

Methane Emissions from Gathering and Boosting Compressor Stations in the U.S.:

Data Dictionary for Supporting Volume 3

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D3-1 Data Dictionary for the DataTables.xlsx

This section provides a data dictionary for DataTable.xlsx, the data file accompanying the Supporting Volume 3 of the report *Methane Emissions from Gathering and Boosting Compressor Stations in the U.S.* Each column header used in the data tables is listed below, in alphabetical order with a short description and a list of sheets where the column appears.

ABSORBENT_CIRCULATION_RATE

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

ABSORBENT_CIRC_PUMP_TYPE

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

ABSORBENT_TYPE

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE

[Table E.3]

Used in: *GHGRP Large Dehy*

AGRU

From G&B GHGRP Report: Number of AGRUs reported

Used in: *GHGRP Data*

AGRU_mean_kgh

Mean methane emission rate for AGRUs on the station, in kg/h

Used in: *Station Emissions*

ActiveSensor

Which sensor in the BHFS was active at the time of the measurement. 'CatOx' - catalytic oxidation sensor from nominally 0-5% gas, 'TCD' thermal conductivity sensor nominally from 5-100% gas

Used in: *BHFS Test Data*

ActivityBasis

The basis for component counting, either UNIT "by unit" or STATION "by station"

Used in: *Components Per Unit, National Detail*

ActivityDriver

Describes what was used as the activity basis for the emission factor

Used in: *Average Whole Gas EF, Average Methane EF*

Activity_Lower

Lower empirical 95% confidence interval (i.e. value at 0.025) of the activity distribution for the emissions

Used in: *National Detail*

Activity_Maximum

Maximum of the activity distribution for the emissions

Used in: *National Detail*

Activity_Mean

Mean of the activity distribution for the emissions

Used in: *National Detail*

Activity_Median

Median of the activity distribution for the emissions

Used in: *National Detail*

Activity_Minimum

Minimum of the activity distribution for the emissions

Used in: *National Detail*

Activity_StdDev

Standard deviation of the activity distribution for the emissions

Used in: *National Detail*

Activity_Upper

Upper empirical 95% confidence interval (i.e. value at 0.975) of the activity distribution for the emissions

Used in: *National Detail*

AmbientTemperature

Ambient temperature (F)

Used in: *BHFS Test Data*

Ambient_Pressure_inHg

Ambient pressure (in Hg)

Used in: *BHFS Test Data*

BCFGasReceived

From G&B GHGRP Report: Amount of gas received during the reporting year (BSCF)

Used in: *GHGRP Data*

BCFGasTransported

From G&B GHGRP Report: Amount of gas transported during the reporting year (BSCF)

Used in: *GHGRP Data*

BHFSBackgroundConcentration

Background gas concentration reading, as read from the BHFS display, (%)

Used in: *BHFS Test Data*

BHFSBlowerSetting

BHFS blower setting, as read from the BHFS display (%)

Used in: *BHFS Test Data*

BHFSFlowRateLPM

BHFS flow rate, as read from the BHFS display (lpm)

Used in: *BHFS Test Data*

BHFSLeakConcentration

Leak gas concentration reading, as read from the BHFS display (%)

Used in: *BHFS Test Data*

BHFSMethaneLeakAlicat_SLPM

The BHFS_LPM value translated to the standard conditions of the mixer exit meter (slpm)

Used in: *BHFS Test Data*

BHFS_Alicat_SLPM

Total emission rate, measured by the outlet meter on the mixer (slpm). Standard conditions are defined as in the Alicat manual.

Used in: *BHFS Test Data*

BHFS_LPM

Reporter leak rate, as read from the BHFS display (LPM)

Used in: *BHFS Test Data*

Basin

AAPG basin number

Used in: *Pneumatic Controller Mix, Production Ratio, Compressors per Station, Separators per Compressor, National Detail, Combustion Slip By Basin, Combustion Slip Model, GHGRP Data*

BasinName

From G&B GHGRP Report: Name of the AAPG basin reported to EPA

Used in: *GHGRP Data*

BlowdownEvents

From G&B GHGRP Report: Number of reported blowdown events

Used in: *GHGRP Data*

BlowdownKGH

From G&B GHGRP Report: Total methane emissions from blowdown events, as reported, and assuming 8760 hours in the year. (kg/h CH₄)

Used in: *GHGRP Data*

CH₄

Methane emission rate in scfh

Used in: *Rodpacking from T&S, Vents from T&S*

CH4Fraction

Methane fraction from a gas composition analysis for the station.

Used in: *Measurements*

CH4FractionSource

Source of the methane fraction used for this station. REPORTED - measured value from a gas sample done prior to the field campaign, LDL SIMULATED - all measurements were zero, and a concentration fraction was simulated by random draw from gas concentration at all stations.

Used in: *Measurements*

CH4_EMISSIONS

See column definition in GGHRP Subpart W, reporting year 2017, Table W_FLARE_STACKS_UNITS [Table N.1]

Used in: *GHGRP Flare Stacks*

CO2_EMISSIONS

See column definition in GGHRP Subpart W, reporting year 2017, Table W_FLARE_STACKS_UNITS [Table N.1]

Used in: *GHGRP Flare Stacks*

CONTROL_DEVICES_VENT_CONTROL

See column definition in GGHRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_SMALL [Table E.1]

Used in: *GHGRP Small Dehy*

CONTROL_DEVICE_TYPE

See column definition in GGHRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_SMALL [Table E.1]

Used in: *GHGRP Small Dehy*

COUNTY_AND_STATE

See column definition in GGHRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

Castirongatheringpipeline

From G&B GHGRP Report: Length of gathering pipeline, cast iron (miles)

Used in: *GHGRP Data*

CentrifCompressors

From G&B GHGRP Report: Number of centrifugal compressors reported

Used in: *GHGRP Data*

Centrifugal

Count of centrifugal compressors

Used in: *Compressor Driver Summary*

CombustionSlip

Each column represents a distribution of estimates for the combustion slip in the basin, in kg/h

Used in: *Combustion Slip By Basin*

CombustionSlip_mean_kgh

Mean methane emission rate from combustion slip, i.e. methane entrained in the combustion exhaust of compressor drivers on the station, in kg/h

Used in: *Station Emissions*

Component

Component ID, see text.

