GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT

MEMORANDUM

DATE: November 11, 2011

TO: Chris Lanane, Scott Weaver

FROM: Mike Horn

SUBJECT: Quality Assurance Audit Report

Attached is the draft version of the document, "Great Basin Unified Air Pollution Control District Quality Assurance Audit Report, Keeler, November 11, 2011," for your review. Please refer any comments you may have on the document to me by January 11, 2012. If no comments are received by that date, the report will be considered final.

Thank you for your cooperation in this matter.

Great Basin Unified Air Pollution Control District
Quality Assurance
Audit Report

SITE:
KEELER

Report Date: November 11, 2011
Prepared by: Mike S. Horn

1.0 Introduction

As part of the Great Basin Unified Air Pollution Control District's (District) quality assurance (QA) program, periodic audits are conducted on the monitoring stations throughout the District. These checks, which are conducted by personnel other than those associated with the day-to-day operation and maintenance of the stations, provide additional assurance that the data collected are of high quality and meet the project objectives. The achievement of these objectives can be determined, in part, by establishing criteria within which monitoring equipment is to be operated and then testing that equipment regularly to verify its operation within those criteria.

In keeping with the District's QA program goals, the Partisol, PM-2.5, PM-10 and T.E.O.M. PM-2.5, PM-10 Monitoring Station at Keeler were audited on November 9, 2011. The audit was conducted by Mike Horn and was witnessed by Scott Weaver, who is the site operator.

2.0 Parameters Audited:

2-PM-2.5 2025 Sequential
2-PM-10 2025 Sequential
1-T.E.O.M. PM-10
1-T.E.O.M. 1405 PM-2.5, 10, Coarse FDMS
1-T.E.O.M. PM-2.5 FDMS

3.0 Results and Actions

The results of the audit are summarized below. Any problems found are addressed under the heading, "Action," and are given below. Sensor responses not specifically addressed below responded within the audit criteria limits. The audit data are presented in detail in Appendix A. The certifications of the audit devices are presented in Appendix B. Audit criteria based on Title 40 code of Federal Regulations Part 58, Appendix A (October 2006), the USEPA Quality Assurance Handbook for Air Pollution Measurement Systems Volumes II, 1997, and IV, 2007, and/ or on the manufactures recommendations, are presented in table A-1.

4.0 Recommendations and Comments

There are no recommendations or comments at this time.

APPENDIX A

Great Basin Unified Air Pollution Control District
R&P PM - 2.5
FLOW AUDIT

Date of Report:	11/11/11	Site Name:	Keeler - Primary
Date:	11/9/11	Operator:	Scott Weaver
Start:	12:30hrs. PST	Project:	SB270
Finish:	12:50hrs. PST	Site Elevation:	3598 ft
Audited By:	Mike Horn	Amb. Press.:	904.3 mm Hg
Witness:	Scott Weaver	Amb. Temp.:	12.2 deg. C

Make:	R&P	Audit Temp:	Testo 735	Serial No:	01467895/712
Model:	2025 Sequential	Audit Temp. Slope:	1.0006	Intercept:	0.0209
Prop. Or Ser. No.:	762/2025A211359907	Certification Date:	12/16/10		
Type:	PM 2.5				
Last Cal. Date:	10/24/11				

Temperature/ Pressure Verification

		Audit		
	Sampler	Raw	Calculated	Diff.
Amb Temp	11.8	12.2	12.2	-0.4
Filter Temp	13.6	14.0	14.0	-0.4
Amb Pressure	675.0	904.3	678.4	-3.4

Audit Device

Make:	BGI Incorporated
Model:	DELTA CAL
S/N:	525
Range:	2 - 20 lpm
Calibration factors:	
Slope:	1.00
Int.:	0.00
Cal Date:	1/4/11

Conversions:
mm Hg = hPa x 0.7502
atm = hPa/1013
in. Hg = hPa x 0.0295
° K = °C + 273

$Q_a=m[dPxT_a/P_a]^{1/2}+b$

w/ T in Kelvin, P in atm.

Leak Check:			Limit
External	22 mmhg/min.	Pass	<25 mmhg
Internal	75 mmhg/min.	Pass	<140 mmhg

Audit Point	Audit Flow Rate Indicated	Audit Flow Rate (VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Nominal Flow Rates Upper Limit (LPM)
Total Flow Rate, Run 1	16.98	16.98	16.70	-1.6	15.0	18.4
Total Flow Rate, Run 2	16.98	16.98	16.70	-1.6	15.0	18.4
Avg Total Flow Rate	16.98	16.98	16.70	-1.6	15.0	18.4

Comments: None.

Great Basin Unified Air Pollution Control District
R&P PM - 2.5
FLOW AUDIT

Date of Report:	11/11/11	Site Name:	Keeler Co-Located
Date:	11/9/11	Operator:	Scott Weaver
Start:	12:50hrs. PST	Project:	SB270
Finish:	13:10hrs. PST	Site Elevation:	3598 ft
Audited By:	Mike Horn	Amb. Press.:	904.1 mm Hg
Witness:	Scott Weaver	Amb. Temp.:	12.8 deg. C

Make:	R&P	Audit Temp:	Testo 735	Serial No:	01467895/712
Model:	2025 Sequential	Audit Temp. Slope:	1.0006	Intercept:	0.0209
Prop. Or Ser. No.:	764/2025A211279906	Certification Date:	12/16/10		
Type:	PM 2.5				
Last Cal. Date:	10/24/11				

Temperature/ Pressure Verification

	Sampler	Audit Raw	Audit Calculated	Diff.
Amb Temp	13.4	12.8	12.8	0.6
Filter Temp	13.5	14.4	14.4	-0.9
Amb Pressure	674.0	904.1	678.3	-4.3

Audit Device

Make:	BGI Incorporated
Model:	DELTA CAL
S/N:	525
Range:	2 - 20 lpm
Calibration factors:	
Slope:	1.00
Int.:	0.00
Cal Date:	1/4/11

Conversions:
mm Hg = hPa x 0.7502
atm = hPa/1013
in. Hg = hPa x 0.0295
° K = °C + 273

$Q_a=m[dPxT_a/P_a]^{1/2}+b$

w/ T in Kelvin, P in atm.

Leak Check:

			Limit
External	20 mmhg/min.	Pass	<25 mmhg
Internal	88 mmhg/min.	Pass	<140 mmhg

Audit Point	Audit Flow Rate Indicated	Audit Flow Rate (VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Nominal Flow Rates Upper Limit (LPM)
Total Flow Rate, Run 1	17.00	17.00	16.69	-1.8	15.0	18.4
Total Flow Rate, Run 2	17.00	17.00	16.69	-1.8	15.0	18.4
Avg Total Flow Rate	17.00	17.00	16.69	-1.8	15.0	18.4

Comments: None.

Great Basin Unified Air Pollution Control District
R&P PM - 10
FLOW AUDIT

Date of Report:	11/11/11	Site Name:	Keeler - Primary
Date:	11/9/11	Operator:	Scott Weaver
Start:	13:10hrs. PST	Project:	SB270
Finish:	12:25hrs. PST	Site Elevation:	3598 ft
Audited By:	Mike Horn	Amb. Press.:	904.1 mm Hg
Witness:	Scott Weaver	Amb. Temp.:	13.2 deg. C

Make:	R&P	Audit Temp: Testo 735	Serial No: 01467895/712
Model:	2025 Sequential	Audit Temp. Slope: 1.0006	Intercept: 0.0209
Prop. Or Ser. No.:	944/21189	Certification Date: 12/16/10	
Type:	PM 10		
Last Cal. Date:	10/24/11		

Temperature/ Pressure Verification

	Sampler	Audit Raw	Audit Calculated	Diff.
Amb Temp	13.4	13.2	13.2	0.2
Filter Temp	15.6	14.9	14.9	0.7
Amb Pressure	675.0	904.1	678.3	-3.3

Audit Device

Make:	BGI Incorporated
Model:	DELTA CAL
S/N:	525
Range:	2 - 20 lpm
Calibration factors:	
Slope:	1.00
Int.:	0.00
Cal Date:	1/4/11

Conversions:
mm Hg = hPa x 0.7502
atm = hPa/1013
in. Hg = hPa x 0.0295
° K = °C + 273

$Q_a=m[dPxT_a/P_a]^{1/2}+b$

w/ T in Kelvin, P in atm.

