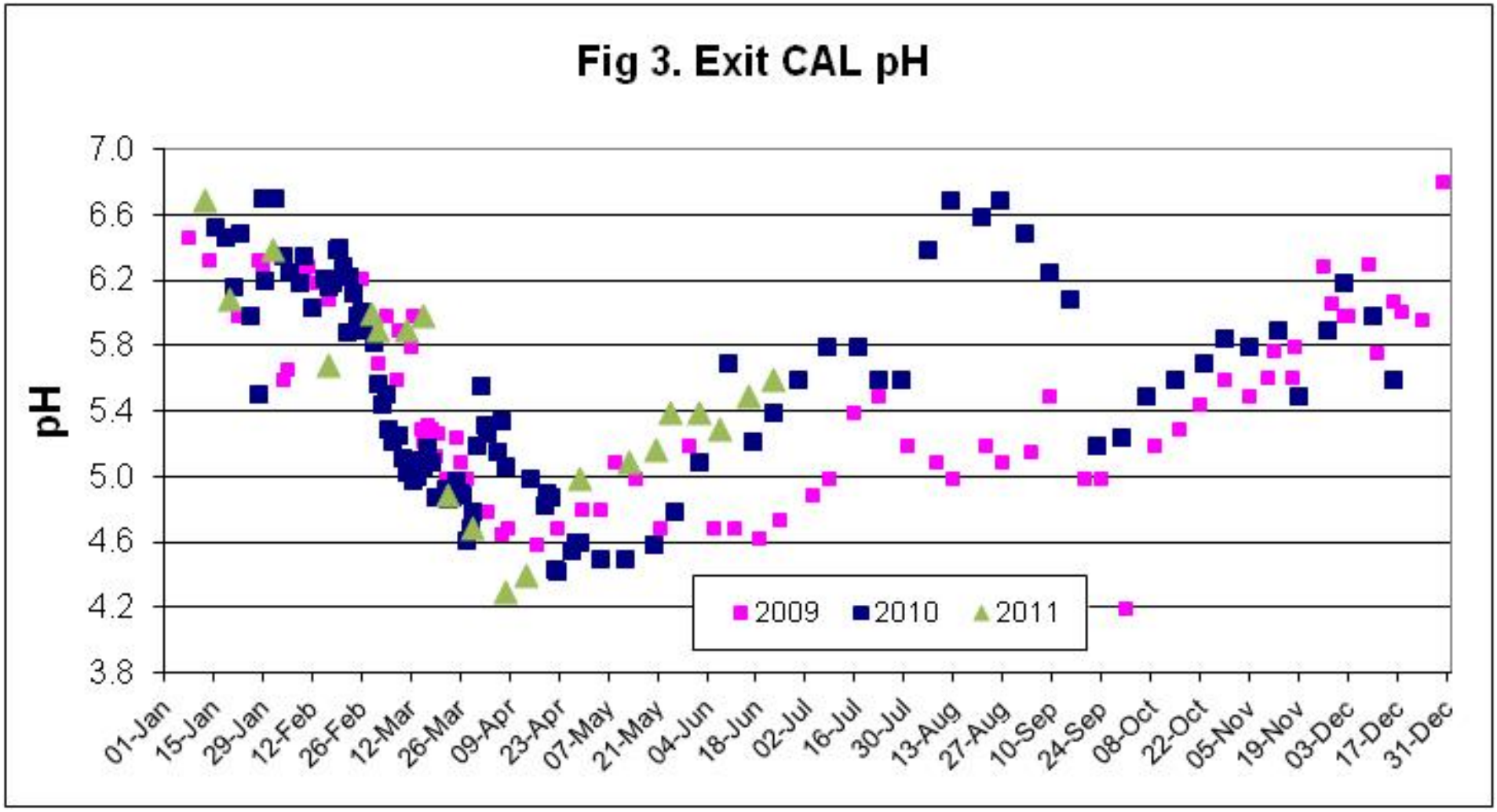


Fig 3. Exit CAL pH
pH
7.0
6.6
6.2
5.8
5.4
5.0
4.6
4.2
3.8
2009
2010
2011
01-Jan
15-Jan
29-Jan
12-Feb
26-Feb
12-Mar
26-Mar
09-Apr
23-Apr
07-May
21-May
04-Jun
18-Jun
02-Jul
16-Jul
30-Jul
13-Aug
27-Aug
10-Sep
24-Sep
08-Oct
22-Oct
05-Nov
19-Nov
03-Dec
17-Dec
31-Dec

