SAMPLING & MEASUREMENT

FOR WW OPERATORS

Agenda

- Introduction
- Why We Sample
- Grab vs Composite
- Preservation
- pH & DO
- Proportional Sampling

WHY WE SAMPLE AND MEASURE

Got Permit?

Got Problems?

What and When We Sample & Measure

- TSS
- BOD
- Flow
- Nitrogen + Phosphorus
- Semi-Volatiles
- Volatiles
- Radionucleides
- Industrial sources

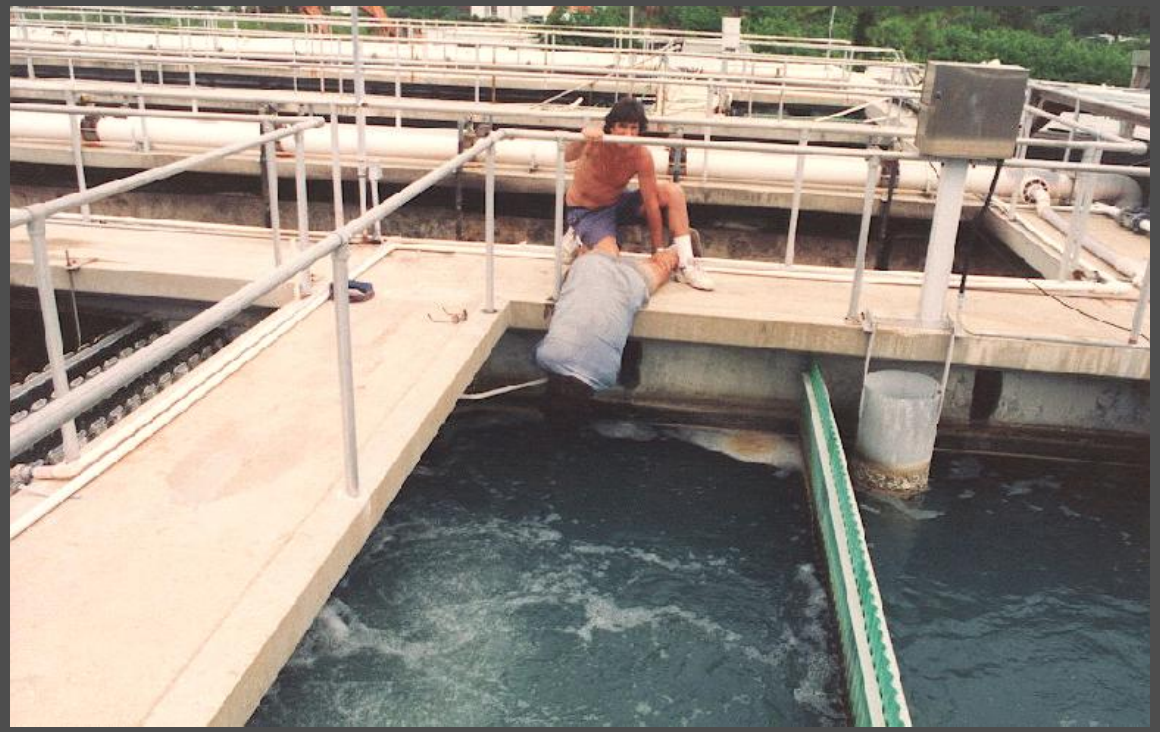
- Based on Permit
- Process Control
- Upset Conditions
- Suspected illicit activities
- Public Health
- High I/I

HOW WE SAMPLE & MEASURE

- GRAB
- COMPOSITE
- IN-SITU (IN PLACE)

GRAB SAMPLE - WHAT IT IS AND HOW TO DO IT

HOW NOT TO DO IT



Remember - the Aeration basin is a mixture of AIR and water.

Humans barely float in water and we don't fly in air.

QUESTIONS

COMPOSITE SAMPLING

Mixing a bunch of grab samples together

- Usually over a period of time
- Can be manual or automatic

EVALUATING AN AUTOMATIC SAMPLER

IN-SITU

In-situ means “in the original place”

This is more applicable to measurements than sampling

MEASUREMENTS (WHY DO YOU HAVE TO TAKE THEM?)

