

ADVANCES IN ONLINE OPTICAL MONITORING

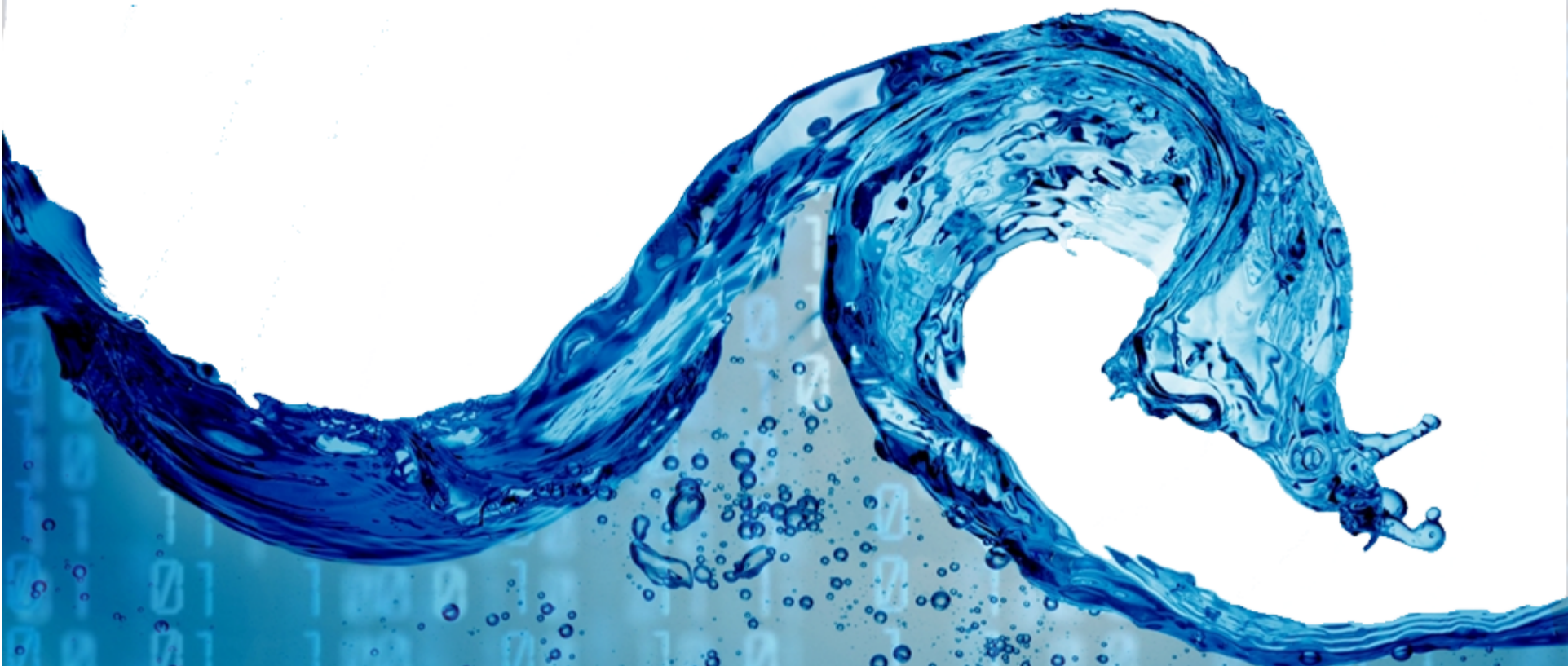
OF BOD/CBOD IN WASTEWATER

by: Chris Russo, Ph.D.

chris.russo@zapstechnologies.com

07/16/2015

BIG DATA



Enhanced View – Enhanced Monitoring

07/16/2015

ZAPS Technologies, Inc.

Direct measurements

In their natural matrix

High definition data - online

HMA

Hybrid Multispectral Analysis

Fully optical analytical approach characterizing the chemical bonding and molecular structure of a sample matrix.

A combination of three optical technique:

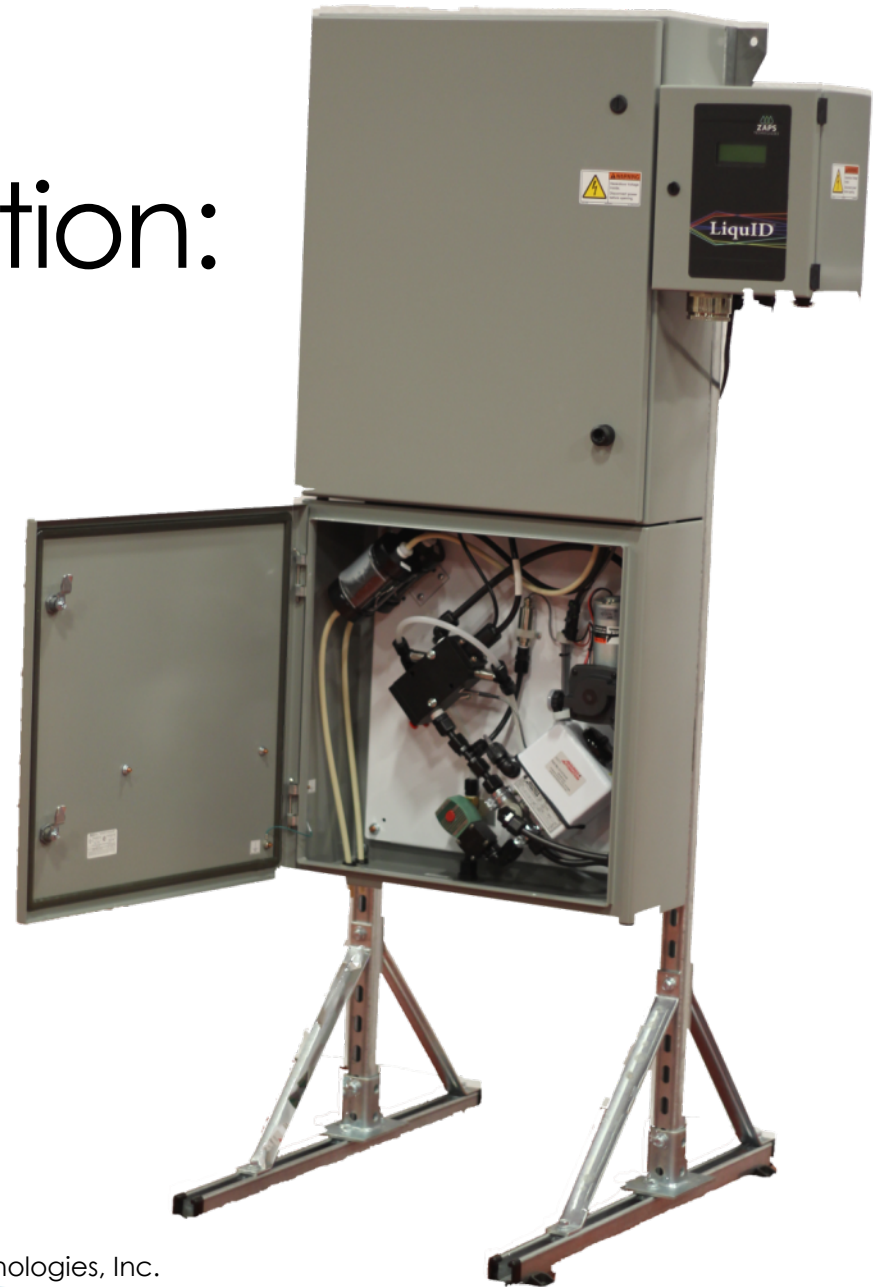
- Absorbance
- Scattering
- Fluorescence



An implementation: LiquiD



An implementation: LiquiD



Quick Glance

Monitor

Data

Quick Review

Alerts

Control

Grab Sample

Station: WWTP Inf ▼ [view](#)

Status: ONLINE

Last transmission received: 2015-06-17 10:27AM PDT

Start: 2013-03-31 00:00 

Scale: 1 week ▼

Metric 1: CBOD ▼

Updates: None ▼ Go

Ex. [2015-06-28 16:00],
or leave empty
for current time.

Metric 2: Sample Temperature ▼

Metric 3: -- Select -- ▼

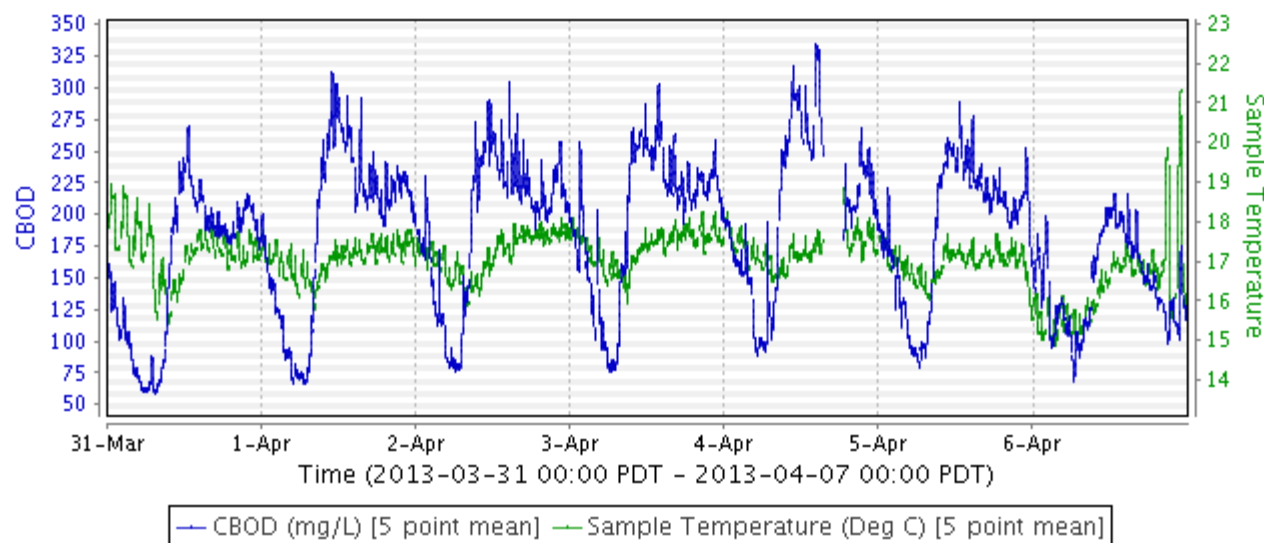
Statistic: 5 point mean ▼

[<<](#) [<](#) [\[\]](#) [>](#) [>>](#)

 Metrics

 Filter Options

WWTP Inf



Color TKN Chlorine
Turbidity TSS Temp.
Oil FDOM CHL-a UVA
BOD Size cBOD COD
NO₂+NO₃ SUVA NH₃
TOC Rhodamine CHL-b
UVT E. coli THM
Phycobilin

Case Study:

BOD/cBOD

A measure of wastewater strength.

