

2014 Calibration Summaries for Hungry Horse and Grand Coulee Dams TDG Monitors



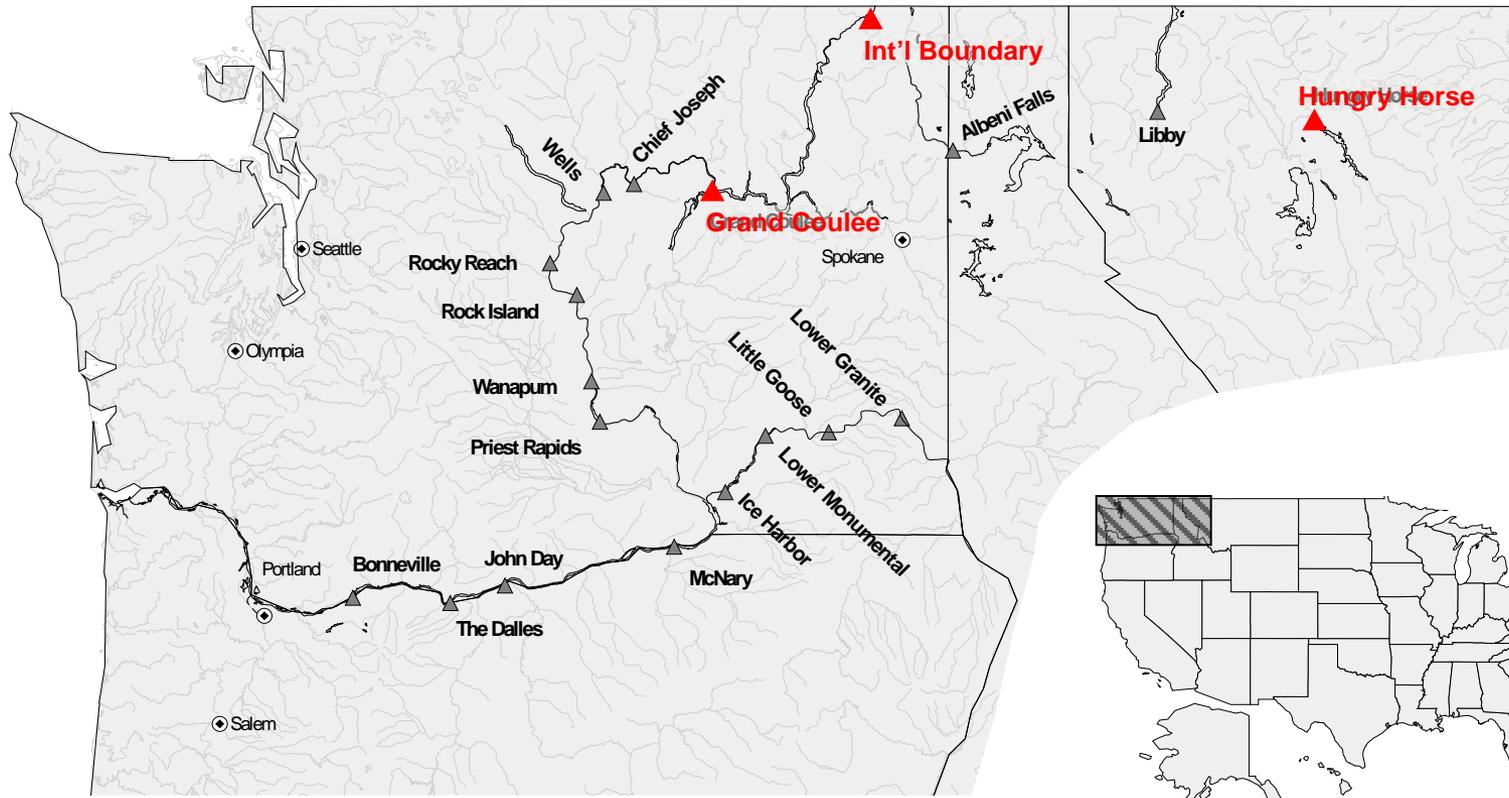
Prepared for
US Bureau of Reclamation

Prepared by
Columbia Basin Environmental

Grand Coulee

Hungry Horse

Drainage Area:	74,700 sq mi	1654 sq mi
Normal Full Pool:	1290.0 ft MSL	3560.0 ft MSL
No. Main Units:	24	4
Hydraulic Capacity:	280,000 cfs	8,900 cfs