Used in: *Components Per Unit*

Compressor

Number of compressors in the basin

Used in: *Separators per Compressor, GHGRP Data*

CompressorCount

Number of compressors in the basin, from partner data with appropriate quality

Used in: *Compressors per Station*

Compressor_Catalyst

Whether the prime mover for a compressor driver has a catalyst, and what type of catalyst

Used in: *Equipment*

Compressor_Cylinders

The number of compression cylinders on a compressor unit

Used in: *Equipment*

Compressor_Inlet_Pressure_psig

Outlet (discharge) pressure of the compressor, in psig, at time of screening

Used in: *Equipment*

Compressor_LoadPercent

The load on the compressor unit when measured

Used in: *Equipment*

Compressor_Make

The Make of a compressor unit

Used in: *Equipment*

Compressor_Model

The Model of a compressor unit

Used in: *Equipment*

Compressor_MoverType

The type of prime mover that drives a compressor unit

Used in: *Equipment, Compressor Driver Summary*

Compressor_Outlet_Pressure_psig

Inlet (suction) pressure of the compressor, in psig, at time of screening

Used in: *Equipment*

Compressor_RatedHP

The rated power, in horsepower, of a compressor unit driver

Used in: *Equipment*

Compressor_SealType

For centrifugal compressors, the type of seals on the compressor

Used in: *Equipment*

Compressor_Stages

The number of compression states of a compressor unit

Used in: *Equipment*

Compressor_mean_kgh

Mean methane emission rate for Compressors on the station, in kg/h

Used in: *Station Emissions*

CorrectionID

Identifier of the BHFS unit that was used for the measurement. See text for unit which were tested

during the post-campaign development

Used in: *Measurements*

CountOrigin

Qualifier on the Activity Driver - either “Counted” (a complete count was performed) or “Assumed” (count was not performed, and a logical assumption was made about the number of components per major equipment unit)

Used in: *Average Whole Gas EF, Average Methane EF*

DOES_FLARE_HV_CONT_FLOW_MONIT

See column definition in GHGRP Subpart W, reporting year 2017, Table W_FLARE_STACKS_UNITS [Table N.1]

Used in: *GHGRP Flare Stacks*

DOES_FLA_HV_CONT_GAS_ANALZR

See column definition in GHGRP Subpart W, reporting year 2017, Table W_FLARE_STACKS_UNITS [Table N.1]

Used in: *GHGRP Flare Stacks*

Data

Components counted for each unit in the sample, separated by commas

Used in: *Components Per Unit*

Date

Date of the test

Used in: *BHFS Test Data*

DehydratorVent_mean_kgh

Mean methane emission rate from dehydrator still vents, i.e. methane entrained in the reboiler still vents of dehydrators on the station, in kg/h

Used in: *Station Emissions*

DehydratorVentsKGH

From G&B GHGRP Report: Total methane emissions from dehydrator vents, as calculated by the project. (kg/h CH₄)

Used in: *GHGRP Data*

Dehydrator_mean_kgh

Mean methane emission rate for dehydrators on the station, in kg/h

Used in: *Station Emissions*

DrillingInfo2017ProductionMSCF

Total reported gas production rate for the basin, in Mscf, from DrillingInfo county-level reports, summed to basin level

Used in: *Production Ratio*

EMISSIONS_TYPE

See column definition in GHGRP Subpart W, reporting year 2017, Table W_BLOWDOWN_STACKS_UNITS [Table I.1 and Table I.2]

Used in: *GHGRP Blowdown Stacks*

EMISSIONS_VENT_FLARE_OR_TUBES

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

EMISSIONS_VENT_NO_FLARE_TUBES

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

EMISSIONS_VENT_VAPOR_RECOVERY

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

EPAID

EPA reporting ID for the GHGRP

Used in: *Pneumatic Controller Mix, GHGRP Data*

EQUIPMENT_TYPE

See column definition in GHGRP Subpart W, reporting year 2017, Table W_BLOWDOWN_STACKS_UNITS [Table I.1 and Table I.2]

Used in: *GHGRP Blowdown Stacks*

EQUIP_EVENT_TYPE_NG_PIPE

See column definition in GHGRP Subpart W, reporting year 2017, Table W_BLOWDOWN_STACKS_UNITS [Table I.1 and Table I.2]

Used in: *GHGRP Blowdown Stacks*

EngineTypeCode

2SLB = all compressor drivers are two stroke lean burn; 4SLB/4SRB = all compressor drivers are

four stroke lean or rich burn, respectively; Diesel = compressor drivers are diesel; Electric = all compressor drivers are electric; Gas turbine = all compressor drivers are gas turbines; Mixed = some combination of drivers; Unknown = no information available

Used in: *Partner Site Data*

EquipmentType

Key classification of the equipment type. See text for “major equipment” types

Used in: *Measurements, Equipment, Components Per Unit, National Detail*

Equipment_ID

Operator’s identifier for the equipment unit, or numerical number if no operator identifier. Names changed if necessary to preserve anonymity.