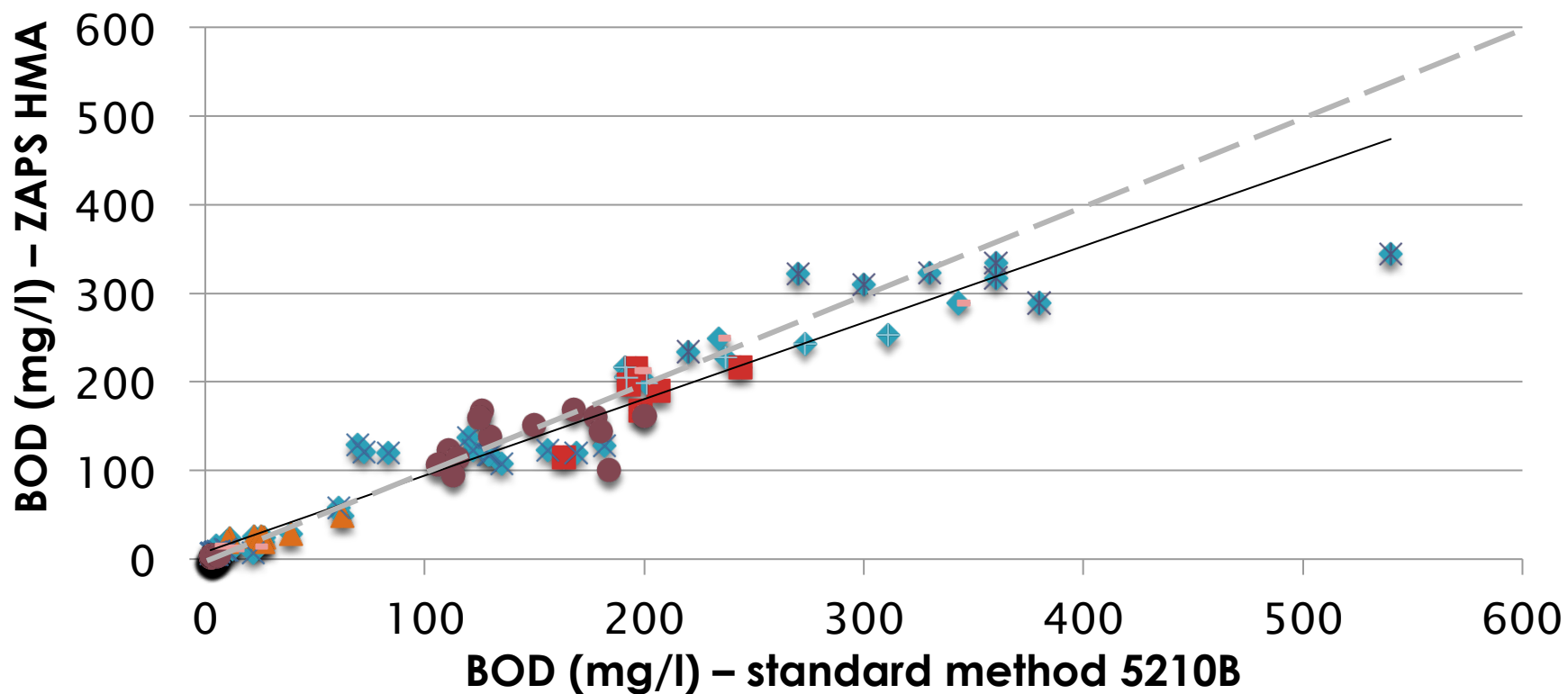


07/16/2015
LONDON BRIDGE. B-10

ZAPS Technologies, Inc.

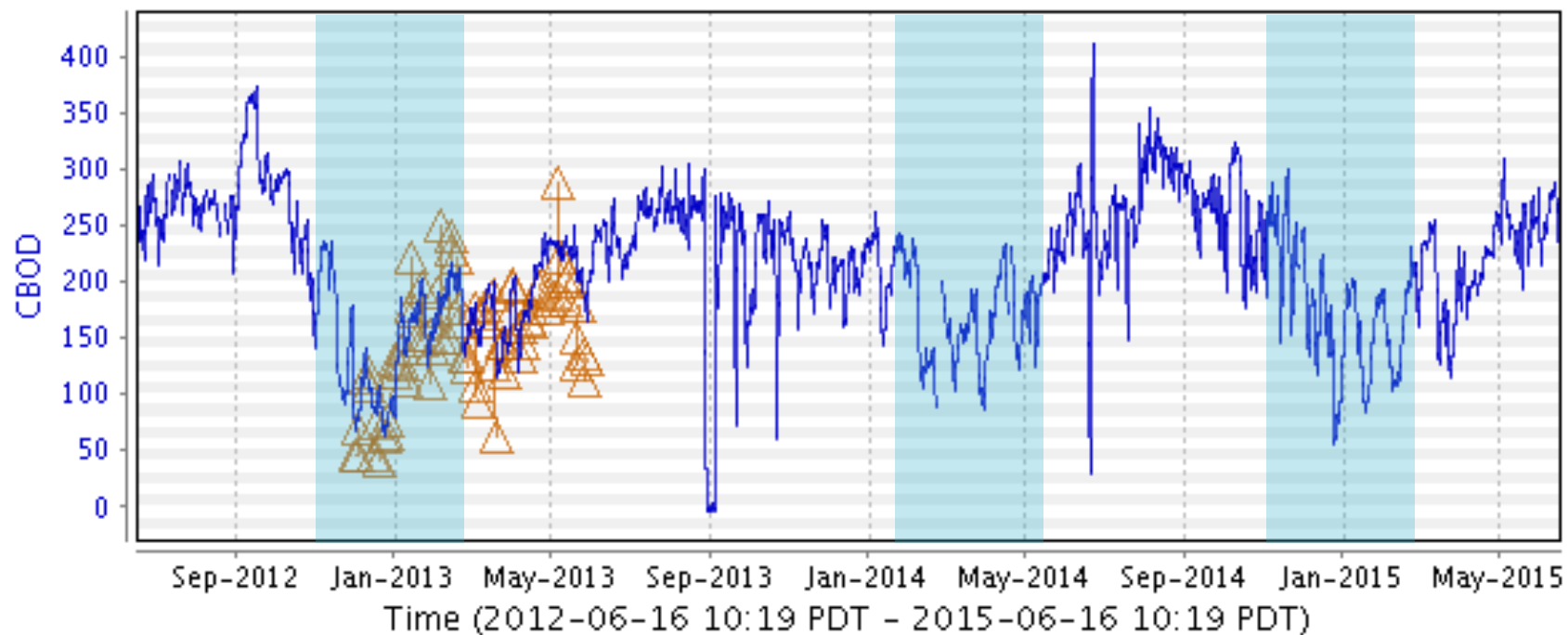
BOD

Legacy Technology Continuity



HMA Data vs Standard Method 5210B

Installation Locations	7
Number of Liquid Stations	11
Grab Samples (N)	100
Correlation (R^2)	0.94



Technique

Report Type

of Days

of Real-time Readings

Average Value (mg/L)

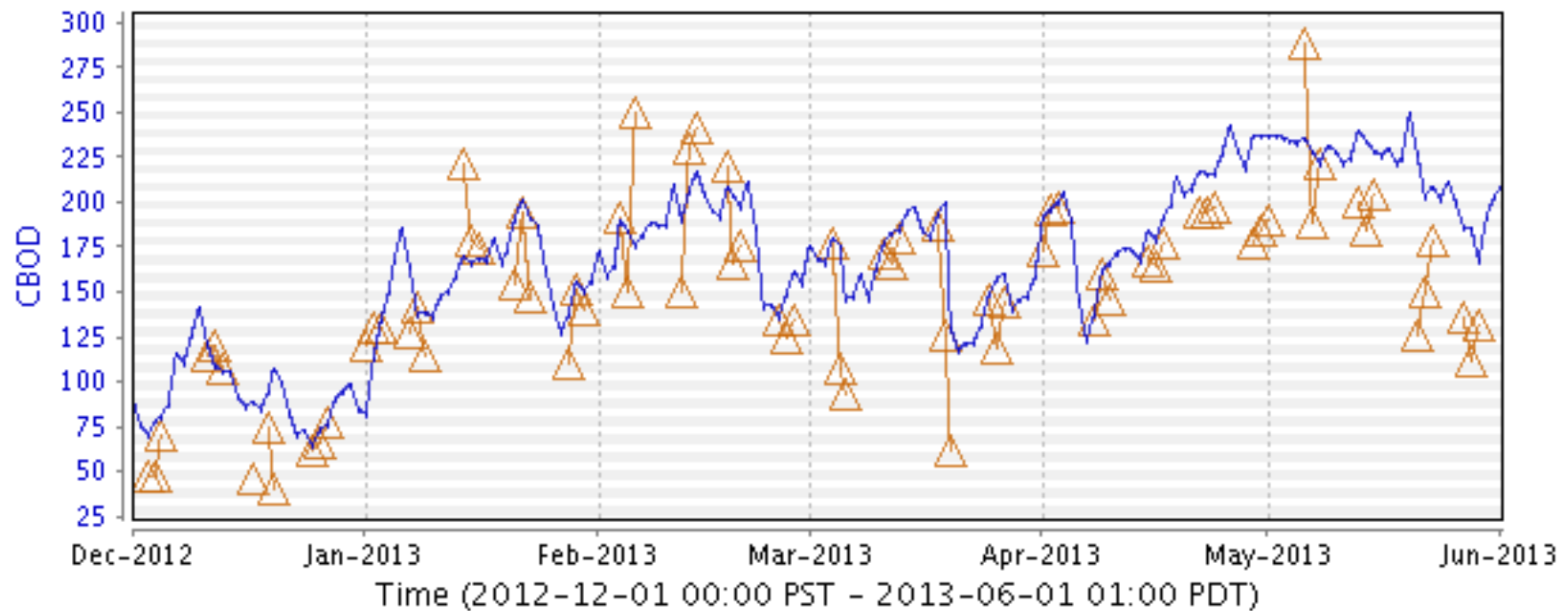
ZAPS Liquid

Daily average

1081 (99.5%)

677,244

215 mg/L



Technique

Report Type

of Days

of Real-time Readings

Average Value (mg/L)

Municipal Lab

Daily Composite

78 (43%)

N/A

145

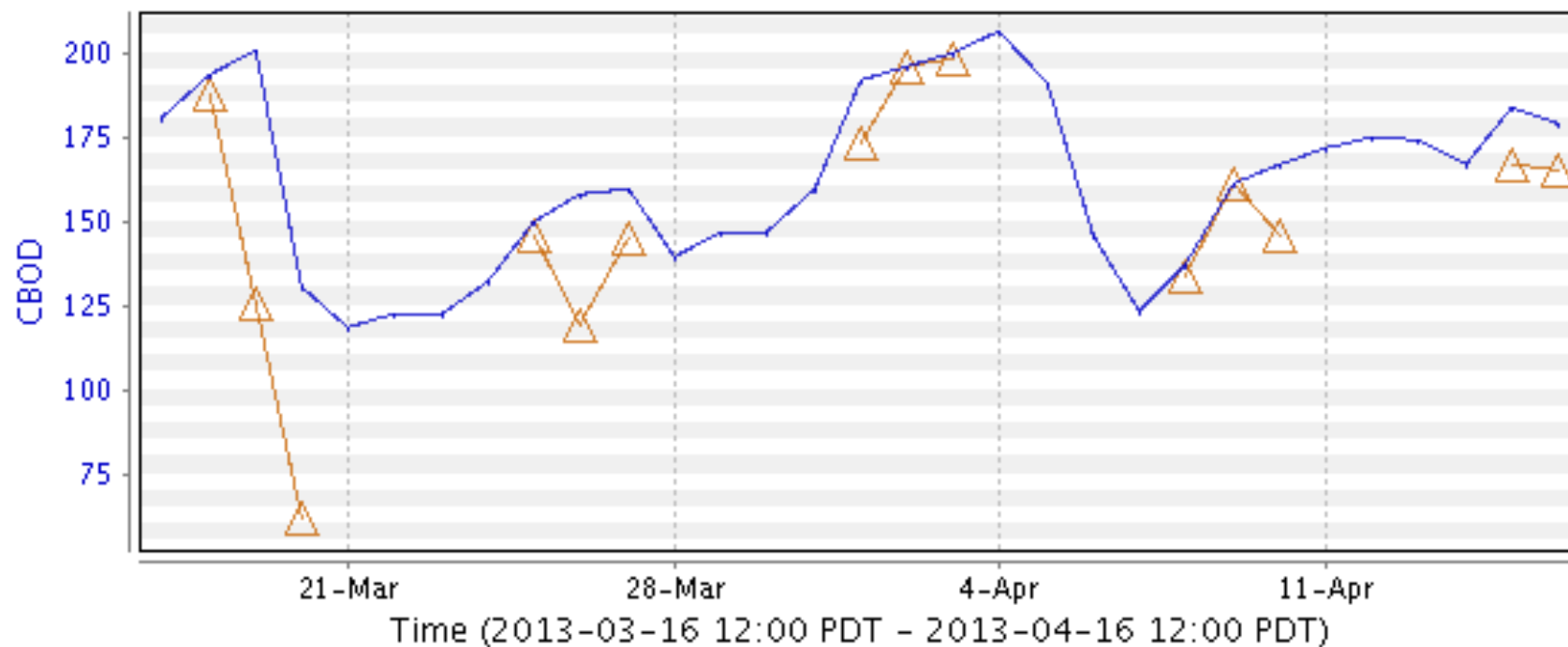
ZAPS LiquiD

Daily average

181 (100%)

