

August 26, 2016

# **Response to Findings:**

## **RTI International Audit Report -**

### ***40 Code of Federal Regulations Part 58 Technical Systems Audit of CASTNET Program Ozone Monitoring Process***

Prepared by:

Amec Foster Wheeler Environment & Infrastructure, Inc.

Prepared for

U.S. Environmental Protection Agency (EPA),  
Clean Air Markets Division

Below please find the Amec Foster Wheeler response to findings documented in the RTI International (RTI) report for the technical systems audit (TSA) performed for the Clean Air Status and Trends Network (CASTNET) ozone laboratory facility and one remote monitoring site between November and December 2015. Responses are organized according to sections that list findings in the RTI report. Findings are quoted from the RTI report without modification.

## Section 2: General Program

### FINDING 1:

Outdated QAPP signature approval sheet with current QAPP.

#### Discussion:

(EPA QA/R-5: March 2001: Element A1)

When the RTI auditor reviewed the QAPP on the CASTNET website, he noticed the dates (February 2011) on the signature approval sheet (see below) did not reflect the current QAPP Revision 8.2 dated October 2014. There was no evidence that the annual QAPP updating has not been through the approval process. The RTI auditor discussed this with Mr. Marcus Stewart (QA Manager for CASTNET program) and he stated the approval page has not been updated on the website at EPA's request, but for the next Revision (8.3), the personnel has been revised and updated and the new signature page will be posted with the Revision 8.3 QAPP.

Clean Air Status and Trends Network		Quality Assurance Project Plan
Title and Approval Sheet		
<b>Clean Air Status and Trends Network</b> <b>Quality Assurance Project Plan</b>		
MACTEC Engineering and Consulting, Inc. <i>H. Kemp Howells</i>	2/17/11	Date
H. Kemp Howells MACTEC Project Manager		
<i>William E. Imbar</i>	2/17/11	Date
William E. Imbar MACTEC Project Quality Assurance Supervisor		
<i>Marcus O. Stewart</i>	2/17/11	Date
Marcus O. Stewart MACTEC Quality Assurance Manager		
United States Environmental Protection Agency		
<i>Lance J. McCluskey</i>	2/22/11	Date
Lance J. McCluskey EPA Project Officer		
<i>Larry Kericher</i>	2/22/11	Date
Larry Kericher EPA Quality Assurance Officer		
National Park Service:		
<i>John D. Ray</i>	2-28-11	Date
John D. Ray Contracting Officer's Technical Representative		

**RECOMMENDATION:**

Mr. Stewart should follow up with EPA to assure the signature approval sheet for each annual update/revision is posted with the current QAPP on the CASTNET website. The management that approves the QAPP should be current and also reflect the distribution list and organizational charts in the QAPP.

**Amec Foster Wheeler RESPONSE:**

Revision 8.3 of the CASTNET QAPP is published on the EPA website as of this writing with current personnel, authorizations and organizational charts. The QA manager will continue to work with EPA to ensure the QAPP remains current according to EPA requirements.

United States and Foreign Approval Sheet  
Quality Assurance Project Plan

Clean Air Status and Trends Network  
Quality Assurance Project Plan

Amec Foster Wheeler Environment & Infrastructure, Inc.

*H. Kemp Howell* 12/18/2015  
H. Kemp Howell  
Amec Foster Wheeler Project Manager  
Date

*[Signature]* 12/10/2015  
Ann Pappas  
Amec Foster Wheeler Project Quality Assurance Supervisor  
Date

*Marcus O. Stewart* 12/10/15  
Marcus O. Stewart  
Amec Foster Wheeler Quality Assurance Manager  
Date

United States Environmental Protection Agency

*Melissa Puchalski* 11/24/15  
Melissa Puchalski  
EPA Project Officer  
Date

*Karen Onelowsky* 11/30/15  
Karen Onelowsky  
EPA Quality Assurance Officer  
Date