CAL pH - Now

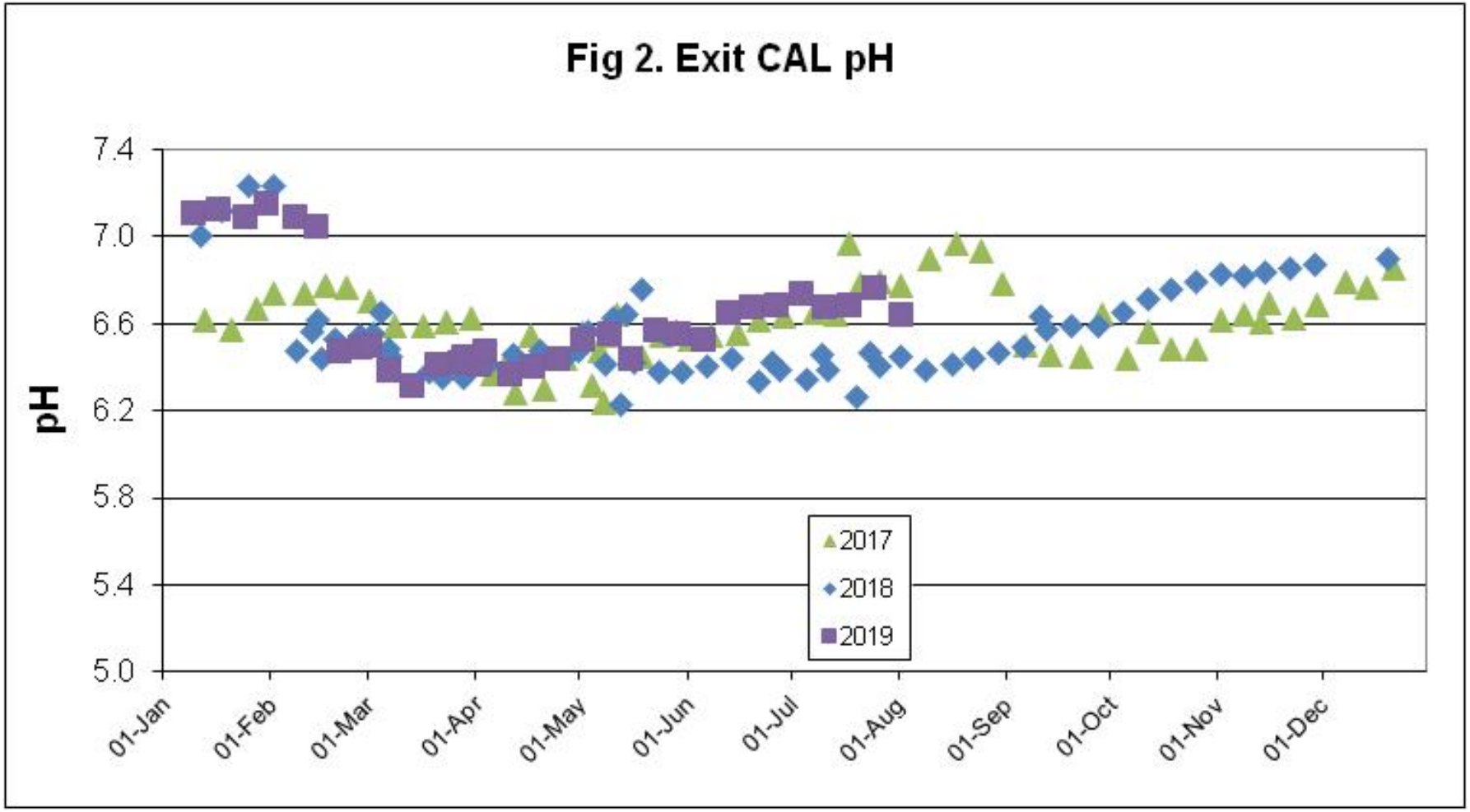