Used in: *Measurements, Equipment*

FACILITY_ID

See column definition from GHGRP Subpart W, reporting year 2018

Used in: *GHGRP Large Dehy, GHGRP Small Dehy, GHGRP Blowdown Stacks, GHGRP Flare Stacks*

FACILITY_NAME

See column definition from GHGRP Subpart W, reporting year 2017

Used in: *GHGRP Large Dehy, GHGRP Small Dehy, GHGRP Blowdown Stacks, GHGRP Flare Stacks*

FEED_NATURAL_GAS_WATER_CONTENT

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

FLARE_COMBUSTION_EFFICIENCY

See column definition in GHGRP Subpart W, reporting year 2017, Table W_FLARE_STACKS_UNITS [Table N.1]

Used in: *GHGRP Flare Stacks*

FLARE_FEED_GAS_CH4_MOLE_FRACT

See column definition in GHGRP Subpart W, reporting year 2017, Table W_FLARE_STACKS_UNITS [Table N.1]

Used in: *GHGRP Flare Stacks*

FLARE_FEED_GAS_CO2_MOLE_FRACT

See column definition in GHGRP Subpart W, reporting year 2017, Table W_FLARE_STACKS_UNITS [Table N.1]

Used in: *GHGRP Flare Stacks*

FLARE_STACK_ID

See column definition in GHGRP Subpart W, reporting year 2017, Table W_FLARE_STACKS_UNITS [Table N.1]

Used in: *GHGRP Flare Stacks*

FLARING_CH4_EMISSIONS

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

FLARING_N2O_EMISSIONS

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

FLOW_METER_TOTAL_CH4_EMISSIONS

See column definition in GHGRP Subpart W, reporting year 2017, Table W_BLOWDOWN_STACKS_UNITS [Table I.1 and Table I.2]

Used in: *GHGRP Blowdown Stacks*

FLOW_METER_TOTAL_CO2_EMISSIONS

See column definition in GHGRP Subpart W, reporting year 2017, Table W_BLOWDOWN_STACKS_UNITS [Table I.1 and Table I.2]

Used in: *GHGRP Blowdown Stacks*

FRACTION_OF_GAS_SENT

See column definition in GHGRP Subpart W, reporting year 2017, Table W_FLARE_STACKS_UNITS [Table N.1]

Used in: *GHGRP Flare Stacks*

FacilityName

From G&B GHGRP Report: Facility name of the G&B facility

Used in: *GHGRP Data*

FacilityType

Indicates the presence of compression (C), dehydration (D), and treating (T) at the station

Used in: *Station Emissions*

Facility_ID

Unique id number assigned to all each station in the data set.
Used in: *Measurements, Equipment, Partner Site Data, Station Emissions*

Flanged_Connector_Count

Number of Flanged Connectors on unit of major equipment
Used in: *Equipment*

Flare

Mean methane emission rate for Flares on the station, in kg/h
Used in: *Station Emissions*

FlareStacks

From G&B GHGRP Report: Number of reported flare stacks
Used in: *GHGRP Data*

FlaringKGH

From G&B GHGRP Report: Total methane emissions from flaring, as reported, and assuming 8760 hours in the year. (kg/h CH₄)
Used in: *GHGRP Data*

FlowRatescfh

Whole gas flow rate in scfh
Used in: *HiFlowLDL*

FractionCaptured

Estimated fraction of emissions captured, as estimated by the observer with a gas imaging camera
Used in: *IncompleteCaptures*

FractionTop5Percent

Fraction of the distribution that is caused by the largest 5% of the distribution
Used in: *Leaker Whole Gas EF, Leaker Methane EF*

GAS_SENT_TO_FLARE

See column definition in GGHRP Subpart W, reporting year 2017, Table W_FLARE_STACKS_UNITS [Table N.1]
Used in: *GHGRP Flare Stacks*

GHGRP2017ProductionMSCF

Total reported gas production rate for the basin, in Mscf, from GHGRP production reports
Used in: *Production Ratio*

GHGRP2017SalesMSCF

Total reported gas sold for the basin, in Mscf, from GHGRP production reports

Used in: *Production Ratio*

GHGRPReportedYesNo

Station was in a basin operation that reported to the GHGRP

Used in: *Partner Site Data*

GHGRPReporting

Whether the site was a reporting ("Reported") or non-reporting ("NonReported") facility for GHGRP reporting

Used in: *Rodpacking from T&S, Vents from T&S*

GLYCOL_DEHYDRATOR_COUNT

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_SMALL [Table E.1]

Used in: *GHGRP Small Dehy*

GLYCOL_DEHYD_OPERATING_HOURS

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

GLY_DEH_MRTHN_FLARING_CO2_EMM

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

GLY_DEH_MRTHN_VENTING_CO2_EMM

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

GasHydrocarbonComposition

Wet = <95% methane; Dry = >95% methane

Used in: *Partner Site Data*

GasType

Type of gas measured - either whole gas or methane, both measured in scfh

Used in: *Leaker Whole Gas EF, Leaker Methane EF, Average Whole Gas EF, Average Methane EF*

Gauge_Count

Number of Gauges on unit of major equipment

Used in: *Equipment*

HCLiquidsReceived

From G&B GHGRP Report: Quantity of hydrocarbon liquids received (BBL)

Used in: *GHGRP Data*

HCLiquidsTransported

From G&B GHGRP Report: Quantity of hydrocarbon liquids transported (BBL)

Used in: *GHGRP Data*

HF_FlowRate1_LPM

The total reported flow rate from the BHFS for measurement 1

Used in: *Measurements*

HF_FlowRate2_LPM

The total reported flow rate from the BHFS for measurement 2

Used in: *Measurements*

HF_FlowRate3_LPM

The total reported flow rate from the BHFS for measurement 3

Used in: *Measurements*

HF_FlowRate4_LPM

The total reported flow rate from the BHFS for measurement 4

Used in: *Measurements*

HF_GasConcentration1

The delta gas concentration measurement - i.e. concentration in the leak minus background concentration - reported by the BHFS for measurement 1