National Park Service

*[Signature]* 11/5/2015  
Barbara Slive  
Contracting Officer's Technical Representative  
Date

Bureau of Land Management

*[Signature]* 11/3/2015  
Ryan Arclammon  
Air Resource Specialist  
Date

Page 4 of 4  
Amec Foster Wheeler

**FINDING 2:**

Inconsistencies with approval signature page and distribution list and organizational charts in QAPP  
**Discussion:**  
(EPA QA/R-5: March 2001: Element A2)

This is a carryover from Finding 1. The current distribution list and organizational charts were inconsistent with the names listed on the approval signature form. The management from Bureau of Land Management (BLM) does not even appear of the current (February 2011) approval form and are one of the five member organizations involved in the CASTNET program, but they are listed in the distribution list (see below). Based on the organizational charts in Revision 8.2, there are five member organizations

in the CASTNET program (US EPA, NPS, AMEC Foster Wheeler, ARS, and BLM). Based on the organizational charts for Revision 8.3 draft QAPP provided by Mr. Stewart, some of the names have changed (see organization chart below). Also, under Field Operations Manager for Revision 8.3 there should be a box for Contracted Auditors that conduct the 6-month calibrations and external audits.

**Distribution List (Revision 8.3)**

**Amec Foster Wheeler**

- H. Kemp Howell, Project Manager
- Ann Bernhardt, Project QA Supervisor
- Marcus O. Stewart, QA Manager
- Kevin P. Mishoe, Field Operations Manager
- Garry L. Price, Laboratory Operations Manager (remove has since retired) replace with Katherine W. Berry
- Christopher M. Rogers, Data Management, Analysis, Interpretation, and Reporting Manager
- Selma Isil, Property Control Manager

**US EPA**

- Melissa Puchalski, Project Officer
- Gregory Beachley, Alternate Project officer/Technical Monitor
- Karen Orehowsky, QA Officer
- Gary Lear, Technical Monitor
- Timothy Sharac, Technical Monitor
- Rob Gray, Contracting Officer

**NPS**

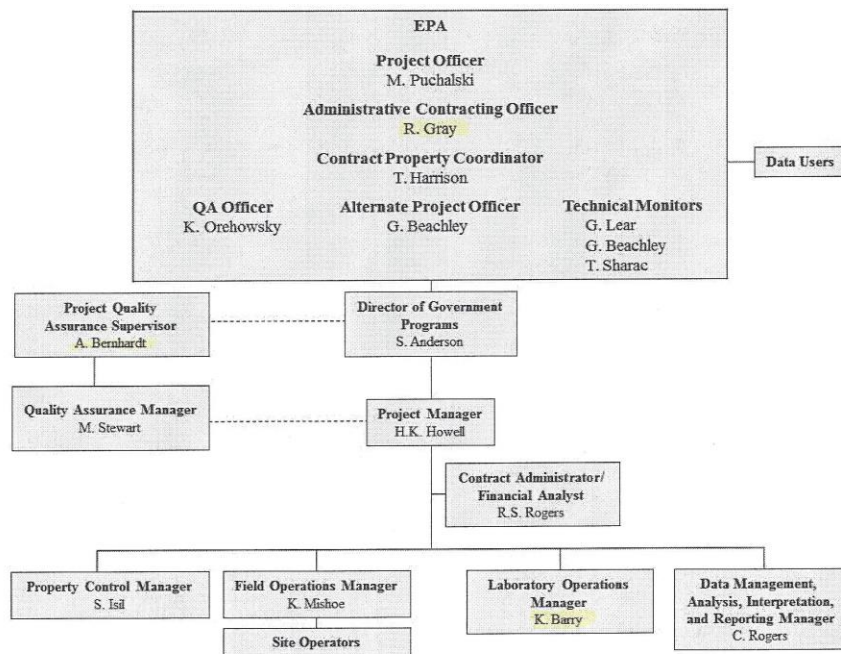
- Barkley Sive, Contracting Officer’s Technical Representative