106,790

157



Technique

Report Type

of Days

of Real-time Readings

Average Value (mg/L)

Municipal Lab

Daily Composite

14 (43%)

N/A

152

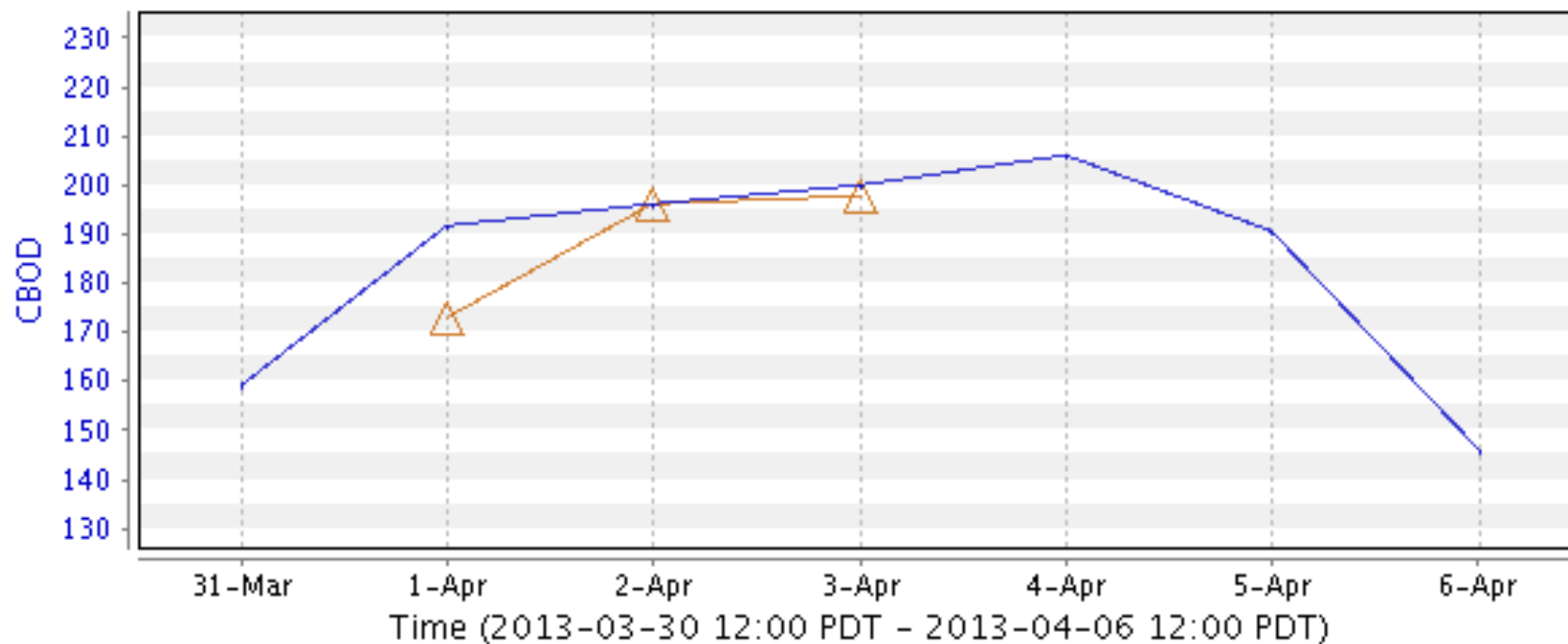
ZAPS LiquiD

Daily average

28 (100%)

18,241

162



Technique

Report Type

of Days

of Real-time Readings

Average Value (mg/L)

Municipal Lab

Daily Composite

3 (43%)

N/A

189

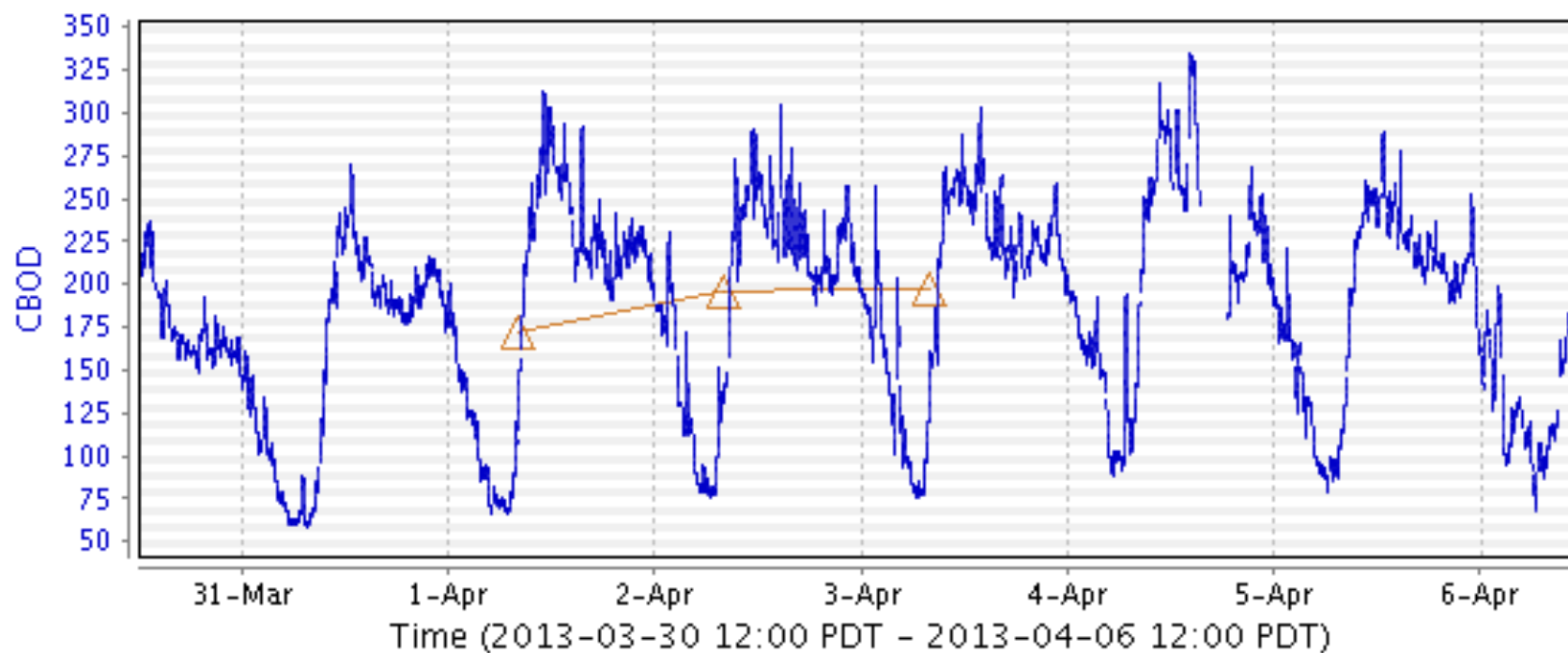
ZAPS LiquiD

Daily average

7 (100%)

4,687

198



Technique

Report Type

of Days

of Real-time Readings

Average Value (mg/L)

Municipal Lab

Daily Composite

3 (43%)

N/A

189

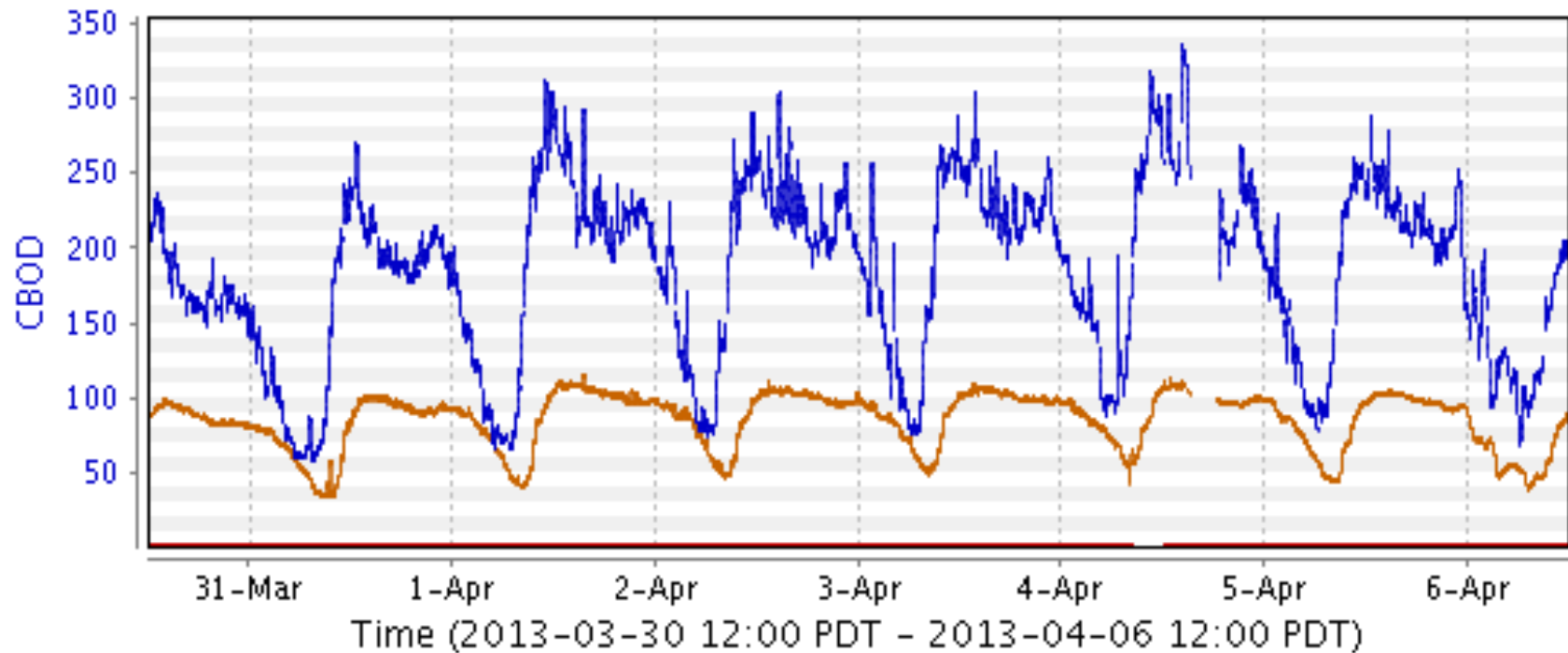
ZAPS LiquiD

Real-time

7 (100%)