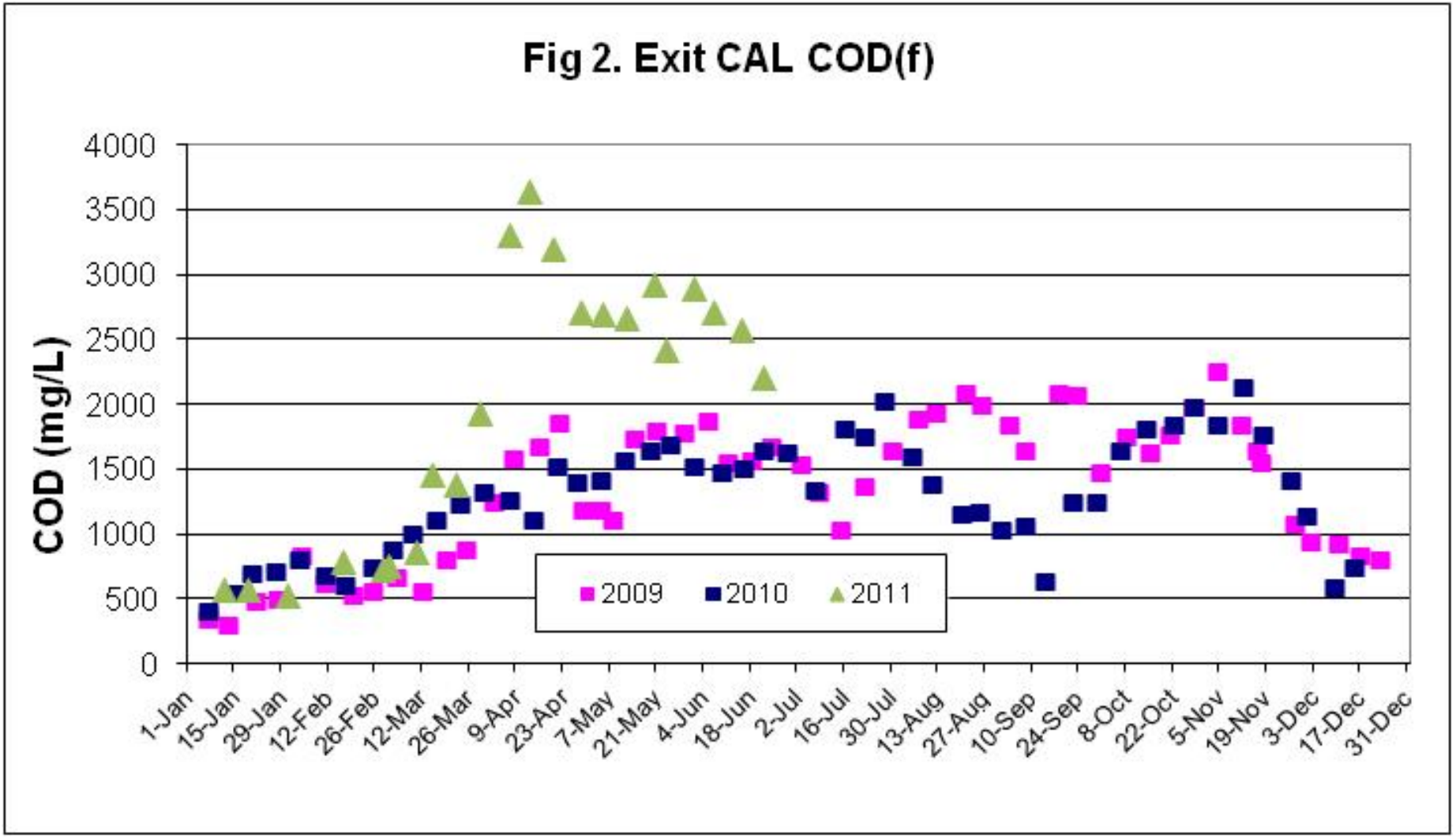