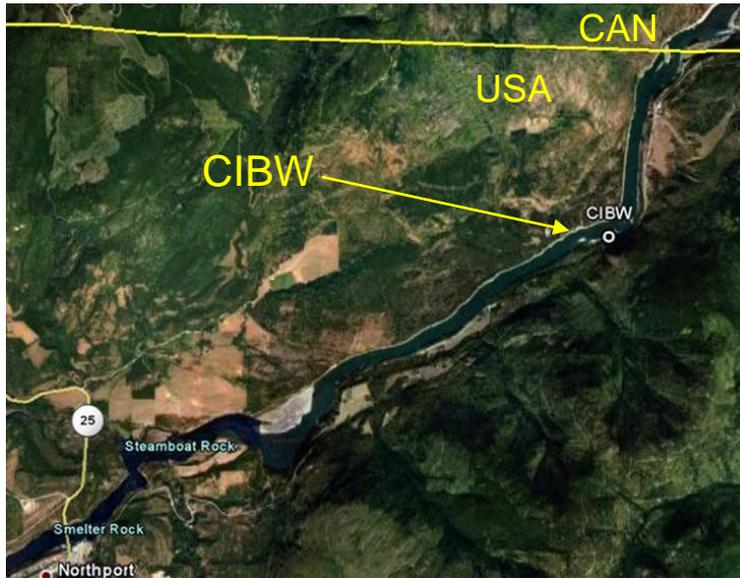
Hungry Horse Tailwater (HGHM)

Established: 1998

Dates in Operation: Year round

Calibration Frequency: Bi-weekly (Mar-Oct)





International Boundary (CIBW)

Established: 1984

Dates in Operation: Year round

Calibration Frequency: Bi-weekly (Mar-Oct)
Monthly (Oct-Mar)



Grand Coulee Dam TDG Monitoring Locations

GCGW

GCGW

Coulee Dam

Grand Coulee
Dam

FDRW

FDRW

Grand Coulee

Image U.S. Geological Survey

2.40 mi

Electric City

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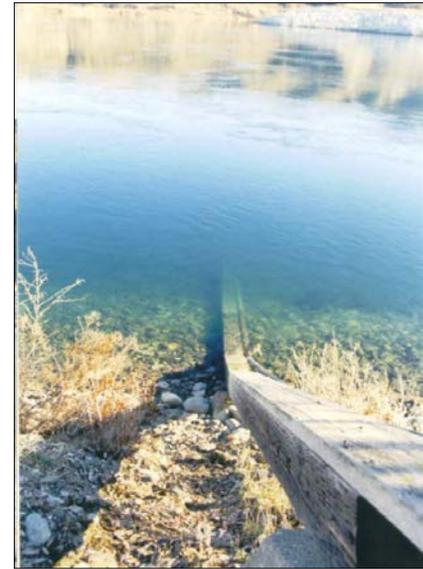
Grand Coulee Forebay (FDRW)



Established: 1997
Dates in Operation: Year round
Calibration Frequency: Bi-weekly (Mar-Oct)
Monthly (Oct-Mar)

Grand Coulee Tailwater (GCGW)

Established: 1983
Dates in Operation: Year round
Calibration Frequency: Bi-weekly (Mar-Oct)
Monthly (Oct-Mar)



