

INTRODUCTION

The purpose of this document is to streamline the review and acceptance of representative samples used for calculating emissions for Air Quality oil and gas facility permit applications. This document provides general guidance on when the Oklahoma Department of Environmental Quality (DEQ) Air Quality Division (AQD) believes a representative sample may be used and defines criteria on how representativeness is established. The AQD has encountered numerous situations where questions have arisen regarding the suitability and accuracy of samples used for emissions calculations. This guidance provides a clear framework regarding use of representative facility samples to estimate emissions for oil and gas facilities. This guidance document is intended to be used for the support of emission calculations of permit applications.

Applicants may request case-by-case determinations on a facility basis for which a sample used for estimating emissions does not meet the criteria of representative set forth in this document. These case-by-case determinations will evaluate whether or not use of the proposed sample will result in emissions calculations at least as accurate as emissions calculations based on a sample that meets the criteria of representative in this document. When requesting a case-by-case determination, an applicant should provide a defensible justification and supporting data. AQD strongly encourages applicants to utilize the DEQ form associated with this document for all case-by-case determination requests. Use of this guidance for one representative sample does not obligate an applicant to follow this guidance for any other sample relied upon for calculating emissions for an application.

For the purpose of this guidance document, the term “actual facility” shall mean the facility under review for the permitting action. The term “representative facility” shall mean a facility being relied upon for emissions calculations with similar operations and process setup. The term “facility-specific operating data” shall mean the operating parameters at the facility (e.g. inlet separator pressure and temperature, etc.), the term “facility-specific sample” shall mean a sample collected from the actual facility that has undergone lab analysis (e.g. extended gas analysis), and the term “representative facility sample” shall mean a sample collected from a representative facility that has undergone lab analysis.

This guidance may be used upon publication, but will affect all permit actions submitted on or after **March 15, 2021**. For each sample used to estimate emissions at the actual facility, the applicant shall submit **DEQ FORM # 100-702** to demonstrate that the selected sample satisfies the criteria listed in this guidance. Flow charts for each facility type discussed in this guidance are attached at the end of this document to assist in determining if a selected sample satisfies the criteria listed in this guidance.

BACKGROUND

Owners and operators rely upon both facility-specific operating data and facility-specific samples to calculate various types of emission, (flashing losses, working losses, breathing/standing losses, tank truck loading losses, fugitive emission releases, etc.) from various emissions sources throughout the oil and gas industry (wellhead facilities, compressor/booster stations, gas plants, tank batteries, etc.).

Data commonly relied upon to characterize products and estimate emissions from oil and gas facilities include American Petroleum Institute (API) gravity, sulfur analyses, and extended hydrocarbon liquids and gas analyses. API gravity data for a facility is fairly common and readily available as it is tested for each time oil is loaded off-facility and is reported on each sales oil ticket/receipt. For facilities processing or handling sour hydrocarbon liquids, sour natural gas, or extracting hydrogen sulfide (H₂S) from a process stream, it is important to have accurate information when estimating emissions and complying with various safety regulations. H₂S content can be measured by utilizing a stain-tube analysis or more complex laboratory analyses. Extended hydrocarbon liquids and gas analyses are sampled from a facility process stream and are analyzed in a laboratory setting using various API, American Society of Testing and Materials (ASTM), and Gas Processors Association (GPA) methodologies.

To estimate emissions from oil and gas facilities, the owner or operator of a facility must be able to characterize the composition of gas and liquid streams containing volatile organic compounds (VOCs), hazardous air pollutants (HAPs), and H₂S with sufficient accuracy to determine applicability of state and federal regulations, to select appropriate permit limits and emission controls, and to demonstrate continued compliance with federal and state rules and permit limits. The cost of sampling and testing can vary significantly depending on the specific methodology used and depth of the analysis. Therefore, the cost of requiring facility-specific samples for every facility would place an unnecessary economic burden on owners and operators within the state of Oklahoma.

