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DRAFT TEST PROTOCOL

Crude Oil, Condensate, and Produced Water Sampling
and Laboratory Procedures for the Determination of Methane,
Carbon Dioxide, and Volatile Organic Compounds

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DRAFT

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Draft Test Protocol

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1. PURPOSE AND APPLICABILITY

The purpose of this protocol is to quantify methane (CH₄) and carbon dioxide (CO₂), and volatile organic compounds (VOCs) from onshore crude oil and natural gas separation and storage tank systems. This protocol describes field procedures for gathering liquid samples from a vessel under at least 10 psig pressure and the laboratory procedures for conducting a liquid and vapor analysis of such samples. This protocol is applicable in all cases where crude oil, condensate, or produced water is created as a result of onshore crude oil or natural gas production.

2. PRINCIPLE AND SUMMARY OF TEST PROTOCOL

This protocol describes procedures for how to gather, measure, and report emissions from crude oil, condensate, or produced water to conduct a site-specific analysis. As these liquids change in pressure and temperature from reservoir to storage conditions, hydrocarbons flash from the liquid as vapor. The rate at which vapor is created is dependant on the composition of the liquid and configuration of the separation and storage tank system. The procedures described in this protocol are primarily based on Gas Processor Association (GPA) 2174 and 2186 Standards.

The sampling methodology and laboratory procedures specified in this protocol are based on the liquid sampled. For crude oil or condensate, the laboratory will perform a Chromatograph Extended Liquid Analysis for use with E&P Tank 2.0 software or equivalent. For produced water, the laboratory will perform a flash liberation analysis for use with the equations described in Section 9.

To conduct this protocol, a pressurized liquid sample is gathered to ensure that hydrocarbons remain entrained in the liquid for laboratory analysis. No samples may be taken from full well-stream sources where liquids have not separated, or from storage tanks that are open to the atmosphere or connected to a vapor recovery system. Samples must be taken from a vessel where liquids have come to equilibrium, but remain under at least 10 psig pressure. The primary location for sampling is from a pressurized separator, located just prior to a storage tank or storage tank system. Duplicate samples are recommended to

DRAFT

verify sample integrity and validate laboratory results.

When a pressurized liquid sample is gathered, the technician records the temperature, pressure, and throughput of the vessel sampled and then ships the sample to a laboratory for analysis. The sample is then reheated and re-pressurized to the same conditions recorded at the time of sampling. The laboratory then allows the sample to change temperature and pressure to the average operating conditions of the final storage tank located within the tank system, which may be at or near local ambient conditions.

While the pressure and temperature of the liquid are changing, the laboratory measures the composition and quantity of the resulting flash vapor. For crude oil or condensate, the lab results are used as input data for E&P Tank 2.0 software or equivalent, which calculates the methane, carbon dioxide, and VOC emission rates. For produced water, the amount of gas liberated from the water is expressed in terms of a gas to water ratio and the emission calculations are performed based on the weight percent of individual compounds.

3. DEFINITIONS

For the purpose of this protocol, the following definitions apply:

Condensate means hydrocarbon liquid, separated from crude oil or natural gas, that condenses due to changes in temperature, pressure, or both, and which remains in liquid form under storage conditions. Condensate has an API Gravity between 41 and 60.

Crude Oil means hydrocarbon liquid that remains in liquid form under storage conditions. Crude oil has an API Gravity equal to or less than 40.

Double-Valve Cylinder means a cylinder used for gathering crude oil or condensate. The cylinder is typically provided by the laboratory conducting the Chromatograph Extended Liquid Analysis and is filled with laboratory grade water. The laboratory grade water is displaced from the cylinder with sample liquid to prevent the sample from expanding and flashing during the sampling procedure.

E&P Tank 2.0 Software means the most current version of Exploration and Production Tank software that estimates flashing, working, and standing losses of hydrocarbons, including methane, carbon dioxide, and VOCs from crude oil and condensate. Equivalent or successor software to E&P Tank 2.0 software (Copyright (C) 1996–1999 by The American Petroleum Institute and The Gas Research Institute) are acceptable provided they supply equivalent results.