Leak Check:			Limit
External	24 mmhg/min.	Pass	<25 mmhg
Internal	71 mmhg?min.	Pass	<140 mmhg

Audit Point	Audit Flow Rate Indicated	Audit Flow Rate (VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Nominal Flow Rates Upper Limit (LPM)
Total Flow Rate, Run 1	16.83	16.83	16.67	-1.0	15.0	18.4
Total Flow Rate, Run 2	16.83	16.83	16.67	-1.0	15.0	18.4
Avg Total Flow Rate	16.83	16.83	16.67	-1.0	15.0	18.4

Comments: None.

Great Basin Unified Air Pollution Control District
R&P PM - 10
FLOW AUDIT

Date of Report:	11/11/11	Site Name:	Keeler - Co-Located
Date:	11/9/11	Operator:	Scott Weaver
Start:	13:25hrs. PST	Project:	SB270
Finish:	13:40hrs. PST	Site Elevation:	3598 ft
Audited By:	Mike Horn	Amb. Press.:	904.7 mm Hg
Witness:	Scott Weaver	Amb. Temp.:	14.4 deg. C

Make:	R&P	Audit Temp: Testo 735	Serial No: 01467895/712
Model:	2025 Sequential	Audit Temp. Slope: 1.0006	Intercept: 0.0209
Prop. Or Ser. No.:	942/21183	Certification Date: 12/16/10	
Type:	PM 10		
Last Cal. Date:	10/24/11		

Temperature/ Pressure Verification

	Sampler	Audit Raw	Audit Calculated	Diff.
Amb Temp	14.8	14.4	14.4	0.4
Filter Temp	13.8	14.0	14.0	-0.2
Amb Pressure	674.0	904.7	678.7	-4.7

Audit Device

Make:	BGI Incorporated
Model:	DELTA CAL
S/N:	525
Range:	2 - 20 lpm
Calibration factors:	
Slope:	1.00
Int.:	0.00
Cal Date:	1/4./11

Conversions:
mm Hg = hPa x 0.7502
atm = hPa/1013
in. Hg = hPa x 0.0295
° K = °C + 273

$Q_a = m[dPxT_a/P_a]^{1/2} + b$

w/ T in Kelvin, P in atm.

Leak Check:

			Limit
External	23 mmhg/min.	Pass	<25 mmhg
Internal	70 mmhg/min.	Pass	<140 mmhg

Audit Point	Audit Flow Rate Indicated	Audit Flow Rate (VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Nominal Flow Rates Upper Limit (LPM)
Total Flow Rate, Run 1	16.83	16.83	16.67	-1.0	15.0	18.4
Total Flow Rate, Run 2	16.83	16.83	16.67	-1.0	15.0	18.4
Avg Total Flow Rate	16.83	16.83	16.67	-1.0	15.0	18.4

Comments: None.

Great Basin Unified Air Pollution Control District
Tapered Element Oscillating Microbalance (TEOM)
AUDIT

Date of report:	11/11/11		
Date:	11/9/11	Site name:	Keeler #1
Start:	11:30hrs. PST	Operator:	Scott Weaver
Finish:	11:45hrs. PST	Project:	SB 270
Audited By:	Mike Horn	Site Elevation:	3598 ft.
Witness:	Scott Weaver	Amb. Pres.:	905.80 hPa
		Amb. Temp.:	9.8 deg. C
Prop. or Serial No.:	24922	Make:	R & P
Type:	PM-2.5 FDMS	Model:	1400ab
		Last cal. date:	9/21/11

AUDIT DEVICE(S)

Make:	BGI Incorporated	Make:	BGI Incorporated
Model:	DELTA CAL	Model:	DELTA CAL
S/N:	525	S/N:	525
Range:	2 - 20 lpm	Range:	2 - 20 lpm
Calibration Factors		Calibration Factors	
Slope:	1.00	Slope:	1.00
Intercept:	0.00	Intercept:	0.00
Cal Date:	1/4/11	Cal Date:	1/4/11

	Main:	Aux:	Sampler temp:	Diff.	Sampler press:	Diff.
Leak check:	0.100	0.090	11.0	1.2	905.80	0.0
Dark current:	N/A	N/A				

Audit Point	Audit Flow Rate, ΔP, in. H2O	Audit Flow Rate, (VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Nominal Flow Rates Upper Limit (LPM)
	$Qa=[dPxTa/Pa]^{1/2}+b$					
Total Flow Rate	16.72	16.72	16.65	-0.4	15.0	18.4
Bypass/Aux Flow Rate	13.69	13.69	13.66	-0.2		
Main Flow Rate	2.89	2.89	2.99	3.5	2.7	3.3
Total Flow Rate	16.77	16.77	16.65	-0.7	15.0	18.4

Comments: None.

Great Basin Unified Air Pollution Control District
Tapered Element Oscillating Microbalance (TEOM)
AUDIT

Date of report:	11/11/11		
Date:	11/9/11	Site name:	Keeler #2
Start:	11:45hrs. PST	Operator:	Scott Weaver
Finish:	12:15hrs. PST	Project:	SB 270
Audited By:	Mike Horn	Site Elevation:	3598 ft.
Witness:	Scott Weaver	Amb. Pres.:	905.30 hPa
		Amb. Temp.:	12.5 deg. C
Prop. or Serial No.:	21002	Make:	
Type:	1405 DF PM 2.5, 10, COARSE	Model:	1405 DF
		Last cal. date:	8/11/11

AUDIT DEVICE(S)

Make:	BGI Incorporated	Make:	BGI Incorporated
Model:	DELTA CAL	Model:	DELTA CAL
S/N:	525	S/N:	525
Range:	2 - 20 lpm	Range:	2 - 20 lpm
Calibration Factors		Calibration Factors	
Slope:	1.00	Slope:	1.00
Intercept:	0.00	Intercept:	0.00
Cal Date:	1/4/11	Cal Date:	1/4/11

	Base	Reference	Sampler temp:	Diff.	Sampler press:	Diff.
PM 2.5	0.100	0.000	11.8	-0.7	899.44	-5.9
Coarse	0.400	0.040				
Bypass	0.600	0.060				

Audit Point	Audit Flow Rate, ΔP, in. H2O	Audit Flow Rate, (VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Nominal Flow Rates Upper Limit (LPM)
Total Flow Rate	16.68	16.68	16.67	-0.1	15.0	18.4
Bypass/Aux Flow Rate	12.00	12.00	12.26	2.2		
PM 2.5 Flow Rate	2.96	2.96	3.00	1.4	2.7	3.3
Coarse Flow Rate	1.67	1.67	1.70	1.8	N/A	N/A
Total Flow Rate	16.99	16.99	16.67	-1.9	15.0	18.4

Comments: New sampler, first audit.