As inspectors we can't be everywhere.

- What is going into public waterbodies
- Capacity of water body

They help you run your facility better

- Preventative
- Diagnostic
- Therapeutic

PRESERVATION

Parameter	Type	Preservation	Holding Time
BOD_5	P/G	Cool, ≤6°C	48 hours
TSS	P/G	Cool, ≤6°C	7 days
Nutrients	P/G	Cool, ≤6°C, H_2SO_4 to pH<2	28 days
Metals	P/G	HNO_3 to pH<2	6 months
Fecal Coli.	P/G	Cool, <10°C, 0.0008% $Na_2S_2O_3$	8 hours
pH	P/G	none	15 minutes
Diss. Oxygen	P/G	none	15 minutes
Res. Chlorine	P/G	none	15 minutes
Oil / Grease	Wide Mouth Glass with Teflon lined lid	HCL or H_2SO_4 pH<2	**28 days**

PRACTICAL

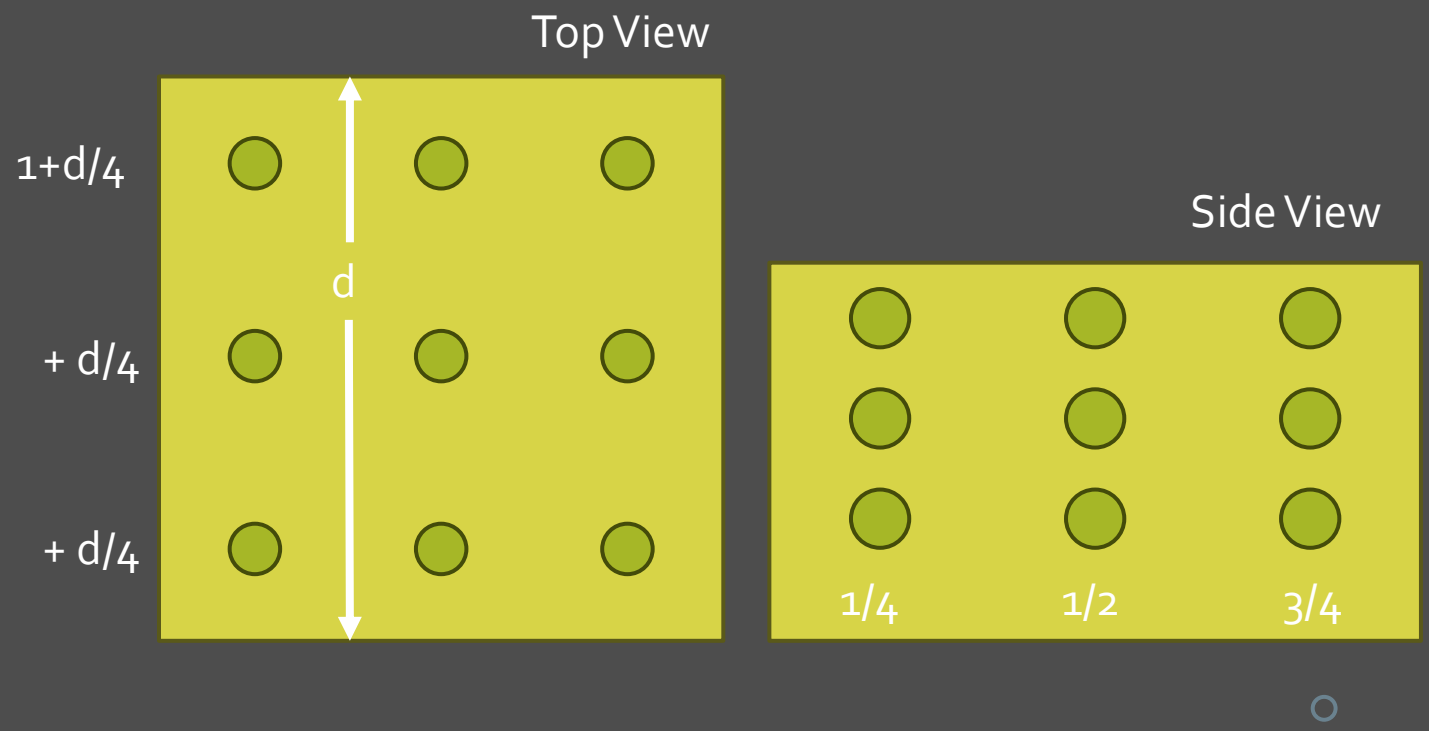
DO CALIBRATION

DO PROFILE

This is a practical diagnostic tool to identify problems inside different tanks.