Flashing means the release of hydrocarbons and carbon dioxide from liquid to surrounding air when the liquid changes temperature and pressure, also known

as phase change.

Flash Vapor means the resulting quantity of hydrocarbon vapor and carbon dioxide that is emitted from the liquid when the liquid changes temperature and pressure.

Floating-Piston Cylinder means a cylinder used for gathering produced water samples. The cylinder contains an internal floating-piston that is manually controlled by relieving inert gas pressure to introduce liquid. A Floating-Piston Cylinder is typically provided by a laboratory with the floating-piston pressurized to the closed position using inert gas pressure. As the inert gas is relieved from the cylinder, the cylinder draws in a produced water sample.

Gas-Water-Ratio or *GWR* means the ratio of hydrocarbon gas liberated from a barrel of produced water when cooling and depressurizing the water from separator to storage tank conditions.

Graduated Cylinder means a device designed to make accurate liquid volume measurements. The volume is read from the lowest portion of the meniscus of the liquid (the lowest portion of the convex dip of the liquid).

Onshore Crude Oil and Natural Gas Production means any structure affixed temporarily or permanently to land that houses equipment to extract hydrocarbon liquid or vapor from wells, gravity separation equipment, and storage tanks, used in the production, extraction, recovery, stabilization, separation, or treatment of hydrocarbon liquid or gas. This includes petroleum and natural gas production facilities located on islands, artificial islands or structures connected by a causeway to land, an island, or artificial island.

Operating Pressure means the working pressure that characterizes the conditions of crude oil, condensate, or produced water inside a particular process, pipeline, vessel or tank.

Operating Temperature means the working temperature that characterizes the conditions of crude oil, condensate, or produced water inside a particular process, pipeline, vessel or tank.

Produced Water means the resulting water that is produced as a byproduct of onshore crude oil or natural gas production.

Reservoir means a porous and permeable underground natural formation containing hydrocarbon liquid or gas. A reservoir is characterized by a single natural pressure.

Throughput means the average daily throughput as recorded in barrels per day of liquid that is sent to a storage tank or tank system.

Vapor Recovery System means any equipment designed to control, capture, or treat gaseous emissions, including piping, connections, and, if necessary, flow-inducing devices for routing gas into a process as a product or fuel source.

4. BIASES AND INTERFERENCES

- 4.1** The sampling procedures specified in this protocol have an impact on the laboratory procedures and final results reported. All samples must be gathered in adherence with the minimum procedures and specifications identified in this protocol.
- 4.2** A representative sampling point must be selected to ensure that pressurized hydrocarbons remain suspended in liquid during sampling. Obtaining a sample from a non-pressurized vessel or from a vessel connected to a vapor recovery system will produce non-representative results. The most common sampling point is from a pressurized crude oil, condensate, or natural gas separator located just prior to a storage tank or tank system.
- 4.3** Uncalibrated equipment, including the use of instruments located on a vessel, may produce inaccurate results. This may result in data errors when analyzing samples in a laboratory. All pressure and temperature measurements used in the field at the time of sampling must be calibrated as described in Section 5.
- 4.4** The analytical portion of this protocol must be conducted by laboratories experienced with laboratory instrumentation, analytical methods, and the GPA Standards specified in this protocol. Laboratories unfamiliar with the laboratory procedures or GPA standards specified in this protocol may report non-representative results.

5. SAMPLING INSTRUMENT SPECIFICATIONS

All pressure and temperature measurements must be recorded using instruments calibrated to the minimum specifications listed. The use of uncalibrated instruments when taking field measurements may produce invalid results.

- 5.1** A low-pressure measuring device capable of measuring low pressure liquid under less than 200 pounds per square inch pressure within +/-10% accuracy.
- 5.2** A high-pressure measuring device capable of measuring high pressure liquid under 200 or more pounds per square inch pressure within +/- 5% accuracy.