Great Basin Unified Air Pollution Control District
Tapered Element Oscillating Microbalance (TEOM)
AUDIT

Date of report:	11/11/11		
Date:	11/9/11	Site name:	Keeler #3
Start:	12:15hrs. PST	Operator:	Scott Weaver
Finish:	12:30hrs. PST	Project:	SB 270
Audited By:	Mike Horn	Site Elevation:	3598 ft.
Witness:	Scott Weaver	Amb. Pres.:	905.00 hPa
		Amb. Temp.:	15.4 deg. C
Prop. or Serial No.:	24786	Make:	R & P
Type:	PM-10	Model:	1400ab
		Last cal. date:	9/21/11

AUDIT DEVICE(S)

Make:	BGI Incorporated	Make:	BGI Incorporated
Model:	DELTA CAL	Model:	DELTA CAL
S/N:	525	S/N:	525
Range:	2 - 20 lpm	Range:	2 - 20 lpm
Calibration Factors		Calibration Factors	
Slope:	1.00	Slope:	1.00
Intercept:	0.00	Intercept:	0.00
Cal Date:	1/4/11	Cal Date:	1/4/11

	Main:	Aux:	Sampler temp:	Diff.	Sampler press:	Diff.
Leak check:	0.070	0.120	14.3	-1.1	895.53	-9.5
Dark current:	N/A	N/A				

Audit Point	Audit Flow Rate, ΔP, in. H2O	Audit Flow Rate, (VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Nominal Flow Rates Upper Limit (LPM)
	$Qa=[dPxTa/Pa]^{1/2}+b$					
Total Flow Rate	16.88	16.88	16.65	-1.4	15.0	18.4
Bypass/Aux Flow Rate	13.80	13.80	13.66	-1.0		
Main Flow Rate	3.05	3.05	2.99	-2.0	2.7	3.3
Total Flow Rate	16.93	16.93	16.65	-1.7	15.0	18.4

Comments: None.

TABLE A-1

GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT
QUALITY ASSURANCE PERFORMANCE AUDIT CRITERIA

Measurement Variable		Evaluation Criteria
Wind Speed		At ws ≤ 5 m/s, input ± 0.25 m/s; At ws > 5 m/s, input ± 5% Starting threshold: 0.5 m/s; R. M. Young 05305 Wind Monitor AQ Starting threshold: 1.0 m/s; R. M. Young 05103 Wind Monitor and NRG Max 40H
Wind Direction		input ± 5° Starting threshold: 0.5 m/s; R. M. Young 05305 Wind Monitor AQ Starting threshold: 1.0 m/s; R. M. Young 05103 Wind Monitor
Temperature		input ± 0.5° C Gravimetry Lab ± 1.0 deg. C input ± 2.0° C for PM-10, PM-2.5 samplers
Relative Humidity		Ambient: input ± 5% RH, ± 1.5°C as dew point Gravimetry Lab: input ± 5%
Precipitation		input ± 10%
Barometric Pressure		Ambient: input ± 10 hPa TEOM: ± 10 mm mercury
PM-10: Hi-Vol SSI, Partisol, BGI, PM-2.5		input ± 10%; Design Flow ± 10% input ± 4%; Design Flow ± 5%
TEOM:	Total Flow	input ± 10%; Design Flow ± 10%
	Main Flow	input ± 10%; Design Flow ± 10%
	Bypass Flow	input ± 10%; Design Flow ± 10%
TEOM:	Leak Check	Main Flow: < 0.15 LPM Bypass Flow: < 0.60 LPM

Appendix B

GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT
QUALITY ASSURANCE CERTIFICATIONS OF AUDIT DEVICES

AUDIT DEVICE	Serial #	Cal Date:	Slope:	Intercept:
BGI Delta CAL:	123	1/24/11	1.0	0.0
BGI Delta CAL:	525	1/4/11	1.0	0.0
Testo 735-1	01467895/712	12/16/10	1.0006	0.0209
Barigo Altimeter/Barometer:	P9	12/17/10	1.0	0.0
RM Young wind speed motor:	CU10, HS10	8/30/11	N/A	N/A
Psychro-Dyne Psychrometer:	RH 04	N/A	1 0	1 0
Texas Electronics FC-525 Precipitation:	52202	N/A		
Chinook Eng. Streamline FTS	108	9/8/10	0.41	0.6

Great Basin Unified Air Pollution Control District

Partisol
FLOW AUDIT Q. M. 2.5 primary

Date:	11/9/11		Site Name:	Keeler	
Start:	12:30	PST	Operator:	Scott Weaver	
Finish:	12:50	PST	Project:	SB270	
			Site Elevation:		ft
Make:	R&P		Amb. Press.:	904.3	in. Hg
Model:	2000 / 2025		Amb. Temp.:	12.2	deg. C
Prop. Or Ser. No.:	762 /				
Type:	PM10 / PM2.5				
Last Cal. Date:	10/24/11				

Audit Device			Temperature/ Pressure Verification			
Make:	BGI INCORPORATED			Sampler	Standard	(Raw)
Model:	DELTA CAL		Amb Temp	11.8		12.2
S/N:	~~0123~~ 525		Filter Temp	13.6		14.0
Range:	2 - 20	lpm	Amb Pressure	675		904.3
Calibration factors:				.7502X		
Slope:	1.0					
Int.:	0.0					
Cal Date:	1/4/11					

$Q_a=m[dPxT_a/P_a]^{1/2}+b$ w/ T in Kelvin, P in atm. ÷ 1013

Leak Check:	Initial Pres.	Final Pres.	P_i-P_f	Limit
External	22		PASS	<5 psi / <25mm
Internal	73		PASS	

Audit Point	Audit Flow Rate Indicated	(VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Upper Limit (LPM)
1. Total Fow Rate	16.98		16.70		15.0	18.4
2.	16.98		16.70			
AVE Total Flow Rate	16.98		16.70		15.0	18.4

Comments:

Calibrated by: Mike [illegible]

Great Basin Unified Air Pollution Control District

Partisol

FLOW AUDIT PM 2.5 CO-Lo

Date:	11/9/11		Site Name:	Kelly	
Start:	12:50	PST	Operator:	Scott Weaver	
Finish:	1:10	PST	Project:	SB270	
			Site Elevation:		ft
Make:	R&P		Amb. Press.:	904.1	in. Hg
Model:	2000 / 2025		Amb. Temp.:	12.8	deg. C
Prop. Or Ser. No.:	764 /				
Type:	PM10 / PM2.5				
Last Cal. Date:	10/24/11				

Audit Device			Temperature/ Pressure Verification			
Make:	BGI INCORPORATED			Sampler	Standard	(Raw)
Model:	DELTA CAL		Amb Temp	13.4		12.8
S/N:	~~0123~~ 525		Filter Temp	13.5		14.4
Range:	2 - 20	lpm	Amb Pressure	674		904.1
Calibration factors:				.7502X		
Slope:	1.0					
Int.:	0.0					
Cal Date:	1/4/11					

$Q_a = m[dP \times T_a / P_a]^{1/2} + b$ w/ T in Kelvin, P in atm. ÷ 1013

Leak Check:	Initial Pres.	Final Pres.	$P_i - P_f$	Limit
External	20		PASS	<5 psi / <25mm
Internal	88		PASS	

Audit Point	Audit Flow Rate Indicated	(VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Upper Limit (LPM)
1. Total Fow Rate	17.00		16.69		15.0	18.4
2.	17.00		16.69			
AVE Total Flow Rate	17.00		16.69		15.0	18.4

Comments:

Calibrated by: Mike [illegible]

Great Basin Unified Air Pollution Control District

Partisol

FLOW AUDIT PM10 primary

Date:	11/9/11		Site Name:	Kelly	
Start:	1:16	PST	Operator:	Scott Weaver	
Finish:	1:25	PST	Project:	SB270	
			Site Elevation:		ft
Make:	R&P		Amb. Press.:	904.1	in. Hg
Model:	2000 / 2025		Amb. Temp.:	13.2	deg. C
Prop. Or Ser. No.:	944 / 21189				
Type:	PM10 / PM2.5				
Last Cal. Date:	10/25/11				

Audit Device			Temperature/ Pressure Verification			
Make:	BGI INCORPORATED			Sampler	Standard	(Raw)
Model:	DELTA CAL		Amb Temp	~~15.6~~	13.4	13.2
S/N:	~~0123~~ 525		Filter Temp	15.6		14.9
Range:	2 - 20	lpm	Amb Pressure	25		904.1
Calibration factors:				.7502X		
Slope:	1.0					
Int.:	0.0					
Cal Date:	1/4/11					

