

Site: Bishop Paiute Reservation

Audit Date: November 19, 2021

Instrumentation Audited: Ozone, Meteorology and Particulate Matter

Key Person(s): Emma Ruppell

Auditor: David Yoho

Technical & Business Systems, Inc.  
25570 Rye Canyon Rd., Unit J  
Valencia, CA 91355

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The purpose of this summary is to provide a report of significant audit findings at the Bishop Paiute Reservation in Bishop, California. Key elements of the audit are identified below. Results of the performance audit comparisons are included.

#### **GENERAL COMMENTS**

No comments were noted at the time of the audit.

#### **KEY AUDIT FINDINGS**

##### **Ozone**

No performance problems were noted.

##### **Meteorology**

No performance problems were noted.

##### **Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>)**

No performance problems were noted.

**AUDIT RECORD**



25570 Rye Cyn Rd., Unit J  
Valencia, CA 91355  
(661) 294-1103

**OZONE**

Date: **11/19/21**  
Start: **8:15 PST**  
Finish: **10:00 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**

Site Name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**

Analyzer make: **Thermo Electron**                      Model: **49i**  
Serial No.: **630719320**                                      Filter: **NA**  
Sample flow: **0.605/0.545 lpm**                      Ozone Measure: **91130**  
Slope Set Point: **1.000**                                      Ozone Ref: **123979**  
Zero Set Point: **-0.40**                                      Last Calibrated: **NA**  
Range: **0.5 ppm**

O <sub>3</sub> Audit Point	PPM Input (X)	PPM DAS (Y)	PPM Dif (%)
1	0.000	0.001	
2	0.016	0.016	0.0
3	0.035	0.034	-2.9
4	0.084	0.082	-2.4
5	0.184	0.177	-3.8

Linear Regression: (Y=PPM Corrected, X=PPM Input)

Audit Statistics	
Slope:	0.958
Intercept:	0.001
Correlation:	1.0000

Comments:      No problems were noted.

Audit Equipment	Make	Model	ID	Certification Date
Dilution System:	API	M700EU	83	11/8/21
Ozone Standard:	API	M700EU	83	09/01/21
Zero Air System:	API	701	2427	NA

Ozone Transfer Standard	
Sample Freq: NA	Cell Temperature: NA deg C
Control Freq: NA	Ambient Pressure: NA "Hg
Span Setting: NA	Certification Slope: 0.9896
	Certification Intercept: 0.0000 ppm

**AUDIT RECORD**



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***HORIZONTAL WIND SPEED***

Date: **11/19/21**  
Start: **8:45 PST**  
Finish: **11:00 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**

Site Name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**

Manufacturer: **RM Young**  
Serial No.: **179042**  
K factor: **3.8**  
Range: **0 - 125**      **mph**  
Last Calibrated: **NA**

Model: **05305**  
Sensor Ht.: **10 meters**  
Starting torque:    **0.1**      **gm cm**  
Starting threshold: **0.36**    **mph**  
Starting threshold criteria: **1.1**    **mph**

Audit Point	Input MPH	DAS MPH	Diff. MPH
1	0.00	0.00	0.00
2	5.73	5.73	0.00

*Audit Criteria: ±56 MPH; ws ≤ 11.2 MPH*

Audit Point	Input MPH	DAS MPH	Diff. %
3	17.18	17.18	0.0
4	28.63	28.63	0.0
5	40.08	40.08	0.0
6	51.53	51.53	0.0

*Audit Criteria: ±5%; ws > 11.2 MPH*

Comments: No problems were noted.

**AUDIT RECORD**



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***HORIZONTAL WIND DIRECTION***

Date: **11/19/21**  
Start: **8:45 PST**  
Finish: **11:00 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**

Site Name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**

Manufacturer: **RM Young**  
Serial No.: **179042**  
K factor: **37**  
Range: **0 - 360°**  
Crossarm: **180°**  
Last Calibrated: **NA**

Model: **05305**  
Sensor Ht.: **10 meters**  
Starting torque: **5 gm cm**  
Starting threshold: **0.82 mph**  
Starting threshold criteria: **1.1 mph**

Audit Point	Degrees Reference	Degrees DAS	Diff. Degrees
1	45	45	0
2	90	90	0
3	135	137	2
4	180	181	1
5	225	226	1
6	270	270	0
7	315	317	2
8	0	0	0

*Audit Criteric ± 5 degrees*

Comments: No problems were noted.

**AUDIT RECORD**



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***AMBIENT TEMPERATURE***

Date: **11/19/21**  
Start: **8:45 PST**  
Finish: **11:00 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**

Site Name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**

Manufacturer: **Climatronics**  
Serial No.: **6916**  
Lower Range: **-22**      **Deg F**  
Upper Range: **122**      **Deg F**  
Last Calibrated: **NA**

Model: **62**  
Sensor Ht.: **9 m**

<b>Audit Point</b>	<b>Input Deg F</b>	<b>DAS Deg F</b>	<b>Diff. Deg F</b>
1	32.1	32.2	0.1
2	71.8	71.6	-0.2
3	103.0	103.1	0.1

*Audit Criteria: ± 1.8°F*

Comments: No problems were noted.

**AUDIT RECORD**

*T&B Systems*

25570 Rye Cyn Rd., Unit J

Valencia, CA 91355

(661) 294-1103

***PRECIPITATION***

Date: **#REF!**

Start: **9:00 PST**

Finish: **10:00 PST**

Auditor: **David Yoho**

Witness: **Emma Ruppell**

Site name: **Bishop Paiute**

Operator: **Emma Ruppell**

Project: **QA**

Manufacturer: **Climatronics**

Serial No.: **956**

Units: **inches**

Last Calibrated: **NA**

Model: **100508-G1**

Sensor Ht.: **1.5 m above roof**

Funnel Diam.: **15.4 cm**

Audit Point	Input Inches	DAS Inches	Diff. %
1	1.06	1.14	7.9

*Audit Criteric  $\pm 10\%$  of input*

Comments: No problems were noted.