Monitor Equipment

Sutron SatLink 2 Datalogger



Sutron Accubar BP Sensor
+/- 0.5 mmHg



Sutron.com



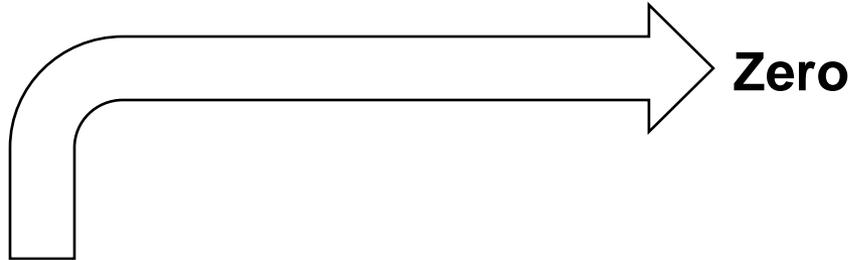
hydrotechzs.com

Hydrotech ZS Compact MiniSonde
Temperature +/- 0.1 °C
TDG +/- 1.0 mmHg

Alpha Designs TDG/Temperature Sensor
Temperature +/- 0.1 °C
TDG +/- 1.0 mmHg



Calibration procedures

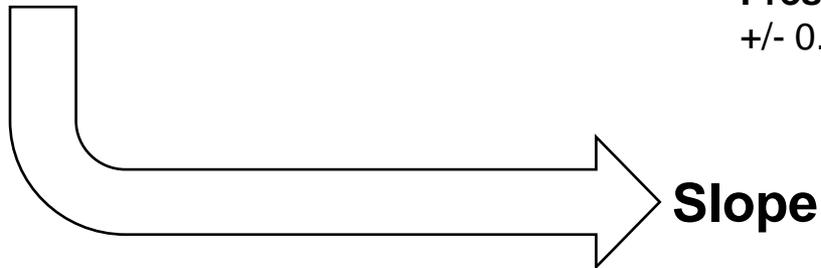


**Princo Instruments
Nova Barometer**
+/- 0.90 mmHg



Total dissolved gas pressure