$Q_a=m[dPxT_a/P_a]^{1/2}+b$ w/ T in Kelvin, P in atm. ÷ 1013

Leak Check:	Initial Pres.	Final Pres.	P_i-P_f	Limit
External	24		PASS	<5 psi / <25mm
Internal	71		PASS	

Audit Point	Audit Flow Rate Indicated	(VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Upper Limit (LPM)
5. Total Fow Rate	16.83		16.67		15.0	18.4
	16.83		16.67			
AVE Total Flow Rate	16.83		16.67		15.0	18.4

Comments:

Calibrated by: Mike [illegible]

Great Basin Unified Air Pollution Control District

Partisol FLOW AUDIT @ PM10 co-Lo

Date:	11/9/11		Site Name:	Keeler	
Start:	1:35	PST	Operator:	Scott Weaver	
Finish:	1:40	PST	Project:	SB270	
			Site Elevation:		ft
Make:	R&P		Amb. Press.:	904.7	in. Hg
Model:	2000 / 2025		Amb. Temp.:	14.4	deg. C
Prop. Or Ser. No.:	9427				
Type:	PM10 / PM2.5				
Last Cal. Date:	11/24/11				

Audit Device		Temperature/ Pressure Verification	Sampler	Standard	(Raw)
Make:	BGI INCORPORATED				
Model:	DELTA CAL	Amb Temp	14.8		14.4
S/N:	~~0123~~ 625	Filter Temp	13.8		14.0
Range:	2 - 20 lpm	Amb Pressure	674		904.7
Calibration factors:			.7502X		
Slope:	1.0				
Int.:	0.0				
Cal Date:	1/4/11				

$Q_a = m[dP \times T_a / P_a]^{1/2} + b$ w/ T in Kelvin, P in atm. ÷ 1013

Leak Check:	Initial Pres.	Final Pres.	$P_i - P_f$	Limit
External	23		PASS	<5 psi / <25mm
Internal	70		PASS	

Audit Point	Audit Flow Rate Indicated	(VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Upper Limit (LPM)
1. Total Fow Rate	16.83		16.67		15.0	18.4
2.	16.83		16.67			
AVE Total Flow Rate	16.83		16.67		15.0	18.4

Comments:

Calibrated by: [signature]

Great Basin Unified Air Pollution Control District

Tapered Element Oscillating Microbalance (TEOM)

FLOW AUDIT #1 FDMS 2.5

Date:	11/9/11		Site Name:	Kern
Start:	11:28	PST	Operator:	Scott Weaver
Finish:	11:45	PST	Project:	SB270
			Site Elevation:	ft
			Amb. Press.:	905.8 in. Hg
			Amb. Temp.:	9.8 deg. C
Prop. Or Ser. No.:	24922		Make:	R&P
Type:	~~PM10~~ 2.5		Model:	1400a
			Last Cal. Date:	9/21/11

Audit Device(s)

Make:	BGI INCORPORATED		Make:	BGI INCORPORATED
Model:	DELTA CAL		Model:	DELTA CAL
S/N:	~~0123~~ 525		S/N:	0123
Range:	2 - 20	lpm	Range:	2 - 20 lpm
Calibration factors:			Calibration factors:	
Slope:	1.0		Slope:	1.0
Int.:	0.0		Int.:	0.0
Cal Date:	1/4/16		Cal Date:	

$Q_a=m[dPxT_a/P_a]^{1/2}+b$ Altitude Correction Factor: ÷ 1013

Leak Check-Initial	Main:	.10	Aux:	.09
Leak Check-Final	Main:		Aux:	

Audit Point	Audit Flow Rate delta P	(VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Upper Limit (LPM)
Total Fow Rate	16.72		2.99/13.66 = 16.65		15.0	18.4
Aux. Flow Rate	13.69		13.66			
Main Flow Rate	2.89		2.99		2.7	3.3
Total Flow Rate	16.77		16.65		15.0	18.4

	Sampler	Standard True	Standard Raw
Amb Temp	11.0		9.8
Amb Press	8.70	901.57	905.8

Comments:

Calibrated By: [signature]

Great Basin Unified Air Pollution Control District

Tapered Element Oscillating Microbalance (TEOM)

FLOW AUDIT #2

Date:	11/9/11		Site Name:	Keeler
Start:	11:45	PST	Operator:	Scott Weaver
Finish:	12:15	PST	Project:	SB270
			Site Elevation:	ft
			Amb. Press.:	905.3 in. Hg
			Amb. Temp.:	12.5 deg. C
Prop. Or Ser. No.:	21005 ~~DF~~		Make:	~~R&P~~
Type:	PM10 2.5, Coarse		Model:	~~1400a~~ 1405 DF
			Last Cal. Date:	8/11/11

Audit Device(s)

Make:	BGI INCORPORATED	Make:	BGI INCORPORATED
Model:	DELTA CAL	Model:	DELTA CAL
S/N:	~~0123~~ 525	S/N:	0123
Range:	2 - 20 lpm	Range:	2 - 20 lpm
Calibration factors:		Calibration factors:	
Slope:	1.0	Slope:	1.0
Int.:	0.0	Int.:	0.0
Cal Date:	1/4/11	Cal Date:	

$Q_a=m[dPxT_a/P_a]^{1/2}+b$ Altitude Correction Factor: ÷ 1013

	Base			Reference		
Leak Check-Initial	2.5	~~Main~~:	0.1	2.5	~~Aux~~:	0.0
Leak Check-Final	Coarse	~~Main~~:	0.4	Coarse	~~Aux~~:	.04
	Bypass		0.6	Bypass		.06

Audit Point	Audit Flow Rate delta P	(VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Upper Limit (LPM)
Total Fow Rate	16.68		16.67		15.0	18.4
Bypass ~~Aux.~~ Flow Rate	12.00		12.26			
2.5 ~~Main~~ Flow Rate	2.96		3.00		2.7	3.3
Coarse ~~Total Flow Rate~~	1.67		1.70		~~15.0~~	~~18.4~~
Total Flow	16.99		16.67		15.0	18.4

	Sampler		Standard True	Standard Raw
Amb Temp	11.8			12.5
Amb Press	.888		899.44	905.3

Comments:

Calibrated By:

Great Basin Unified Air Pollution Control District

Tapered Element Oscillating Microbalance (TEOM)

FLOW AUDIT #3 PM10

Date:	11/9/11	Site Name:	Kuhl	
Start:	12:15 PST	Operator:	Scott Weaver	
Finish:	12:30 PST	Project:	SB270	
		Site Elevation:	15.4	ft
		Amb. Press.:	905.0	in. Hg
		Amb. Temp.:	15.4	deg. C
Prop. Or Ser. No.:	24786	Make:	R&P	
Type:	PM10	Model:	1400a	
		Last Cal. Date:	9/21/11	

Audit Device(s)

Make:	BGI INCORPORATED	Make:	BGI INCORPORATED
Model:	DELTA CAL	Model:	DELTA CAL
S/N:	~~0123~~ 525	S/N:	0123
Range:	2 - 20 lpm	Range:	2 - 20 lpm
Calibration factors:		Calibration factors:	
Slope:	1.0	Slope:	1.0
Int.:	0.0	Int.:	0.0
Cal Date:	1/4/11	Cal Date:	

$Q_a=m[dPxT_a/P_a]^{1/2}+b$ Altitude Correction Factor: ÷ 1013

Leak Check-Initial	Main: .07	Aux: .12		
Leak Check-Final	Main:	Aux:		

Audit Point	Audit Flow Rate delta P	(VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Upper Limit (LPM)
Total Fow Rate	16.88		2.99/13.66=16.65		15.0	18.4
Aux. Flow Rate	13.80		13.66			
Main Flow Rate	3.05		2.99		2.7	3.3
Total Flow Rate	16.93		16.65		15.0	18.4

	Sampler	Standard True	Standard Raw
Amb Temp	14.3		~~14.3~~ 15.4
Amb Press	.887	895.53	905.0

Comments:

Calibrated By: Mike Hu

GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT

MEMORANDUM

DATE: July 7, 2011

TO: Chris Lanane, Scott Weaver

FROM: Mike Horn

SUBJECT: Quality Assurance Audit Report

Attached is the draft version of the document, "Great Basin Unified Air Pollution Control District Quality Assurance Audit Report, Keeler, July 7, 2011," for your review. Please refer any comments you may have on the document to me by September 7, 2011. If no comments are received by that date, the report will be considered final.

