

# Quality Assurance and Quality Control



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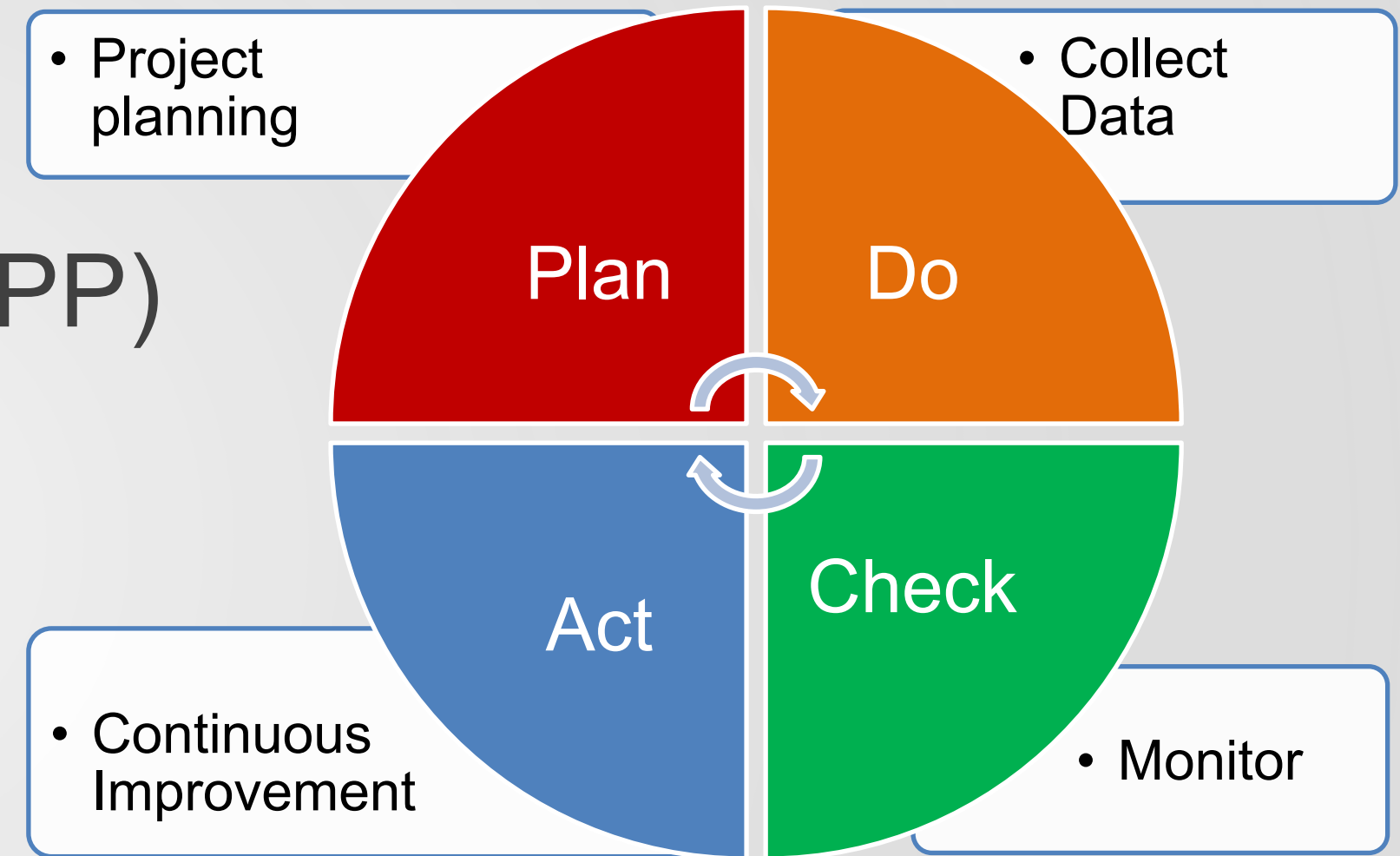
# Overview of Quality Assurance

- What is quality assurance?
  - An integrated system of management activities
  - Prevention-based
- What is quality control
  - An overall system of technical activities
  - Detection-based