Fig 2. Exit CAL pH
pH
7.4
7.0
6.6
6.2
5.8
5.4
5.0
01-Jan
01-Feb
01-Mar
01-Apr
01-May
01-Jun
01-Jul
01-Aug
01-Sep
01-Oct
01-Nov
01-Dec
2017
2018
2019

CAL CODf - Then



CAL CODf - Now

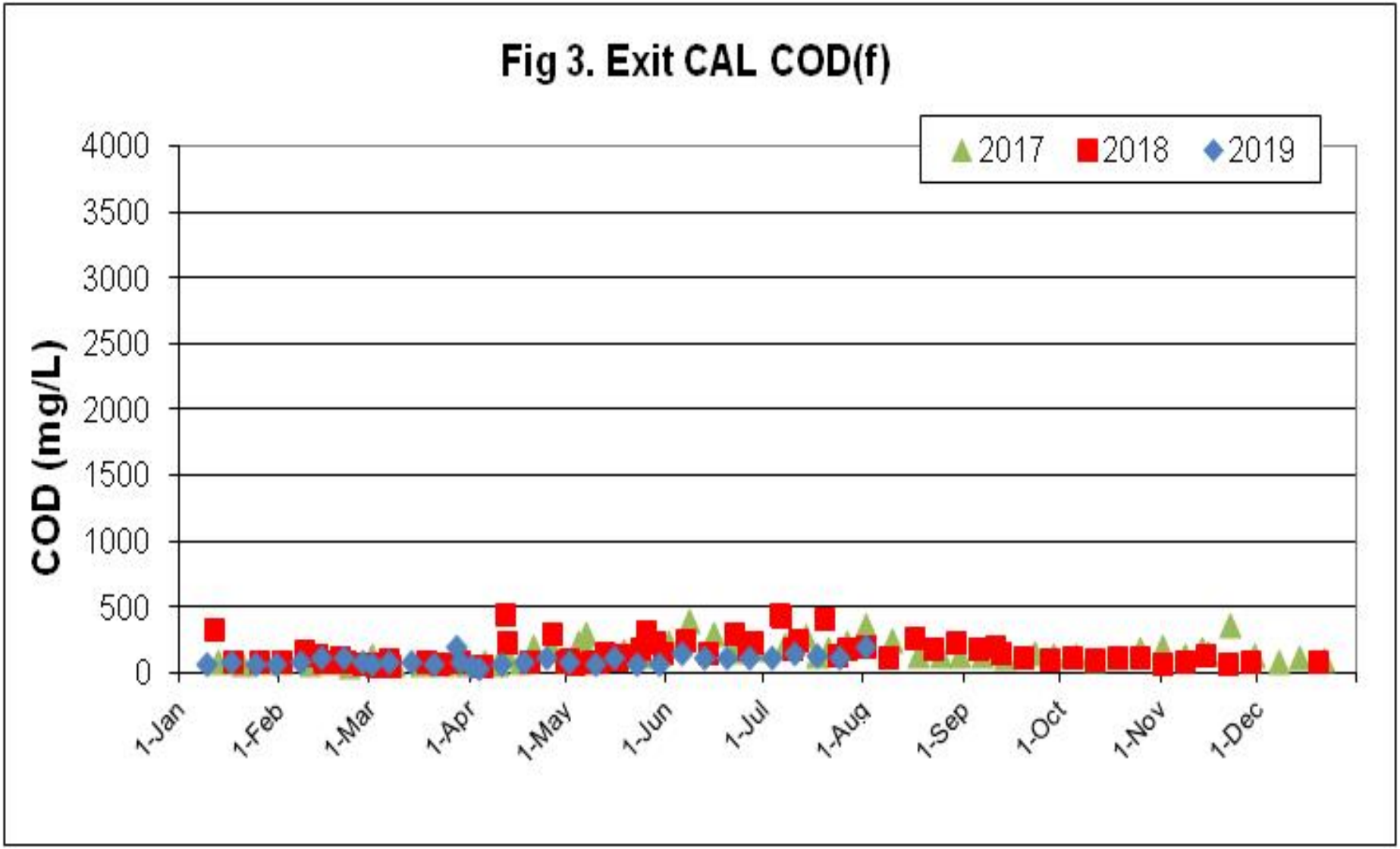