Thank you for your cooperation in this matter.

Great Basin Unified Air Pollution Control District
Quality Assurance
Audit Report

SITE:
KEELER

Report Date: July 7, 2011
Prepared by: Mike S. Horn

1.0 Introduction

As part of the Great Basin Unified Air Pollution Control District's (District) quality assurance (QA) program, periodic audits are conducted on the monitoring stations throughout the District. These checks, which are conducted by personnel other than those associated with the day-to-day operation and maintenance of the stations, provide additional assurance that the data collected are of high quality and meet the project objectives. The achievement of these objectives can be determined, in part, by establishing criteria within which monitoring equipment is to be operated and then testing that equipment regularly to verify its operation within those criteria.

In keeping with the District's QA program goals, the Partisol, PM-2.5, PM-10 and T.E.O.M. PM-2.5, PM-10 Monitoring Station at Keeler were audited on July 6, 2011. The audit was conducted by Mike Horn and was witnessed by Scott Weaver, who is the site operator.

2.0 Parameters Audited:

2-PM-2.5 2025 Sequential
2-PM-10 2025 Sequential
2-T.E.O.M. PM-10
1-T.E.O.M. PM-2.5 FDMS

3.0 Results and Actions

The results of the audit are summarized below. Any problems found are addressed under the heading, "Action," and are given below. Sensor responses not specifically addressed below responded within the audit criteria limits. The audit data are presented in detail in Appendix A. The certifications of the audit devices are presented in Appendix B. Audit criteria based on Title 40 code of Federal Regulations Part 58, Appendix A (October 2006), the USEPA Quality Assurance Handbook for Air Pollution Measurement Systems Volumes II, 1997, and IV, 2007, and/ or on the manufactures recommendations, are presented in table A-1.

4.0 Recommendations and Comments

There are no recommendations or comments at this time.

APPENDIX A

Great Basin Unified Air Pollution Control District
R&P PM - 2.5
FLOW AUDIT

Date of Report:	7/7/11	Site Name:	Keeler - Primary
Date:	7/6/11	Operator:	Scott Weaver
Start:	11:00hrs. PST	Project:	SB270
Finish:	11:15hrs. PST	Site Elevation:	3598 ft
Audited By:	Mike Horn	Amb. Press.:	891.3 mm Hg
Witness:	Scott Weaver	Amb. Temp.:	23.0 deg. C

Make:	R&P	Audit Temp:	Testo 735	Serial No:	01467895/712
Model:	2025 Sequential	Audit Temp. Slope:	1.0006	Intercept:	0.0209
Prop. Or Ser. No.:	762/2025A211359907	Certification Date:	12/16/10		
Type:	PM 2.5				
Last Cal. Date:	6/30/11				

Temperature/ Pressure Verification

		Audit		
	Sampler	Raw	Calculated	Diff.
Amb Temp	33.2	32.0	32.0	1.2
Filter Temp	36.0	35.0	35.0	1.0
Amb Pressure	668.0	891.3	668.7	-0.7

Audit Device

Make:	BGI Incorporated
Model:	DELTA CAL
S/N:	525
Range:	2 - 20 lpm
Calibration factors:	
Slope:	1.00
Int.:	0.00
Cal Date:	1/4/11

Conversions:
mm Hg = hPa x 0.7502
atm = hPa/1013
in. Hg = hPa x 0.0295
° K = °C + 273

$Q_a=m[dPxT_a/P_a]^{1/2}+b$

w/ T in Kelvin, P in atm.

Leak Check:

			Limit
External	19 mmhg/min.	Pass	<25 mmhg
Internal	60 mmhg/min.	Pass	<140 mmhg

Audit Point	Audit Flow Rate Indicated	Audit Flow Rate (VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Nominal Flow Rates Upper Limit (LPM)
Total Flow Rate, Run 1	16.78	16.78	16.70	-0.5	15.0	18.4
Total Flow Rate, Run 2	16.78	16.78	16.70	-0.5	15.0	18.4
Avg Total Flow Rate	16.78	16.78	16.70	-0.5	15.0	18.4

Comments: None.

Great Basin Unified Air Pollution Control District
R&P PM - 2.5
FLOW AUDIT

Date of Report:	7/7/11	Site Name:	Keeler Co-Located
Date:	7/6/11	Operator:	Scott Weaver
Start:	11:15hrs. PST	Project:	SB270
Finish:	11:30hrs. PST	Site Elevation:	3598 ft
Audited By:	Mike Horn	Amb. Press.:	891.1 mm Hg
Witness:	Scott Weaver	Amb. Temp.:	37.0 deg. C

Make:	R&P	Audit Temp:	Testo 735	Serial No:	01467895/712
Model:	2025 Sequential	Audit Temp. Slope:	1.0006	Intercept:	0.0209
Prop. Or Ser. No.:	764/2025A211279906	Certification Date:	12/16/10		
Type:	PM 2.5				
Last Cal. Date:	6/30/11				

Temperature/ Pressure Verification

	Sampler	Audit Raw	Audit Calculated	Diff.
Amb Temp	35.6	37.0	37.0	-1.4
Filter Temp	37.3	36.2	36.2	1.1
Amb Pressure	667.0	891.1	668.5	-1.5

Audit Device

Make:	BGI Incorporated
Model:	DELTA CAL
S/N:	525
Range:	2 - 20 lpm
Calibration factors:	
Slope:	1.00
Int.:	0.00
Cal Date:	1/4/11

Conversions:
mm Hg = hPa x 0.7502
atm = hPa/1013
in. Hg = hPa x 0.0295
° K = °C + 273

$Q_a=m[dPxT_a/P_a]^{1/2}+b$

w/ T in Kelvin, P in atm.

Leak Check:			Limit
External	17 mmhg/min.	Pass	<25 mmhg
Internal	41 mmhg/min.	Pass	<140 mmhg

Audit Point	Audit Flow Rate Indicated	Audit Flow Rate (VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Nominal Flow Rates Upper Limit (LPM)
Total Flow Rate, Run 1	16.89	16.89	16.70	-1.1	15.0	18.4
Total Flow Rate, Run 2	16.89	16.89	16.70	-1.1	15.0	18.4
Avg Total Flow Rate	16.89	16.89	16.70	-1.1	15.0	18.4

Comments: None.

Great Basin Unified Air Pollution Control District
R&P PM - 10
FLOW AUDIT

Date of Report:	7/7/11	Site Name:	Keeler - Primary
Date:	7/6/11	Operator:	Scott Weaver
Start:	11:30hrs. PST	Project:	SB270
Finish:	11:45hrs. PST	Site Elevation:	3598 ft
Audited By:	Mike Horn	Amb. Press.:	891.4 mm Hg
Witness:	Scott Weaver	Amb. Temp.:	33.5 deg. C

Make:	R&P	Audit Temp:	Testo 735	Serial No:	01467895/712
Model:	2025 Sequential	Audit Temp. Slope:	1.0006	Intercept:	0.0209
Prop. Or Ser. No.:	944/21189	Certification Date:	12/16/10		
Type:	PM 10				
Last Cal. Date:	6/30/11				

Temperature/ Pressure Verification

	Sampler	Audit Raw	Audit Calculated	Diff.
Amb Temp	34.1	33.5	33.5	0.6
Filter Temp	38.3	37.3	37.3	1.0
Amb Pressure	667.0	891.4	668.7	-1.7

Audit Device

Make:	BGI Incorporated
Model:	DELTA CAL
S/N:	525
Range:	2 - 20 lpm
Calibration factors:	
Slope:	1.00
Int.:	0.00
Cal Date:	1/4/11

Conversions:
mm Hg = hPa x 0.7502
atm = hPa/1013
in. Hg = hPa x 0.0295
° K = °C + 273

$Q_a=m[dPxT_a/P_a]^{1/2}+b$

w/ T in Kelvin, P in atm.