**AUDIT RECORD**

***SOLAR RADIATION***



25570 Rye Cyn Rd., Unit J  
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Date: **11/19/21**  
Start: **8:45 PST**  
Finish: **11:00 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**

Site name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**

Sensor Mfg: **K&Z**  
Serial No.: **113299**  
Range: **0 - 2.145 Langleys/min**  
Last Calibrated: **NA**

Model: **SP-Lite**  
Sensor Ht.: **8 meters**

<b>Audit Point</b>	<b>Input L/min</b>	<b>DAS L/min</b>	<b>% Diff</b>
1	0.732	0.698	-4.6
2	0.742	0.718	-3.2
3	0.768	0.758	-1.3
4	0.805	0.773	-4.0

*Criteria: ± 10%*

Comments: No problems were noted.

**AUDIT RECORD**

***BAROMETRIC PRESSURE***



25570 Rye Cyn Rd., Unit J  
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Date: **11/19/21**  
Start: **8:45 PST**  
Finish: **11:00 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**

Site name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**

Manufacturer: **Climatronics**  
Serial No.: **87**  
Units: **mb**  
Last Calibrated: **NA**

Model: **1022761**  
Sensor Ht.: **2 m**

Audit Point	Input mb	DAS mb	Diff. mb
1	877.4	878.7	1.3

*Audit Criteria: ± 3.0 mb*

Comments: There were no issues noted.



**AUDIT RECORD**

*T&B Systems*

25570 Rye Cyn Rd., Unit J

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***RELATIVE HUMIDITY***

Date: **11/19/21**  
Start: **8:45 PST**  
Finish: **11:00 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**

Site name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**

Sensor Mfg: **Climatronics**  
Serial No.: **NA**  
Range: **0-100 %**  
Last Calibrated: **NA**

Model: **NA**  
Sensor Ht.: **9 meters**

<b>Audit Point</b>	<b>Input RH (%)</b>	<b>DAS RH (%)</b>	<b>Diff. %</b>
1	35.0	32.7	-2.3
2	34.4	32.6	-1.8
3	27.3	30.3	3.0
4	24.5	29.3	4.8
5	25.2	29.0	3.8

*Criteria: ±10%*

Comments: No problems were noted.

**AUDIT RECORD**

*PM<sub>10</sub>*



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Date: **11/19/21**  
Start: **11:00 PST**  
Finish: **12:00 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**

Site name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**

Sampler: **TEOM (PM10)**  
Serial No.: **1405A231661508**  
Last Calibrated.: **NA**

Make: **Thermo**  
Model: **1405**

Amb. Press: **25.89 in. Hg**  
Amb. Temp.: **15.3 °C**

Flowmeters  
Model: **Alicat FP25**  
Certification Date: **5/20/2021**

T Case (°C): **50.00**  
T Air (°C): **50.00**

T Cap (°C): **50.00**  
F Main (lpm): **3.00**  
F Aux (lpm) **13.65**

	<b>Audit</b>	<b>Site</b>	<b>Diff.</b>
Main	2.97 lpm	3.00 lpm	1.0%
Bypass	13.90 lpm	13.65 lpm	-1.8%
Total	16.87 lpm	16.65 lpm	-1.3%
Amb T	15.3 °C	16.5 °C	1.2
Amb P	0.865 atm	0.861 atm	-0.004

*Audit Criteria:* Flow - ± 10%; Total 15.00 - 18.34 lpm  
Amb T - ± 2° C  
Amb P - ± 0.013 atm

**Leak Check**

Main: 0.00 lpm      Audit Criteria: <0.15 lpm  
Bypass: -0.01 lpm      <0.60 lpm

**Mass Transducer Calibration Verification**

<b>Cal Filter Weight (g)</b>	<b>Frequency (w/o filter) (Hz)</b>	<b>Frequency (with filter) (Hz)</b>	<b>Audit K<sub>0</sub></b>	<b>Actual K<sub>0</sub></b>	<b>Error (%)</b>
NA	NA	NA	NA	NA	NA

*Audit Criteria:* ± 2.5%

Comments: No problems were noted. A mass transducer calibration verification was not performed.

**AUDIT RECORD**



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*PM*<sub>2.5</sub>

Date: **11/19/21**  
Start: **11:00 PST**  
Finish: **12:00 PST**  
Auditor: **David Yoho**  
Witness: **Emma Ruppell**

Site name: **Bishop Paiute**  
Operator: **Emma Ruppell**  
Project: **QA**

Sampler: **Teledyne API**  
Serial No.: **070600000**  
Last Calibrated.: **NA**

Model: **T640**

Amb. Press: **25.89 in. Hg**  
Amb. Temp.: **17.0 °C**  
Leak Check: **0.000 ug/m3**

Flowmeters  
Model: **Alicat FP25**  
Certification Date: **5/20/2021**

	<b>Audit</b>	<b>Site</b>	<b>Diff.</b>
Flowrate:	4.94 lpm	5.00 lpm	1.2%
Amb T (°C)	17.0 °C	16.5 °C	-0.5
Amb P (mm Hg)	657.5 mm Hg	654.3 mm Hg	-3.2

*Audit Criteria:*      *Flow - ±4%*  
                                  *Amb T - ±2° C*  
                                  *Amb P - ±10 mm Hg*

Comments: No problems were noted.