



Comparing Apples to Apples: The Importance of a Primary Quality Assurance Organization from EPA's Perspective

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Overview – 3 PQAO presentations

- From broad to specific:



- EPA



- ARB

- Mojave Desert Air Quality Management District

Overview - This presentation

- PQAO basics
 - What is a PQAO and why does it matter?
 - 5 common factors
- Requirements every PQAO must meet
- Types of PQAO structures
- What kinds of issues does EPA see that a PQAO addresses?
- ARB PQAO Activities

Back in the old days...

Reporting Organization?

? If someone else's lab is reporting your data ?

?

? If you report your data, but you rely on the ARB network to meet quality assurance requirements ?

Back in the old days...

Primary Quality Assurance
Organization (PQAO)

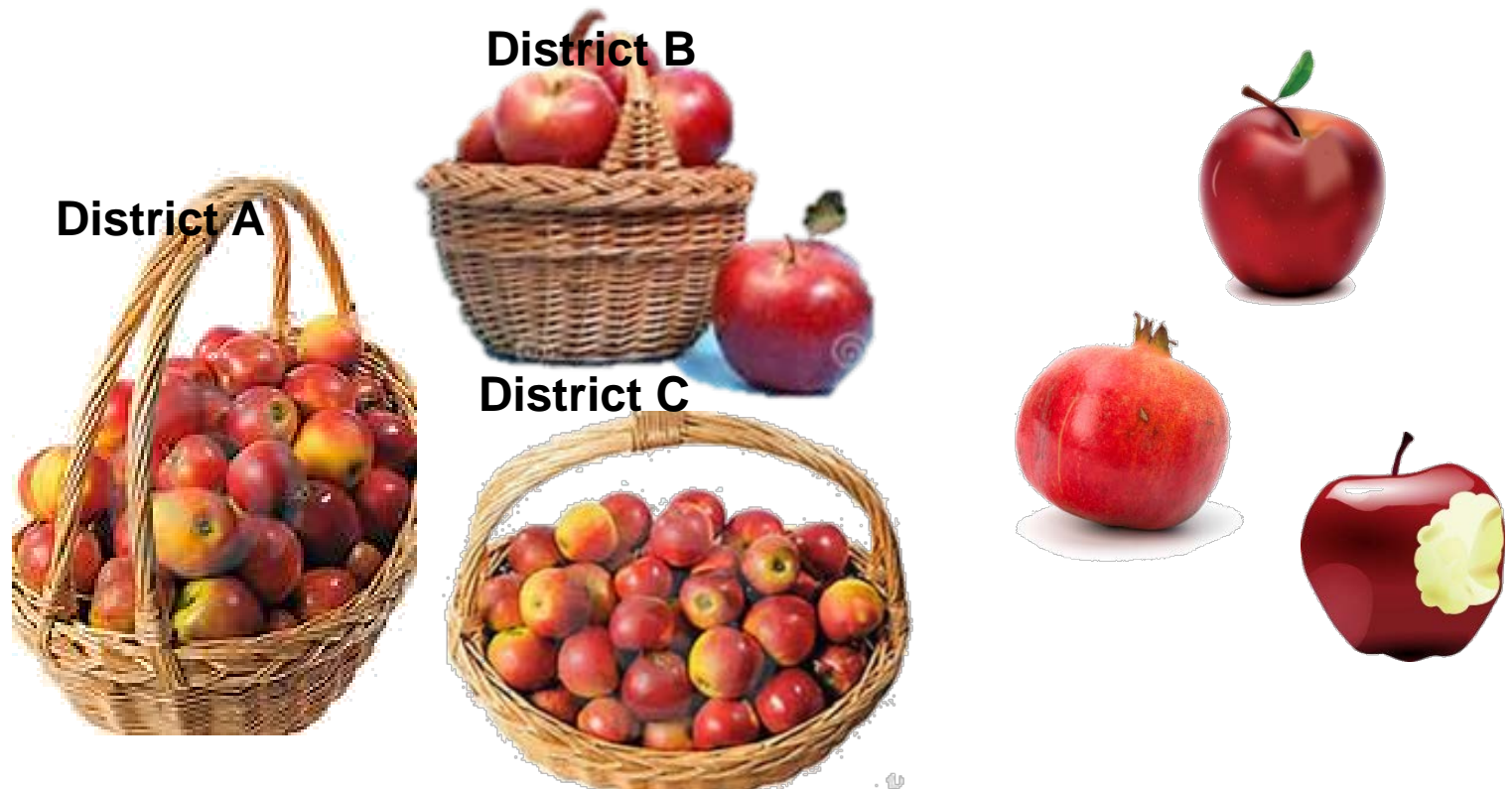
...data, but you rely on the ARB
to meet quality assurance requirements ?

What is a PQAO and why does it matter?

“A monitoring organization or a coordinated aggregation of such organizations that is responsible for a set of stations that monitors the same pollutant(s) and for which data quality assessments can logically be pooled.” – 40 CFR 58.1 and Appendix A

What is a PQAO and why does it matter?

Ensure consistent, high quality, defensible data.