Leak Check:			Limit
External	16 mmhg/min.	Pass	<25 mmhg
Internal	66 mmhg?min.	Pass	<140 mmhg

Audit Point	Audit Flow Rate Indicated	Audit Flow Rate (VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Nominal Flow Rates Upper Limit (LPM)
Total Flow Rate, Run 1	17.09	17.09	16.70	-2.3	15.0	18.4
Total Flow Rate, Run 2	17.09	17.09	16.70	-2.3	15.0	18.4
Avg Total Flow Rate	17.09	17.09	16.70	-2.3	15.0	18.4

Comments: None.

Great Basin Unified Air Pollution Control District
R&P PM - 10
FLOW AUDIT

Date of Report:	7/7/11	Site Name:	Keeler - Co-Located
Date:	7/6/11	Operator:	Scott Weaver
Start:	11:45hrs. PST	Project:	SB270
Finish:	12:00hrs. PST	Site Elevation:	3598 ft
Audited By:	Mike Horn	Amb. Press.:	891.3 mm Hg
Witness:	Scott Weaver	Amb. Temp.:	33.3 deg. C

Make:	R&P	Audit Temp:	Testo 735	Serial No:	01467895/712
Model:	2025 Sequential	Audit Temp. Slope:	1.0006	Intercept:	0.0209
Prop. Or Ser. No.:	942/21183	Certification Date:	12/16/10		
Type:	PM 10				
Last Cal. Date:	6/30/11				

Temperature/ Pressure Verification

	Sampler	Audit Raw	Audit Calculated	Diff.
Amb Temp	33.8	33.3	33.3	0.5
Filter Temp	37.4	36.3	36.3	1.1
Amb Pressure	667.0	891.3	668.7	-1.7

Audit Device

Make:	BGI Incorporated
Model:	DELTA CAL
S/N:	525
Range:	2 - 20 lpm
Calibration factors:	
Slope:	1.00
Int.:	0.00
Cal Date:	1/4./11

Conversions:
mm Hg = hPa x 0.7502
atm = hPa/1013
in. Hg = hPa x 0.0295
° K = °C + 273

$Q_a = m[dP x T_a / P_a]^{1/2} + b$

w/ T in Kelvin, P in atm.

Leak Check:			Limit
External	16 mmhg/min.	Pass	<25 mmhg
Internal	94 mmhg/min.	Pass	<140 mmhg

Audit Point	Audit Flow Rate Indicated	Audit Flow Rate (VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Nominal Flow Rates Upper Limit (LPM)
Total Flow Rate, Run 1	17.24	17.24	16.70	-3.1	15.0	18.4
Total Flow Rate, Run 2	17.24	17.24	16.70	-3.1	15.0	18.4
Avg Total Flow Rate	17.24	17.24	16.70	-3.1	15.0	18.4

Comments: None.

Great Basin Unified Air Pollution Control District
Tapered Element Oscillating Microbalance (TEOM)
AUDIT

Date of report:	7/7/11		
Date:	7/6/11	Site name:	Keeler #1
Start:	12:00hrs. PST	Operator:	Scott Weaver
Finish:	12:20hrs. PST	Project:	SB 270
Audited By:	Mike Horn	Site Elevation:	3598 ft.
Witness:	Scott Weaver	Amb. Pres.:	892.00 hPa
		Amb. Temp.:	35.8 deg. C
Prop. or Serial No.:	24922	Make:	R & P
Type:	PM-2.5 FDMS	Model:	1400ab
		Last cal. date:	6/16/11

AUDIT DEVICE(S)

Make:	BGI Incorporated	Make:	BGI Incorporated
Model:	DELTA CAL	Model:	DELTA CAL
S/N:	525	S/N:	525
Range:	2 - 20 lpm	Range:	2 - 20 lpm
Calibration Factors		Calibration Factors	
Slope:	1.00	Slope:	1.00
Intercept:	0.00	Intercept:	0.00
Cal Date:	1/4/11	Cal Date:	1/4/11

	Main:	Aux:	Sampler temp:	Diff.	Sampler press:	Diff.
Leak check:	0.140	0.070	36.8	1.0	890.43	-1.6
Dark current:	N/A	N/A				

Audit Point	Audit Flow Rate, $Qa=[dPxTa/Pa]^{1/2}+b$ ΔP, in. H2O	Audit Flow Rate, (VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Nominal Flow Rates Upper Limit (LPM)
Total Flow Rate	17.04	17.04	16.64	-2.3	15.0	18.4
Bypass/Aux Flow Rate	13.98	13.98	13.65	-2.4		
Main Flow Rate	3.00	3.00	2.99	-0.3	2.7	3.3
Total Flow Rate	17.06	17.06	16.64	-2.5	15.0	18.4

Comments: None.

Great Basin Unified Air Pollution Control District
Tapered Element Oscillating Microbalance (TEOM)
AUDIT

Date of report:	7/7/11		
Date:	7/6/11	Site name:	Keeler-Primary #2
Start:	12:20hrs. PST	Operator:	Scott Weaver
Finish:	12:40hrs. PST	Project:	SB 270
Audited By:	Mike Horn	Site Elevation:	3598 ft.
Witness:	Scott Weaver	Amb. Pres.:	890.70 hPa
		Amb. Temp.:	35.6 deg. C
Prop. or Serial No.:	24923	Make:	R & P
Type:	PM-10	Model:	1400ab
		Last cal. date:	6/16/11

AUDIT DEVICE(S)

Make:	BGI Incorporated	Make:	BGI Incorporated
Model:	DELTA CAL	Model:	DELTA CAL
S/N:	525	S/N:	525
Range:	2 - 20 lpm	Range:	2 - 20 lpm
Calibration Factors		Calibration Factors	
Slope:	1.00	Slope:	1.00
Intercept:	0.00	Intercept:	0.00
Cal Date:	1/4/11	Cal Date:	1/4/11

	Main:	Aux:	Sampler temp:	Diff.	Sampler press:	Diff.
Leak check:	0.090	0.160	34.5	-1.1	891.44	0.7
Dark current:	N/A	N/A				

Audit Point	Audit Flow Rate, ΔP, in. H2O	Audit Flow Rate, (VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Nominal Flow Rates Upper Limit (LPM)
	$Qa=[dPxTa/Pa]^{1/2}+b$					
Total Flow Rate	16.89	16.89	16.66	-1.4	15.0	18.4
Bypass/Aux Flow Rate	13.80	13.80	13.66	-1.0		
Main Flow Rate	3.08	3.08	3.00	-2.6	2.7	3.3
Total Flow Rate	16.91	16.91	16.66	-1.5	15.0	18.4

Comments: None.