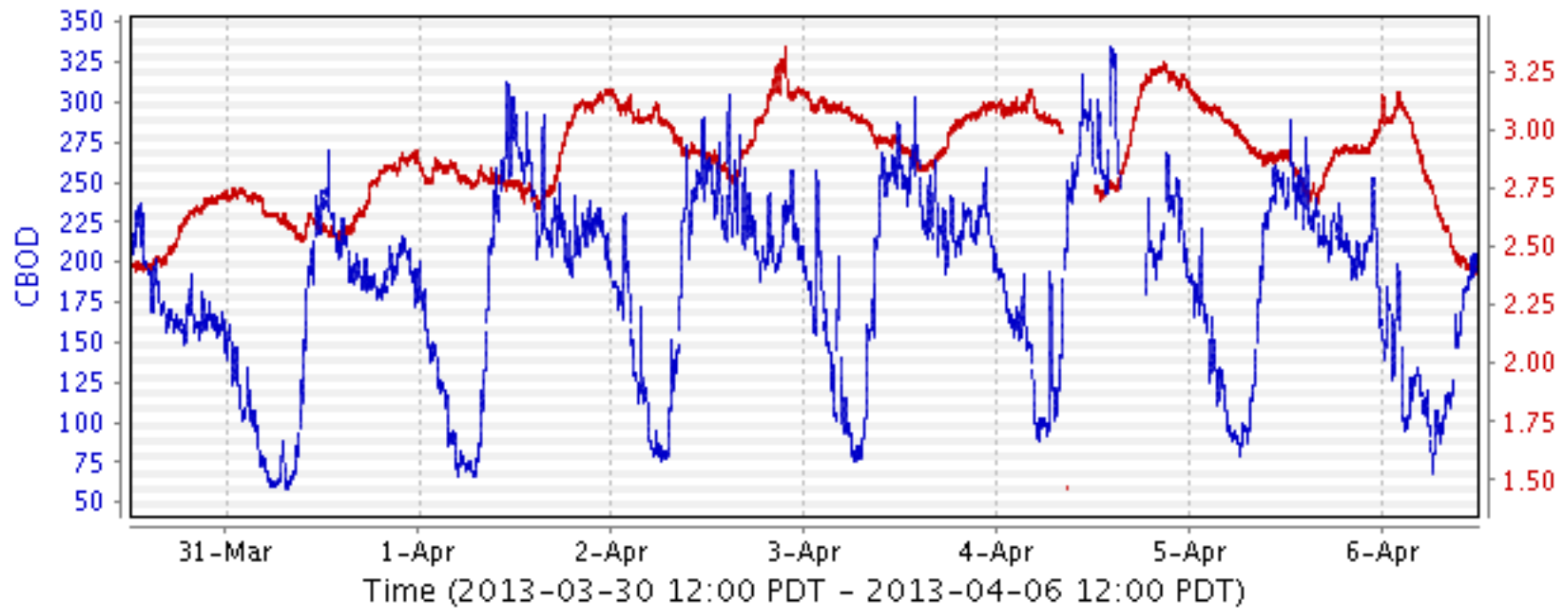
4,687

198



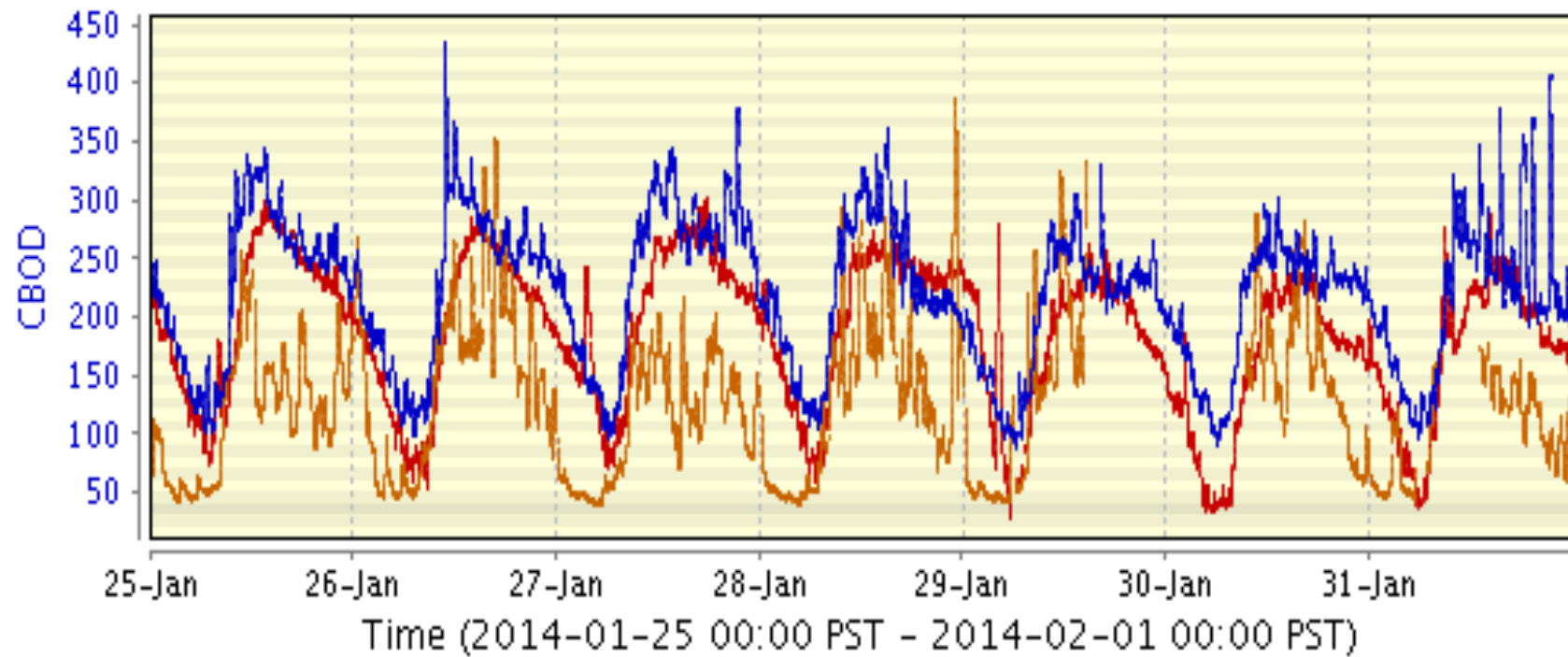
Raw Influent – **Primary Effluent** – **Final Effluent**

4,700 cBOD readings per series.



Raw Influent **Final Effluent**

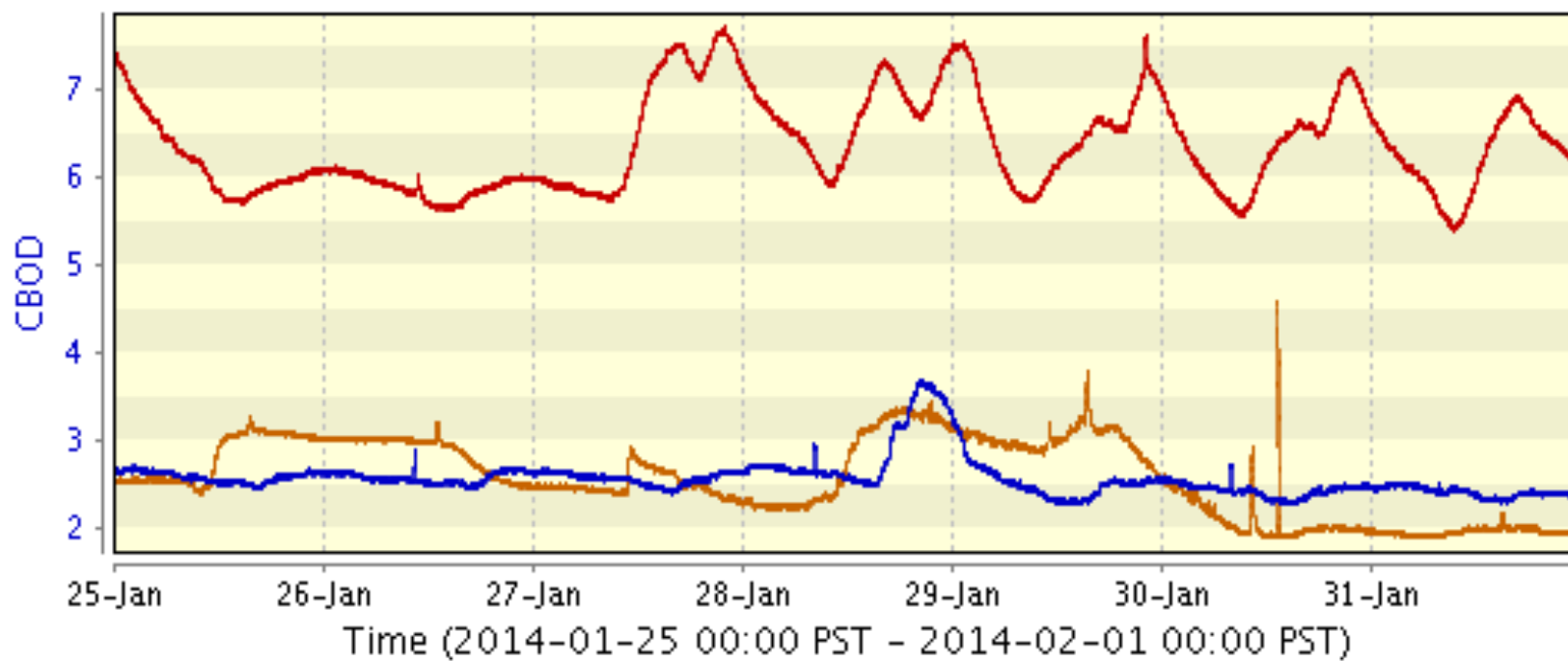
4,700 cBOD readings per series.