**ARS**

- Joe Aldhoch, Program Manager
- Christian Kirk, QA Officer
- Jessica Ward, Data Management Section Manager
- Mike Slate, Network Operations Section Manager

**BLM**

- Ryan McCammon (Air Resource Specialist)
- Charis Tuers (Air Resource Specialist)



## RECOMMENDATION:

Tracking the management changes from year to year to make sure the signature approval page, distribution list, and organizational chart are consistent is one of the most important and time consuming events when conducting the annual review of a QAPP. During next year's review of the QAPP, Mr. Stewart and Amec Foster Wheeler management should track any management change to the CASTNET program and make it a priority to confirm that the approval page, distribution list, and organizational chart are consistent.

## Amec Foster Wheeler RESPONSE:

Revision 8.3 of the CASTNET QAPP is published on the EPA website as of this writing with current personnel, authorizations and organizational charts. The QA manager will continue to work with EPA to ensure the QAPP remains current according to EPA requirements.

*Clean Air Status and Trends Network*

*Quality Assurance Project Plan*

### **Distribution List**

#### **Amec Foster Wheeler Environment & Infrastructure, Inc.:**

H. Kemp Howell, Project Manager  
Ann Bernhardt, Project QA Supervisor  
Marcus O. Stewart, QA Manager  
Kevin P. Mishoe, Field Operations Manager  
Kathy Barry, Laboratory Operations Manager  
Christopher M. Rogers, Data Management, Analysis, Interpretation, and Reporting Manager  
Selma Isil, Property Control Manager

#### **United States Environmental Protection Agency:**

Melissa Puchalski, Project Officer  
Gregory Beachley, Alternate Project Officer/Technical Monitor  
Karen Orehowsky, QA Officer  
Gary Lear, Technical Monitor  
Timothy Sharac, Technical Monitor  
Rob Gray, Contracting Officer