Great Basin Unified Air Pollution Control District
Tapered Element Oscillating Microbalance (TEOM)
AUDIT

Date of report:	7/7/11		
Date:	7/6/11	Site name:	Keeler-Co-Located #3
Start:	12:40hrs. PST	Operator:	Scott Weaver
Finish:	134:00hrs. PST	Project:	SB 270
Audited By:	Mike Horn	Site Elevation:	3598 ft.
Witness:	Scott Weaver	Amb. Pres.:	891.10 hPa
		Amb. Temp.:	34.4 deg. C
Prop. or Serial No.:	24786	Make:	R & P
Type:	PM-10	Model:	1400ab
		Last cal. date:	6/16/11

AUDIT DEVICE(S)

Make:	BGI Incorporated	Make:	BGI Incorporated
Model:	DELTA CAL	Model:	DELTA CAL
S/N:	525	S/N:	525
Range:	2 - 20 lpm	Range:	2 - 20 lpm
Calibration Factors		Calibration Factors	
Slope:	1.00	Slope:	1.00
Intercept:	0.00	Intercept:	0.00
Cal Date:	1/4/11	Cal Date:	1/4/11

	Main:	Aux:	Sampler temp:	Diff.	Sampler press:	Diff.
Leak check:	0.070	0.090	35.0	0.6	888.40	-2.7
Dark current:	N/A	N/A				

Audit Point	Audit Flow Rate, ΔP, in. H2O	Audit Flow Rate, (VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Nominal Flow Rates Upper Limit (LPM)
Total Flow Rate	16.89	16.89	16.65	-1.4	15.0	18.4
Bypass/Aux Flow Rate	13.81	13.81	13.66	-1.1		
Main Flow Rate	3.06	3.06	2.99	-2.3	2.7	3.3
Total Flow Rate	16.92	16.92	16.65	-1.6	15.0	18.4

$Qa=[dPxTa/Pa]^{1/2}+b$

Comments: None.

TABLE A-1

GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT
QUALITY ASSURANCE PERFORMANCE AUDIT CRITERIA

Measurement Variable	Evaluation Criteria
Wind Speed	At ws ≤ 5 m/s, input ± 0.25 m/s; At ws > 5 m/s, input ± 5% Starting threshold: 0.5 m/s; R. M. Young 05305 Wind Monitor AQ Starting threshold: 1.0 m/s; R. M. Young 05103 Wind Monitor and NRG Max 40H
Wind Direction	input ± 5° Starting threshold: 0.5 m/s; R. M. Young 05305 Wind Monitor AQ Starting threshold: 1.0 m/s; R. M. Young 05103 Wind Monitor
Temperature	input ± 0.5° C input ± 2.0° C for PM-10, PM-2.5 samplers
Relative Humidity	Ambient: input ± 5% RH, ± 1.5°C as dew point Gravimetry Lab: input ± 5%
Precipitation	input ± 10%
Barometric Pressure	Ambient: input ± 10 hPa TEOM: ± 10 mm mercury
PM-10: Hi-Vol SSI, Partisol, BGI,	input ± 10%; Design Flow ± 10%
PM-2.5	input ± 4%; Design Flow ± 5%
TEOM: Total Flow	input ± 10%; Design Flow ± 10%
Main Flow	input ± 10%; Design Flow ± 10%
Bypass Flow	input ± 10%; Design Flow ± 10%
TEOM: Leak Check	Main Flow: < 0.15 LPM Bypass Flow: < 0.60 LPM

Appendix B

GREAT BASIN UNIFIED AIR POLLUTION CONTROL DISTRICT
QUALITY ASSURANCE CERTIFICATIONS OF AUDIT DEVICES

AUDIT DEVICE	Serial #	Cal Date:	Slope:	Intercept:
BGI Delta CAL:	123	1/24/11	1.0	0.0
BGI Delta CAL:	525	1/4/11	1.0	0.0
Testo 735-1	01467895/712	12/16/10	1.0006	0.0209
Barigo Altimeter/Barometer:	P9	12/17/10	1.0	0.0
RM Young wind speed motor:	CUO1, HSO1	12/3/10	N/A	N/A
Cole-Parmer 3312-40 Psychrometer:	RH 03	12/10/04	Wet 1.0037 Dry 1.0059	Wet -0.0598 Dry -0.1518
Texas Electronics FC-525 Precipitation:	52202	N/A		
Chinook Eng. Streamline FTS	108	9/8/10	0.41	0.6

Great Basin Unified Air Pollution Control District

Partisol

FLOW AUDIT PM 2.5 primary

Date:	7/6/11		Site Name:	Keeler	
Start:	11:00	PST	Operator:	Scott Weaver	
Finish:	11:15	PST	Project:	SB270	
			Site Elevation:		ft
Make:	R&P		Amb. Press.:	891.3	in. Hg
Model:	2000 / 2025		Amb. Temp.:	23.8	deg. C
Prop. Or Ser. No.:	762				
Type:	PM10 / PM2.5				
Last Cal. Date:	6/30/11				

Audit Device		Temperature/ Pressure Verification	Sampler	Standard	(Raw)
Make:	BGI INCORPORATED				
Model:	DELTA CAL	Amb Temp	33.2		32.0
S/N:	0123 525	Filter Temp	36.0		35.0
Range:	2 - 20 lpm	Amb Pressure	668 .7502X		891.3
Calibration factors:					
Slope:	1.0				
Int.:	0.0				
Cal Date:	1/4/11				

$Q_a=m[dPxT_a/P_a]^{1/2}+b$ w/ T in Kelvin, P in atm. ÷ 1013

Leak Check:	Initial Pres.	Final Pres.	P_i-P_f	Limit
External	19	PASS		<5 psi / <25mm
Internal	60	PASS		

Audit Point	Audit Flow Rate Indicated	(VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Upper Limit (LPM)
1. Total Fow Rate	16.78		16.70		15.0	18.4
2.	16.78		16.70			
AVE Total Flow Rate	16.78		16.70		15.0	18.4

Comments:

Calibrated by: [signature]

Great Basin Unified Air Pollution Control District

Partisol

FLOW AUDIT 6 M 2.5 co-Le

Date:	7/6/11		Site Name:	Keeler	
Start:	11:15	PST	Operator:	Scott Neave	
Finish:	11:30	PST	Project:	SB270	
			Site Elevation:	35.6	ft
Make:	R&P		Amb. Press.:	891	in. Hg
Model:	2000 / 2025		Amb. Temp.:	37.6	deg. C
Prop. Or Ser. No.:	764				
Type:	PM10 / PM2.5				
Last Cal. Date:	6/30/11				

Audit Device			Temperature/ Pressure Verification			
Make:	BGI INCORPORATED			Sampler	Standard	(Raw)
Model:	DELTA CAL		Amb Temp	35.6		37.0
S/N:	~~0123~~ 525		Filter Temp	37.3		36.7
Range:	2 - 20	lpm	Amb Pressure	667		891.1
Calibration factors:				.7502X		
Slope:	1.0					
Int.:	0.0					
Cal Date:	1/4/11					

$Q_a=m[dPxT_a/P_a]^{1/2}+b$ w/ T in Kelvin, P in atm. ÷ 1013

Leak Check:	Initial Pres.	Final Pres.	P_i-P_f	Limit
External	17		PASS	<5 psi / <25mm
Internal	41		PASS	

Audit Point	Audit Flow Rate Indicated	(VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Upper Limit (LPM)
1. Total Fow Rate	16.89		16.70		15.0	18.4
2.	16.89		16.70			
AVE Total Flow Rate	16.89		16.70		15.0	18.4

Comments:

Calibrated by: Mike [illegible]

Great Basin Unified Air Pollution Control District

Partisol

FLOW AUDIT PM 10 primary

Date:	7/6/11		Site Name:	Keeler	
Start:	11:30	PST	Operator:	Scott Weaver	
Finish:	11:45	PST	Project:	SB270	
			Site Elevation:	-	ft
Make:	R&P		Amb. Press.:	891.4	in. Hg
Model:	2000 / 2025		Amb. Temp.:	33.5	deg. C
Prop. Or Ser. No.:	944 / 21189				
Type:	PM10 / PM2.5				
Last Cal. Date:	6/30/11				

Audit Device			Temperature/ Pressure Verification	Sampler	Standard	(Raw)
Make:	BGI INCORPORATED					
Model:	DELTA CAL		Amb Temp	34.1		33.5
S/N:	~~0123~~ 525		Filter Temp	38.3		37.3
Range:	2 - 20	lpm	Amb Pressure	667 .7502X		891.4
Calibration factors:						
Slope:	1.0					
Int.:	0.0					
Cal Date:	1/4/11					