Used in: *Measurements*

HF_GasConcentration2

The delta gas concentration measurement - i.e. concentration in the leak minus background concentration - reported by the BHFS for measurement 2

Used in: *Measurements*

HF_GasConcentration3

The delta gas concentration measurement - i.e. concentration in the leak minus background concentration - reported by the BHFS for measurement 3

Used in: *Measurements*

HF_GasConcentration4

The delta gas concentration measurement - i.e. concentration in the leak minus background concentration - reported by the BHFS for measurement 4

Used in: *Measurements*

HF_LeakRate1_LPM

Indicated (pre correction) emission rate from BHFS for measurement 1

Used in: *Measurements*

HF_LeakRate2_LPM

Indicated (pre correction) emission rate from BHFS for measurement 2

Used in: *Measurements*

HF_LeakRate3_LPM

Indicated (pre correction) emission rate from BHFS for measurement 3

Used in: *Measurements*

HF_LeakRate4_LPM

Indicated (pre correction) emission rate from BHFS for measurement 4

Used in: *Measurements*

HasDiesel

0 = no diesels; 1 = at least one diesel engine; -1 = unknown

Used in: *Partner Site Data*

HasTurbines

1 = no turbines; 1 = at least one turbine; -1 = unknown

Used in: *Partner Site Data*

HiFlowID

Internal identifier of the Bacharach High Flow Samplers utilized on the project. See Text.

Used in: *Measurements, BHFS Test Data*

HiFlow_Serial_Number

Serial number of Bacharach high flow used for the measurement, or other notes as appropriate

Used in: *Measurements*

HighBleedPC_mean_kgh

Mean methane emission rate for intermittent bleed pneumatic controllers on the station, in kg/h

Used in: *Station Emissions*

HighBleedPneumaticDevices

Reported count of high bleed gas pneumatic devices

Used in: *Pneumatic Controller Mix, GHGRP Data*

ID_Level_1

First level of 5-level leak location identifier.

Used in: *Measurements*

ID_Level_2

Second level of 5-level leak location identifier.

Used in: *Measurements*

ID_Level_3

Third level of 5-level leak location identifier.

Used in: *Measurements*

ID_Level_4

Fourth level of 5-level leak location identifier.

Used in: *Measurements*

ID_Level_5

Fifth level of 5-level leak location identifier.

Used in: *Measurements*

INDUSTRY_SEGMENT

See column definition from GHGRP Subpart W, reporting year 2022

Used in: *GHGRP Large Dehy, GHGRP Small Dehy, GHGRP Blowdown Stacks, GHGRP Flare Stacks*

IS_FLASH_TANK_SEPARATOR_USED

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

IS_STRIPPER_GAS_USED

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

IndicatedLeakRatescfh

Whole gas flow rate reported by the high flow instrument, in scfh

Used in: *HiFlowLDL*

InstrumentAir

True if station had instrument air

Used in: *Equipment, Partner Site Data, Station Emissions*

IntermittentBleedPC_mean_kgh

Mean methane emission rate for low bleed pneumatic controllers on the station, in kg/h

Used in: *Station Emissions*

IntermittentBleedPneumaticDevices

Reported count of intermittent bleed gas pneumatic devices

Used in: *Pneumatic Controller Mix, GHGRP Data*

IsPartner

From G&B GHGRP Report: Identification of whether the reporter is a project partner

Used in: *GHGRP Data*

Label

Full name of the emission factor

Used in: *Leaker Whole Gas EF, Leaker Methane EF, Average Whole Gas EF, Average Methane EF*

LargeDehydrators

From G&B GHGRP Report: Number of large dehydrators; refer to GHGRP reporting rules for the definition of a large dehydrator.

Used in: *GHGRP Data*

LargeEmitterCount

Number of detected large emitters at the station. See text for definition of large emitter.

Used in: *Station Emissions*

LocationType

LatLng = station location was known to a latitude and longitude; Count = Station location was

only known to the resolution of the county it was in
Used in: *Partner Site Data*

LowBleedPC_mean_kgh

Mean methane emission rate for high bleed pneumatic controllers on the station, in kg/h
Used in: *Station Emissions*

LowBleedPneumaticDevices

Reported count of low bleed gas pneumatic devices
Used in: *Pneumatic Controller Mix, GHGRP Data*

Lower

Lower empirical 95% confidence interval (i.e. value at 0.025) of the distribution
Used in: *Compressors per Station, Separators per Compressor, National Detail, Leaker Whole Gas EF, Leaker Methane EF, Average Whole Gas EF, Average Methane EF, Components Per Unit*

LowerCI_kgh

Lower confidence interval of the methane emission rate in kg/h
Used in: *Station Emissions*

Maximum

Maximum of the distribution
Used in: *Compressors per Station, Separators per Compressor, Leaker Whole Gas EF, Leaker Methane EF, National Detail, Average Whole Gas EF, Average Methane EF*

Mean

Mean of the distribution
Used in: *Components Per Unit, Compressors per Station, Separators per Compressor, Leaker Whole Gas EF, Leaker Methane EF, National Detail, Average Whole Gas EF, Average Methane EF*

Mean_kgh

Mean methane emission rate in kg/h
Used in: *Station Emissions*

Measured_WholeGas_scfh

Whole gas emission rate in scfh
Used in: *IncompleteCaptures*

MeasurementCount

Number of measurements used to create the emission factor

Used in: *Leaker Whole Gas EF, Leaker Methane EF, Average Whole Gas EF, Average Methane EF*