- 5.3 A temperature measuring device capable of reading liquid temperature to within +/- 2°F. The range of the instrument must be at least 32 to 200°F.

6. SAMPLING EQUIPMENT

- 6.1 A Double-Valve Cylinder for gathering crude oil or condensate or a Floating-Piston Cylinder for gathering produced water samples.
- 6.2 A Graduated Cylinder to capture and accurately measure displaced water from a Double-Valve Cylinder.
- 6.3 A waste container suitable for capturing and disposing of sample liquid.
- 6.4 High-pressure rated components and control valves that can withstand liquid pressure under the same operating conditions as the vessel sampled.
- 6.5 A low-pressure and a high-pressure measuring device with minimum specifications listed in Section 5 of this protocol.
- 6.6 A temperature measuring device with minimum specifications listed in Section 5 of this protocol.

7. SAMPLING PROTOCOL

The sampling protocol chosen depends on the liquid sampled. Crude oil and condensate are collected using the Partial Displacement Method specified in Section 7.1. Produced water is collected using the Floating-Piston Cylinder method specified in Section 7.2. The location for gathering samples must be pressurized and precede a storage tank that is open to the atmosphere or controlled by a vapor recovery system. Samples must not be gathered from vessels that contain full-well stream liquid (liquid streams where oil, condensate, and water are not in equilibrium). The vessel must contain pressurized, stable liquid of a known average throughput in barrels per day.

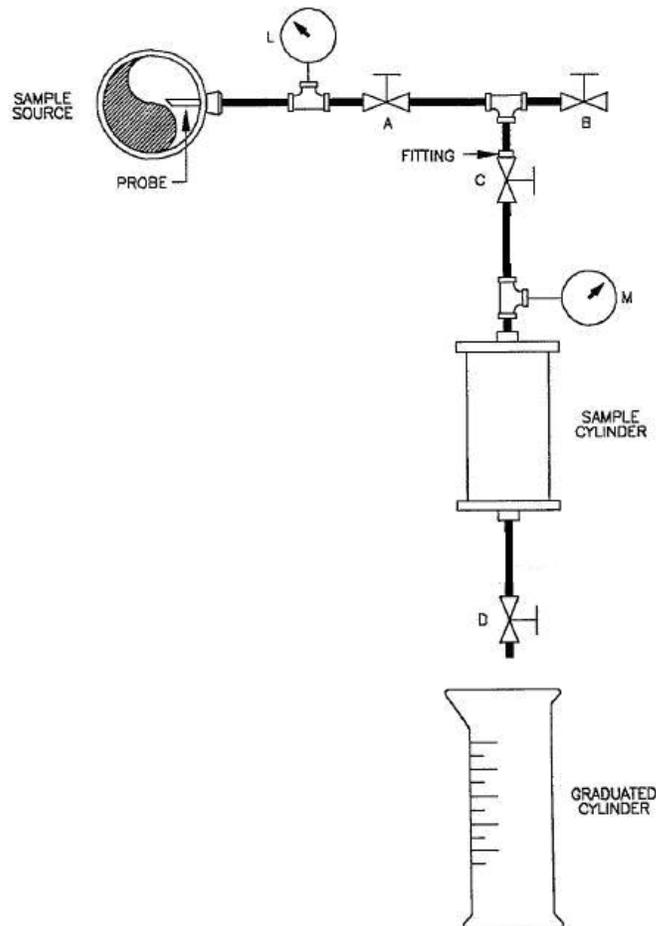
7.1 PARTIAL DISPLACEMENT SAMPLING METHOD FOR GATHERING CRUDE OIL OR CONDENSATE LIQUID

The Partial Displacement Method refers to the displacement of a specified amount of water with pH between 5 and 7 from a Double-Valve Cylinder with pressurized crude oil or condensate. The water prevents hydrocarbons from flashing while sample liquid is introduced. The cylinder is typically provided by the laboratory conducting the analysis and is supplied full of the specified laboratory grade water.