# Quality Assurance Components

- Project Plans
- Quality Assurance Project Plans (QAPP)
  - Standard Operating Procedures
  - Data Quality Objectives
  - Data Management Processes
  - Quality Control Requirements
  - Data Review and Validation Procedures
  - Data Analysis Techniques



# Quality Control Components


- Calibration and maintenance records
- Field Sheets
- Training records
- Checklists
- Consumables records
- Issue logs
- Data flagging



Pre-Measurement Calibration

Water Quality Instrument Form

California Department of Water Resources



Instrument ID: \_\_\_\_\_

Discrete: ☐ Real Time: ☐ Performed by (Last Name): \_\_\_\_\_ Date of Calibration: \_\_\_\_\_

Site/Run to be used on: \_\_\_\_\_ Time of Calibration (PST): \_\_\_\_\_

Attachment(s)? ☐ \_\_\_\_\_

Verification Instruments	
NIST Thermometer S/N	
Therm. Cal. Due Date	/ /
Turbidimeter S/N	
Turbidmeter Cal. Due Date	/ /
Barometer S/N	
Barometer Cal. Due Date	/ /

Calibration Standards	Lot #	Expiration Date
Turbidity Std.		
Conductance Std.		
Additional Std.		
7 pH Std.		
4 pH Std.		
10 pH Std.		

Calibration (to be completed within 72 hours before measurement)

Followed standard operating procedures version: \_\_\_\_\_

\* Use pH Standard vs. Temperature Table or calculator

\*\*DO %Sat = Local barometric pressure / 7.6

\*\*\*Use Dissolved Oxygen Lookup Table (DOLT) or calculator

Parameter	Standard	Pre-Cal	Post-Cal	Additional Info.	Passing Criteria
Specific Conductance (µS/cm) Dry	0				< 2 µS/cm
Temperature (°C) in Water	NIST Thermometer				≤ ± 0.20 °C
Chlorophyll (RFU) in DIW	0.00				< 0.10 RFU
Chlorophyll (µg/L) in DIW	0.00				< 0.10 µg/L
Blue Green Algae (RFU) in DIW	0.00				< 0.10 RFU
Blue Green Algae (µg/L) in DIW	0.00				< 0.10 µg/L
Turbidity (FNU) in DIW - Low	0.0				≤ ± 0.5 FNU
Turbidity (FNU) in Std - High					≤ ± 5%
Specific Conductance (µS/cm) in Std				Cell Constant:	≤ ± 3%
7 pH (units)	*			mV	≤ ± 0.2 units
4 pH (units)	*			mV	≤ ± 0.2 units
10 pH (units)	*			mV	≤ ± 0.2 units
Dissolved Oxygen (%sat)	**			Baro. Pres. (mmHg):	≤ ± 5%
Dissolved Oxygen (mg/L)	***			Temp. (°C) in bucket:	≤ ± 0.3 mg/L
Dissolved Oxygen (Gain)			ODO Gain	0.87-1.25 range ideal	n/a

Delta slope (pH 7 mV - pH 10 mV): \_\_\_\_\_ [Ideal range 160-180 mV, replace module if slope ≤ 155 mV]

1. Calibrate depth to 0 feet: ☐ 2. Verify sufficient battery voltage for use: ☐

Comments: \_\_\_\_\_

Wiper activated during calibration: ☐



# QC Examples for Different Data Types

- Discrete Water Quality
  - Field and lab QC data checks
  - Total/dissolved constituent pairs
- Real Time Water Quality
  - Calibration and fouling error
- Biological
  - Verification of species identification
  - Verification of measurements (e.g., fork length)
- Environmental
  - Secondary verification