5 Common Factors of a PQAO



What Requirements do PQAOs Need to Meet?

- Independent standards and audits 
- Collocated monitoring
- Performance monitoring programs: NPAP & PEP
- Personnel that are independent from the site operator to conduct independent reviews of the data 
- Consistency of field operators through trainings
- Quality Management Documents: QAPPs, SOPs, QMPs

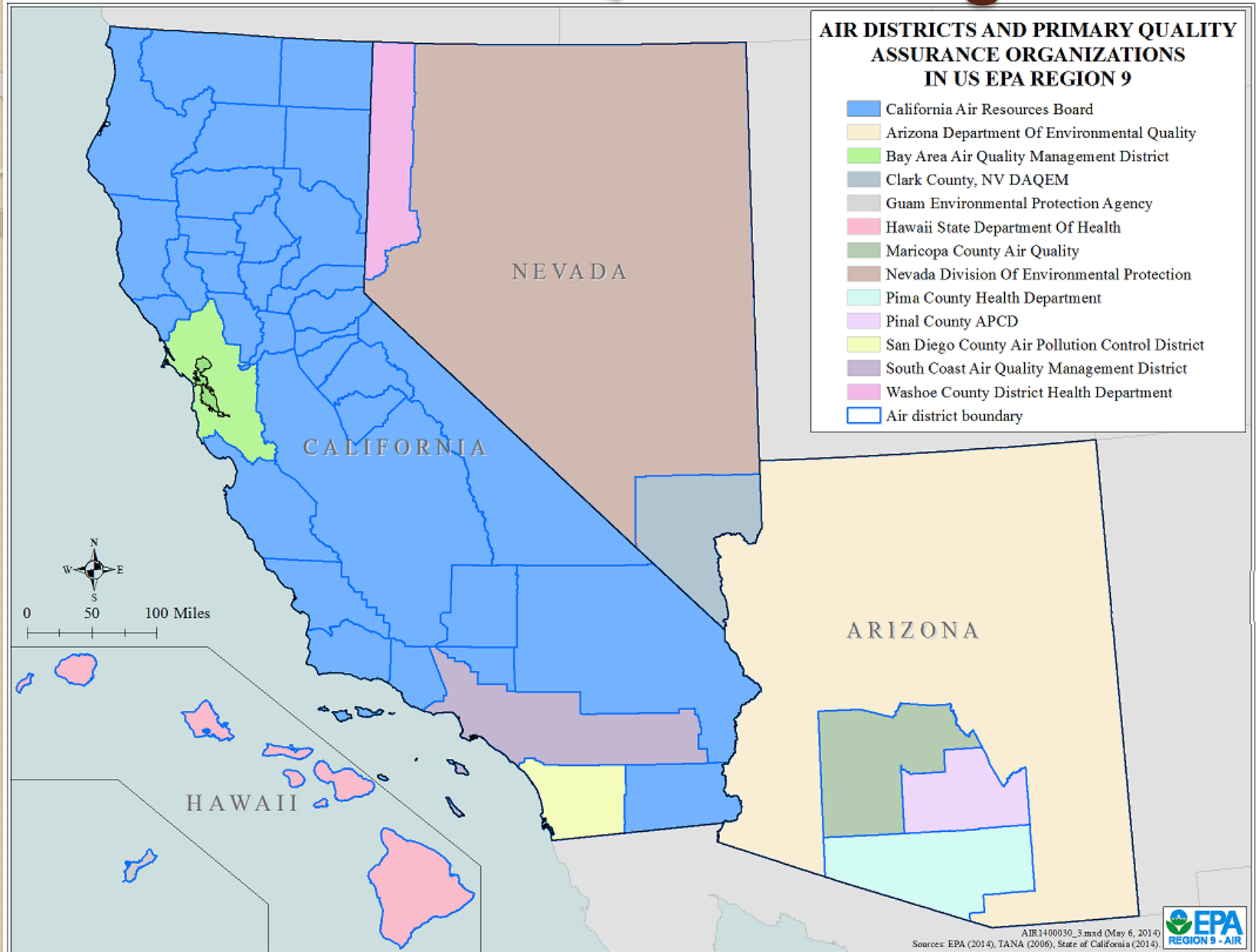


Types of PQAOs



1. Multi-agency PQAOs
2. Single-agency PQAOs
3. Remain outside the PQAO structure – only an option for non-regulatory data that is not submitted to AQS.
 - Some Tribes


State & Local PQAOs in Region 9



Examples outside of R9

- Multi agency – Florida PQAO
 - 6 state districts
 - 1 office
 - 8 local programs
 - A few private contractors
- Maine PQAO
 - State and 3 tribes
- Kentucky PQAO
 - State and 1 local agency





Question: Can I collect data for comparison to a Federal Standard and **not** be part of a PQAO?

-- **No!**

Question: Is it easy to become a PQAO?

-- **Must meet a number of requirements, and get EPA approval.**

What happens if things do not go right?



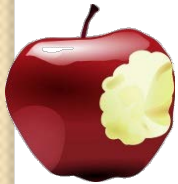
Areas have had to keep rules about emissions controls and permit fees longer.