WWTP Large
18 MGD

WWTP Medium
5 MGD

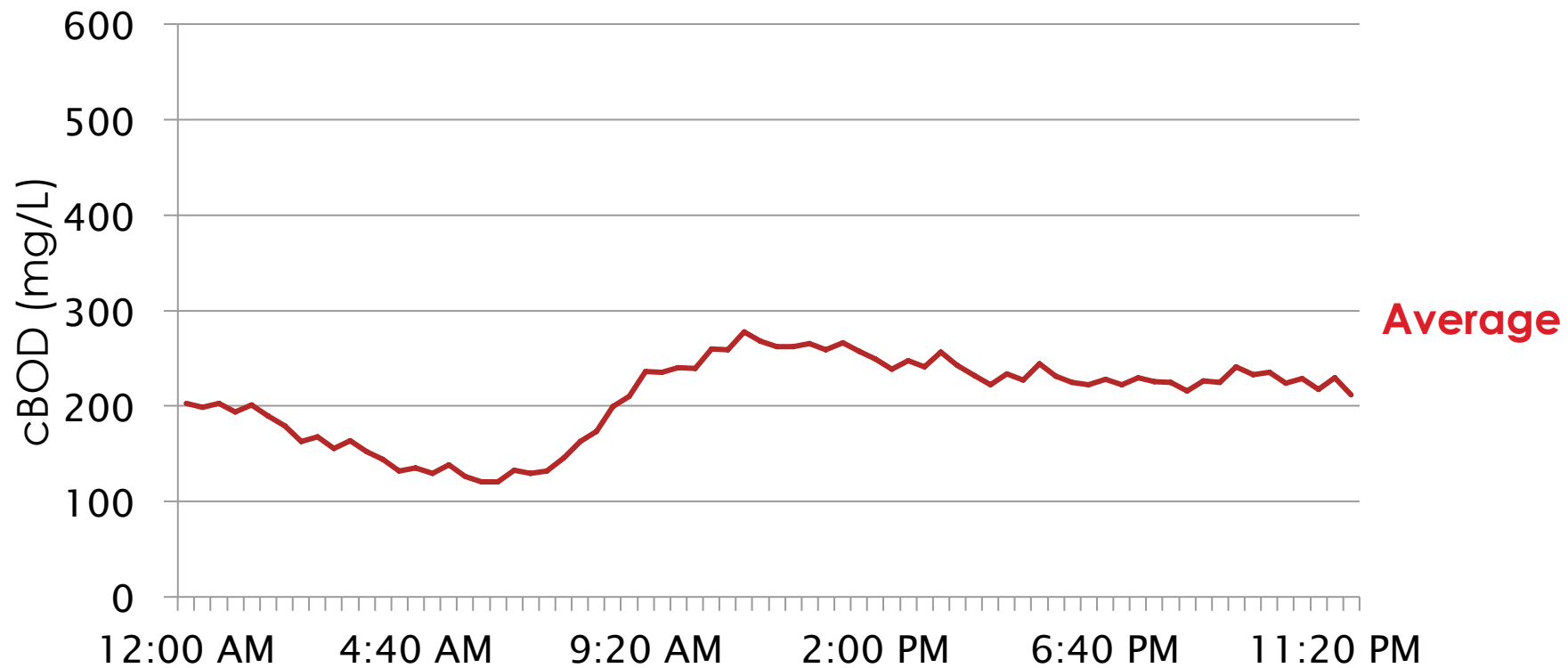
WWTP Small
0.25 MGD



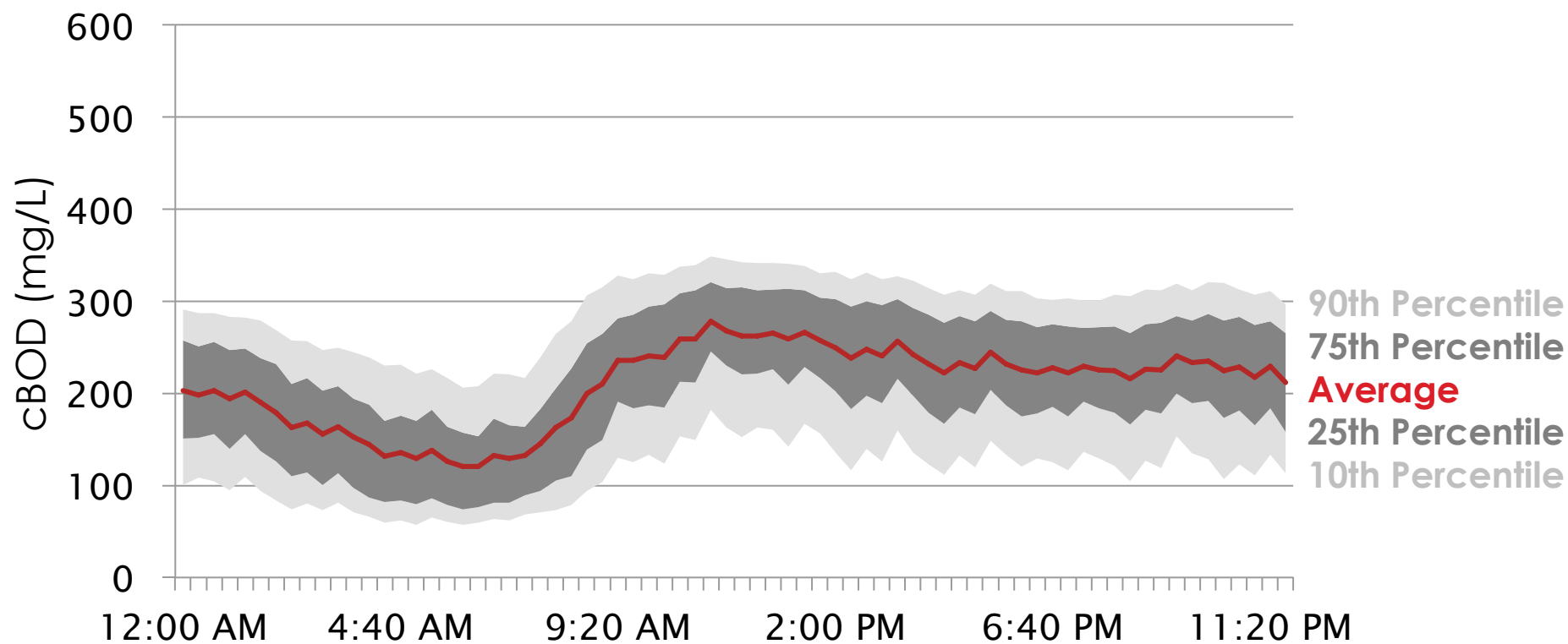
WWTP Large
18 MGD

WWTP Medium
5 MGD

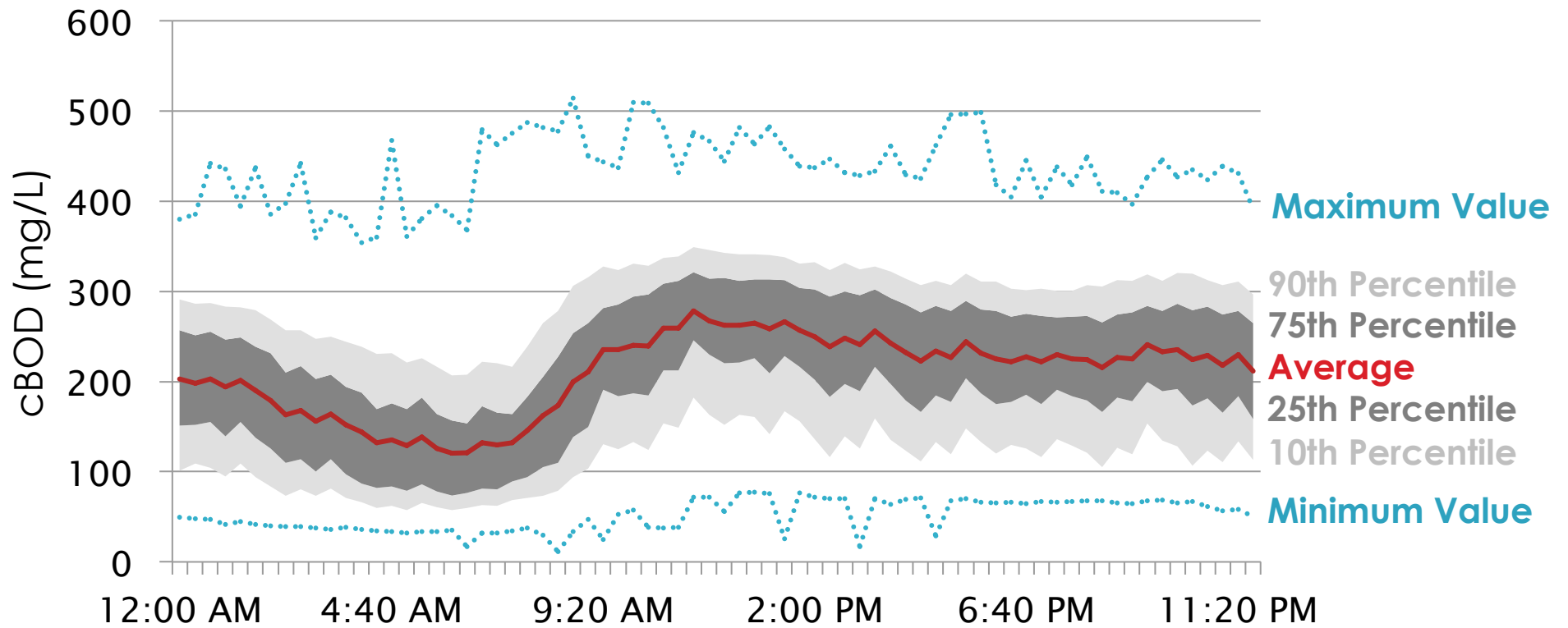
WWTP Small
0.25 MGD



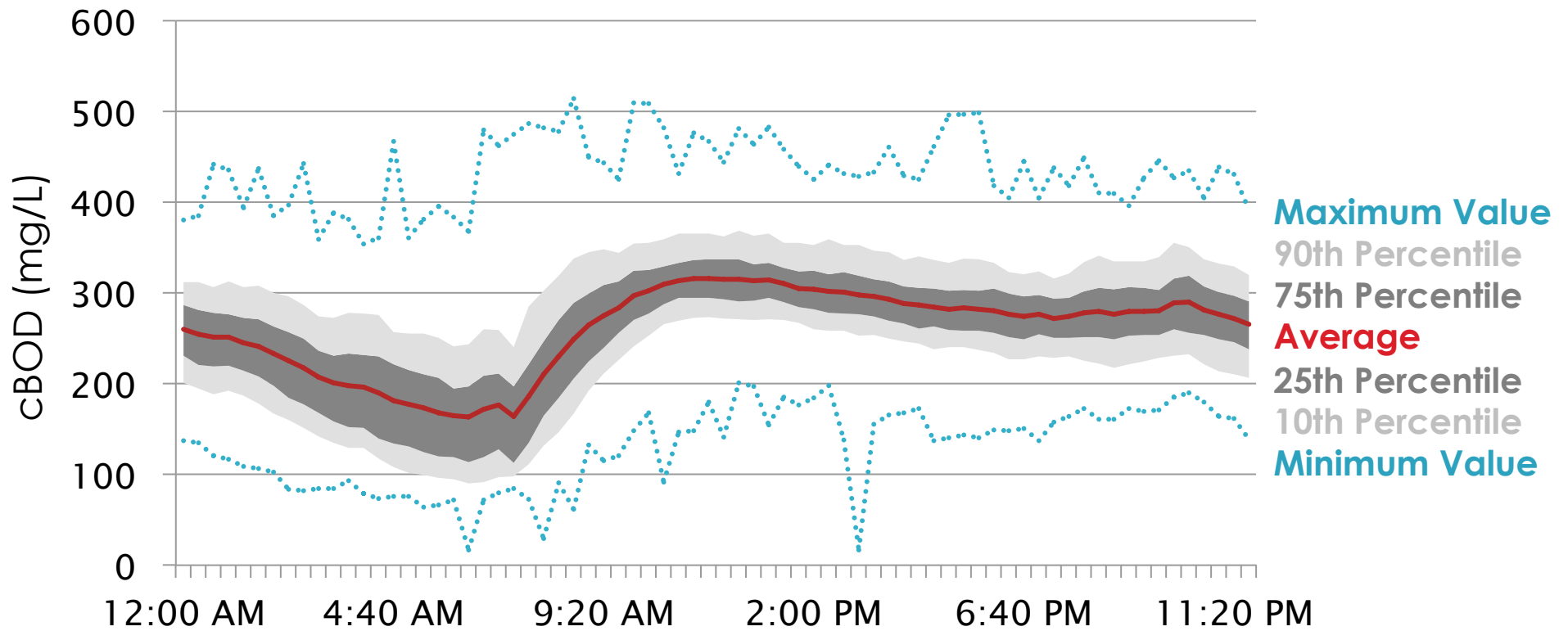
Diurnal Cycle – one year of data
213,642 cBOD readings