#### **National Park Service:**

Barkley Sive, Contracting Officer's Technical Representative

#### **Bureau of Land Management:**

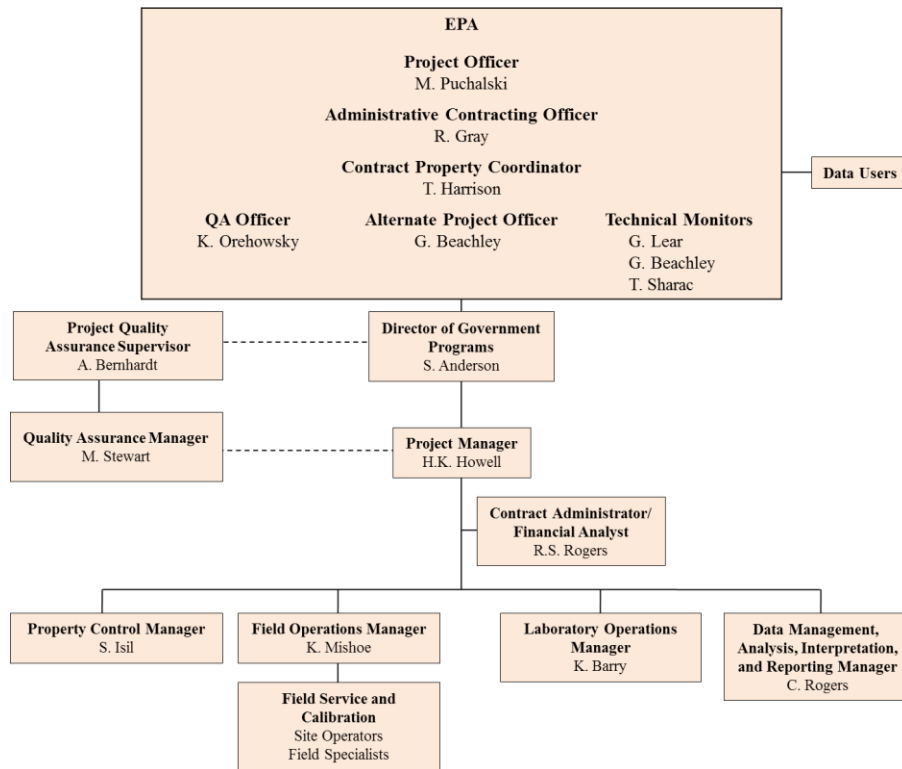
Ryan McCammon, Air Resource Specialist

#### **Air Resource Specialists, Inc.:**

Joe Adlloch, Program Manager  
Christian Kirk, QA Officer  
Jessica Ward, Data Management Section Manager  
Mike Slate, Network Operations Section Manager

#### **Field Services Contractors**

**Figure 1-12** EPA/Amec Foster Wheeler CASTNET Project Organization



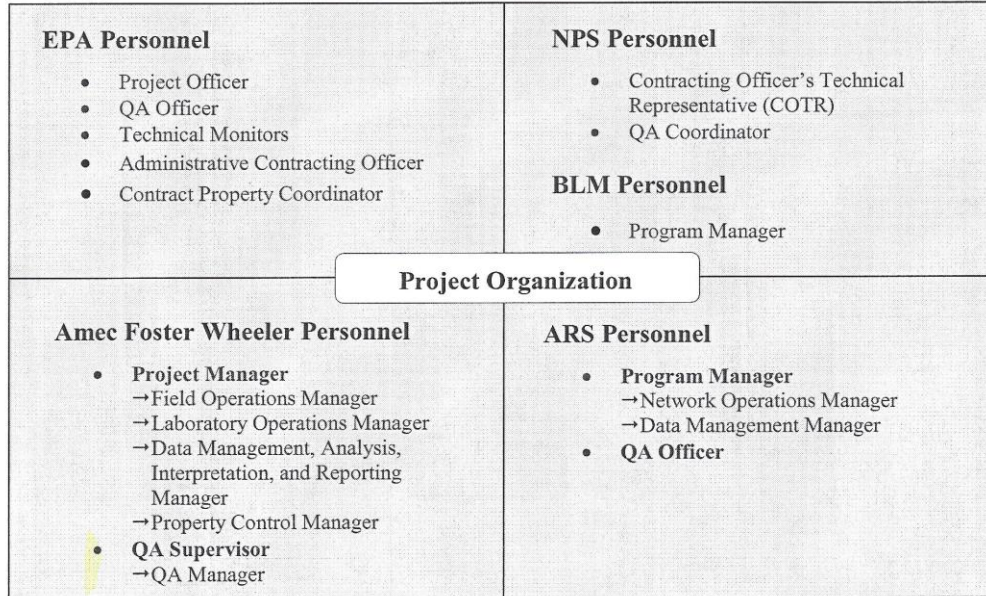
**FINDING 3:**

Missing roles and responsibilities of the five organizational members and their interactions in the CASTNET program

Discussion:

*(EPA QA/R-5: March 2001: Element A4)*

Based on the organizational chart (see below) in Revision 8.2, there are five member organizations in the CASTNET program (US EPA, NPS, AMEC Foster Wheeler, ARS, and BLM). The role and responsibilities for these five organizations are not fully explained in the QAPP. A complete list of responsibilities for each organization should be defined in the QAPP. The QAPP also needs to include interaction between the five organizations.



**RECOMMENDATION:**

Provide a bullet list of the operations performed by each of the five organizations. Be sure to document management and communication roles and how they might overlay between organizations to show the interactions of management and any support staff. The roles, responsibilities, and interactions should be for all aspects of the CASTNET program; not just the ozone sampling and data management of the program.

**Amec Foster Wheeler RESPONSE:**

Description of team member roles and responsibilities added to QAPP 8.3 section 1.2 (see below). Working relationships are documented by this text and figures 1-11, 1-12, and 1-13 and their associated text.