The idea is to get readings at evenly spaced intervals. Then compare these readings against our expectations or desires

Then adjust the process and measure again. Repeat until the desired outcome is met



PH CALIBRATION

FLOW VS TIME COMPOSITING

We use Flow Proportioned Based sampling (automatic or not) when you have

- varying flow volumes or
- Varying effluent content

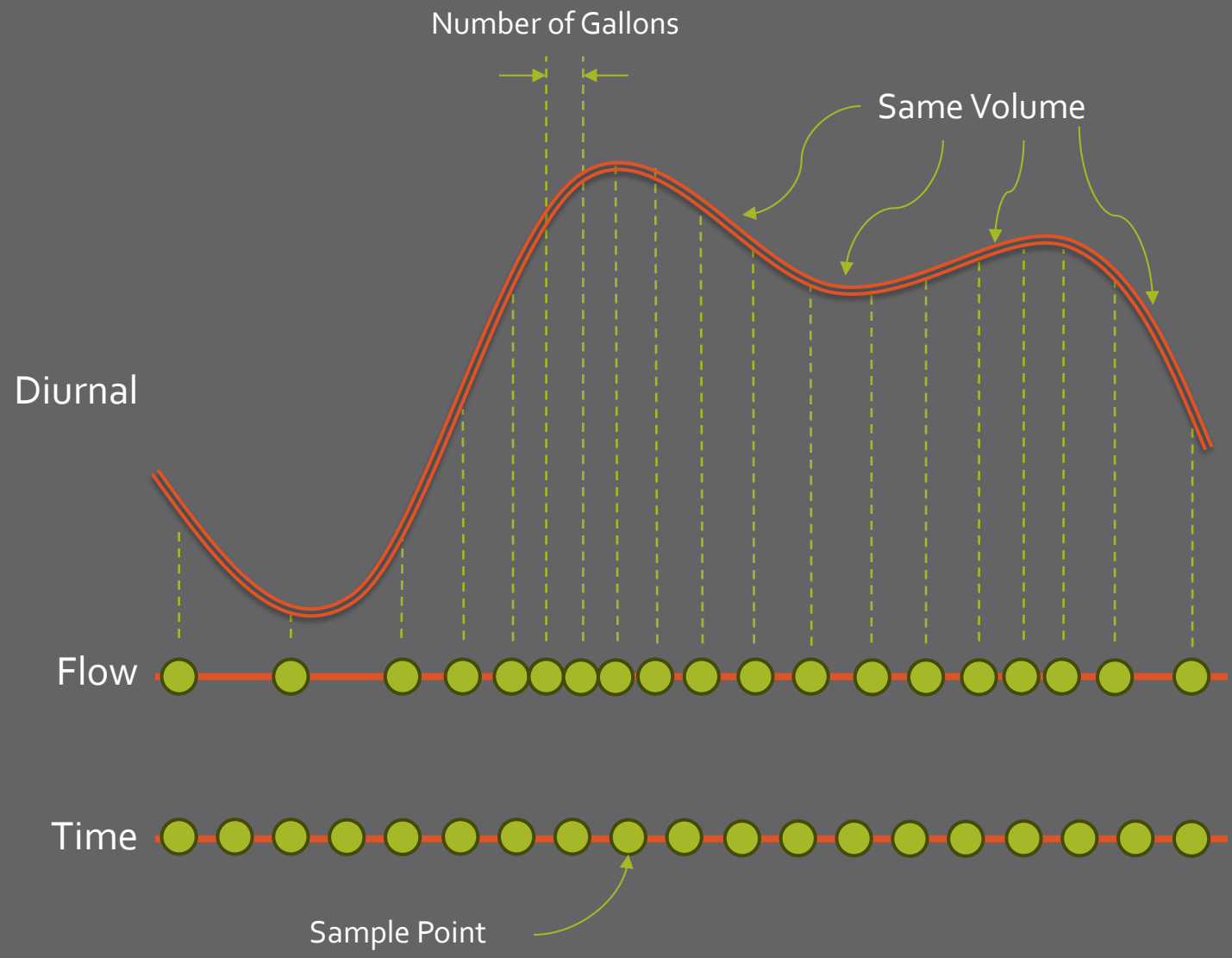
We use time proportioned sampling when

- things are stable
- identify substances based on time

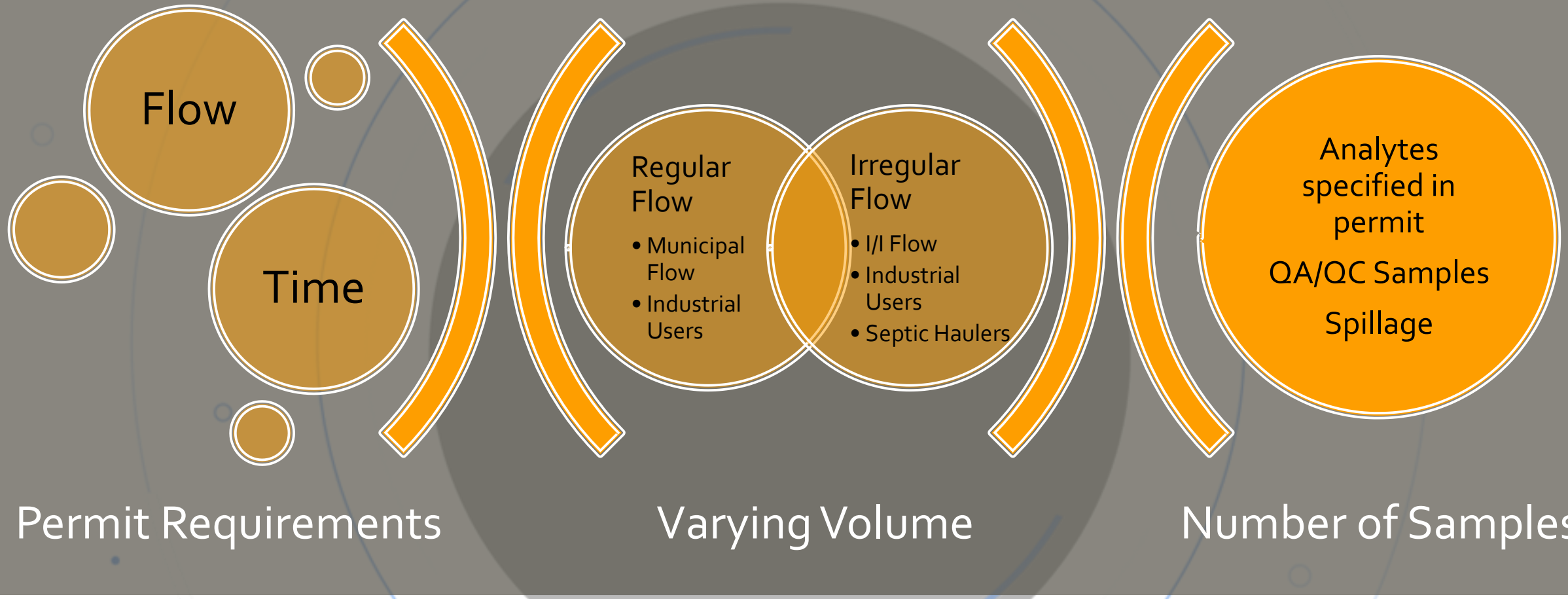
FLOW V. TIME

The intention with flow is to make the area under the curve in each section the same volume

Note the same number of samples between Time and Flow



THINGS TO CONSIDER



HOW TO CALCULATE TIME BASED COMPOSITE SAMPLING

- Define the required sample volume - Based on permit / lab requirements
- Know your sample container size (2.5 gallon; 9400mL / 4 gallon;15,000mL)
- ASK YOURSELF - Is my sample container big enough for all my samples?
- Determine sample aliquot by dividing sample container size by
  - 96 for a sample every 15 min
  - 48 for a sample ever 30 min
  - 24 for a sample every hour
- ASK YOURSELF – Is my sample aliquot larger than 105mL? If yes you are good to go! If no, get a larger sample container or increase sample interval so there are less samples.