Diurnal Cycle – one year of data
213,642 cBOD readings

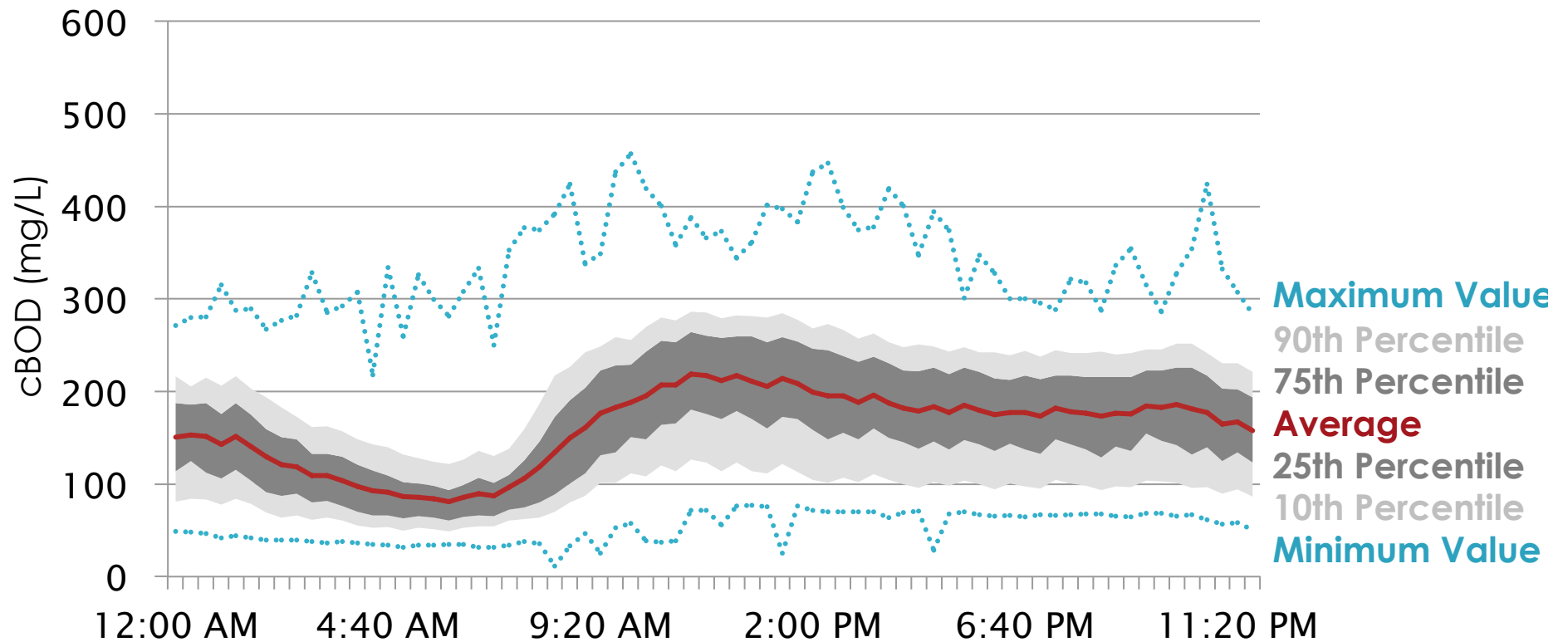


Diurnal Cycle – one year of data
213,642 cBOD readings



Summer Season – Diurnal Cycle – one year of data

106,525 cBOD readings

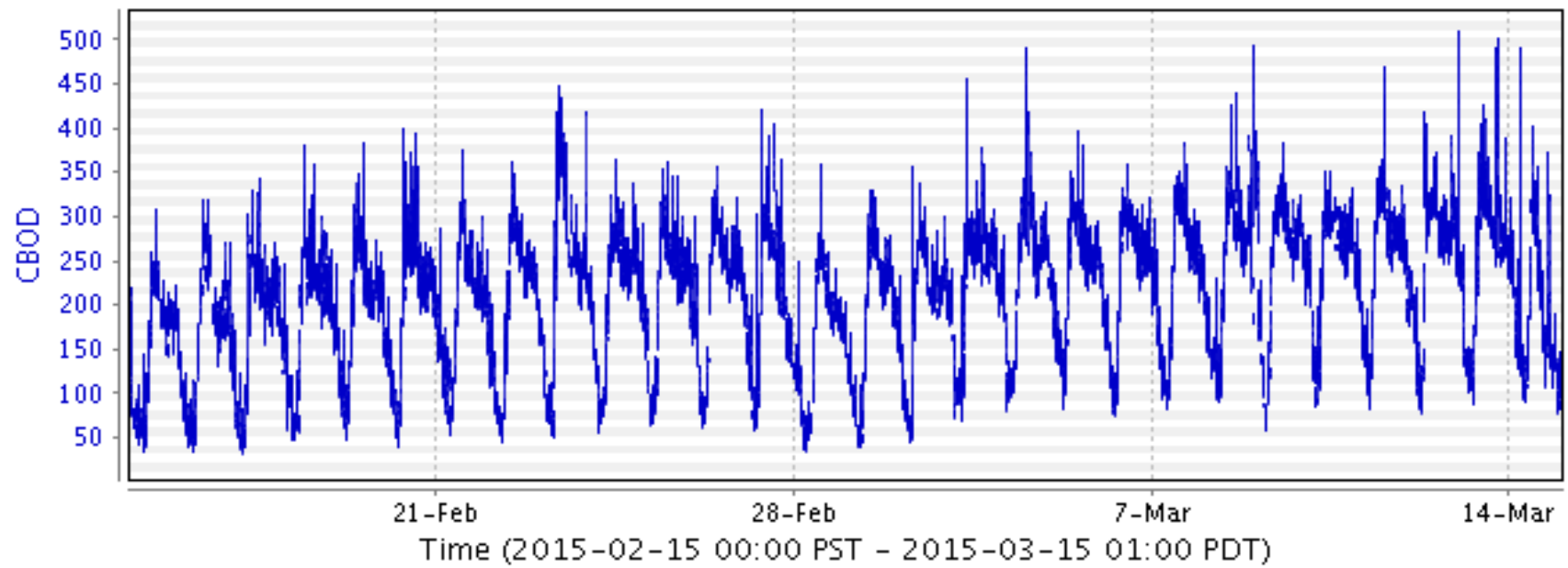


Winter Season – Diurnal Cycle – one year of data

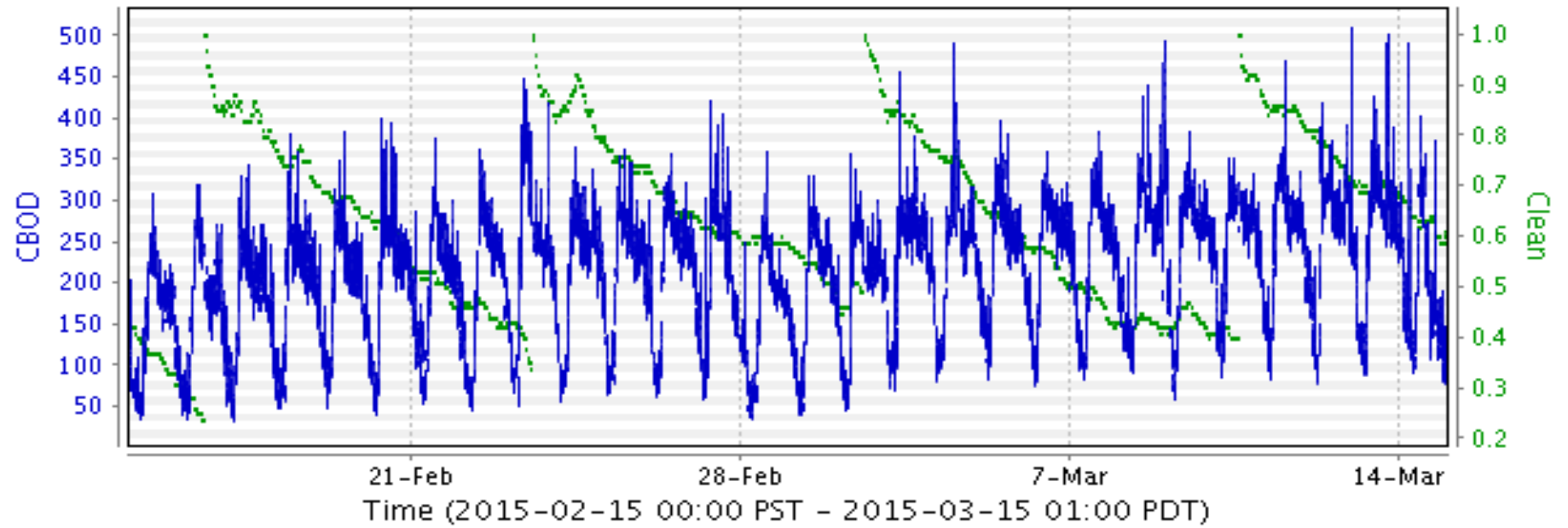
107,117 cBOD readings



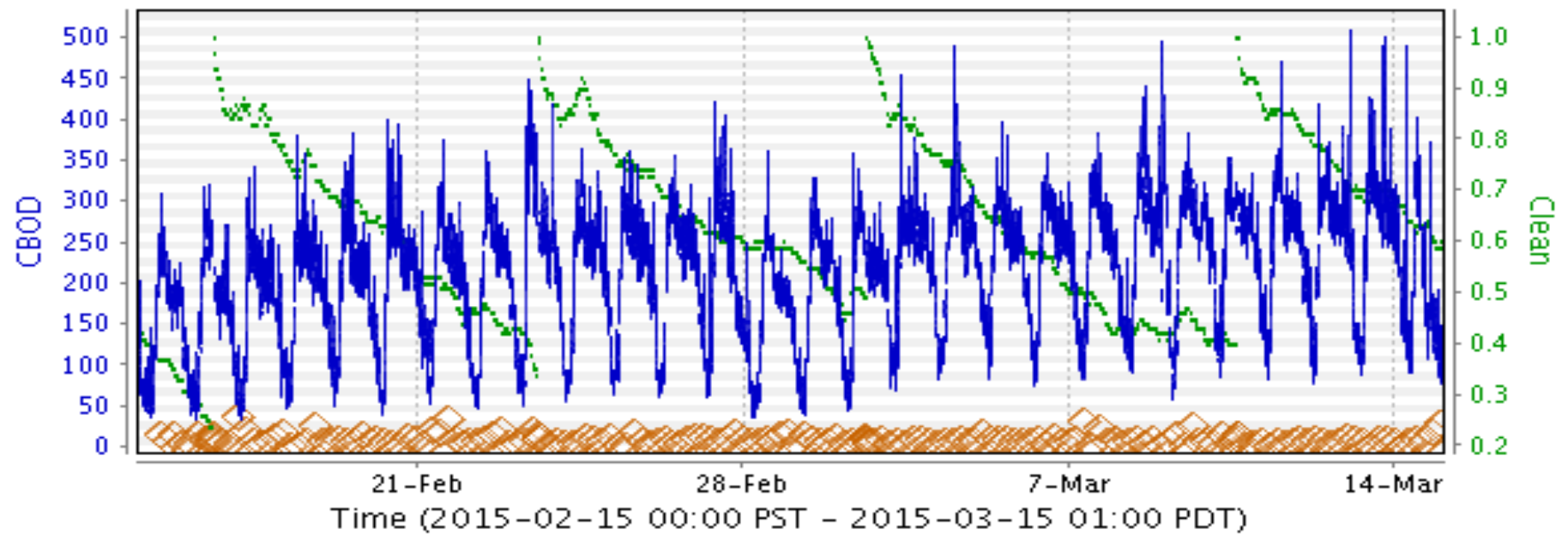
Instrument & Data Management



Liquid cBOD

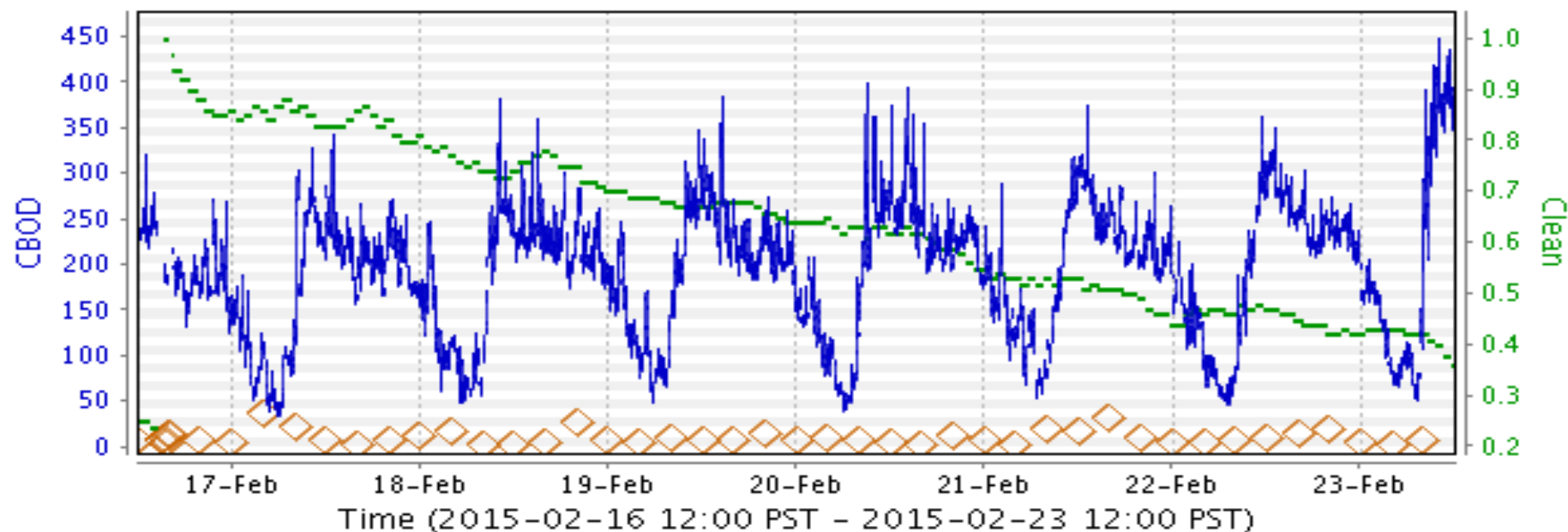


LiquidID cBOD – ‘Clean’ Parameter



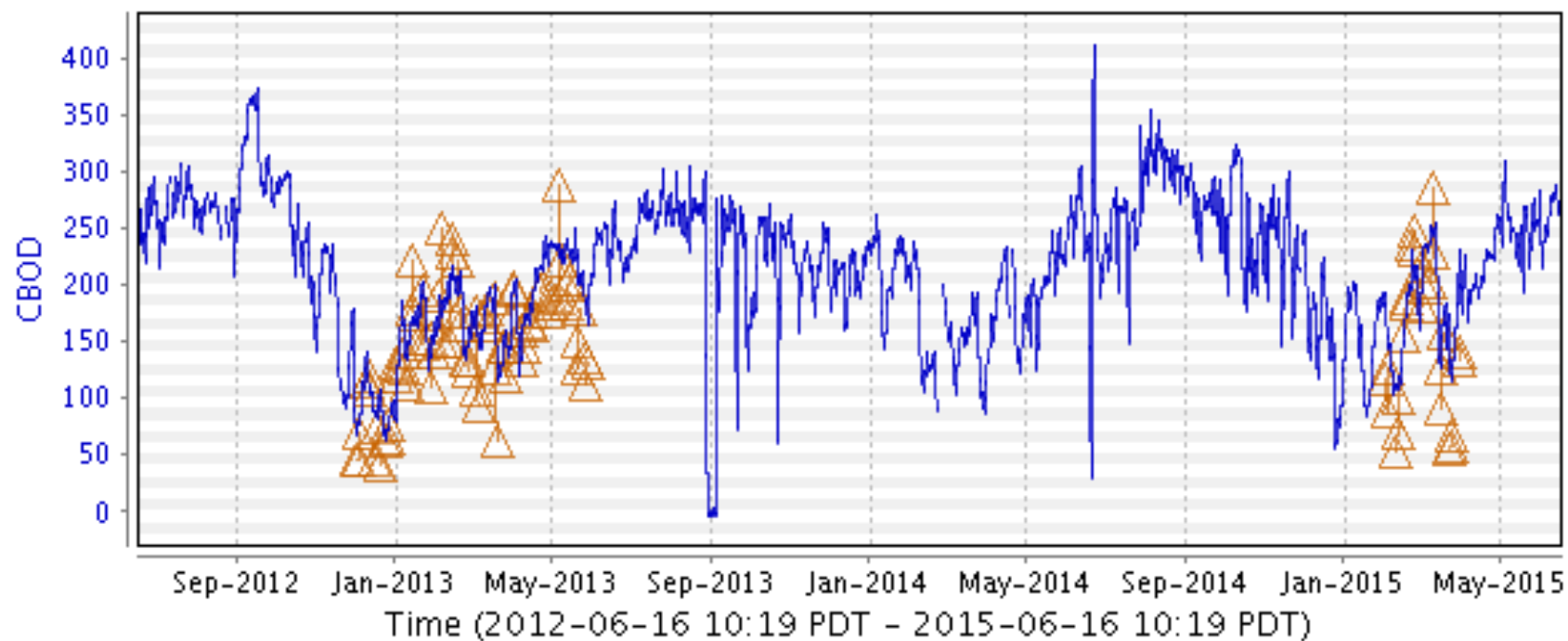
Liquid cBOD – ‘Clean’ Parameter – Automated Calibrations

Automated Processes	Total	Per Day
Days	28	