Emission controls that may be needed to protect the public have been delayed.



Additional work is necessary to try to address missing data.



Harder to respond to public inquiries.



So...What kind of data issues are we talking about?

Example A: Inappropriate change in sampling frequency resulting in “make-up” samples.

| | |
|----|------|
| 12 | 3.4 |
| 13 | BJ |
| 14 | 16.5 |
| 15 | |
| 16 | 6.9 |
| 17 | |
| 18 | 8.2 |
| 19 | BJ |
| 20 | 7.0 |
| 21 | |
| 22 | 11.4 |
| 23 | |
| 24 | |
| 25 | 8.9 |
| 26 | |
| 27 | 10.7 |
| 28 | BJ |
| 29 | 9.9 |

Example B: Invalidated data occurring over several months, during high PM_{2.5} season

| Day | JANUARY | FEBRUARY | MARCH | APRIL | MAY | JUNE |
|-----|---------|----------|-------|-------|--------|------|
| 1 | AF | | | 11.2 | 4.9 | |
| 2 | | | AN | | | |
| 3 | | 23.4 | | | | 3.0 |
| 4 | AN | | | 6.0 | 7.7 IT | |
| 5 | | | AF | | | |
| 6 | | 25.6 | AG | | | 4.2 |
| 7 | AN | | | 3.4 | 5.4 | |
| 8 | 28.2 | | 5.7 | | | |
| 9 | 19.8 | 20.4 | | | | 4.0 |
| 10 | | | | 7.8 | 4.4 | |
| 11 | | | 15.6 | | | |
| 12 | | AN | | | | 4.6 |
| 13 | AN | | 21.5 | 6.8 | 3.5 | |
| 14 | | | | | | |
| 15 | | AG | | | | 3.2 |
| 16 | AF | | | 9.2 | 3.6 | |
| 17 | | | 16.6 | | | |
| 18 | | AN | | | | 2.9 |
| 19 | AF | | | 11.6 | 5.1 | |
| 20 | | | 2.0 | | | |
| 21 | | AN | | | | 4.8 |
| 22 | AF | | | 10.8 | 3.9 | |
| 23 | | | 12.5 | | | |
| 24 | | AN | | | | 1.0 |
| 25 | AF | | | 6.4 | 4.9 | |
| 26 | 20.6 | | 17.5 | | | |
| 27 | | AN | | | | 3.0 |
| 28 | 25.6 | | | 5.7 | 2.7 | |
| 29 | | | 7.8 | | | |
| 30 | | | | | | 3.9 |
| 31 | 29.0 | | | | 2.9 | |

Example B: Invalidated data occurring over several months, during high PM_{2.5} season

| Day | JANUARY | FEBRUARY |
|-----|---------|----------|
| 1 | AF | |
| 2 | | |
| 3 | | 23.4 |
| 4 | AN | |
| 5 | | |
| 6 | | 25.6 |
| 7 | AN | |
| 8 | 28.2 | |
| 9 | | 20.4 |
| 10 | 19.8 | |
| 11 | | |
| 12 | | AN |
| 13 | AN | |
| 14 | | |
| 15 | | AG |
| 16 | AF | |
| 17 | | |

Example B: Invalidated data occurring over several months, during high PM_{2.5} season

Months 1-6

| Day | JANUARY | FEBRUARY | MARCH | APRIL | MAY | JUNE |
|-----|---------|----------|-------|-------|--------|------|
| 1 | AF | | | 11.2 | 4.9 | |
| 2 | | | AN | | | |
| 3 | | 23.4 | | | | 3.0 |
| 4 | AN | | | 6.0 | 7.7 IT | |
| 5 | | | AF | | | |
| 6 | | 25.6 | AG | | | 4.2 |
| 7 | AN | | | 3.4 | 5.4 | |
| 8 | 28.2 | | 5.7 | | | |
| 9 | 19.8 | 20.4 | | | | 4.0 |
| 10 | | | | 7.8 | 4.4 | |
| 11 | | | 15.6 | | | |
| 12 | | AN | | | | 4.6 |
| 13 | AN | | | 6.8 | 3.5 | |
| 14 | | | 21.5 | | | |
| 15 | | AG | | | | 3.2 |
| 16 | AF | | | 9.2 | 3.6 | |
| 17 | | | 16.6 | | | |
| 18 | | AN | | | | 2.9 |
| 19 | AF | | | 11.6 | 5.1 | |
| 20 | | | 2.0 | | | |
| 21 | | AN | | | | 4.8 |
| 22 | AF | | | 10.8 | 3.9 | |
| 23 | | | 12.5 | | | |
| 24 | | AN | | | | 1.0 |
| 25 | AF | | | 6.4 | 4.9 | |
| 26 | 20.6 | | 17.5 | | | |
| 27 | | AN | | | | 3.0 |
| 28 | 25.6 | | | 5.7 | 2.7 | |
| 29 | | | 7.8 | | | |
| 30 | | | | | | 3.9 |
| 31 | 29.0 | | | | 2.9 | |