“While all program partners cooperate in managing and operating the network, EPA is the primary program sponsor and, therefore, establishes the program requirements. Each sponsoring agency has established their own monitoring objectives; however, there are common network objectives (Section 1.1) across the agencies. The contractor for each agency collects and validates network data according to the QA program described in this QAPP and its appendices. Amec Foster Wheeler is responsible for common database management, data reporting, and all filter pack analyses. The program sponsors and their contractors communicate routinely through regularly scheduled meetings.”



**FINDING 4:**

Missing date information for changes in the Background Section of QAPP

**Discussion:**

*(EPA QA/R-5: March 2001: Element A5)*

Section 1.1 Purpose/Background of the QAPP (Revision 8.2) provides details of the program's growth/expansion over the years. Some of the changes from year to year are not provided with a date of the change, making it confusing when tracking the program changes such as the number of total sites operating in the program; the number of site measuring ozone; or the sites monitoring other gaseous pollutants other than ozone.

**RECOMMENDATION:**

RTI recommends developing a table or chart to illustrate the current status of the CASTNET program. This table or chart would be a quick reference for staff to explain the current status of the program. During the annual review of the QAPP, this information can be transposed to text describing the activities during the previous year. A new table will be created showing the current status for the upcoming year. This table should include the number of sites collection filter packs, the number of sites collecting ozone, number of sites collecting sulfur dioxide (SO<sub>2</sub>), number of sites collecting nitrogen oxide (NO)/nitrogen dioxide (NO<sub>2</sub>)/oxides of nitrogen (NO<sub>x</sub>), number of sites collecting carbon monoxide (CO), and number of sites collecting particulate matter (PM). As a footnote to the table, special circumstances can be listed for a site.



## **Amec Foster Wheeler RESPONSE:**

Description of program status was added using a callout box in section 1.1 of QAPP Revision 8.3.

**CASTNET Site Measurements\***

- **95 sites**
  - 93 locations (two sites collocated)
  - 65 EPA
  - 25 NPS
  - 5 BLM
  - 80 sites measure ozone
  - 15 sites operate a filter pack only
- **Trace Gas Sites**
  - NO<sub>y</sub>**
    - 6 EPA
    - 2 NPS
  - SO<sub>2</sub>**
    - 2 EPA
    - 2 NPS
  - CO**
    - 1 EPA
    - 2 NPS
- **36 Sites with Meteorological Measurements**
  - 6 EPA sites
  - 24 NPS sites
  - 5 BLM sites

\*Individual site histories -  
[http://java.epa.gov/castnet/epa\\_jsp/sites.jsp](http://java.epa.gov/castnet/epa_jsp/sites.jsp)

\*Network changes listed in annual reports -  
<http://java.epa.gov/castnet/documents.do>

## **FINDING 5:**

Training records at field site

### **Discussion:**

*(EPA QA/R-5: March 2001: Element A8)*

Section 2.3.1 of Revision 8.2 QAPP discuss training regimen of the EPA-sponsored field sites. During the TSAs conducted by RTI in 2012, the two site operators for the North Carolina sites could not provide any documentation showing training for the ozone collection for the CASTNET program. But when the auditor visited the Field Operations Laboratory, Mr. Stewart was able to provide the auditor with documentation stating the site operator acknowledge by signature that they fully understood the operations of the ozone collection system. The acknowledgement form was coupled with signing off on the Safety Plan for the field sites. To not create any further confusing, RTI recommended for Amec Foster Wheeler (AMEC at that time) to develop a mechanism to track training of field operators. This process was developed through the “CASTNET Site Operator Evaluation Questionnaire” administered by the service technician during the 6-month calibration checks of the ozone analyzers. When the RTI auditor asked the site operator if he had been trained and could he provide a record showing this; he (Mr. Brooks) was unable to. When the auditor visited the Field Operations Laboratory in Newberry, FL, Mr. Stewart was able to provide the form (see below).