Two point calibration with adjustments
for deviation => 2mm Hg



**Netech Instruments Digimano 2000
Pressure Vacuum Meter**
+/- 0.90 mmHg



Calibration procedures *continued*

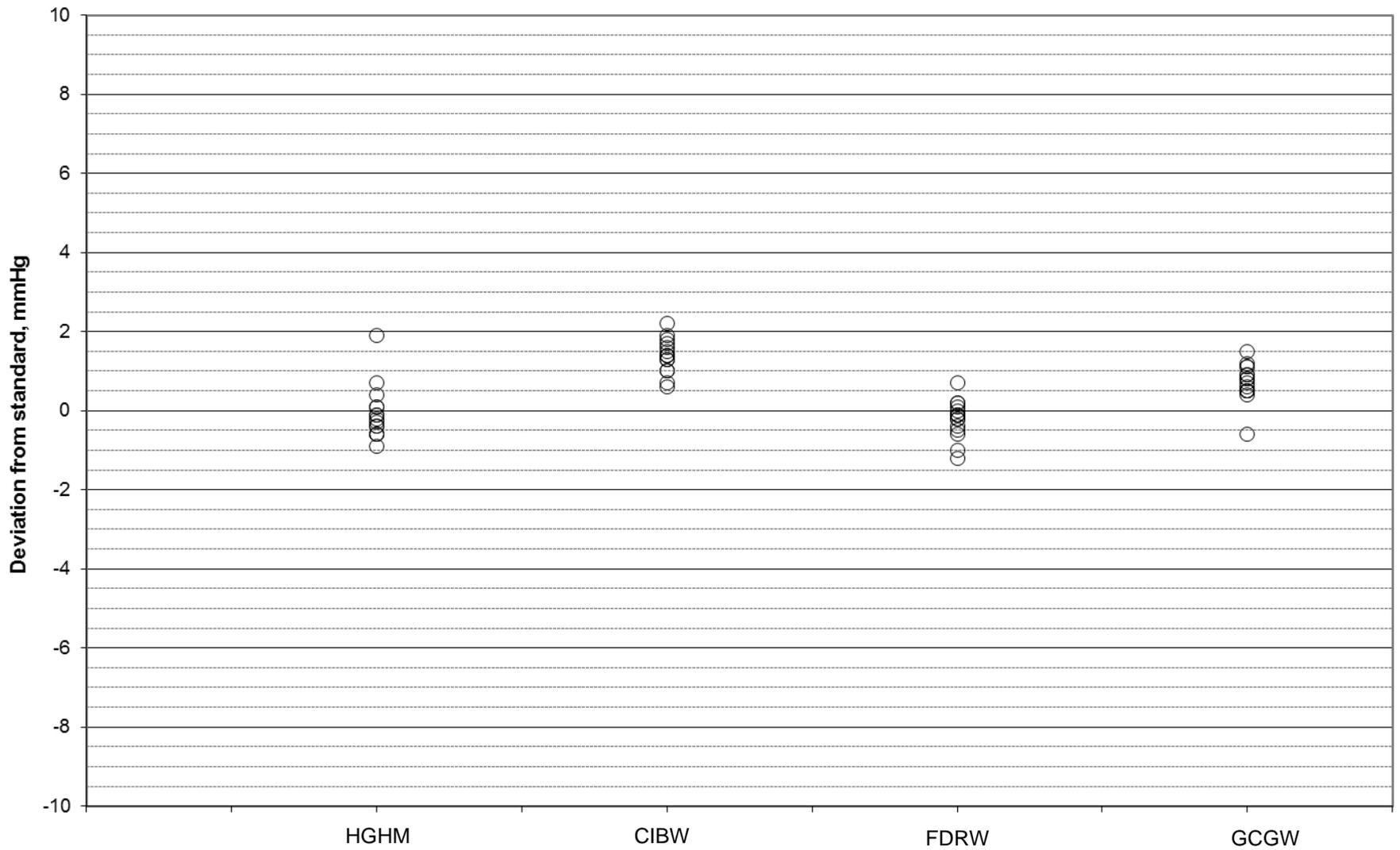
Temperature

Probe values are checked against standard with deviation $\Rightarrow 0.3\text{ }^{\circ}\text{C}$
resulting in retrieval for factory check

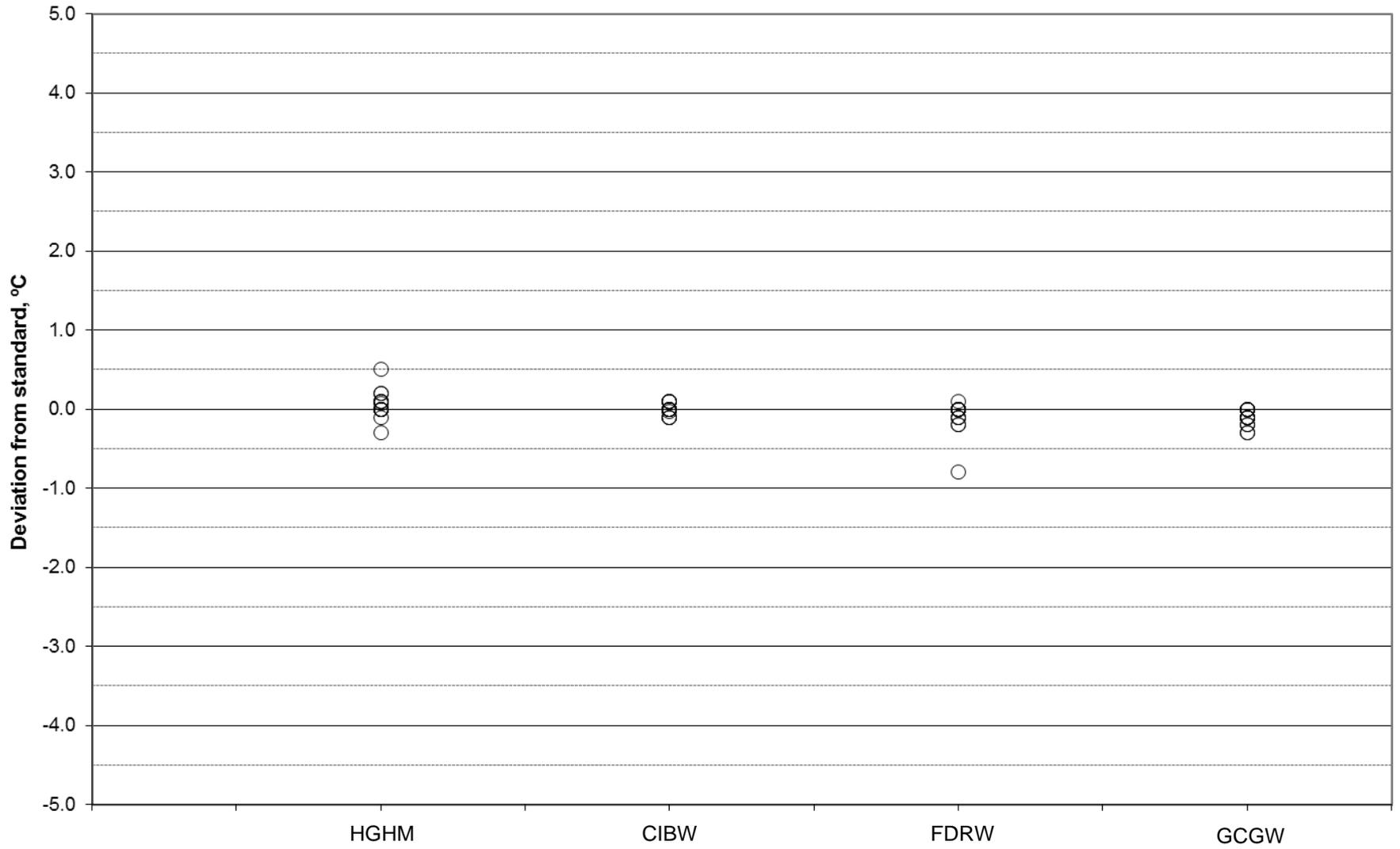
**ThermoProbe, Inc. TL1-A
Laboratory Thermometer**
 $\pm 0.06\text{ }^{\circ}\text{C}$