Additionally, certain situations exist where facility-specific operating data or facility-specific samples are not available to estimate emissions from an emissions source. Written justification must be provided when using data that is not facility-specific.

DISCUSSION

Prior to Construction/Modification

Estimating emissions prior to the construction of a new facility represents an obvious challenge because there is no facility-specific operating data or samples. DEQ's policy is to provide the owner or operator considerable latitude in predicting the parameters of various process streams and in estimating emissions prior to first construction, provided that the owner or operator provides a complete description of the assumptions used and the methods employed. This may also apply to owners or operators proposing to modify an existing facility for which no facility-specific operational data can be used to adequately represent emissions. For facilities filing an application for combined construction and operating, it is the facility's responsibility to ensure compliance with all requirements of the permit.

Existing Operating Facilities

For existing facilities, the owner or operator will have the option to use a sample from the actual facility or a sample from a representative facility. The owner or operator will have access to additional facility-specific operating data at the actual existing facility; this facility-specific operating data shall be used to estimate emissions.

If a facility is modified such that emission calculations based off a sample do not change, a new sample is not needed. (e.g., if an additional compressor engine is added to a well site facility, a new facility-specific or representative facility sample to estimate tank emissions is not needed.)

Considerations for All Facilities

The AQD processes permit applications and handles enforcement actions differently depending on whether a facility is de minimis, permit exempt, a minor source, a synthetic-minor source, a major source or a Prevention of Significant Deterioration (PSD) source. To properly address the correct processing procedures and federal and state rule applicability, emissions at a facility should be appropriately characterized.

Emissions Controls

Many facilities utilize combustion devices such as a flare or an enclosed combustor to reduce VOC emissions from liquid hydrocarbon storage tanks. These combustion devices (adequately designed) have been evaluated to have an overall control efficiency of at least 95%. Facilities utilizing combustion devices and/or vapor recovery units (VRUs) may use a representative facility sample to estimate emissions in certain scenarios. Utilization of a VRU is considered to be process equipment and is not considered emissions controls.

Federal Requirements

Many owners or operators submit operational data and emissions calculations to demonstrate that a facility or emissions source emits less than a federal or state regulation threshold to avoid applicability. For example, owners and operators apply for emission limits of less than 6 TPY VOC to avoid being subject to the storage vessel requirements of New Source Performance Standards (NSPS), 40 CFR Part 60, Subparts OOOO and OOOOa. To ensure the accuracy when demonstrating compliance with these emission limits, AQD will require facility-specific sampling related to the calculation of emissions from storage tanks with calculated emissions greater than 4.0 TPY VOC per tank if not controlled with a combustion device.

AQD will also require facility-specific sampling at facilities with a facility-wide Potential to Emit (PTE) within 20% of a given federal or state regulation threshold (i.e., the major source Part 70 threshold of 100 TPY VOC, single HAP threshold of 10 TPY, total HAP threshold of 25 TPY, and the PSD thresholds of 100 TPY VOC for listed sources and 250 TPY VOC for all other sources). Formaldehyde is the most significant HAP emitted from engines and is generally emitted in negligible quantities from other oil and gas sources. Furthermore, laboratory analyses are not commonly relied upon for the estimating emissions calculations from engines in permit applications. Therefore, for the purpose of this guidance document, HAP emissions from engines should not be considered when determining whether the facility-wide HAP emissions are within 20% of the major source single HAP or total HAP thresholds.

Additionally, certain federal rules may require sampling in determining emissions and/or major source determinations. For example, 40 CFR Part 63, National Emission Standards for Hazardous Air Pollutants (NESHAP), Subpart HH outlines various requirements for estimating emissions. Under §63.760(c), Subpart HH requires area sources with actual HAP emissions of 50% or more of the major source thresholds to update its major source determination each year using gas composition data measured during the preceding 12 months. Under §63.764, Subpart HH requires

glycol dehydration units at major sources and area sources of HAPs to comply with control requirements, operational requirements, monitoring requirements, and/or recordkeeping requirements as applicable unless the source meets the exemption criteria under §63.764(e)(1). Glycol dehydration units meet the exemption criteria under §63.764(e)(1) by either having an actual annual flow rate of less than 85,000 standard cubic meters per day (3.0 million standard cubic feet per day), or having actual emissions of benzene of less than 0.90 megagrams per year (0.99 TPY) from the glycol dehydration unit process vent.