Figure 1 illustrates a Double-Valve Cylinder sampling train. Sample liquid enters

the cylinder when water is slowly purged by the sample technician into a graduated cylinder. The configuration shows a Double-Valve Cylinder outfitted with high-pressure rated components that can be used for sampling and controlling the flow of liquid. Calibrated temperature (Gauge L) and pressure (Gauge M) measurement devices are included for conducting field measurements. A graduated cylinder is used to accurately measure and record the amount of water displaced from the sample cylinder (also known as outage).

Figure 1
Double-Valve Cylinder Sampling Train



- (a) Prior to sampling, determine the volume of the Double-Valve Cylinder and calculate the amount of water to be displaced. The following example depicts the amount of water to displace from a 500 ml Double-Valve Cylinder, pre-filled with laboratory grade water: 70% of the volume ($0.7 \times 500 \text{ ml} = 350 \text{ ml}$) represents the amount of water that is displaced with sample liquid. 20% ($0.2 \times 500 \text{ ml} = 100 \text{ ml}$) represents the amount of water to displace after the sample is gathered to allow liquid to expand and contract during shipping. 10% ($0.1 \times 500 \text{ ml} = 50 \text{ ml}$) of water

DRAFT

remains in the sample cylinder with the sample liquid.

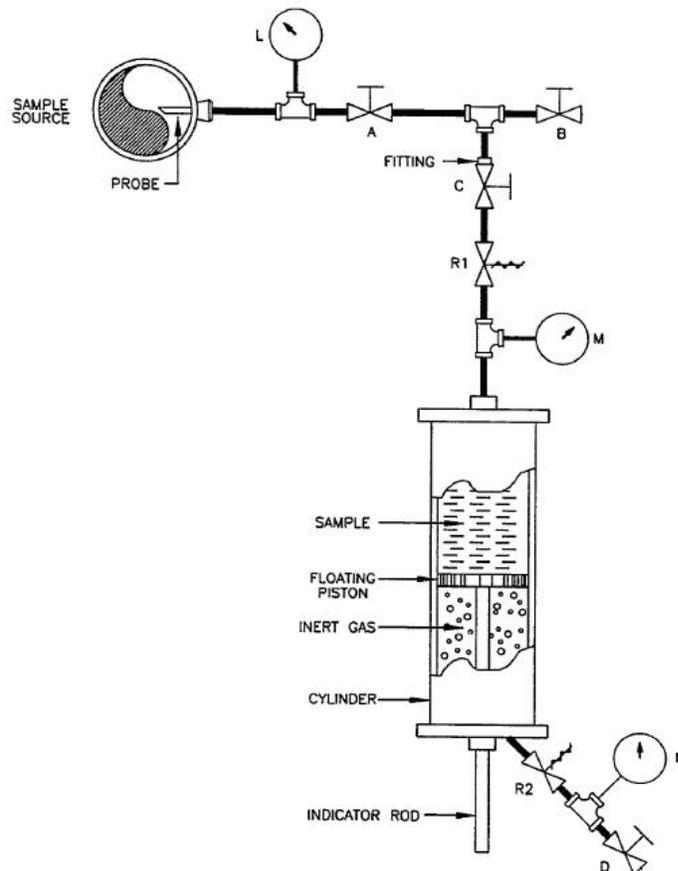
- (b) Connect the sampling train to a sampling point on the pressurized vessel. Bushings or reducers may be required.
- (c) Purge the sample line: with Valves C and D closed, route the outlet of Valve B into a suitable waste container to purge sample liquid. Slowly open Valve B. Slowly open Valve A and allow liquid to purge. Continue purging until a consistent, steady stream of liquid is observed and gas pockets subside. Close Valve B.
- (d) With Valve C and D closed, slowly open Valve A to the full-open position and then slowly open Valve C to the full-open position.
- (e) Slowly open Valve D to allow a slow discharge of water into the graduated cylinder at a rate of approximately 60 ml per minute (1 drip per second).
- (f) Record the temperature from Gauge L and pressure from Gauge M while the liquid is filling the cylinder. Do not take temperature or pressure measurements on stagnant liquid. Continue allowing a slow discharge of liquid until 70% of the water is displaced with sample liquid.
- (g) Close Valves D, C, and A in that order.
- (h) Purge the line pressure: slowly open Valve B and allow pressurized liquid to drain into the waste container.
- (i) Take outage: while holding the sample cylinder in a vertical position, slowly open Valve D and drain another 20% of the pre-filled water from the sample cylinder into the graduated cylinder. 10% of the pre-filled water remains in the sample cylinder along with the sample liquid. Close Valve D to the full-closed position.
- (j) Disconnect the Double-Valve Cylinder from the sampling train and disconnect the sampling train from the pressurized vessel.
- (k) Check Valves C and D for leaks. If either Valve C or D is leaking, drain the cylinder into a suitable waste container and use a different cylinder to obtain a new sample.
- (l) Wrap the threaded connections with Teflon tape and cap using threaded metal caps to protect the threads and ensure the cylinder is securely sealed for shipping.
- (m) Identify and ship the sample cylinder to the laboratory for analysis according to the procedures listed in Section 8.