Example B: Invalidated data occurring over several months, during high PM_{2.5} season

Months 7-12

| JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER | DECEMBER |
|------|---------|-----------|---------|----------|----------|
| | | 4.3 IT | 9.1 | | |
| 6.0 | 2.6 | | | 11.6 | 19.0 |
| | 4.3 | 5.8 IT | 2.7 | | |
| 3.8 | | 7.0 IT | 13.0 | 32.5 | 44.4 |
| | 3.6 | | | | |
| 3.5 | | 1.0 | 12.1 | 32.9 | AK |
| | 7.1 IT | | | | |
| 2.3 | | 4.3 | 9.6 | 38.8 | AN |
| | 14.0 IT | | | | |
| 3.5 | | 3.4 | 22.6 | 19.2 | AN |
| | 15.9 IT | | | | |
| 3.0 | | 2.7 | 16.3 | 22.6 | AN |
| | 22.5 IT | | | | |
| 7.5 | | AV | 15.9 | 6.8 | AN |
| | 18.9 IT | | | | |
| 5.1 | | 3.2 | 24.7 | 35.8 | AN |
| | 7.7 IT | | | | |
| 4.4 | | 10.1 | 7.1 | 40.5 | AP |
| | 5.6 IT | | | | |
| 8.3 | | | 29.0 | 36.0 | 51.8 |

Example C: Repeated data invalidation for the same reason, over several months & years

| DAY | HOUR | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 0000 | 0100 | 0200 | 0300 | 0400 | 0500 | 0600 | 0700 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 | |
| 1 | .024 | .031 | .032 | AX | BD | .032 | .030 | .026 | .030 | .031 | .022 | .014 | .024 | .021 | .019 | .018 | .014 | .010 | DA | DA | DA | DA | DA | DA | |
| 2 | DA | DA | BD | AX | BD | .002 | DA | DA | .002 | .002 | .005 | .009 | .017 | .022 | .023 | .020 | .011 | DA | DA | DA | DA | DA | DA | DA | |
| 3 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .002 | .007 | .011 | .019 | .025 | .028 | .029 | .021 | DA | DA | .002 | DA | DA | DA | DA | |
| 4 | DA | .002 | BD | AX | BD | DA | DA | DA | DA | .007 | .016 | .020 | .022 | .027 | .031 | .031 | .020 | DA | DA | DA | DA | DA | DA | DA | |
| 5 | DA | DA | BD | AX | BD | DA | DA | DA | .002 | .002 | .010 | .017 | .022 | .026 | .036 | .038 | .027 | DA | DA | DA | DA | DA | DA | DA | |
| 6 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .002 | .007 | .015 | .020 | .024 | .031 | .032 | .016 | DA | DA | DA | DA | DA | DA | .002 | DA |
| 7 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .007 | .014 | .016 | .018 | .024 | .027 | .027 | .013 | DA | DA | DA | DA | DA | DA | DA | DA |
| 8 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .002 | .006 | .013 | .018 | .027 | .025 | .024 | .012 | DA | DA | DA | DA | DA | DA | DA | DA |
| 9 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .008 | .015 | .013 | .019 | .025 | .023 | .013 | DA | DA | DA | DA | DA | DA | DA | DA | DA |
| 10 | DA | DA | BD | AX | BD | DA | DA | DA | DA | DA | .002 | .002 | .012 | .019 | .031 | .033 | .024 | .008 | DA | DA | DA | DA | DA | DA | DA |
| 11 | DA | .002 | BD | AX | BD | DA | DA | DA | DA | .002 | .006 | .018 | .028 | .038 | .043 | .045 | .043 | DA | DA | DA | DA | DA | DA | DA | DA |
| 12 | DA | DA | BD | AX | BD | DA | DA | DA | DA | DA | .002 | .002 | .015 | .017 | .024 | .026 | .029 | .012 | DA | DA | DA | .002 | .002 | DA | DA |
| 13 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .002 | .002 | BA | .021 | BA | BA | BA | .016 | DA | DA | DA | DA | DA | DA | DA | DA |
| 14 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .011 | .014 | .019 | .021 | .025 | .028 | .030 | .017 | DA | DA | DA | DA | DA | DA | DA | DA |
| 15 | .006 | .007 | .002 | AX | BD | DA | DA | DA | DA | DA | .002 | .016 | .026 | .027 | .030 | .029 | .025 | .012 | .013 | .015 | .011 | .012 | .002 | DA | DA |
| 16 | DA | DA | BD | AX | BD | DA | DA | DA | .005 | .006 | .010 | .012 | .016 | .018 | .022 | .029 | .022 | DA | DA | DA | DA | DA | DA | DA | DA |
| 17 | DA | DA | BD | AX | BD | DA | DA | DA | DA | DA | .002 | .002 | .011 | .018 | .027 | .028 | .030 | .022 | .012 | .006 | .010 | .002 | .002 | .002 | .006 |
| 18 | .009 | DA | BD | AX | BD | DA | DA | DA | DA | .002 | .014 | .027 | .035 | .041 | .041 | .038 | .027 | .008 | DA | DA | DA | DA | .002 | DA | DA |
| 19 | DA | DA | BD | AX | BD | DA | DA | DA | DA | BD | .005 | .009 | .017 | .018 | .023 | .028 | .021 | DA | DA | DA | DA | DA | DA | DA | DA |
| 20 | .002 | .002 | BD | AX | BD | DA | DA | DA | DA | .008 | .021 | .025 | .032 | .035 | .036 | .032 | .021 | DA | DA | DA | DA | DA | DA | DA | DA |
| 21 | DA | DA | BD | AX | BD | DA | DA | DA | BD | DA | .007 | .013 | .019 | .027 | .034 | .034 | .020 | DA | DA | DA | DA | DA | DA | DA | DA |
| 22 | DA | DA | BD | AX | BD | DA | DA | DA | BD | DA | DA | .002 | .012 | .019 | .026 | .022 | DA | DA | DA | DA | DA | DA | DA | DA | DA |
| 23 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .008 | .012 | .014 | .021 | .030 | .029 | .027 | .013 | DA | DA | DA | DA | DA | DA | DA | DA |
| 24 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .002 | .011 | .019 | .028 | .033 | .031 | .033 | .032 | .019 | DA | .002 | DA | DA | DA | DA | DA |
| 25 | DA | DA | BD | AX | BD | DA | DA | DA | .002 | .008 | .016 | .022 | .026 | .031 | .037 | .037 | .028 | .015 | .006 | .002 | .002 | DA | DA | DA | DA |
| 26 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .002 | .007 | .014 | .027 | .031 | .034 | .038 | .030 | DA | DA | DA | DA | DA | DA | DA | DA |
| 27 | DA | DA | BD | AX | BD | DA | DA | DA | DA | DA | .007 | .010 | .016 | BA | .032 | .036 | .025 | DA | DA | DA | DA | DA | DA | .002 | DA |
| 28 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .010 | .021 | .031 | .035 | .032 | .032 | .031 | .028 | DA | DA | DA | DA | DA | DA | DA | DA |
| 29 | DA | DA | BD | AX | BD | DA | DA | DA | .002 | .007 | .011 | .018 | .027 | .029 | .029 | .029 | .014 | DA | DA | DA | DA | DA | DA | DA | DA |
| 30 | .002 | .002 | .005 | AX | BD | DA | DA | DA | DA | .011 | .007 | .011 | .025 | .030 | .034 | .032 | .014 | DA | DA | DA | DA | DA | DA | .007 | .017 |
| 31 | .008 | DA | BD | AX | BD | DA | .012 | DA | .002 | .005 | .007 | .014 | .019 | .025 | .028 | .027 | .022 | DA | DA | DA | DA | DA | .002 | .002 | DA |