Most facilities permitted by the AQD qualify for the exemption by having actual benzene emissions of less than 0.99 TPY, and are required to maintain records of their determination as required in §63.772(b)(2). Under §63.772(b)(2), the determination of actual average benzene may be demonstrated by one of two options: 1) determine emissions using GRI-GLYCalc™, Version 3.0 or higher using representative inputs and the procedures presented in the associated GRI-GLYCalc™ Technical Reference Manual, or 2) determine the hourly mass emission rate through direct measurement of the dehydration process vent. Most facilities permitted by the AQD demonstrate having actual benzene less than 0.99 TPY by using GRI-GLYCalc™. The GRI-GLYCalc™ Technical Reference Manual stresses “[t]he natural gas composition (upstream of the contactor) is one of the most important inputs to GRI-GLYCalc. To obtain accurate emissions estimates, the gas must be carefully sampled and analyzed for hydrocarbons (C₁ – C₈ including aromatics) and non-hydrocarbons (CO₂, N₂, and H₂S). It is particularly important to accurately determine the composition of BTEX in the gas, since the BTEX compounds are more soluble in glycols than the aliphatic hydrocarbons. With the condenser control device option, however, the concentrations of all components in the gas become important.” The GRI-GLYCalc™ Technical Reference Manual also states “emissions calculations are most reliable when the gas concentrations of all the specific compounds listed in the program’s inlet gas input form are known. An extended gas analysis method, such as GPA 2286, is required to speciate the necessary compounds for the most accurate GRI-GLYCalc™ emission estimates.”

Based on the requirements of NESHAP Subpart HH and the points discussed in the GRI-GLYCalc™ Technical Reference Manual for accurately estimating emissions, AQD believes an extended gas analysis from facility-specific sampling should be used for estimating emission from glycol dehydration units for the purpose of establishing federally enforceable emission limits or demonstrating eligibility for coverage under a general permit.

Facility Configuration and Sample Conditions

In order for the representative facility sample of a stream to give a reasonably accurate emissions estimate, the sample needs to be taken from a representative facility that processes the stream in a similar manner as the actual facility. Operational parameters of the facility should be similar. Additionally, properties of the crude oil, condensate, intermediate hydrocarbon liquids, or produced water should be similar.

For the purpose of determining flashing emissions, many companies sample pressurized liquids produced from the heater treater. In many cases, the heater treater is the second or even third stage of separation of liquids from natural gas. Utilizing a pressurized liquids sample lab analysis from the third stage of separation to estimate flashing emissions could result in different emissions estimates than a sample lab analysis obtained at the first stage of separation from the same facility.

Furthermore, even if the operational parameters (e.g., outlet pressure and temperature) of a separator at the third stage of separation at a representative facility were similar to a separator at the first stage of separation at the actual facility, emissions estimates could be different depending on the efficiency of the separators, the throughput through each separator, and whether a separator is being utilized as a 2-phase or 3-phase separator.

Facility Setup/Sampling Point

Oil and gas facilities vary in the number of stages of separation. Some facilities are constructed with a single stage of separation and some facilities have three or more stages of separation. As identified in the AQD's "Guidance on Estimating Flashing Losses" document, several calculation methods and models are commonly relied upon for estimating emissions. These methods vary from simple to complex. The method/model selected will determine what data may be utilized.

When using a model that calculates emissions from storage tanks based on a pressurized liquids stream from the separator immediately upstream of the storage tanks, the representative facility sample used as input should also be taken from the pressurized liquids stream from the separator immediately upstream of the storage tanks at the representative facility. However, for example, if the actual facility has only one stage of separation between the facility inlet and the storage tanks, a representative facility sample shall not be used as input for the model if it was collected after any additional stages of separation.