$Q_a=m[dPxT_a/P_a]^{1/2}+b$ w/ T in Kelvin, P in atm. ÷ 1013

Leak Check:	Initial Pres.	Final Pres.	P_i-P_f	Limit
External	66		PASS	<5 psi / <25mm
Internal	66		PASS	

Audit Point	Audit Flow Rate Indicated	(VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Upper Limit (LPM)
1. Total Fow Rate	17.09		16.70		15.0	18.4
2.	17.09		16.70			
AVE Total Flow Rate	17.09		16.70		15.0	18.4

Comments:

Calibrated by: [signature]

Great Basin Unified Air Pollution Control District

Partisol PM 10 co-Lo

FLOW AUDIT

Date:	7/6/11		Site Name:	Kelly	
Start:	11:45	PST	Operator:	Scott Weaver	
Finish:	12:00	PST	Project:	SB270	
			Site Elevation:		ft
Make:	R&P		Amb. Press.:	891.3	in. Hg
Model:	2000 / 2025		Amb. Temp.:	33.3	deg. C
Prop. Or Ser. No.:	9421				
Type:	PM10 / PM2.5				
Last Cal. Date:	6/30/11				

Audit Device			Temperature/ Pressure Verification	Sampler	Standard	(Raw)
Make:	BGI INCORPORATED					
Model:	DELTA CAL		Amb Temp	33.8		33.3
S/N:	~~0123~~ 525		Filter Temp	37.4		36.3
Range:	2 - 20	lpm	Amb Pressure	665		891.3
Calibration factors:				.7502X		
Slope:	1.0					
Int.:	0.0					
Cal Date:	1/4/11					

$Q_a=m[dPxT_a/P_a]^{1/2}+b$ w/ T in Kelvin, P in atm. ÷ 1013

Leak Check:	Initial Pres.	Final Pres.	P_i-P_f	Limit
External	16		PASS	<5 psi / <25mm
Internal	94		PASS	

Audit Point	Audit Flow Rate Indicated	(VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Upper Limit (LPM)
1. Total Fow Rate	17.24		16.70		15.0	18.4
2.	17.24		16.70			
AVE Total Flow Rate	17.24		16.70		15.0	18.4

Comments:

Calibrated by: [signature]

Great Basin Unified Air Pollution Control District

Tapered Element Oscillating Microbalance (TEOM)

FLOW AUDIT #1 FDMS

Date:	7/6/11		Site Name:	Ruby
Start:	12:00	PST	Operator:	Scott Weaver
Finish:	12:30	PST	Project:	SB270
			Site Elevation:	ft
			Amb. Press.:	892.0 in. Hg
			Amb. Temp.:	35.8 deg. C
Prop. Or Ser. No.:	24922		Make:	R&P
Type:	PM10 2.5 FDMS		Model:	1400a
			Last Cal. Date:	6/16/11

Audit Device(s)

Make:	BGI INCORPORATED		Make:	BGI INCORPORATED
Model:	DELTA CAL		Model:	DELTA CAL
S/N:	~~0123~~ 525		S/N:	0123
Range:	2 - 20	lpm	Range:	2 - 20 lpm
Calibration factors:			Calibration factors:	
Slope:	1.0		Slope:	1.0
Int.:	0.0		Int.:	0.0
Cal Date:	1/4/11		Cal Date:	

$Q_a=m[dPxT_a/P_a]^{1/2}+b$ Altitude Correction Factor: ÷ 1013

Leak Check-Initial	Main:	.14	Aux:	.07
Leak Check-Final	Main:		Aux:	

Audit Point	Audit Flow Rate delta P	(VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Upper Limit (LPM)
Total Fow Rate	17.04		2.99/13.65=16.64		15.0	18.4
Aux. Flow Rate	13.98		13.65			
Main Flow Rate	3.00		2.99		2.7	3.3
Total Flow Rate	17.06		16.64		15.0	18.4

	Sampler	Standard True	Standard Raw
Amb Temp	36.8		35.8
Amb Press	879	890.43	892.0

Comments:

Calibrated By: Mike

Great Basin Unified Air Pollution Control District
Tapered Element Oscillating Microbalance (TEOM)
FLOW AUDIT #2 primary

Date:	7/6/11		Site Name:	Ruby
Start:	12:00	PST	Operator:	Scott Weaver
Finish:	12:40	PST	Project:	SB270
			Site Elevation:	ft
			Amb. Press.:	890.7 in. Hg
			Amb. Temp.:	35.6 deg. C
Prop. Or Ser. No.:	24923 primary		Make:	R&P
Type:	PM10		Model:	1400a
			Last Cal. Date:	6/6/11

Audit Device(s)

Make:	BGI INCORPORATED		Make:	BGI INCORPORATED
Model:	DELTA CAL		Model:	DELTA CAL
S/N:	~~0123~~ 525		S/N:	0123
Range:	2 - 20	lpm	Range:	2 - 20 lpm
Calibration factors:			Calibration factors:	
Slope:	1.0		Slope:	1.0
Int.:	0.0		Int.:	0.0
Cal Date:	1/4/11		Cal Date:	

$Q_s=m[dPxT_s/P_s]^{1/2}+b$ Altitude Correction Factor: ÷ 1013

Leak Check-Initial	Main: .09		Aux: .16	
Leak Check-Final	Main:		Aux:	

Audit Point	Audit Flow Rate delta P	(VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Upper Limit (LPM)
Total Fow Rate	16.89		3.00/13.66=16.66		15.0	18.4
Aux. Flow Rate	13.80		13.66			
Main Flow Rate	3.08		3.00		2.7	3.3
Total Flow Rate	16.91		16.66		15.0	18.4

	Sampler	Standard True	Standard Raw
Amb Temp	.880	891.44	890.7
Amb Press	34.5		35.6

Comments:

Calibrated By: Mike [illegible]

Great Basin Unified Air Pollution Control District

Tapered Element Oscillating Microbalance (TEOM)

FLOW AUDIT # 3

Date:	7/6/11		Site Name:	Weely
Start:	12:00	PST	Operator:	Scott Weaver
Finish:	13:00	PST	Project:	SB270
			Site Elevation:	ft
			Amb. Press.:	891.1 in. Hg
			Amb. Temp.:	34.4 deg. C
Prop. Or Ser. No.:	24786 co-lo		Make:	R&P
Type:	PM10		Model:	1400a
			Last Cal. Date:	6/16/11

Audit Device(s)

Make:	BGI INCORPORATED	Make:	BGI INCORPORATED
Model:	DELTA CAL	Model:	DELTA CAL
S/N:	~~0123~~ 525	S/N:	0123
Range:	2 - 20 lpm	Range:	2 - 20 lpm
Calibration factors:		Calibration factors:	
Slope:	1.0	Slope:	1.0
Int.:	0.0	Int.:	0.0
Cal Date:	1/4/11	Cal Date:	

$Q_a=m[dP \times T_a/P_a]^{1/2}+b$ Altitude Correction Factor: ÷ 1013

Leak Check-Initial	Main:	.07	Aux:	.09
Leak Check-Final	Main:		Aux:	

Audit Point	Audit Flow Rate delta P	(VLPM)	Site Flow Rate (VLPM)	Diff. (%)	Nominal Flow Rates Lower Limit (LPM)	Upper Limit (LPM)
Total Fow Rate	16.89		2.99/13.66 = 16.65		15.0	18.4
Aux. Flow Rate	13.81		13.66			
Main Flow Rate	3.06		2.99		2.7	3.3
Total Flow Rate	16.92		16.65		15.0	18.4

	Sampler	Standard True	Standard Raw
Amb Temp	35.0		34.4
Amb Press	877	888.40	891.1

Comments:

Calibrated By: Mike [illegible]