MeasurementInstrument

Method used for measurement. Valid values are “Hi Flow” (Bacharach HiFlow), “Calibrated Bag” (bag and timer), or “Anemometer” (in-flow anemometer)

Used in: *Rodpacking from T&S, Vents from T&S*

Median

Median of the distribution

Used in: *Compressors per Station, Separators per Compressor, National Detail, Average Whole Gas EF, Average Methane EF*

Meter_Count

Number of Meters on unit of major equipment

Used in: *Equipment*

Methane_scfh

Methane emission rate in scfh

Used in: *Measurements*

Minimum

Minimum of the distribution

Used in: *Compressors per Station, Separators per Compressor, Leaker Whole Gas EF, Leaker Methane EF, National Detail, Average Whole Gas EF, Average Methane EF*

MixerEthane

Flow rate of ethane into the mixer (slpm)

Used in: *BHFS Test Data*

MixerEthaneFraction

Ethane fraction of the emission (mass fraction)

Used in: *BHFS Test Data*

MixerGasTemperature

Gas temperature exiting the mixer (F)

Used in: *BHFS Test Data*

MixerImpurityFraction

Fraction of other gas impurities in the gas stream (mass fraction)

Used in: *BHFS Test Data*

MixerMethane

Flow rate of methane into the mixer (slpm)

Used in: *BHFS Test Data*

MixerMethaneFraction

Methane fraction of the emission (mass fraction)

Used in: *BHFS Test Data*

MixerPropane

Flow rate of propane into the mixer (slpm)

Used in: *BHFS Test Data*

MixerPropaneFraction

Propane fraction of the emission (mass fraction)

Used in: *BHFS Test Data*

MixerTotal

Total emission flow rate out of the mixer (slpm)

Used in: *BHFS Test Data*

N2O_EMISSIONS

See column definition in GHGRP Subpart W, reporting year 2017, Table W_FLARE_STACKS_UNITS [Table N.1]

Used in: *GHGRP Flare Stacks*

NATURAL_GAS_FLOW_RATE

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

NCompressors

Number of compressors at the station

Used in: *Station Emissions*

NElectric

Number of electrically driven compressors

Used in: *Station Emissions*

NPneumaticsLowerCI

Lower confidence interval for the number of pneumatics on the station

Used in: *Station Emissions*

NPneumaticsMean

Mean number of pneumatics on the station

Used in: *Station Emissions*

NPneumaticsUpperCI

Upper confidence interval for the number of pneumatics on the station

Used in: *Station Emissions*

NumberEngines

Number of engines on the station

Used in: *Partner Site Data*

OEL_Count

Number of Open-ended lines on unit of major equipment

Used in: *Equipment*

OGIDetected

Emission could be seen by an Opgal EyeCGas camera during the test

Used in: *HiFlowLDL*

OUTLET_NAT_GAS_WATER_CONTENT

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

OperatingMode

Operating mode of the compressor at time of measurement.

Used in: *Measurements, Equipment*

OperatingModeWhenMeasured

Operating mode of the compressor at time of measurement.

Used in: *Rodpacking from T&S, Vents from T&S*

Origin

Reported origin of the measurement; Field or Partner (see study for definition)

Used in: *Rodpacking from T&S, Vents from T&S*

OriginalRecordID

Original record ID from the T&S Study, CDFMaster.xlsx file

Used in: *Rodpacking from T&S, Vents from T&S*

PCActualCount

From G&B GHGRP Report: Reported pneumatic controller count from actual count of components

Used in: *GHGRP Data*

PCCount

Total reported count of gas pneumatic devices, all types

Used in: *Pneumatic Controller Mix, GHGRP Data*

PCCountStatus

From G&B GHGRP Report: Field indicating if the PC count was an actual count ('Counted'), and estimated count ('Estimated') or if the report indicated that there were no gas pneumatics in the facility

Used in: *GHGRP Data*

PCEstimatedCount

From G&B GHGRP Report: Reported pneumactic controller count using EPA-approved estimation methods

Used in: *GHGRP Data*

PRV_Count

Number of Pressure relief valves on unit of major equipment

Used in: *Equipment*

PartnerID

Operator of the station, i.e. a unique partner ID

Used in: *Measurements, Equipment*

Plasticcompositegatheringpipeline

From G&B GHGRP Report: Length of gathering pipeline, plastic or plastic composite (miles)

Used in: *GHGRP Data*

Pneumatic_Count

Number of Pneumatic controllers on unit of major equipment

Used in: *Equipment*

Pneumatic_Ratio_Source

Source used to estimate the ratio of different types of pneumatic controllers at this station. See Text.

Used in: *Equipment*

Protectedsteelgatheringpipeline

From G&B GHGRP Report: Length of gathering pipeline, protected steel (miles)

Used in: *GHGRP Data*

QuadOCompressors

Partner-reported number of compressors which are governed by EPA OOOO requirements. Note that partner reports were incomplete, and the data should be considered partial.

Used in: *Partner Site Data*

QuadOaCompressors

Partner-reported number of compressors which are governed by EPA OOOOa requirements. Note that partner reports were incomplete, and the data should be considered partial.

Used in: *Partner Site Data*

QualityClass

Quality classification assigned to the measurement; see text.