Predictive Method

- Estimated volume of flow
- Risk not getting the needed volume of sample
- Risk not covering your sample period
- Work post sample collection period is reduced

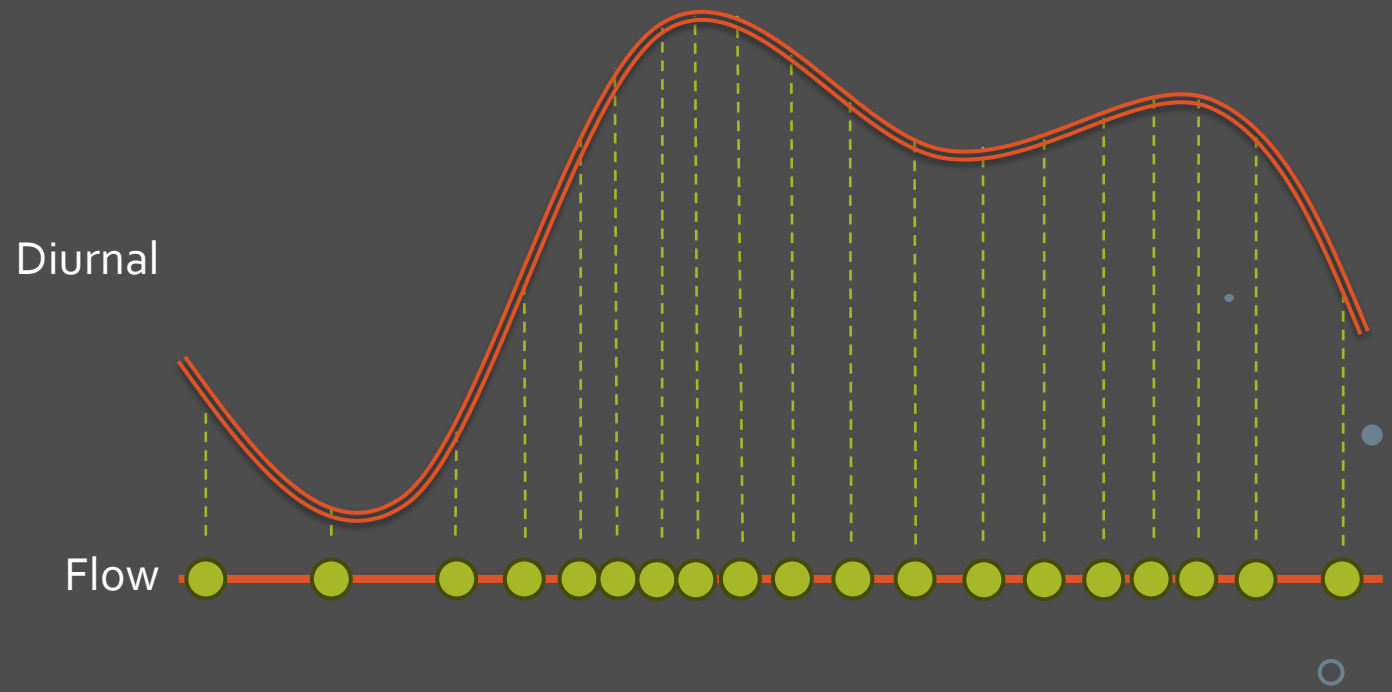
Reactive Method

- Measured volume of flow
- No risk getting enough sample
- No risk covering sample period
- Work post sample collection period is increased

PREDICTIVE FLOW COMPOSITE

Identify the expected flow for the time frame you are compositing

Divide the flow by the number of aliquots you need to take being careful to not overfill your container