### **RECOMMENDATION:**

RTI recommends that Amec Foster Wheeler through their iCASTNET software develop a folder to be placed on the desktop at each site that shows training and safety records along with the current QA documentations (QAPP and SOPs). The calibration records are already on the desktop; the addition of the records for the site activities and site operator’s credentials would be a positive step. Not only would

these records be maintained at the Field Operations Laboratory, but they would also be available at the field sites. The current CASTNET Site Operator Evaluation Questionnaire form is a hard copy. It could be saved in the site operator’s folder on their site’s desktop as a PDF copy or iCASTNET can develop an electronic form that would allow the service technician and site operator to sign and date during the 6-month calibration check of the ozone analyzers.

**CASTNET Site Operator Evaluation Questionnaire**  
Interviewer Guide

Rev. 0.1  
8/30/2013

Site ID Number: PE1108 Site Operator Name(s): Gene Brooks Interviewer Name: Anthony Ward  
FSO since 1987 Date of Interview: 2/5/15

	Site Operator Evaluation ("Open Book" Interview)	Satisfactory (y/n)	Notes
1	<p>Have you read and understood the procedural overview section of your Site Operator Handbook?</p> <p>The Site Operator Handbook is Section II.A of the Field SOP (Appendix 1) of the QAPP. Section II.A.1 is the site operations overview and the FSO's should be able to cite all main topic bullets from sec. 6.0. Section II.A.2 provides an overview of each piece of equipment and Section II.B has detailed site visit instructions, but are covered in subsequent questions.</p> <p>The main purpose of this question is to make sure the FSO is familiar with the QAPP, has a current accessible copy, and knows how and where to look for information regarding site visits. In addition, if the FSO has difficulty with the overview of the visit, this question will help direct the rest of the interview.</p>	Y	CD; kept onsite looked @ it @ prep of questionnaire
2	<p>Have you read and understood the hardware overview section of your Site Operator Handbook?</p> <p>Section II.A.2 of Appendix 1 of the QAPP. Should be able to identify key equipment and describe its basic purpose.</p> <p>At a minimum, the following should be verified</p> <ul style="list-style-type: none"> <li>✓ Can identify the ozone analyzer, transfer standard and zero air generation system</li> <li>✓ Can identify Raven, Router, data logger, switch, phone/modem. (Does not necessarily need to know how a router works, but should know it is used for communications).</li> <li>✓ Can identify flow components (MFC, knockout bottles, rotameter, pump, hour meter)</li> </ul>	Y	
3	<p>What information is recorded in the site narrative log?</p> <p>Site ID on each page (important because the pages are removed from the book), Personnel onsite, Date and time, ... Sign each page (legibly)</p> <p>The reason some information is duplicated in the narrative log is because it serves as a backup for lost/illegible SSRF entries, problem ticket actions used during final data validation, which can be months after the event (after the semi-annual audit)</p>	Y	"About everything" checks up/down, weather, and things out of ordinary leak checks, etc...