There are more complex models that can calculate emissions from storage tanks and also have the ability to calculate multiple user defined process streams and equipment at a facility. The user may enter laboratory speciated data as input into the model to represent the facility inlet, or any downstream process stream defined by the user. While these complex models are more versatile, a representative facility sample shall not be used as input if the sample was collected at a point of separation beyond the number of stages of separation at the actual facility.

Sample Conditions

AQD conducted a modeling effort using the results of several laboratory analyses from pressurized samples as input parameters into a process simulation software. Through the analysis, AQD determined a pressurized liquids sample may be representative if the operating parameters of the separator at which the sample was taken are within the following ranges of the separator at which the sample is used to calculate emissions for the actual facility: 1) the temperature must be within 20°C (36°F), and 2) for facilities operating below 30 psig, the representative sample pressure must not be less than half of the actual facility pressure or for facilities operating at or above 30 psig, the representative sample pressure must be within 20 psig of the actual facility pressure. However, due to the low potential of producing storage tank flashing emissions from natural gas transmission compressor stations and natural gas processing plants, natural gas transmission compressor stations and natural gas processing plants are excluded from this requirement.

Fugitive components at oil and gas facilities do not generally emit significant quantities of VOC or HAP emissions. Additionally, it is not common industry practice for well site or compressor station facilities to obtain extended gas sample analyses, as generally, industry is typically interested in obtaining the Btu content and composition of light hydrocarbons of the gas such as methane. Therefore, when selecting a representative facility or facility-specific sample to calculate

emissions from gas/vapor fugitive components from well sites or compressor stations, an extended gas analysis is not required. At the very least, the sample analysis shall include the total VOC content. Furthermore, sampling of liquid fugitive components is not generally available. Therefore, applicants may assume a VOC content of 100% for liquid fugitive components, otherwise, a facility-specific sample analysis is required.

Amine Units

Due to hazardous components that are potentially contained in the acid gas, AQD believes that facility-specific sampling of the gas should be conducted, which should include an extended gas analysis and H₂S sampling. While no representative sampling is allowed for characterizing H₂S emissions at the facility, methods of compliance with H₂S are already addressed in each permit.

Considerations for Well Sites

As defined in 40 CFR Part 60, Subpart OOOOa, “[w]ell site means one or more surface sites that are constructed for the drilling and subsequent operations of any oil well, natural gas well, or injection well...well site also means a separate tank battery surface site collecting crude oil, condensate, intermediate hydrocarbon liquids, or produced water from wells not located at the well site (e.g., centralized tank batteries).”

Geologic Formation

For well site facilities, perhaps the most important consideration in ensuring that a sample from another well site is sufficiently representative in that the sample originates from a facility producing from the same geologic feature as the actual facility. Many permitted facilities located at the wellhead pad contain multiple wells which may or may not be drilled at similar depths or zones within a formation. Additionally, central tank batteries may be receiving crude oil, condensate, intermediate hydrocarbon liquids, or produced water from wells not drilled to the same depth or zone of a formation. Since several formations in Oklahoma overlap, it may also be possible for a facility to produce crude oil, condensate, intermediate hydrocarbon liquids, and produced water from different wells that have been drilled at different depths and into different formations. While the specific depth and zone of a geologic formation to which a well is drilled would be valuable information when characterizing whether another well site sample is representative of the actual facility, AQD believes this would place an unnecessary burden to verify such information on not only applicants, but on AQD as well. AQD does not possess the resources or tools to verify this information.

Many applications have been submitted utilizing samples from other facilities that have been determined to be representative based on the justification that the sample originates from a well site located in the same county and producing from the same formation. This justification, however, unnecessarily excludes certain facilities from being considered representative for the purpose of emissions estimations for the actual facility. For example, a well site in another county, within one-quarter mile from the actual facility, both producing from the same formation, would be excluded from being representative simply because the facilities were separated by a county line. Therefore, AQD believes that “same county” should be removed from the requirement to characterize data from other facilities as representative.