PREDICTIVE FLOW COMPOSITE EXAMPLE

- Anticipated flow, Q, over the next 24 hours is 11.4 MGD
- Need a total of 4L (1L for TSS, 1L for BOD, 1L for Metals, 1L for N+P). Will collect 4.5L (4,500mL) to account for spillage
- Container size is 2.5 gal (9.4L, 9400mL)
- 1 sample every 30 min = 48 samples

$$\frac{9{,}000ml}{48\ samples} = 187.5\frac{ml}{sample}$$

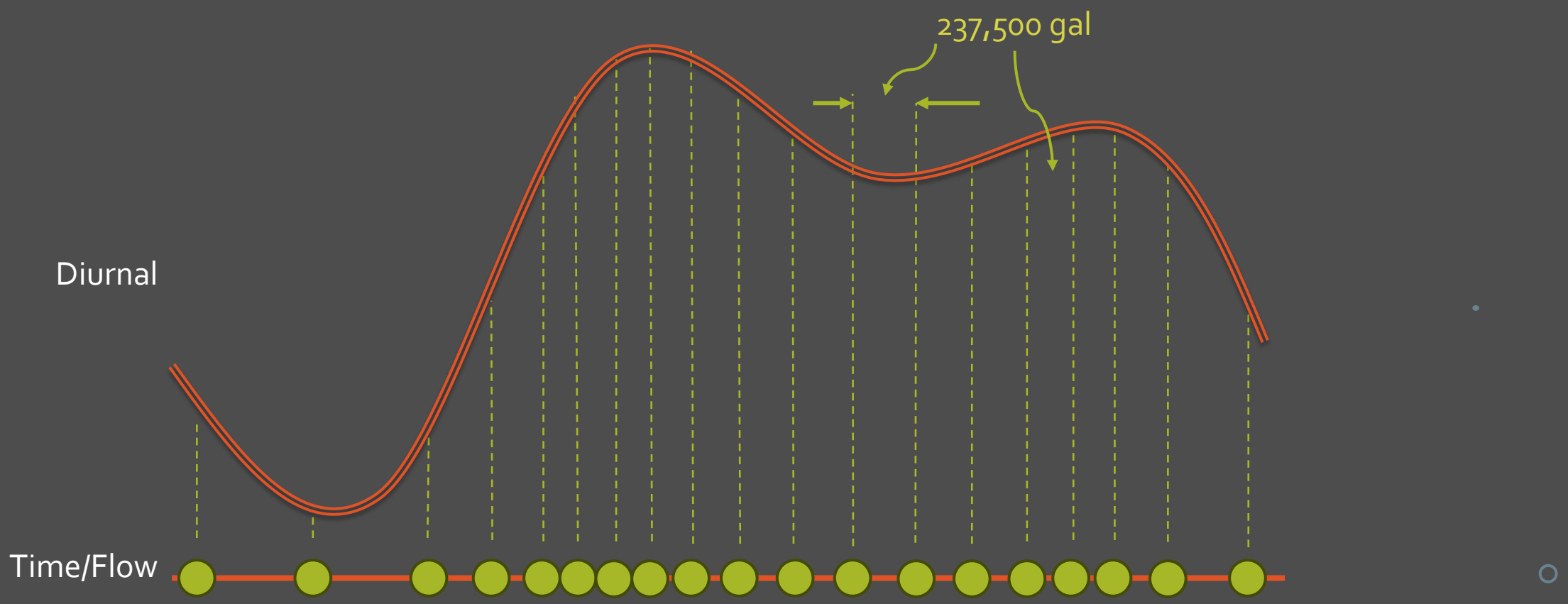
More than 4,500

Minimum of 105

- Figure out how much flow passes for each sample, Q_s

$$Q_s = \frac{11{,}400{,}000\ Gal}{48\ samples} = 237{,}500\ \frac{gal}{sample}$$