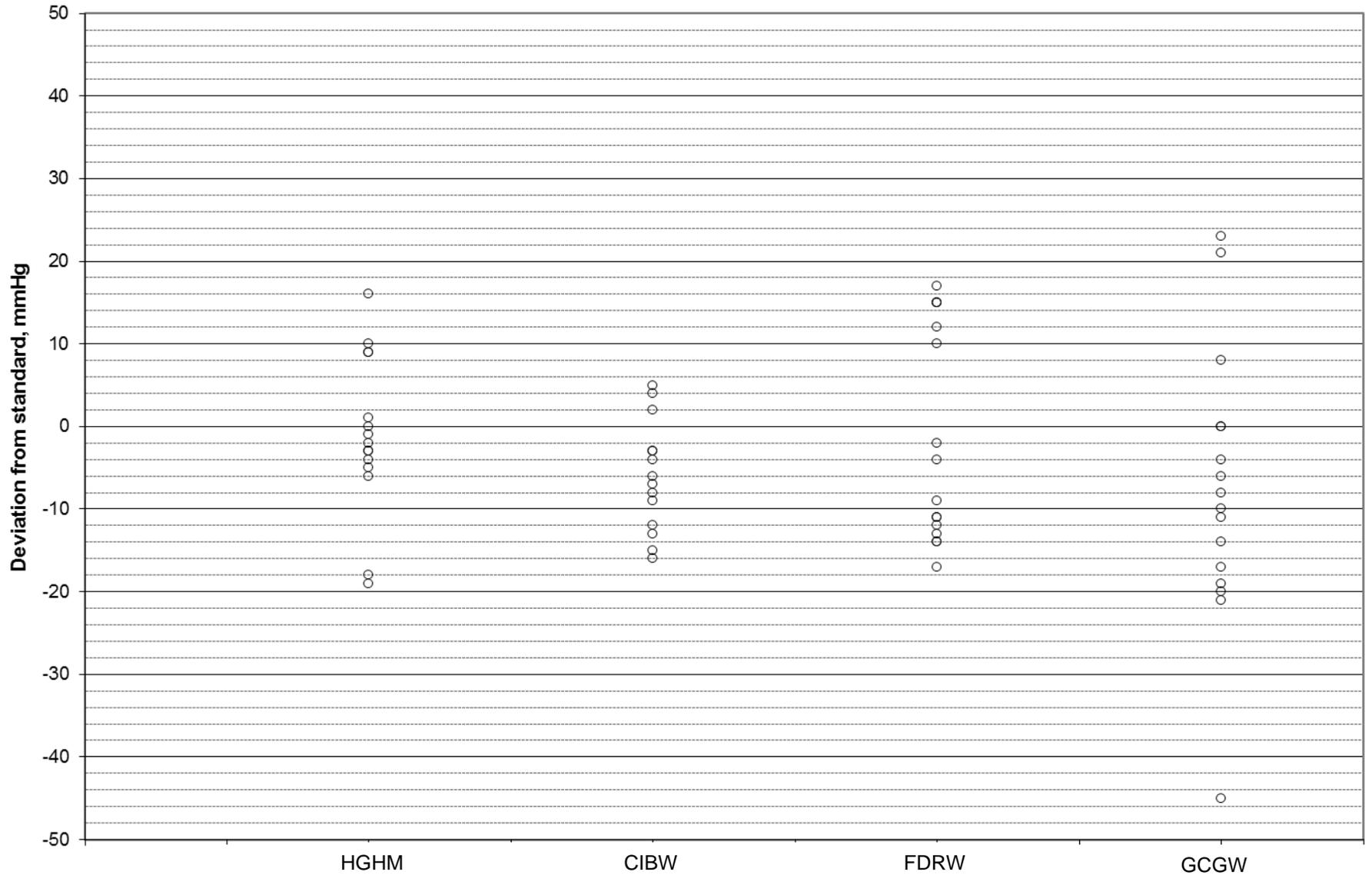
Barometric Pressure Field Comparisons



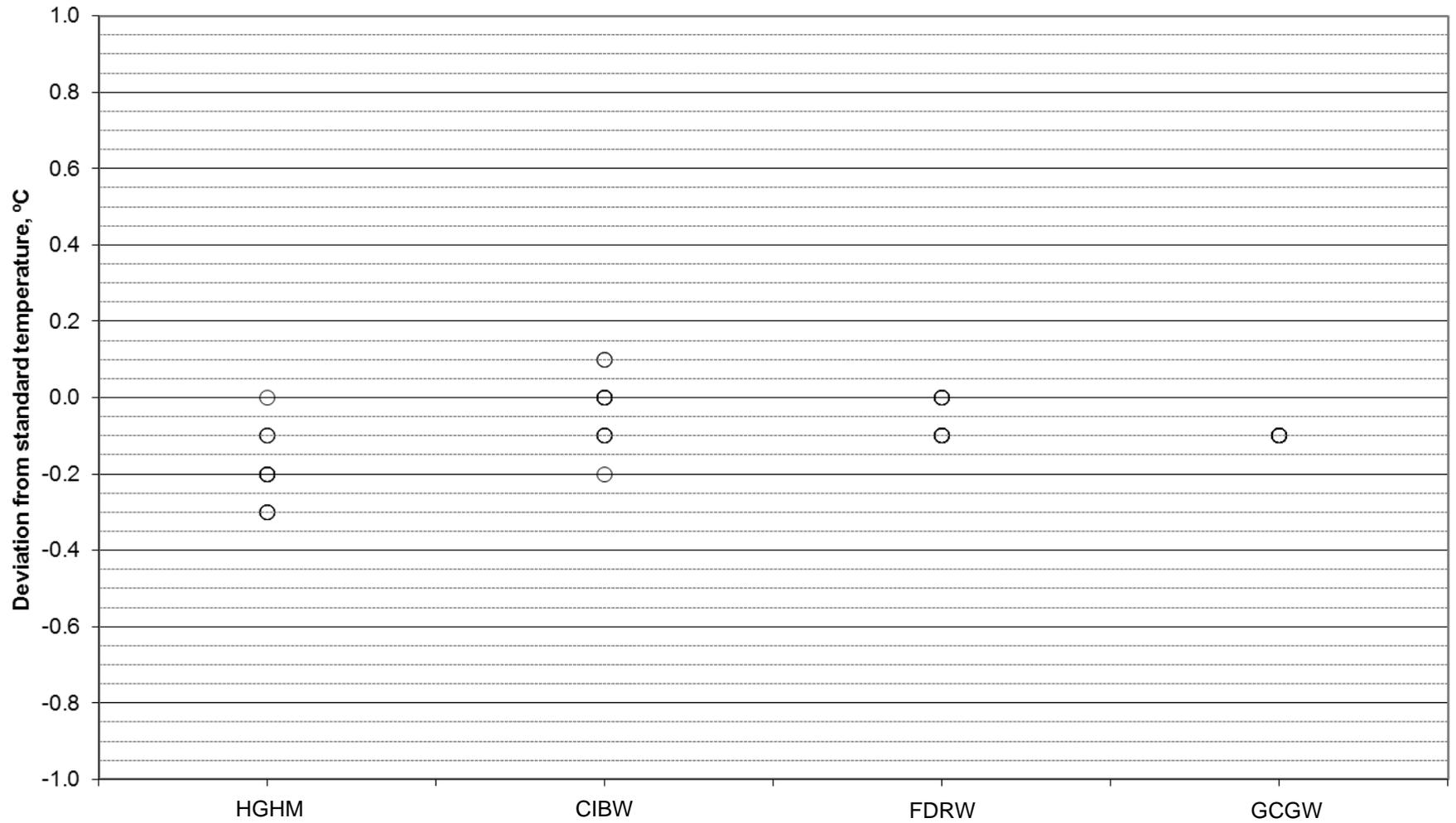
Temperature Field Comparisons



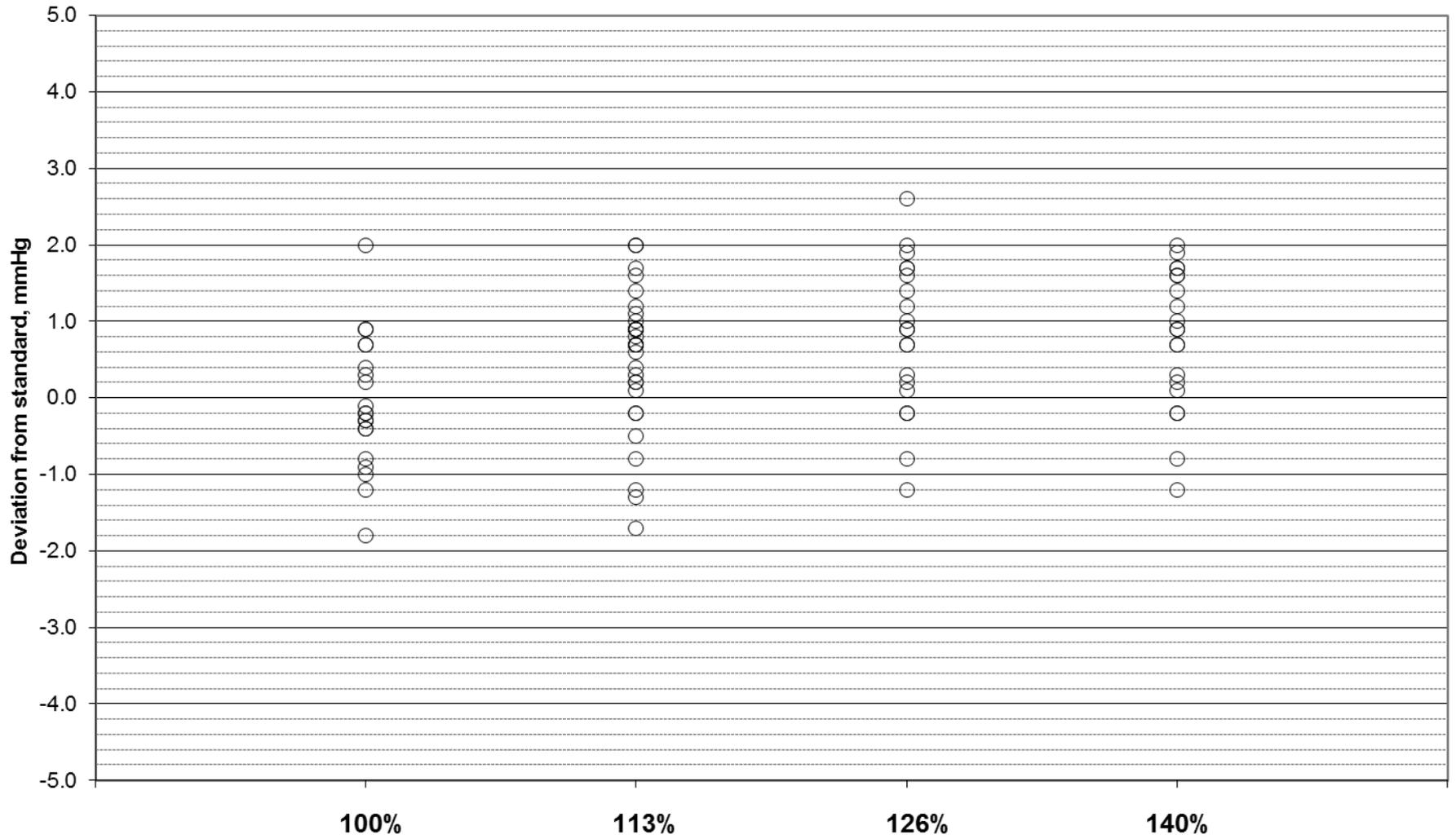