- (n) Calculate the emission rates as described in Section 9 and report the results as described in Section 10.

7.2 FLOATING-PISTON CYLINDER SAMPLING METHOD FOR GATHERING PRODUCED WATER LIQUID

The Floating-Piston Cylinder Method is used for gathering produced water samples. The cylinder is typically provided by the laboratory conducting the analysis with the floating-piston pressurized with inert gas to a pressure of at least 10 psig (69 kPa) above the vessel pressure. Sample liquid enters the cylinder when the inert gas is purged by the sampling technician. This allows liquid to be gathered without allowing flashing or gas expansion to occur. Figure 2 shows a Floating-Piston Cylinder sample train outfitted with high-pressure rated components that can be used for sampling and controlling the flow of liquid. Calibrated temperature (Gauge L) and pressure (Gauge M) measuring devices are included for conducting field measurements.

Figure 2
Floating-Piston Cylinder Sampling Train



DRAFT

- (a) Connect the sampling train to a sampling point on the pressurized vessel. Bushings or reducers may be required.
- (b) Purge the sample line: with Valves C and D closed, route the outlet of Valve B into a suitable waste container to purge sample liquid. Slowly open Valve A to the full-open position. Slowly open Valve B and allow liquid to purge. Continue purging until a consistent, steady stream of liquid is observed and gas pockets subside. Close Valve B.
- (c) Slowly open Valve C to the full-open position.
- (d) Slowly open Valve D to release inert gas pressure until the pressure indicated on Gauge N is equal to Gauge M. When both gauges read equal pressure, close Valve D and prepare to gather sample liquid.
- (e) Slowly open Valve D and allow liquid to enter the cylinder at a slow rate of approximately 60 ml per minute to prevent flashing.
- (f) Record the temperature from Gauge L and pressure from Gauge M while liquid is gathered. Do not take measurements on stagnant liquid.
- (g) Continue gathering liquid until the cylinder is 80% full. No outage is required when using a Floating-Piston Cylinder.
- (h) Close valves D, C, and A in that order.
- (i) Purge the line pressure: slowly open Valve B and allow pressurized liquid to drain into the waste container.
- (j) Disconnect the Floating-Piston Cylinder from the sampling train and disconnect the sampling train from the pressurized vessel.
- (k) Check Valves C and D for leaks. If either Valve C or D is leaking, drain the cylinder into a suitable waste container and use a different cylinder to obtain a new sample.
- (l) Wrap the threaded connections with Teflon tape and cap using threaded metal caps to protect the threads and ensure the cylinder is securely sealed for shipping.
- (m) Identify and ship the sample cylinder to the laboratory for analysis according to the procedures listed in Section 8.
- (n) Calculate the emission rates as described in Section 9 and report the results as described in Section 10.