CASTNET Site Operator Evaluation Questionnaire  
Interviewer Guide

Rev. 0.1  
8/30/2013

4	How do you interface with the site data logger during Tuesday site visits? <b>Section II.B (Site Operator Instructions)</b> – Should be able to describe procedure to down and up channels. [Interviewer: Discuss the PC200 display screens – assess FSO understanding of field names as related to hardware and associated data fields. Note that AMEC is available to assist if any difficulties are encountered.]	Y	
5	How do you download data and review on site? <b>Section II.D.1 (Site Data Acquisition System – Attachment: Manual Data Collection)</b> – Most FSOs will probably not be able to do this, but they may be asked during an audit (since it is typical for most other monitoring networks). It will be included in future training, emphasis will be on what data is recorded in what tables (e.g. five minute data, ZPS results) and how to review the data (i.e. using View application).	N	Definitely could
6	How do you perform an on-flow and zero precision span check? <b>Section II.D.3 (Ozone Monitoring)</b> [Interviewer: Assess FSO ability to perform. Discuss how to check results via the site laptop computer and assessment of good, bad, and suspicious results.]	N	Never done
7	How do you read the data? <b>Section II.D.1 (Site Data Acquisition System)</b>	Y	has done before
8	What is your weekly filter pack exchange procedure? <b>Section II.D.2 (Filter Sampling)</b> – Should be able to describe main bullets in section 6.0 with correct details for: <ul style="list-style-type: none"> <li>handling to avoid contamination (proper use of re-sealable bags, gloves and sampling cartridge end caps);</li> <li>correct order of tasks (e.g. filter off DAS flow -&gt; filter off pump off -&gt; leak check for both weeks -&gt; NEW gloves -&gt; filter on pump off -&gt; filter on DAS flow).</li> <li>flow and gas analyzer system leak checks; Every other week</li> <li>proper documentation (SSRF);</li> <li>checking sample lines for obstructions including water;</li> <li>checking and emptying knockout bottle</li> </ul> [Interviewer: Discuss situations that require direct communication with AMEC field technicians for troubleshooting (e.g. failed leak checks). Most likely this question should take the most amount of time to discuss. For sample contamination, small details are often the most important and difficult to discuss over the telephone (e.g. when gloves are changed, what is touched with gloved hands – hopefully not the tower, when and what caps are used)]	Y	Operator very familiar with QAPP/SOP SOP states *change O3 inline filters monthly? => do not use! *Reset min/max temp? => Not on SSRF anymore *Send SSRF in envelope? => Goes in after pack table *Turn off computer when done? => NO! * Tweezers of O3 samplers after?

**Amec Foster Wheeler RESPONSE:**

Amec Foster Wheeler has established and is currently testing a secure SharePoint site accessible via the site laptop. The site contains a training certification library, instrument manual library, and the current QAPP. The site operator will have access to the libraries for operational and audit purposes. The site will be operational in 2016.

**Section 6: Data and Data Management**

**FINDING 1:**

Review of the QAPP revealed that it is a comprehensive document with detailed descriptions. However, minor edits need to be made to correct minor errors. These include:

- Updating QAPP to correct figure and table references. Certain locations appear to have incorrect references. For example, on page 23 of 47 of section 4.0 of the QAPP (revision 8.2), the first line refers to Figures 2-10 and 2-11. It appears that these should instead refer to Figure 2-13 and Figure 2-15 respectively.
- Verifying and updating webpage links mentioned in the QAPP and the SOPs. The EPA webpage appears to be under reconfiguration, and some links appear to be broken during the audit review. However, we recommend that Amec Foster Wheeler verify all electronic links during the revision and finalization of the QAPP and the SOPs.
- In Appendix 6, SOP on CASTNET Data Operations, references to attachments of data sets appear to be incorrect. For example, the SAS Datasets REG1 and REG2 appear in Attachments “F” and “G”, but the documents refer to attachments “D” and “E”. The Attachment “E” is itself a SAS program. The references to the programs that require those datasets also need to be updated.
- Page 25 of 39 of section 1.0 of the QAPP refers to three levels of security. There is some confusion as to what it refers to and mix-up with the three levels of data validation. These

references need to be clarified and expanded upon.

**RECOMMENDATION:**

It is recommended that the incorrect references to figures, tables and attachments be corrected, and certain phrases be clarified, during the next revision of the QAPP. Further, we recommend that Amec Foster Wheeler verify all webpage electronic links at the time of the revision to ensure those are current.

**Amec Foster Wheeler RESPONSE:**

The webpage links and table and figure references have been corrected in the main body of QAPP Revision 8.3. The sentence in section 1.3.1.4.1 regarding three levels of security did not belong there and was deleted. The Appendix 6 SOP will be updated in the next revision of the QAPP.