Example C: Repeated data invalidation for the same reason, over several months & years

| HOUR | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|
| DAY | 0000 | 0100 | 0200 | 0300 | 0400 | 0500 | 0600 | 0700 | 0800 |
| 1 | .024 | .031 | .032 | AX | BD | .032 | .030 | .026 | .030 |
| 2 | DA | DA | BD | AX | BD | .002 | DA | DA | .002 |
| 3 | DA | DA | BD | AX | BD | DA | DA | DA | DA |
| 4 | DA | .002 | BD | AX | BD | DA | DA | DA | DA |
| 5 | DA | DA | BD | AX | BD | DA | DA | DA | .002 |
| 6 | DA | DA | BD | AX | BD | DA | DA | DA | DA |
| 7 | DA | DA | BD | AX | BD | DA | DA | DA | DA |
| 8 | DA | DA | BD | AX | BD | DA | DA | DA | DA |
| 9 | DA | DA | BD | AX | BD | DA | DA | DA | DA |
| 10 | DA | DA | BD | AX | BD | DA | DA | DA | DA |
| 11 | DA | .002 | BD | AX | BD | DA | DA | DA | DA |
| 12 | DA | DA | BD | AX | BD | DA | DA | DA | DA |
| 13 | DA | DA | BD | AX | BD | DA | DA | DA | DA |
| 14 | DA | DA | BD | AX | BD | DA | DA | DA | DA |
| 15 | .006 | .007 | .002 | AX | BD | DA | DA | DA | DA |
| 16 | DA | DA | BD | AX | BD | DA | DA | DA | .005 |
| 17 | DA | DA | BD | AX | BD | DA | DA | DA | DA |
| 18 | .009 | DA | BD | AX | BD | DA | DA | DA | DA |

Example C: Repeated data invalidation for the same reason, over several months & years