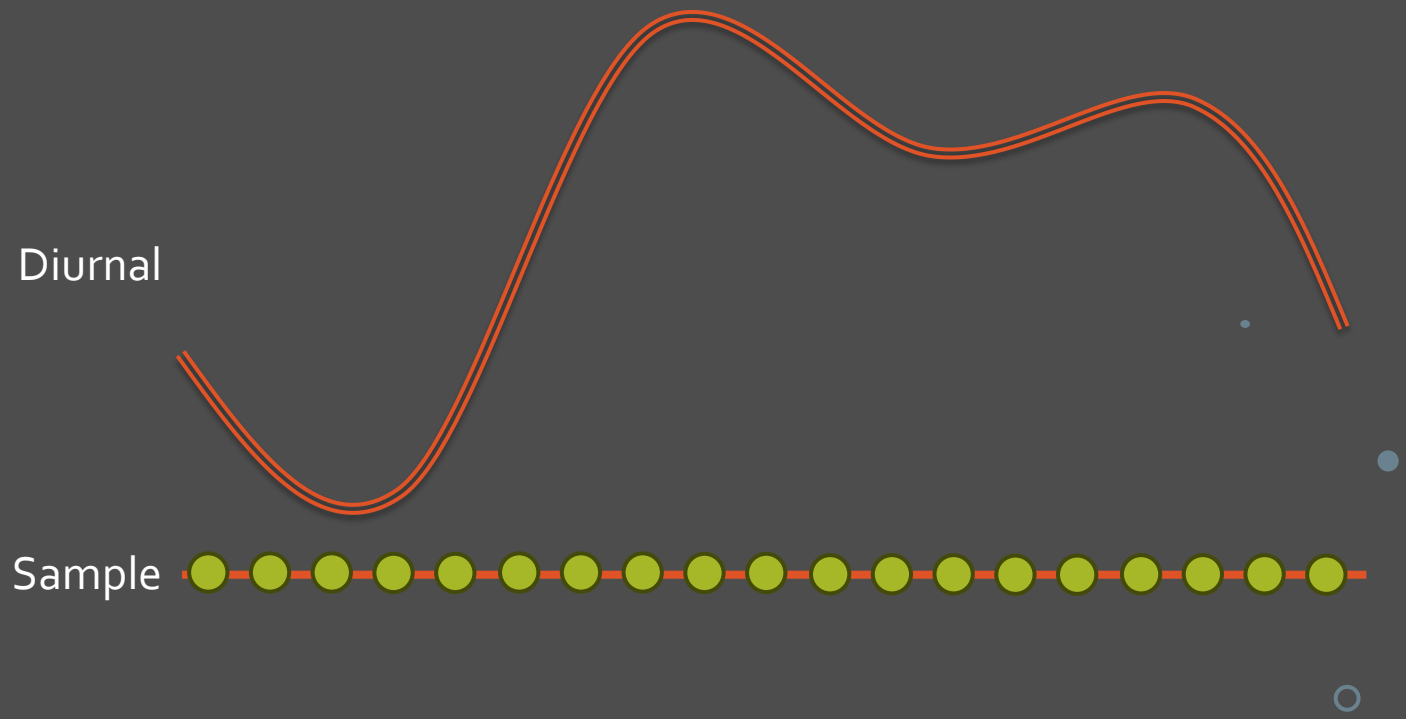
PREDICTIVE FLOW COMPOSITE (CONT'D)