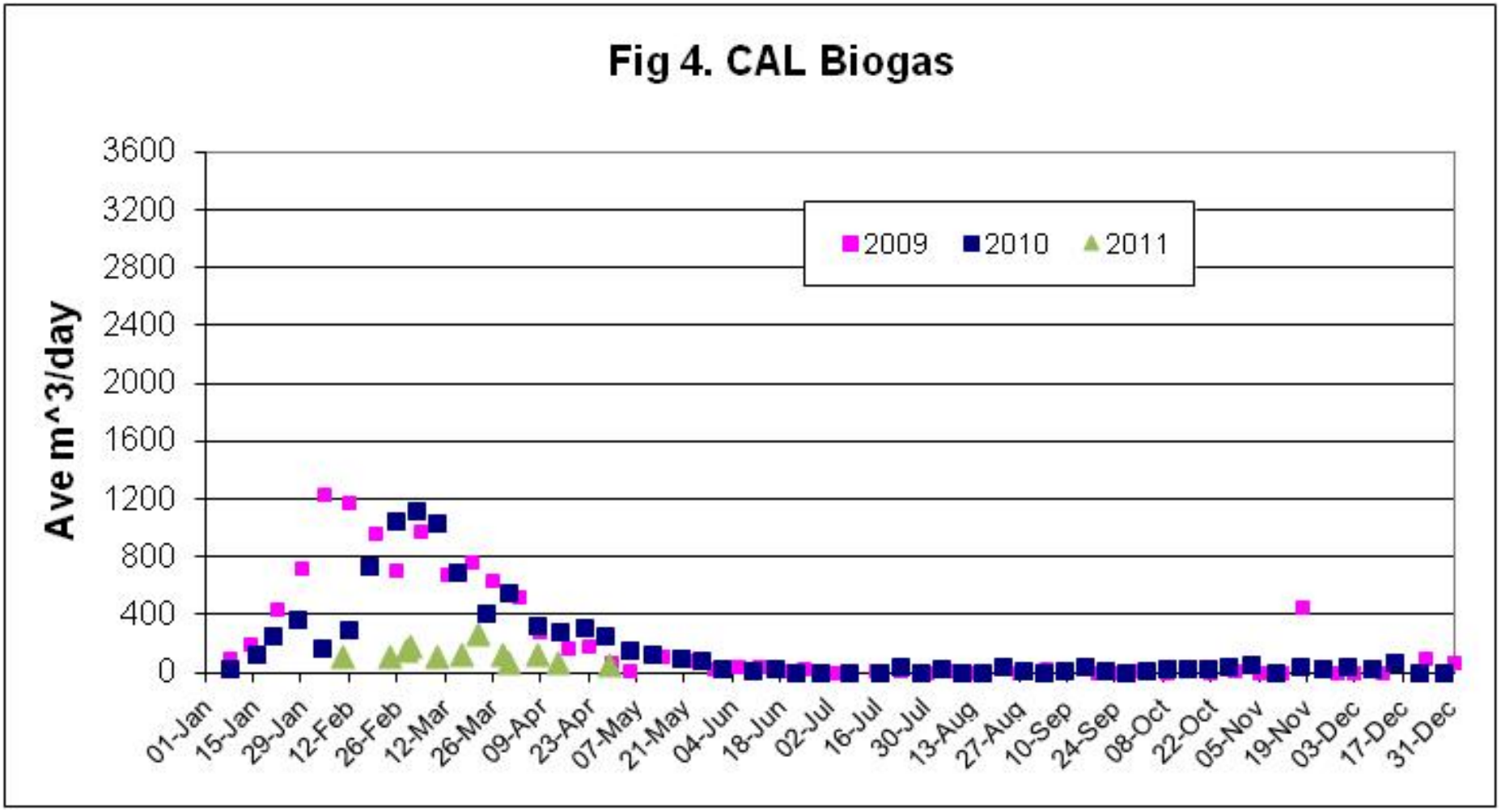
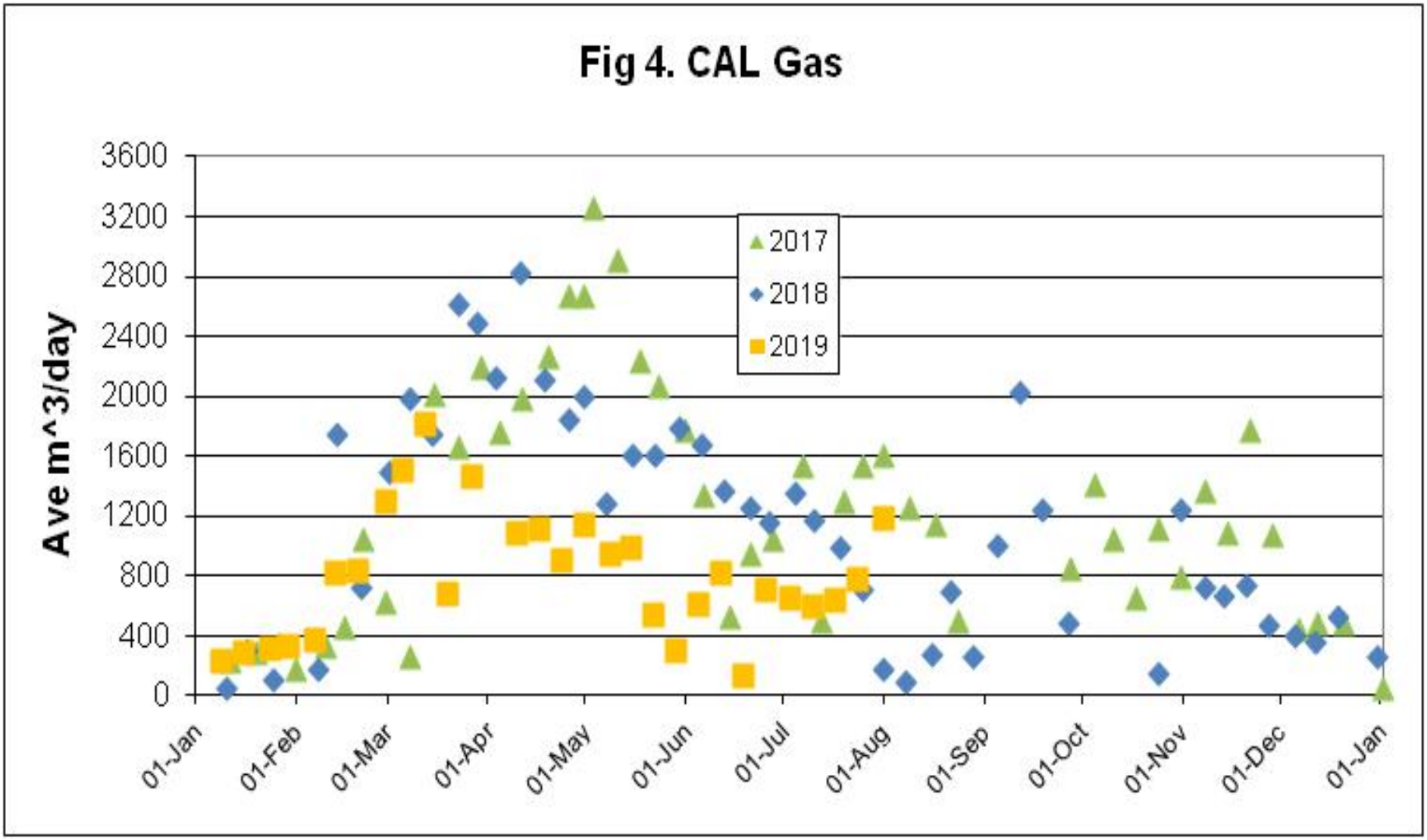