Month 1

| HOUR | | | | | | | | | | | | | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| DAY | 0000 | 0100 | 0200 | 0300 | 0400 | 0500 | 0600 | 0700 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 |
| 1 | .019 | .024 | .027 | AX | BD | .024 | .022 | .026 | .031 | .036 | .039 | .049 | .055 | .061 | .063 | .062 | .059 | .048 | .042 | .038 | .039 | .044 | .041 | .034 |
| 2 | .032 | .028 | .022 | AX | BD | .014 | .012 | .015 | .022 | .029 | .039 | .048 | .057 | .063 | .070 | .072 | .068 | .060 | .048 | .035 | .033 | .029 | .028 | .028 |
| 3 | .022 | .019 | .016 | AX | BD | .009 | .006 | .021 | .024 | .027 | .030 | .036 | .044 | .052 | .053 | .048 | .046 | .039 | .036 | .031 | .027 | .023 | .018 | .015 |
| 4 | .012 | .010 | .006 | AX | BD | .008 | .005 | .011 | .016 | .023 | .030 | .034 | .041 | BA | .040 | .045 | .045 | .042 | .032 | .024 | .018 | .022 | .020 | .020 |
| 5 | .015 | .014 | .021 | AX | BD | .030 | .021 | .015 | .018 | .023 | .034 | .036 | .040 | BA | .044 | .042 | .039 | .036 | .035 | .033 | .029 | .026 | .020 | .011 |
| 6 | .007 | DA | .007 | AX | BD | .002 | .002 | .008 | .022 | .023 | .033 | .038 | .038 | .039 | .040 | .038 | .036 | .031 | .026 | .022 | .020 | .021 | .017 | .007 |
| 7 | .006 | .005 | .002 | AX | BD | DA | DA | .005 | .007 | .011 | .021 | .028 | .034 | .035 | .040 | .042 | .041 | .036 | .028 | .019 | DA | DA | DA | DA |
| 8 | DA | DA | DA | AX | BD | DA | DA | .006 | .009 | .029 | .038 | .044 | .047 | .052 | .058 | .061 | .059 | .052 | .037 | .019 | DA | DA | DA | DA |
| 9 | DA | .005 | .006 | AX | BD | .007 | .005 | .016 | .028 | .040 | .047 | .056 | .065 | .069 | .069 | .068 | .065 | .056 | .042 | .033 | .036 | .027 | .015 | .008 |
| 10 | .011 | DA | DA | AX | BD | DA | DA | DA | .002 | .007 | .020 | .022 | .035 | .041 | .041 | .051 | .058 | .051 | .033 | .023 | .018 | .015 | .009 | .008 |
| 11 | .010 | .005 | .005 | AX | BD | DA | DA | .005 | .013 | .017 | .020 | BA | BA | BA | BA | .030 | .030 | .029 | .026 | .022 | .023 | .018 | .016 | .012 |
| 12 | .007 | .006 | .002 | AX | BD | DA | DA | .002 | .008 | .018 | .027 | .035 | .041 | .043 | .047 | .052 | .058 | .049 | .019 | .018 | .013 | .005 | DA | DA |
| 13 | DA | DA | DA | AX | BD | DA | DA | .006 | .009 | .021 | .030 | .039 | .053 | .067 | .077 | .082 | .074 | .054 | .032 | .011 | DA | DA | DA | .002 |
| 14 | .006 | .009 | .002 | AX | BD | DA | .002 | .002 | .011 | .024 | .046 | .064 | .074 | .083 | .086 | .081 | .080 | .062 | .043 | .009 | DA | DA | DA | DA |
| 15 | DA | DA | DA | AX | BD | DA | DA | .014 | .027 | .036 | .050 | .068 | .085 | .094 | .097 | .102 | .097 | .068 | .041 | .012 | .031 | .022 | .010 | .017 |
| 16 | .012 | .008 | .016 | AX | BD | .019 | .012 | .011 | .016 | .024 | .031 | .047 | .057 | .065 | .067 | .070 | .065 | .051 | .045 | .042 | .034 | .029 | .022 | .021 |
| 17 | .018 | .010 | .008 | AX | BD | DA | DA | .002 | .002 | .015 | .021 | .031 | .049 | .057 | .064 | .066 | .062 | .044 | .011 | DA | DA | DA | DA | DA |
| 18 | .008 | .013 | .012 | AX | BD | DA | DA | .009 | .017 | .023 | .037 | .067 | .076 | .083 | .090 | .089 | .090 | .067 | .036 | .038 | .035 | .024 | .034 | .028 |
| 19 | .029 | .017 | .019 | AX | BD | .018 | .018 | .018 | .021 | BA | .032 | .038 | .041 | .041 | .050 | .050 | .048 | .039 | .035 | .028 | .030 | .015 | .015 | .015 |
| 20 | .012 | .009 | .002 | AX | BD | DA | DA | DA | .009 | .012 | .023 | .042 | .054 | .058 | .063 | .063 | .059 | .046 | .031 | .020 | .019 | .010 | .009 | .006 |
| 21 | .002 | DA | DA | AX | BD | DA | DA | DA | .013 | .026 | .041 | .037 | .053 | .051 | .052 | .053 | .048 | .041 | .026 | .017 | .010 | .008 | DA | DA |
| 22 | DA | DA | DA | AX | BD | DA | DA | DA | .019 | .036 | .049 | .061 | .071 | .078 | .081 | .083 | .079 | .051 | .027 | .011 | .002 | DA | .006 | .010 |
| 23 | .006 | .015 | .013 | AX | BD | .017 | .015 | .023 | .037 | .042 | .062 | .076 | .083 | .085 | .087 | .090 | .079 | .050 | .012 | DA | .010 | .011 | .018 | .013 |
| 24 | .006 | DA | DA | AX | BD | .002 | DA | .006 | .013 | .032 | .046 | .055 | .065 | .072 | .073 | .073 | .070 | .047 | .014 | .025 | .006 | .015 | .022 | .021 |
| 25 | .015 | .016 | .017 | AX | BD | .011 | .007 | .010 | .020 | .025 | .032 | .035 | .034 | .044 | .049 | .050 | .048 | .031 | .020 | .026 | .024 | .017 | .018 | .016 |
| 26 | .011 | .009 | .006 | AX | BD | DA | .002 | .006 | .009 | .012 | .017 | .020 | .030 | .035 | .038 | .039 | .037 | .027 | DA | DA | DA | DA | .002 | DA |
| 27 | DA | DA | .002 | AX | BD | .002 | DA | .006 | .013 | .021 | .030 | .040 | .043 | .048 | .049 | .048 | .045 | .023 | DA | DA | DA | DA | DA | DA |
| 28 | DA | DA | DA | AX | BD | DA | DA | DA | .019 | .032 | .041 | .041 | .049 | .053 | .055 | .062 | .057 | .032 | .018 | .009 | DA | DA | DA | DA |
| 29 | DA | DA | DA | AX | BD | .005 | .002 | .002 | .011 | .021 | .034 | .039 | .050 | .059 | .063 | .065 | .056 | .037 | DA | DA | DA | .007 | .014 | .011 |
| 30 | .015 | .014 | .018 | AX | BD | .012 | .011 | .011 | .031 | .048 | .053 | .063 | .070 | .075 | .077 | .081 | .069 | .046 | .010 | DA | DA | DA | DA | .007 |
| 31 | .002 | .006 | .009 | AX | BD | .006 | .002 | .007 | .014 | .020 | .037 | .058 | .067 | .072 | BA | .060 | .058 | .026 | .007 | DA | DA | DA | DA | .015 |