Automated Cleaning Cycles	877	31
Automated Calibration Checks (plotted)	189	7
cBOD Parameter Readings (plotted)	18,116	647
Manual Optics Cleans	4	



Liquid cBOD – ‘Clean’ Parameter – Automated Calibrations

Automated Processes	Total	Per Day
Days	7	
Automated Cleaning Cycles	219	31
Automated Calibration Checks (plotted)	47	7
cBOD Parameter Readings (plotted)	4,529	647
Manual Optics Cleans	1	



Technique

Report Type

of Days

of Real-time Readings

Average Value (mg/L)

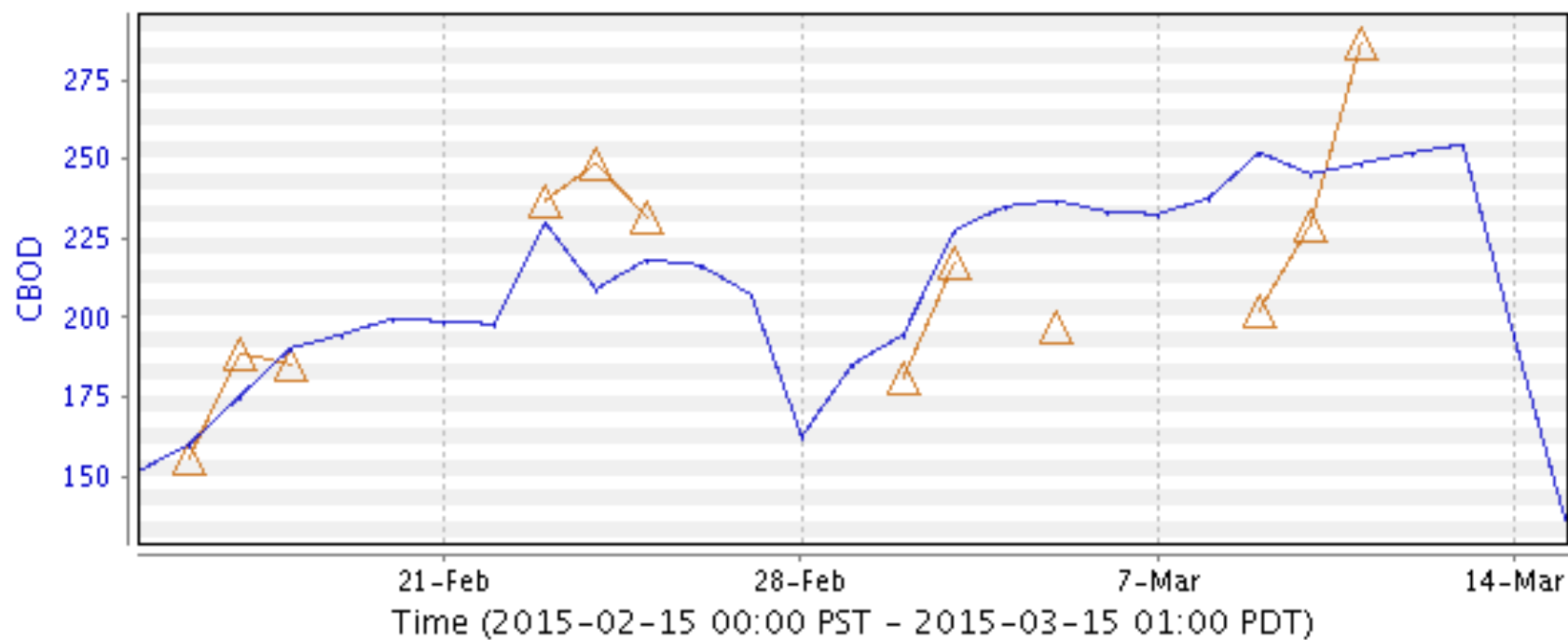
ZAPS Liquid

Daily average

1081 (99.5%)

677,244

215 mg/L



Technique

Report Type

of Days

of Real-time Readings

Average Value (mg/L)

Municipal Lab

Daily Composite

12 (43%)