8. SAMPLE IDENTIFICATION AND SHIPPING

Prepare the sample cylinder information tag and package the sample cylinder for shipping. The sampling technician must make prior arrangements with the laboratory to notify them of the type of the sample liquid and sample being delivered for analysis.

8.1 Identify the sample cylinder with the following minimum information:

- (a) Date and time;
- (b) Unique sample ID number or cylinder number;
- (c) Sample type (crude oil, condensate, or produced water);
- (d) Sample pressure and temperature during sampling;
- (e) Vessel description;
- (f) Vessel throughput in barrels per day;
- (g) Facility name and location of where sample was gathered; and
- (h) Average storage tank temperature and pressure in the storage tank or storage tank system.

8.2 Package the cylinder(s) in a suitable container to meet the hazardous material shipping requirements of the shipping company. Obtain a tracking number and Bill-of-Lading to track shipment progress.

9. CALCULATING RESULTS

9.1 Crude Oil and Condensate Emission Results

For crude oil and condensate, the laboratory must provide the results of a Chromatograph Extended Liquid Analysis for use with E&P Tank 2.0 software or equivalent. The sampling technician must provide the vessel temperature, pressure, and daily throughput, and the average storage tank temperature and pressure where the liquid is stored. The laboratory must provide the weight percent of all compounds listed in Table 9.1, as well as the total gaseous molecular weight of those compounds, API Gravity, and Specific Gravity of the decanes plus. The laboratory analysis is conducted according to the procedures specified in Section 12.

- (1) Input the laboratory and field data results into E&P Tank 2.0 software or equivalent. Include the throughput of the separator, the storage tank API Gravity, and the average storage tank temperature and pressure where the liquid is stored. Indicate if the storage tank is connected to a vapor recovery system on Form 1.

9.2 Produced Water Emission Results

The methane, carbon dioxide, and VOC emission rates from produced water are determined by measuring the volume of gas liberated from produced water due to changes in pressure and temperature from separator to storage tank conditions. This is conducted by performing a laboratory flash liberation analysis (modified GPA Standard 2186). This procedure is different from the Chromatograph Extended Liquid Analysis and the E&P Tank 2.0 software methodology.

To conduct this protocol, the sampling technician must provide the average separator temperature, pressure, and throughput, and the average storage tank temperature and pressure conditions where the produced water is stored. The laboratory must provide a listing of all resulting compounds specified in Table 9.1 in terms of Weight %, and include the Gas-Water-Ratio (GWR) and molecular weight of the sample gas liberated during the analysis.

- (1) From the lab results and field data, calculate the cubic feet of gas liberated from the produced water per year as follows:

$$Ft^3 / Year = \left(\frac{Ft^3}{Barrel} \right) \left(\frac{Barrels}{day} \right) \left(\frac{days}{Year} \right) \quad \text{Equation 1}$$

Where:

$Ft^3/Year$ = total volume of gas liberated per year

$Ft^3/Barrel$ = volume of gas liberated per barrel of water (GWR)

Barrels/day = number of barrels of separator throughput per day

days/Year = number of days separator is in operation per year

- (2) Convert the cubic feet of gas liberated to tons of emissions per year using the following methodology:

Equation 2

$$Tons / Year = \left(\frac{tons}{ton - mole} \right) \left(\frac{Ft^3}{Year} \right) \left(\frac{28,317 cm^3}{ft^3} \right) \left(\frac{gr - mole}{23.690 cm^3} \right) \left(\frac{lb - mole}{454 gr - mole} \right) \left(\frac{ton - mole}{2,000 lb - mole} \right)$$

Where:

Tons/Year = total tons of gas liberated from the produced water per year

tons/ton-mole = molecular weight of sample gas (from laboratory analysis)