Example C: Repeated data invalidation for the same reason, over several months & years

Month 3

| | | HOUR | | | | | | | | | | | | | | | | | | | | | | | |
|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| DAY | 0000 | 0100 | 0200 | 0300 | 0400 | 0500 | 0600 | 0700 | 0800 | 0900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 | |
| 1 | .024 | .031 | .032 | AX | BD | .032 | .030 | .026 | .030 | .031 | .022 | .014 | .024 | .021 | .019 | .018 | .014 | .010 | DA | DA | DA | DA | DA | DA | |
| 2 | DA | DA | BD | AX | BD | .002 | DA | DA | .002 | .002 | .005 | .009 | .017 | .022 | .023 | .020 | .011 | DA | DA | DA | DA | DA | DA | DA | |
| 3 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .002 | .007 | .011 | .019 | .025 | .028 | .029 | .021 | DA | DA | .002 | DA | DA | DA | DA | |
| 4 | DA | .002 | BD | AX | BD | DA | DA | DA | DA | .007 | .016 | .020 | .022 | .027 | .031 | .031 | .020 | DA | DA | DA | DA | DA | DA | DA | |
| 5 | DA | DA | BD | AX | BD | DA | DA | DA | .002 | .002 | .010 | .017 | .022 | .026 | .036 | .038 | .027 | DA | DA | DA | DA | DA | DA | DA | |
| 6 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .002 | .007 | .015 | .020 | .024 | .031 | .032 | .016 | DA | DA | DA | DA | DA | DA | .002 | DA |
| 7 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .007 | .014 | .016 | .018 | .024 | .027 | .027 | .013 | DA | DA | DA | DA | DA | DA | DA | DA |
| 8 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .002 | .006 | .013 | .018 | .027 | .025 | .024 | .012 | DA | DA | DA | DA | DA | DA | DA | DA |
| 9 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .008 | .015 | .013 | .019 | .025 | .023 | .013 | DA | DA | DA | DA | DA | DA | DA | DA | DA |
| 10 | DA | DA | BD | AX | BD | DA | DA | DA | DA | DA | .002 | .012 | .019 | .031 | .033 | .024 | .008 | DA | DA | DA | DA | DA | DA | DA | DA |
| 11 | DA | .002 | BD | AX | BD | DA | DA | DA | DA | .002 | .006 | .018 | .028 | .038 | .043 | .045 | .043 | DA | DA | DA | DA | DA | DA | DA | DA |
| 12 | DA | DA | BD | AX | BD | DA | DA | DA | DA | DA | .002 | .015 | .017 | .024 | .026 | .029 | .012 | DA | DA | DA | .002 | .002 | DA | DA | DA |
| 13 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .002 | .002 | BA | .021 | BA | BA | BA | .016 | DA | DA | DA | DA | DA | DA | DA | DA |
| 14 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .011 | .014 | .019 | .021 | .025 | .028 | .030 | .017 | DA | DA | DA | DA | DA | DA | DA | DA |
| 15 | .006 | .007 | .002 | AX | BD | DA | DA | DA | DA | DA | .002 | .016 | .026 | .027 | .030 | .029 | .025 | .012 | .013 | .015 | .011 | .012 | .002 | DA | DA |
| 16 | DA | DA | BD | AX | BD | DA | DA | DA | .005 | .006 | .010 | .012 | .016 | .018 | .022 | .029 | .022 | DA | DA | DA | DA | DA | DA | DA | DA |
| 17 | DA | DA | BD | AX | BD | DA | DA | DA | DA | DA | .002 | .011 | .018 | .027 | .028 | .030 | .022 | .012 | .006 | .010 | .002 | .002 | .002 | .002 | .006 |
| 18 | .009 | DA | BD | AX | BD | DA | DA | DA | DA | .002 | .014 | .027 | .035 | .041 | .041 | .038 | .027 | .008 | DA | DA | DA | DA | .002 | DA | DA |
| 19 | DA | DA | BD | AX | BD | DA | DA | DA | DA | BD | .005 | .009 | .017 | .018 | .023 | .028 | .021 | DA | DA | DA | DA | DA | DA | DA | DA |