Total Dissolved Gas Field Comparisons



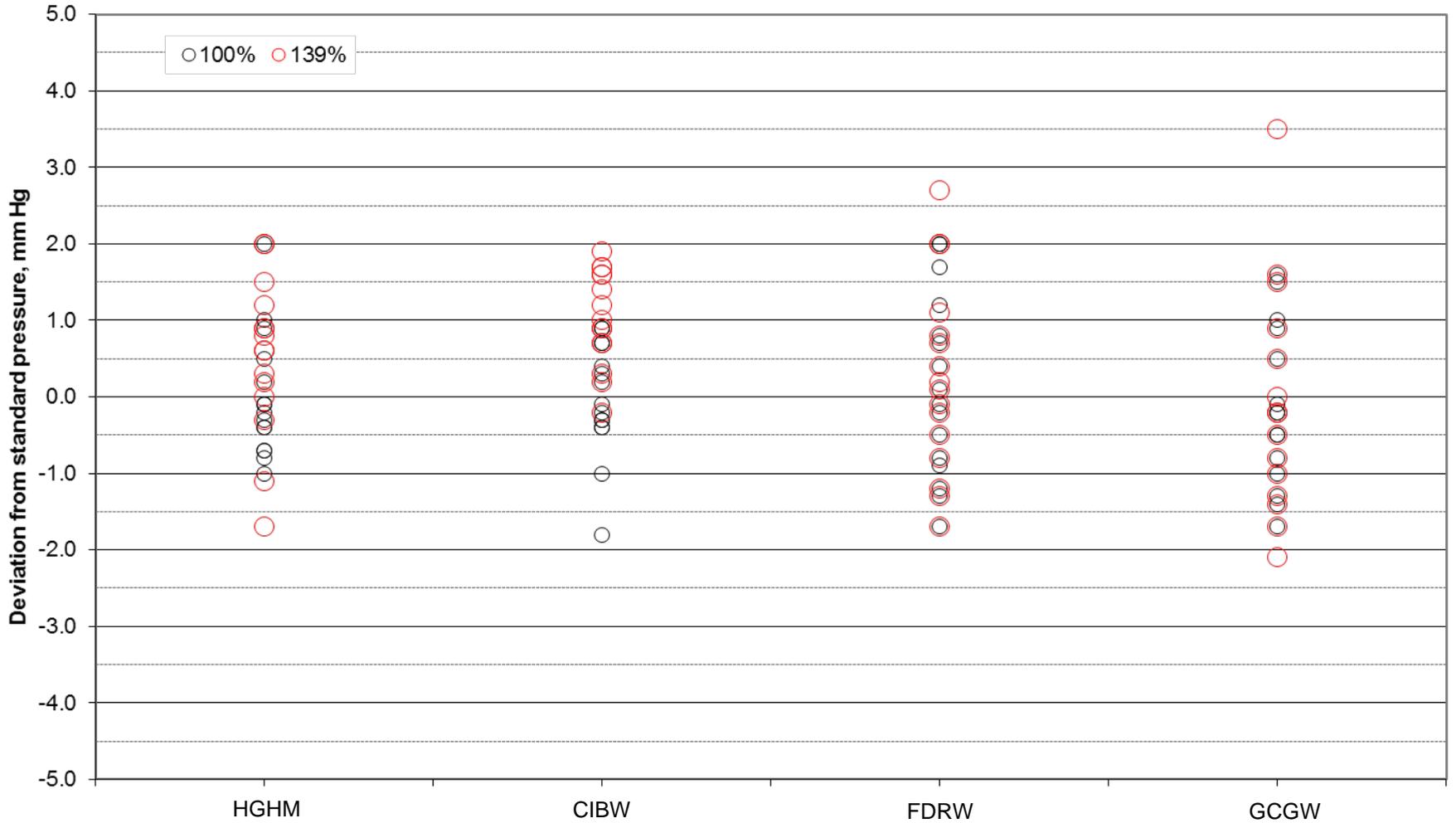
Temperature Calibration Summaries



TDG Pressure Calibration Summaries



TDG Calibration Summaries by Site



2014 Calibration Summaries

	Deviation from Standard				
	Temperature (°C)	TDG Pressure, mmHg			
		100%	113%	126%	139%
Mean	-0.10	-0.01	0.35	0.60	0.43
Median	-0.10	-0.20	0.50	0.70	0.60
Standard Deviation	0.09	0.95	1.03	1.13	1.19
Variance	0.01	0.90	1.07	1.27	1.42
Minimum	-0.30	-1.80	-1.70	-1.70	-2.10
Maximum	0.10	2.00	2.70	3.00	3.50
n	61	61	61	61	61