Used in: *Measurements*

REPORTING_YEAR

See column definition from GHGRP Subpart W, reporting year 2019

Used in: *GHGRP Large Dehy, GHGRP Small Dehy, GHGRP Blowdown Stacks, GHGRP Flare Stacks*

Ratio

Ratio of GHGRP reported production divided by DrillingInfo reported production

Used in: *Production Ratio*

RecipCompressors

From G&B GHGRP Report: Number of reciprocating compressors reported

Used in: *GHGRP Data*

Reciprocating

Count of reciprocating compressors

Used in: *Compressor Driver Summary*

RecordID

Unique sequential record ID for each input data table

Used in: *Measurements, Equipment, IncompleteCaptures*

Regulator_Count

Number of Regulators on unit of major equipment

Used in: *Equipment*

SMALL_DEHYD_VENT_TO_FLARES

See column definition in GGHRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_SMALL [Table E.1]

Used in: *GHGRP Small Dehy*

SMALL_DEHYD_VENT_TO_FLARES_CNT

See column definition in GGHRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_SMALL [Table E.1]

Used in: *GHGRP Small Dehy*

SMALL_FLARE_CH4_EMISSIONS

See column definition in GGHRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_SMALL [Table E.1]

Used in: *GHGRP Small Dehy*

SMALL_FLARE_CO2_EMISSIONS

See column definition in GGHRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_SMALL [Table E.1]

Used in: *GHGRP Small Dehy*

SMALL_FLARE_N2O_EMISSIONS

See column definition in GGHRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_SMALL [Table E.1]

Used in: *GHGRP Small Dehy*

SMALL_NOT_FLARED_CH4_EMISSIONS

See column definition in GGHRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_SMALL [Table E.1]

Used in: *GHGRP Small Dehy*

SMALL_NOT_FLARED_CO2_EMISSIONS

See column definition in GGHRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_SMALL [Table E.1]

Used in: *GHGRP Small Dehy*

SMALL_OTHER_CONTROL_COUNT

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_SMALL [Table E.1]

Used in: *GHGRP Small Dehy*

SUB_BASIN_IDENTIFIER

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

SalesRatio

Ratio of GHGRP reported sales divided by GHGRP reported production

Used in: *Production Ratio*

SampleID

Identifier for a test condition within one set of tests

Used in: *BHFS Test Data*

Score

True if non-zero reading by the instrument, false if no reading.

Used in: *HiFlowLDL*

Screw

Count of screw compressors

Used in: *Compressor Driver Summary*

Secondary_Equipment_Type

Additional information about the equipment type

Used in: *Measurements, Equipment*

SensorActive

Project's estimation of which sensor in the BHFS was active during the measurement. 'CatOx' - catalytic oxidation sensor from 0-5% gas, 'TCD' thermal conductivity sensor nominally from 5-100% gas, 'LDL' measurement was below the lower detection limit of the BHFS, 'Both' active sensor was uncertain and corrections for both sensors were used

Used in: *Measurements*

Separator

Number of separators in the basin
Used in: *Separators per Compressor*

Separator_mean_kgh

Mean methane emission rate for separators on the station, in kg/h
Used in: *Station Emissions*

SetID

Set identifier for a group of tests
Used in: *BHFS Test Data*

SiteType

Type of site where measurement was completed; either a Storage or a Trans(mission) site.
Used in: *Rodpacking from T&S, Vents from T&S*

SmallDehydrators

From G&B GHGRP Report: Number of small dehydrators; refer to GHGRP reporting rules for the definition of a small dehydrator
Used in: *GHGRP Data*

StationCount

Number of stations in the basin from partner data that had appropriate quality
Used in: *Compressors per Station*

StationType

Type of equipment at station. “C” = Compression, “D” = Dehydration, “T” = treating, “Other” some other combination of equipment, typically one or more of the other codes but no compression.
Used in: *Partner Site Data*

StdDev

Standard deviation of the distribution
Used in: *Compressors per Station, Separators per Compressor, National Detail, Average Whole Gas EF, Average Methane EF*

StreetAddress

From G&B GHGRP Report: Reported address of the facility
Used in: *GHGRP Data*

TABLE_DESC

See column definition from GHGRP Subpart W, reporting year 2021

Used in: *GHGRP Large Dehy, GHGRP Small Dehy, GHGRP Blowdown Stacks, GHGRP Flare Stacks*

TABLE_NUM

See column definition from GHGRP Subpart W, reporting year 2020

Used in: *GHGRP Large Dehy, GHGRP Small Dehy, GHGRP Blowdown Stacks, GHGRP Flare Stacks*

TNLowerCI

Lower confidence interval of throughput normalized methane emissions

Used in: *Station Emissions*

TNMean

Meanthroughput normalized methane emission rate

Used in: *Station Emissions*

TNUppwerCI

Upper confidence interval of throughput normalized methane emissions

Used in: *Station Emissions*

TOTAL_BLOWDOWNS

See column definition in GGHRP Subpart W, reporting year 2017, Table W_BLOWDOWN_STACKS_UNITS
[Table I.1 and Table I.2]

Used in: *GHGRP Blowdown Stacks*

TOTAL CARBON DIOXIDE EMISSIONS

See column definition in GGHRP Subpart W, reporting year 2017, Table W_BLOWDOWN_STACKS_UNITS
[Table I.1 and Table I.2]

Used in: *GHGRP Blowdown Stacks*

TOTAL_CH4_EMISSIONS

See column definition in GGHRP Subpart W, reporting year 2017, Table W_BLOWDOWN_STACKS_UNITS
[Table I.1 and Table I.2]

Used in: *GHGRP Blowdown Stacks*

Tank

From G&B GHGRP Report: Number of tanks reported

Used in: *GHGRP Data*

TankControl

Atmospheric = tank was open to atmosphere with no thief hatch or lid; Enardo = pressure relief valve to atmosphere; flare = tank vents were connected to a flare; Unknown = tank controls were

not recorded when on site; VRU = tank vents were connected to a vapor recovery unit; NA = not applicable to non-tank records

Used in: *Measurements, Equipment*

Tank_mean_kgh

Mean methane emission rate for tanks on the station, in kg/h

Used in: *Station Emissions*

TargetFlow_SLPm

Target emission rate for this test (slpm)