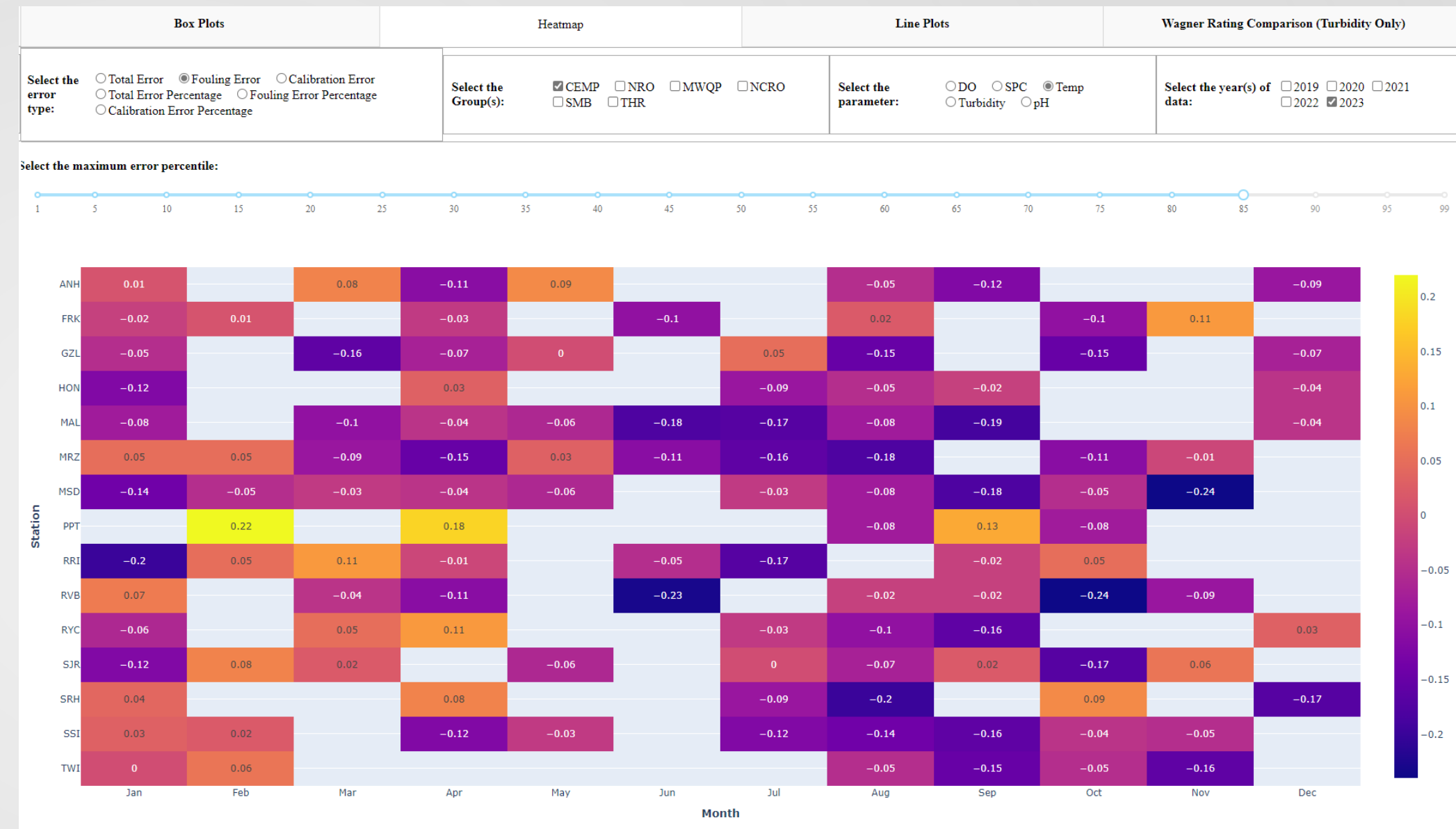


Ron Ballanti



# Data Management QC Examples

- Field sheet completeness checks
- Manual QC vs double data entry
- Electronic data checks
- Data visualization
- Statistical tools for outlier detection
- Data Qualifiers



# Resources available

- IEP DUWG website: <https://iep.ca.gov/Data/Data-Utilization-Working-Group>
  - Fish QC Best Practices
  - Digital Datasheet Best Practices
  - Standard Operating Procedures Template
  - Metadata templates
- DWR Outlier Detection Working Group GitHub: <https://github.com/ODWG/ODWGtools>
  - R package tasks associated with outlier detection





# Resources available Cont'd

- DWR Resources accessible on Box:  
<https://cadwr.box.com/s/2k4s7dp80dle08wv8aecd8fpub3u76d8>
  - QAPP Template
  - Outlier Detection Best Practices
  - Discrete Water Quality Data Review Best Practices
  - Lab QC Data Review Best Practices





# Questions?

Please reach out!

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