$Ft^3/Year$ = total cubic feet of gas liberated (result of Equation 1)

$23.690 cm^3/gr-mole$ = molar volume of ideal gas at standard conditions of

DRAFT

101.325 kPa at 68⁰F.¹²

- (3) Calculate the carbon dioxide, methane, and VOC_{C2+} emission rates using the Weight % of the required compounds and Equations 3 through 5 as follows:

$$Tons\ CO_2 / Year = \left(\frac{WT\% \ CO_2}{100} \right) (Tons / Year) \quad \text{Equation 3}$$

$$Tons\ CH_4 / Year = \left(\frac{WT\% \ CH_4}{100} \right) (Tons / Year) \quad \text{Equation 4}$$

$$Tons\ VOC_{C2+} / Year = \left(\frac{WT\% \ C2+}{100} \right) (Tons / Year) \quad \text{Equation 5}$$

Where:

Tons CO₂, CH₄, VOC_{C2+} / Year = tons of emissions per year

WT%CO₂, WT%CH₄, WT%VOC_{C2+} = the Weight % of required compounds (from laboratory analysis)

Tons/Year = mass of gas liberated per year (result of Equation 2)

- (4) If a vapor recovery system is installed on the storage tank where the produced water is stored, reduce the CO₂, CH₄, and VOC_{C2+} emissions by 95% control efficiency as follows:

Equation 6

$$Emissions_{CO_2/CH_4/VOC_{C2+}} = (Tons / Year_{CO_2/CH_4/VOC_{C2+}}) (1 - 0.95)$$

Where:

Emissions CO₂, CH₄, VOC_{C2+} = tons of emissions per year

Tons/Year_{CO2/CH4/VOC_{C2+}} = emissions (results of Equations 3 through 5)

¹ Standards of Performance for New Sources", 40 CFR--Protection of the Environment, Chapter I, Part 60, Section 60.2, 1990.

² <http://www.epa.gov/apti/bces/module1/pressure/pressure.htm>.

Table 9.1
Compounds for Inclusion in Reported Results

Compound	Common Name
H2S	Hydrogen Sulfide
O2	Oxygen
CO2	Carbon Dioxide
N2	Nitrogen
C1	Methane
C2	Ethane
C3	Propane
i-C4	Isobutane
n-C4	n-butane
i-C5	Isopentane
n-C5	n-Pentane
C6	Cyclohexane
n-C6	n-Hexane
C7	Heptanes
C8	Octanes
2,2,4 Trimethylpentane	Iso-octane
C9	Nonanes
C10+	Decanes Plus
Benzene	Benzene
Toluene	Toluene
E-Benzene	Ethyl benzene
Xylene	Xylene

10. REPORTING RESULTS

10.1 Report all field and laboratory results in electronic spreadsheet format, including the information identified on Form 1. Alternative electronic spreadsheet formats are acceptable, as long as they provide the same minimum information required. Data reported must include:

Crude Oil or Condensate

- (a) Input data for use with E&P Tank 2.0 software or equivalent, include average separator temperature, pressure, and throughput;
- (b) Average temperature and pressure of the storage tank where the liquid is stored;
- (c) Laboratory results including details of all components measured in terms of Weight %, API gravity of the storage tank liquid, the Gas Specific Gravity, the Gas Molecular Weight; and,
- (d) The E&P Tank 2.0 or equivalent output data included in the E&P Tank 2.0 Emission Summary and Emission Compositions tabs.

Produced Water

- (a) Characteristics of the sample gathered, including the separator temperature, pressure, and throughput;
- (b) Average temperature and pressure of the storage tank where the liquid is stored;
- (c) Laboratory results including results of all compounds in terms of Weight %, the Gas Specific Gravity, the Gas Molecular Weight; and,
- (d) Calculated methane, carbon dioxide, and VOC (C2+) emission rates per year.