Used in: *BHFS Test Data*

Team

1 = Team 1; 2 = Team 2; 3 = data acquired from GSI Environmental; see text

Used in: *Measurements*

Threaded_Connector_Count

Number of Threaded Connectors on unit of major equipment

Used in: *Equipment*

ThroughputKGH

Throughput of the station in methane kg/h

Used in: *Station Emissions*

Time

Time of the test, fraction of day

Used in: *BHFS Test Data*

TotalEmissionsPerUnit_KGH

Project's estimation of hourly emission rate for the facility, assuming 8760 hours in the year and the provided unit count. (kg/h/unit CH₄)

Used in: *GHGRP Large Dehy, GHGRP Small Dehy, GHGRP Blowdown Stacks, GHGRP Flare Stacks*

TotalPipelineLength

From G&B GHGRP Report: Total gathering pipeline length (miles)

Used in: *GHGRP Data*

TotalPneumaticEmissions

From G&B GHGRP Report: Total pneumatic emissions for the facility, as calculated by the project. Calculation uses whole gas emission factors from the GHGRP and reported PC counts. (scfh whole

gas)

Used in: *GHGRP Data*

TotalVented

Project's consolidation of total vented emissions for the facility (kg CH₄)

Used in: *GHGRP Large Dehy, GHGRP Small Dehy*

Type

Type of emission factor, either "Component Leaker Factor" or "Component Average Factor"

Used in: *Leaker Whole Gas EF, Leaker Methane EF, Average Whole Gas EF, Average Methane EF*

UNIT_IDENTIFIER

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

Unit_Measured

Yes if major equipment unit was measured after screening with OGI

Used in: *Equipment*

Unit_Screened_OGI

Yes if major equipment unit was screened with OGI

Used in: *Equipment*

UnitsCounted

Number of units counted for the activity count

Used in: *Components Per Unit*

UnitsCountedAndMeasured

Number of units both counted and measured, and thus used for the emission factor

Used in: *Average Whole Gas EF, Average Methane EF*

UnitsSimmed

Unused; quality control purposes only.

Used in: *Components Per Unit*

UnmeasuredCount

Number of identified emission locations which were not measured for this component count during the field campaign

Used in: *Leaker Whole Gas EF, Leaker Methane EF*

Unprotectedsteelgatheringpipeline

From G&B GHGRP Report: Length of gathering pipeline, unprotected steel (miles)

Used in: *GHGRP Data*

Upper

Upper empirical 95% confidence interval (i.e. value at 0.975) of the distribution

Used in: *Compressors per Station, Separators per Compressor, National Detail, Leaker Whole Gas EF, Leaker Methane EF, Average Whole Gas EF, Average Methane EF, Components Per Unit*

UpperCI_kgh

Upper confidence interval of the methane emission rate in kg/h

Used in: *Station Emissions*

VAPOR_REC_DEHYDRATOR_COUNT

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_SMALL [Table E.1]

Used in: *GHGRP Small Dehy*

VAPOR_REC_USED_VENT_CONTROL

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_SMALL [Table E.1]

Used in: *GHGRP Small Dehy*

VENTING_CH4_EMISSIONS

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE [Table E.3]

Used in: *GHGRP Large Dehy*

Valve_Count

Number of Valves on unit of major equipment

Used in: *Equipment*

WERE_CEMS_USED

See column definition in GHGRP Subpart W, reporting year 2017, Table W_FLARE_STACKS_UNITS [Table N.1]

Used in: *GHGRP Flare Stacks*

WET_NATURAL_GAS_PRESSURE

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE

[Table E.3]

Used in: *GHGRP Large Dehy*

WET_NATURAL_GAS_TEMPERATURE

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE

[Table E.3]

Used in: *GHGRP Large Dehy*

WET_NG_CH4_CONCENTRATION

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE

[Table E.3]

Used in: *GHGRP Large Dehy*

WET_NG_CO2_CONCENTRATION

See column definition in GHGRP Subpart W, reporting year 2017, Table W_DEHYDRATORS_LARGE

[Table E.3]

Used in: *GHGRP Large Dehy*

WasSimulated

Unused; quality control purposes only.

Used in: *Components Per Unit*

Week

Field campaign week

Used in: *Measurements*

WholeGas

Whole gas emission rate in scfh

Used in: *Rodpacking from T&S, Vents from T&S*

WholeGasLower

Lower empirical 95% confidence interval (i.e. value at 0.025) of the estimated whole gas emission rate (scfh)

Used in: *Measurements*

WholeGasMaximum

Maximum of the estimated whole gas emission rate (scfh)

Used in: *Measurements*

WholeGasMean

Mean of the estimated whole gas emission rate (scfh)
Used in: *Measurements*

WholeGasMedian

Median of the estimated whole gas emission rate (scfh)
Used in: *Measurements*

WholeGasMinimum

Minimum of the estimated whole gas emission rate (scfh)
Used in: *Measurements*

WholeGasStdDev

Standard deviation of the estimated whole gas emission rate (scfh)
Used in: *Measurements*

WholeGasUpper

Upper empirical 95% confidence interval (i.e. value at 0.975) of the estimated whole gas emission rate (scfh)
Used in: *Measurements*

WholeGas_scfh

Whole gas emission rate in scfh
Used in: *Measurements*

Whole_gas_to_methane_Conversion

Fraction of whole gas that is methane, in mass units.
Used in: *Station Emissions*

YardPiping_mean_kgh

Mean methane emission rate for yard piping on the station, in kg/h
Used in: *Station Emissions*

D3-2 Data Dictionary for the AvgFactor.xlsx

This section provides a data dictionary for AvgFactor.xlsx, one of the data files accompanying the Supporting Volume 3 of the report *Methane Emissions from Gathering and Boosting Compressor Stations in the U.S.* Table D3-1 provides an example of the top left rows, and three columns, of each spreadsheet. Above the intentionally blank row, a header provides information about the emission factor. Column A contains the parameter name, each of which is defined below, column B

the value for that parameter, and column C is intentionally blank. Below the blank row, a variable number of rows provide a binned histogram (a probability density function) for the emission factor. *BinStart* and *BinEnd* are the start and end of the bin – $BinStart \leq binvalue < BinEnd$. In use, it is valid to take a randomly distributed value between within the bin, or to use the centerpoint of the bin. *Count* is the number of, typically simulated, samples produced by the simulation code that fell within this bin. This value can be normalized to fractional values by the total in column C to produce a normalized probability density function.