N/A

213

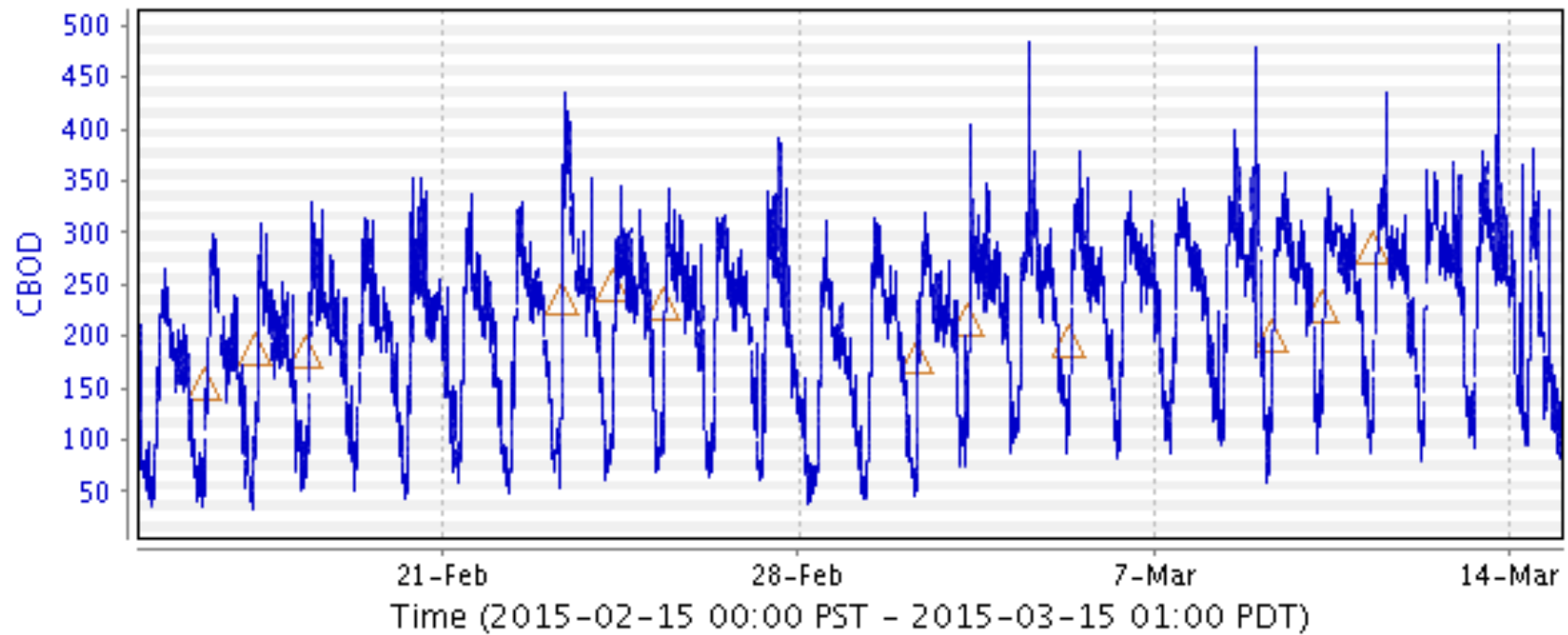
ZAPS LiquiD

Daily Average

28 (100%)

18,116

212



Technique

Report Type

of Days

of Real-time Readings

Average Value (mg/L)

Municipal Lab

Daily Composite

12 (43%)

N/A

213

ZAPS LiquiD

Real-time

28 (100%)

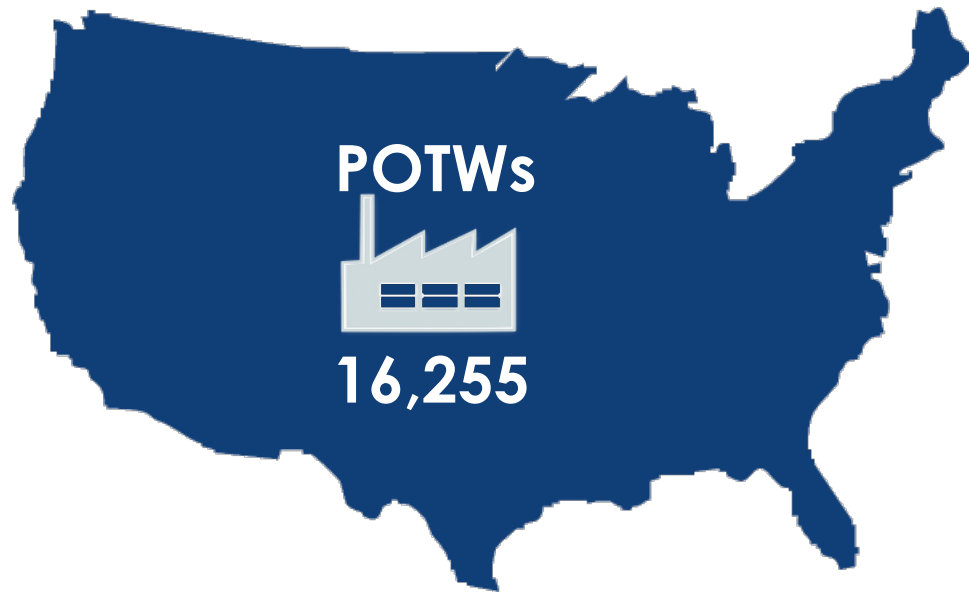
18,116

212

Annual BOD/cBOD Readings

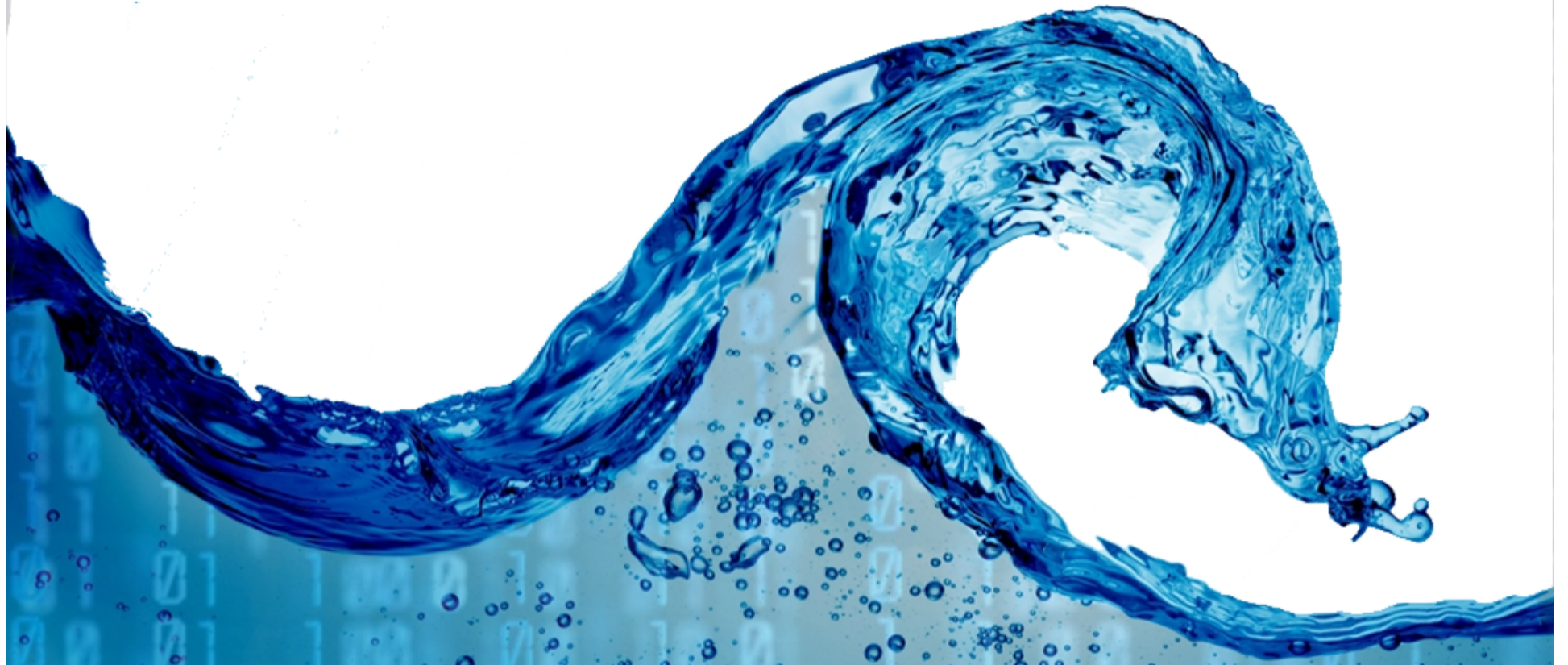


5,232,500



5,071,560

BIG DATA

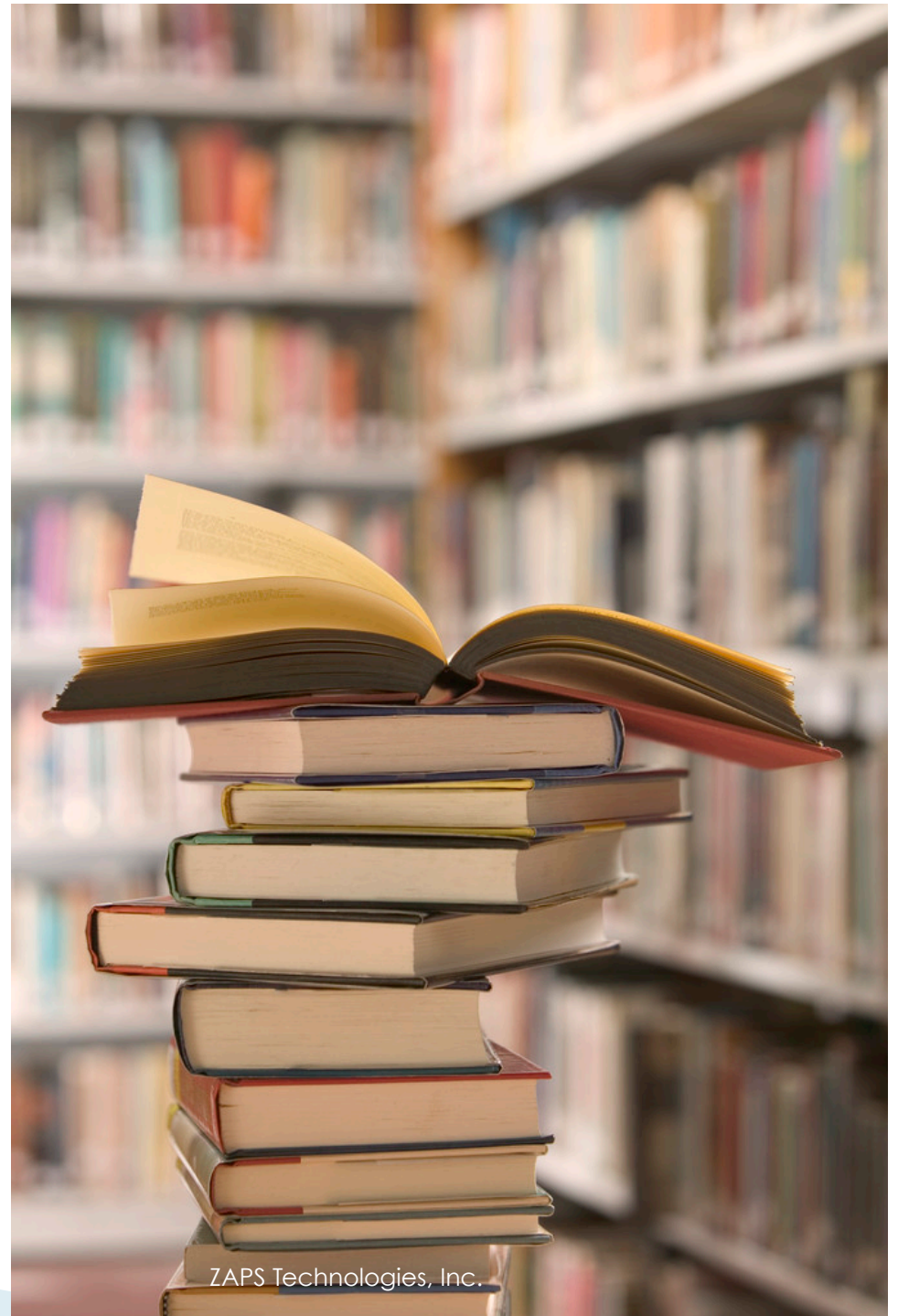


Enhanced View – Enhanced Monitoring

07/16/2015

ZAPS Technologies, Inc.

07/16/2015



ZAPS Technologies, Inc.

Online Real-time Monitoring



07/16/2015