10.2 Submit a copy of the field data sheet, laboratory analysis, and emission results in electronic spreadsheet format that includes the minimum information required above.

11. ANALYTICAL LABORATORY PROCEDURES

11.1 LABORATORY PROCEDURES

The laboratory procedures referenced in this section are approved for conducting the analyses of crude oil, condensate, or produced water liquid. As a requirement of this protocol, a copy of the original laboratory analysis and reference to the GPA Standard(s) used to evaluate samples must be provided. The following methods are approved for use with this protocol:

- GPA 2174 *Obtaining Liquid Hydrocarbon Samples for Analysis by Gas Chromatography*
- GPA 2177 *Analysis of Natural Gas Liquid Mixtures Containing Nitrogen and Carbon Dioxide by Gas Chromatography*
- GPA 2186 *(Including Modifications) - Method for the Extended Analysis of Hydrocarbon Liquid Mixtures Containing Nitrogen and Carbon Dioxide by Temperature Programmed Gas Chromatography*
- GPA 2261 *Regular gas analysis utilizing a Thermal Conductivity Detector*
- GPA 2286 *Extended gas analysis utilizing a Flame Ionization Detector*

Other Relevant Standards, Procedures, and References:

- ASTM D-86 *Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure*

DRAFT

ASTM D-2001 *Standard Test Method for Depentanization of Gasolines and Naphthas*

ASTM D-4052 *Standard Test Method for Density and Relative Density of Liquids by Digital Density Meter*

American Petroleum Institute 4697:2000 E&P Tank 2.0 software

11.2 LABORATORY REPORTS

Any chromatograph system that allows for the collection, storage, interpretation, adjustment, or quantification of chromatograph detector output signals representing relative component concentrations may be used to conduct this protocol. However, the laboratory results must be submitted as specified in Section 10. The following minimum data, needed to calculate results specified in Section 9, and report results specified in Section 10, must include:

- (a) The composition of all compounds including the C1 through C20 classification, with Weight % and molecular weight of the compound;
- (b) For compound classifications of C8 or greater, the Weight %, and molecular weight of the class;
- (c) API Gravity of the crude oil or condensate under both sample and storage conditions;
- (d) Reid Vapor Pressure of the crude oil or condensate sample under both sample and storage conditions;
- (e) Specific Gravity of the gas liberated (from crude oil, condensate, and produced water);
- (f) Molecular Weight of the gas liberated (from crude oil, condensate, and produced water);
- (g) Volumetric Gas-Water-Ratio for produced water;
- (h) Separator throughput, temperature, and pressure (provided by the sampling technician);
- (i) Average annual storage tank temperature and pressure (provided by the sampling technician);
- (j) The presence of a vapor recovery system on the storage tank where the liquid is diverted and stored; and,
- (k) The type of vapor recovery system (flare, incinerator, or other) including throughput per day.

Form 1
Crude Oil, Condensate, and Produced Water Sampling Field Data Sheet

Facility Information:

Facility Name: _____
Address: _____
City: _____
Zip Code: _____
Facility Contact: _____

Sample Information:

Date: _____ Ambient Temperature: _____ Degrees F
Time: _____ Sample Temperature: _____ Degrees F
Sample ID Number: _____ Sample Pressure: _____ PSI

Shipping Information:

Shipping Date: _____
Shipping Company Name: _____
Tracking Number: _____

Sample Vessel Information:

Vesel Type: _____
Vessel Throughput: _____ (barrels/day) Days in Operation/Year: _____
Vessel Pressure: _____ PSI Vessel Temperature: _____ Degrees F
Sample Location (describe): _____

Storage Tank System:

Vapor Recovery System: Yes No Throughput: _____ scfm/day
Type: _____ (flare, incinerator, other) _____
Average Pressure: _____ PSI Average Temperature: _____ Degrees F

Calculated Results:

Methane: _____ tons/year
Carbon Dioxide: _____ tons/year
VOCs: _____ tons/year