| 20 | .002 | .002 | BD | AX | BD | DA | DA | DA | DA | .008 | .021 | .025 | .032 | .035 | .036 | .032 | .021 | DA | DA | DA | DA | DA | DA | DA | DA |
| 21 | DA | DA | BD | AX | BD | DA | DA | DA | BD | DA | .007 | .013 | .019 | .027 | .034 | .034 | .020 | DA | DA | DA | DA | DA | DA | DA | DA |
| 22 | DA | DA | BD | AX | BD | DA | DA | DA | BD | DA | DA | .002 | .012 | .019 | .026 | .022 | DA | DA | DA | DA | DA | DA | DA | DA | DA |
| 23 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .008 | .012 | .014 | .021 | .030 | .029 | .027 | .013 | DA | DA | DA | DA | DA | DA | DA | DA |
| 24 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .002 | .011 | .019 | .028 | .033 | .031 | .033 | .032 | .019 | DA | .002 | DA | DA | DA | DA | DA |
| 25 | DA | DA | BD | AX | BD | DA | DA | DA | .002 | .008 | .016 | .022 | .026 | .031 | .037 | .037 | .028 | .015 | .006 | .002 | .002 | DA | DA | DA | DA |
| 26 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .002 | .007 | .014 | .027 | .031 | .034 | .038 | .030 | DA | DA | DA | DA | DA | DA | DA | DA |
| 27 | DA | DA | BD | AX | BD | DA | DA | DA | DA | DA | .007 | .010 | .016 | BA | .032 | .036 | .025 | DA | DA | DA | DA | DA | DA | .002 | DA |
| 28 | DA | DA | BD | AX | BD | DA | DA | DA | DA | .010 | .021 | .031 | .035 | .032 | .032 | .031 | .028 | DA | DA | DA | DA | DA | DA | DA | DA |
| 29 | DA | DA | BD | AX | BD | DA | DA | DA | .002 | .007 | .011 | .018 | .027 | .029 | .029 | .029 | .014 | DA | DA | DA | DA | DA | DA | DA | DA |
| 30 | .002 | .002 | .005 | AX | BD | DA | DA | DA | DA | .011 | .007 | .011 | .025 | .030 | .034 | .032 | .014 | DA | DA | DA | DA | DA | DA | .007 | .017 |
| 31 | .008 | DA | BD | AX | BD | DA | .012 | DA | .002 | .005 | .007 | .014 | .019 | .025 | .028 | .027 | .022 | DA | DA | DA | DA | .002 | .002 | DA | DA |



Example D: Loss of staff resulting in nearly a year of lost data.

- Lots of staffing turnover occurring
- Important to have clear procedures
- Ensure you can cover the key responsibilities
 - → Talk to ARB & EPA if you think this will not be possible.

What questions does EPA ask about these data?

- What documentation was recorded as the events occurred?
- How was the issue resolved?
- Were QAPP/SOPs followed?

Audit Finding - Inconsistencies!

What has been done to address these findings?

- What documentation was recorded as the events occurred?

Trainings!

- How was the issue resolved?

Corrective Action Notifications
(CANs)

- Were QAPP/SOPs followed?


ARB quality documents / approvals

Overall – What could be done to address / prevent data issues?

- Communicate issues to ARB quickly
- Determine if there's a way to address
- ARB will include EPA as appropriate
- Document!

- Process to address issues in a timely fashion.
- Data review procedures;





Question: What aspects of the PQAO structure would help address these data issues?

- Corrective Action Notification (CAN),
- Data reviews,
- Broader data quality assessments,
- Data validation QAPP,
- Roles & Responsibilities document,
- Trainings!

How ARB's PQAO Is Meeting the Challenges

- Streamlined PQAO activities and communication
 - Trainings
 - Communication on site initiations, relocations, terminations
 - Data Certification
 - Five year network assessments
- Communication with other PQAOs





THANKS!

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