Fig 3. Exit CAL COD(f)
2017
2018
2019
COD (mg/L)
4000
3500
3000
2500
2000
1500
1000
500
0
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec

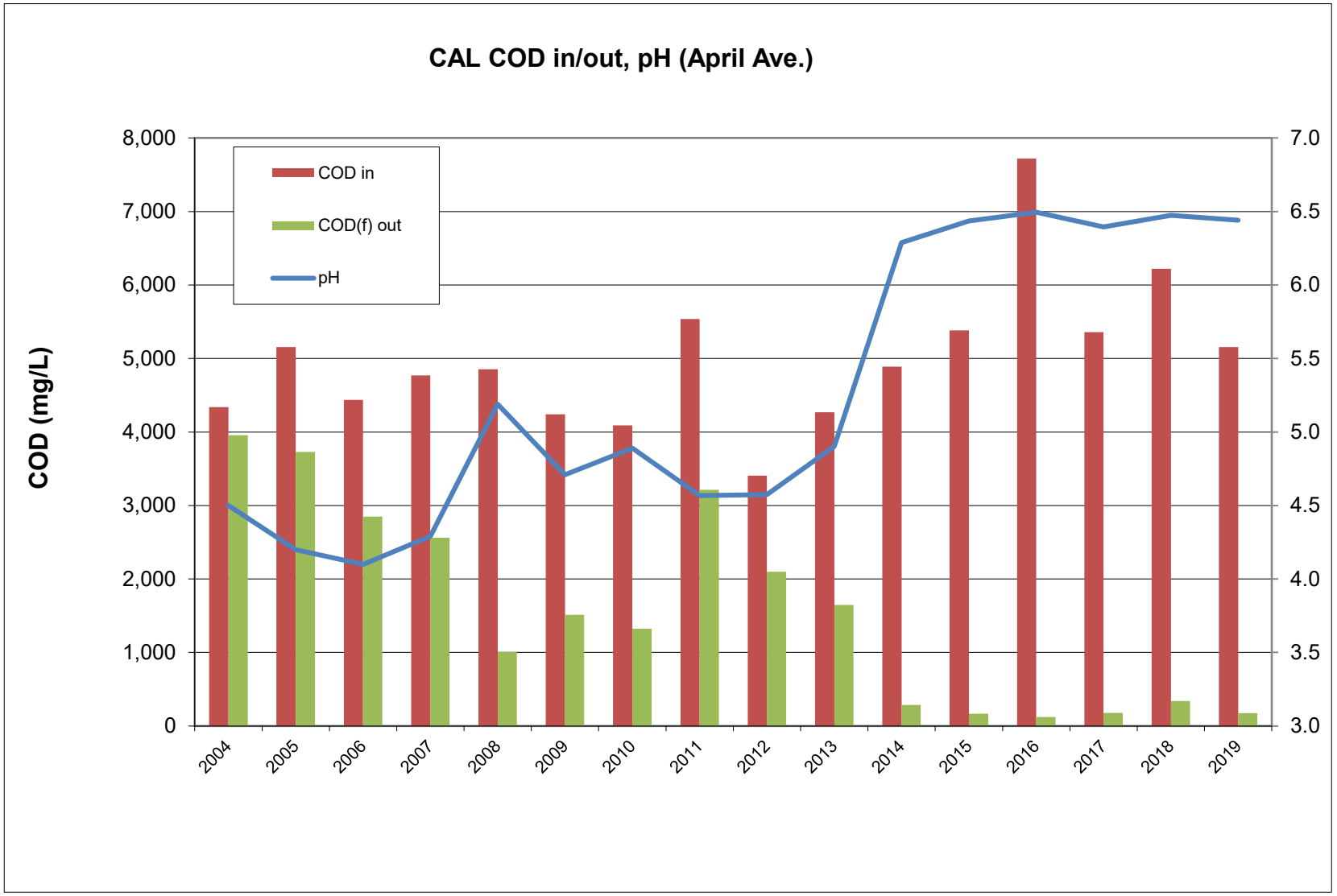
CAL Biogas - Then



CAL Biogas - Now



CAL Over 15 Years



Lessons 1

- Recycling Water Is A Journey
- Management Commitment – Initial & Continuing.
- Design
    - Treatment capacity,
    - Water balance,
    - Winter storage.
- Process evaluation and continuous improvement
- Good operators are Gold

Lessons 2

- Reuse of Winery Wastewater
  - Reduces water taken from Murray Darling.
  - In winery:
    - Eliminate & Reduce waste
    - Minimise salt emitted (cleaners, Lees)
    - Harvest stormwater
- Anaerobic Treatment Of Winery Wastewater
  - Can use microbiology (not chemicals) to correct pH.
  - Need to protect the CAL – Surge & Bypass.
  - Maintaining a healthy sludge layer is essential.

Thanks

NPEC Board Greg Pearce Tony Robinson at TWE
Rob Pelton, Nigel Logos & Lin Lin Low at Tarac

JJC Operations Mike Carson
Darren Dugmore
Michael Raven
Julie Constable

WEA for providing this opportunity

And you.

<u>More Information</u>

Chat during “Networking & Stress Relief”

&

John Constable
Mobile 0407 553 663
john@jjcgroup.com.au