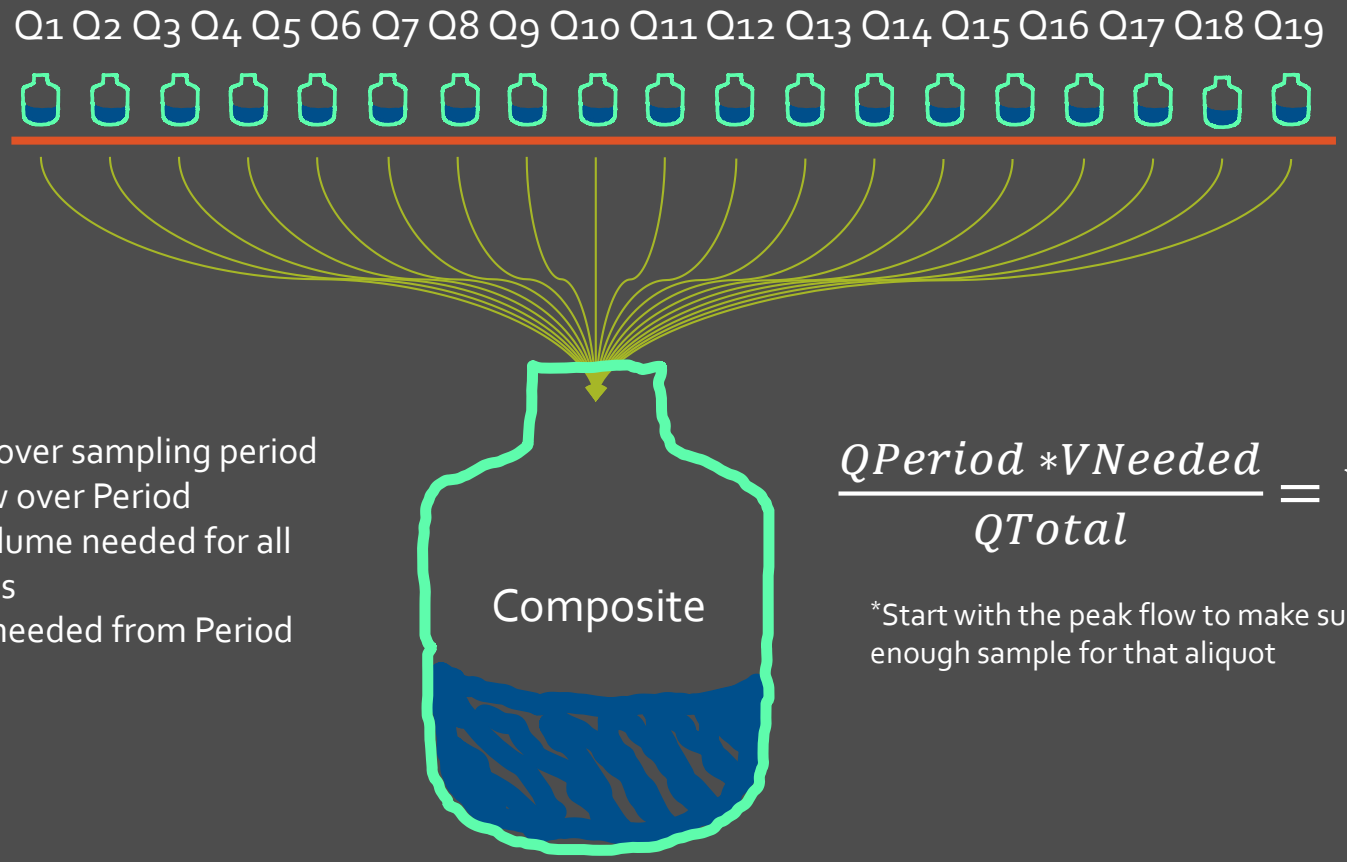
REACTIVE FLOW COMPOSITE

Reset the flow meter at the start of the sampling period. We need to know the exact amount of flow is going through the sampling point PER HOUR

The sampler will have individual bottles for each sample.



REACTIVE FLOW COMPOSITE (CONT'D)



QTotal = Total flow over sampling period
QPeriod = Total flow over Period
VNeeded = Total volume needed for all samples
VAliquot = Volume needed from Period

$$\frac{QPeriod * VNeeded}{QTotal} = VAliquot^{*}$$

*Start with the peak flow to make sure that you have enough sample for that aliquot

REACTIVE FLOW COMPOSITE EXAMPLE

Flow Profile or sampling period

6am	7	8	9	10	11	12pm	1	2	3	4	5
0.2MGD	0.4	0.6	1.0	1.2	1.4	1.5	1.2	1.0	1.0	1.0	0.9
79mL	158	237	395	474	553	592	474	395	395	395	355

Total Flow = 11.4MGD
Volume Needed – 4,500mL

Start with your largest time!

Repeat this for every time
Total volume composited = 4,502mL

- < 9,400mL Container
- > 4,500mL needed for analysis

$$\frac{1.5\ MGD\ x\ 4{,}500mL}{11.4\ MGD} = 592\text{mL}$$

Less than 1L bottle size

QUESTIONS