Table D3-1: Example of the Upper Left Rows of One Sheet in AvgFactor.xlsx

A	B	C
Emission Factor	Compressor Connector Flanged	
Emission Factor Type:	Average Simulated	
Gas Type	WholeGas	
Activity Basis	Counted Components	
Notes		
Number Screened Components (Mean)	30955.8036	
Number Screened Components (Standard Deviation)	784.4757	
Number Detected Emissions	47	
Measured	41	
Simulated	6	
Skipped - Large Emitter	1	
Mean of Leaking	12.2694	
Est Average Factor	0.018629	
	<i>intentionally blank row</i>	
BinStart	BinEnd	Count
0	0.05	10292
0.05	0.1	4795

Starting in cell G1, each sheet contains the primary values of the *standard average factor* for this emission factor, as published in the report. Not all emission factors have a standard factor; this is available only if the activity basis is fully counted. An example is shown in D3-2. Column headers are as defined in Section D3-2.

Table D3-2: Example of the Upper Left Rows of One Sheet in AvgFactor.xlsx

G	H	I	J	K	L	M
Minimum	Lower	Mean	Upper	Maximum	StdDev	Median
0.014502966	0.015902297	0.018640889	0.023339533	0.027976792	0.0018066	0.018384116

The remainder of this section lists the parameters used in the Table D3-1. Each parameter is listed with a brief description of its meaning and contents.

Activity Basis

A short description of the activity basis – the counts – underlying the emission factor. If an emission

factor includes a parenthetical not, such as (*All Compressor on stations screened and measured*) , this indicates that *a complete count of this emitter type was not performed*. Rather, the software assumes that one of the following is true:

- There is no component of this type on the major equipment unit or at the station, as per the comment.
- There is a component of this type, but it was not emitting.

Therefore the basis of the emission factor in this case is either all major equipment units or stations, considering the probability of a *leaking* component on that unit or station. For example, for *Compressor Common Multi-Unit Vent* , 140 units were screened. Of those 14 (10%) had detectable emissions. The emissions from these detected sources are provided in the histogram on the sheet *C Multi-Unit Vent*.

To use emission factors of this type, use the following procedure:

1. Randomly identify the number of units with an emitter. In the example, this would be $\approx 10\%$ of all compressor units.
2. For each identified emitter, draw an emission rate from the histogram on the sheet.

Emission Factor

Name of the emission factor, as used in the text.

Emission Factor Type:

Specifies how the emission factor was calculated. It has one of three values:

- *Average Simulated*: An activity count was available and the emission factor was developed as described in *Average Emission Factors* in Supplemental Volume 3.
- *Average Simulated by Station*: No emitter-specific activity count was available, and the emission factor was developed on a *per-station* basis; i.e. assuming there could be an emitter of this case on every station screened. See description under *Activity Basis*, above.
- *Average Simulated by Unit*: No emitter-specific activity count was available, and the emission factor was developed on a *per-unit* basis for major equipment units. See description under *Activity Basis*, above.

Est Average Factor

An estimate of the standard average (population) emission factor computed from the histogram. Comparing this value with the value in the emission factor table (starting in cell G1) provides an estimate of the difference in mean emission rate that would be produced by randomly drawing from the histogram versus the mean value in the emission factor table. The difference is caused by the binning in the histogram.

Gas Type

All emission factors are whole gas, scfh.

Mean of Leaking

Mean value from the histogram on the sheet.

Measured

Number of measured emitters.

Mix Meas and Sim

When creating *per-unit* or *per-station* emission factors, multiple detected emitters must be combined to represent all the emissions on a single unit. This field is the number of cases where some of these emitters were measured – i.e. emissions were directly measured during the field campaign – and some of the emitters were simulated – i.e. estimated using other data (see text).

Notes

Additional notes about the use and or inputs to the emission factor. See description in *Activity Basis*, above.

Number Detected Emissions

Total number of detected emissions. This is the sum of all simulated, measured, and mix measured and simulated counts.

Number Screened Components (Mean) / Number Screened Units (Mean)

Mean of total components or units screened with OGI for this emission factor. Number may be non-integral of the count of components on one or more units was simulated from using data from other units.

Number Screened Components (Standard Deviation) / Number Screened Units (Standard Deviation)

Standard deviation of total components or units screened with OGI for this emission factor. Number non-zero if count on one or more units was simulated from using data from other units.

OGI Non-detect

Number of potential emitters which were screened with OGI, had no emissions visible, but were also measured.

Skipped - OGI Non-detect without reported emissions

Same as *OGI Non-detect*, but no measurement value was recorded during the field campaign. These are skipped.

Simulated

Number of emitters which were not measured and were estimated using simulation methods.

Skipped - Large Emitter

Provides the number of large emitters identified on this emitter type. Large emitters were not included in individual emission factors.

Units with Detected Emissions

Number of units where emissions were detected. See description in *Activity Basis*, above.