**FINDING 2:**

In terms of data communication, two sites use dial-up modem, while the rest of the sites use cellular modems with internet access. Figure 4-1 in the QAPP currently lists cellular data network as the mode of communication.

**RECOMMENDATION:**

It is recommended that the exception for the 2 sites be noted in Figure 4-1 of the QAPP through a footnote.

**Amec Foster Wheeler RESPONSE:**

The element describing mode of communication was removed from Figure 4-1 in QAPP Revision 8.3.

**FINDING 3:**

The hourly ozone values in the AIRNow dataset vary depending on the data source. Data from the airnowapi.org website are off by  $\pm 1$  ppb for some records compared to the values in AQS and/or the calculated hourly averages. It is unclear why the values are different from the other datasets, including the raw data. The data from the airnowtech.org website agrees perfectly with the data in AQS as well as with the raw data.

**RECOMMENDATION:**

It is recommended that Amec Foster Wheeler discuss with the AIRNow group at EPA to understand the reasons for this discrepancy and the types of processing performed to the data prior to posting it on AIRNow. The QAPP needs to be updated with the outcome of that discussion. It is also recommended that the QAPP note the potential differences in the AIRNow data based on the data source and caution the data user on the correct data source to be used.

**Amec Foster Wheeler RESPONSE:**

After investigation, Amec Foster Wheeler determined that AIRNow rounds (instead of truncating) values. Amec Foster Wheeler had been submitting hourly values with additional significant digits. Amec Foster Wheeler now truncates the hourly ozone data to prevent this discrepancy in values.

#### **FINDING 4:**

Except for the discrepancy in AIRNow (noted in Finding 3), all other data agreed between the different data sets. No major discrepancies in data were identified upon comparing data, other than the 1-hour offset that was easily explained. The data from the CASTNET website is censored to not include flags associated with invalid data.

#### **RECOMMENDATION:**

It might be beneficial to add the data status flags in the dataset posted on the CASTNET website as well, so that data users are aware of the reason for the data invalidation. Not all users may have access to the data in AQS.

#### **Amec Foster Wheeler RESPONSE:**

Amec Foster Wheeler does not manage the CASTNET website. The recommendation will be discussed with EPA.

#### **FINDING 5:**

Comparison of the raw data with the data obtained from the CASTNET website revealed 5 hours with missing data. Discussions with Mr. Rogers of Amec Foster Wheeler indicated that it represented a break in the polling of the data logger and were addressed during the end of month validation. Re-download of data from the CASTNET website showed that the missing hours were replaced with valid ozone data that agreed with the raw hourly data. The qa\_code had also changed from “1” in the original download from the CASTNET website to “2” in the second download. The replacement of missing hours, coinciding with the change in qa\_code is consistent with the activities described in the QAPP associated with the different levels of data validation. This also served as a real example of where missing data was fixed through re-polling. The description of the flag or the qa\_code was however missing from the QAPP.

#### **RECOMMENDATION:**

Table 4-7 of the QAPP does not describe the flag “X” in the raw data. Please update the table to include flag “X”.

#### **Amec Foster Wheeler RESPONSE:**

Description will be added in next QAPP revision.

#### **FINDING 6**

An examination of electronic and hard copy of the level 3 validation log showed good agreement with the data set and against each other. Both electronic and hard copy notes match. The “Update\_date” field in the dataset downloaded from CASTNET website matched with the date of the level 3 validation.

#### **RECOMMENDATION:**

No action required.

**FINDING 7:**

Amec Foster Wheeler is moving from CDMSA to iCASTNET software for their data validation procedures. The software is still being completed and tested as part of their ongoing data validation.

**RECOMMENDATION:**

It is recommended that Amec Foster Wheeler continue to compile and maintain their ongoing tests to serve as documentation of the detailed evaluation of the iCASTNET software.

**Amec Foster Wheeler RESPONSE:**

Amec Foster Wheeler agrees with the recommendation and will continue to maintain appropriate documentation related to all software used on the CASTNET project.