AQD does not believe a requirement of “same formation” by itself is an adequate justification for determining whether a sample from another well site is representative. Formations in Oklahoma are typically heterogeneous, and many formations spread throughout multiple counties. In other words, a sample from one side of a formation may not be representative of a sample from the opposite side of a formation. With the advancement of horizontal drilling technologies, it is possible to have a well pad with multiple wells horizontally drilled in opposing directions, therefore, covering a wide area from a single well pad. As mentioned previously, central tank batteries also receive produced liquids and gas from wells from various locations.

AQD conducted a brief analysis of the location of facilities with an SIC of 1311 and the proximity to other facilities with an SIC of 1311 throughout Oklahoma. As a result of the analysis, AQD determined that if a representative facility sample is used to estimate emissions, the representative facility must be located within 10 miles of the actual facility, producing from the same formation.

Well Site Product Characteristics

Throughout a well site’s life, the composition of produced liquids from the facility may change due to a number of reasons such as gas or water injection, increases or decreases in downhole pressure, fracturing or refracturing the well, etc. AQD reviewed historical API gravity records from several facilities as a means to determine the variability in composition of produced liquids from well sites. From the review, AQD determined the API gravity for a typical facility normally varied plus or minus five degrees. Some facilities did show greater ranges of variability; however, these larger ranges of variability were determined to be a result of aging of the well and potential errors introduced by the sampler during tank truck loadout. Therefore, AQD has determined the sales oil of the representative facilities should have an API gravity within plus or minus five degrees of the actual facility. To address potential concerns with aging of the well, laboratory analyses from pressurized samples shall be no older than three (3) calendar years at the time of submittal.

Sample Averaging

If there are multiple representative facility samples provided for a given site, the sample resulting in the highest emitting emissions shall be used in order to provide a conservative emissions estimate. Averaging of representative facility samples at a well site does not increase the reliability of the data and shall not be used for emissions calculations. The sample(s) shall be recent, being no older than three (3) calendar years. Additionally, if the actual facility has conducted facility-specific sampling, this sampling should be used rather than representative sampling.

Excluded Well Sites

A review of permitted well site facilities was conducted to identify potential facility oil throughputs at which the variance in emissions from tanks (working, breathing, and flashing losses), and tank truck loading will not vary significantly when comparing emissions calculated based on a facility-specific sample to emissions calculated based on a representative facility sample. AQD found that well sites with oil throughputs less than 10-bbl/day generally do not produce a significant amount of emissions.

A similar review was conducted for permitted well site facilities where crude oil/condensate storage tank vapors are routed to a combustion device for control. AQD found that emissions from

well sites with oil throughputs less than 1,200-bbl/day will not vary significantly whether using samples from the actual facility or a representative facility.

Therefore, AQD believes well sites with a facility oil or condensate throughput of less than 10-bbl/day will not be required to conduct facility-specific sampling, or meet the criteria to justify the use of a representative facility sample. Furthermore, AQD believes that well sites with a facility oil or condensate throughput of less than 1,200-bbl/day that utilize a vapor recovery unit upstream of the storage tanks and/or where the storage tank vapors are routed to a combustion device will not be required to conduct facility-specific sampling, or meet the criteria to justify use of a representative facility sample. However, if the actual facility has facility-wide VOC emissions within 20% of a permit category threshold as discussed previously, facility-specific sampling will be required.

Considerations for Natural Gas Compressor Stations

Natural gas gathering compressor stations are compressor stations that are considered production field facilities as defined in 40 CFR §63.761 that gather natural gas from other production field facilities and could gather natural gas originating from several formations. Natural gas transmission compressor stations are compressor stations involved in natural gas transmission (as defined in 40 CFR §63.1271). Natural gas transmission compressor stations gather natural gas from large areas and likely gather natural gas from multiple formations. The gas handled at natural gas transmission compressor stations is typically almost all methane.

Proximity

Natural gas gathering compressor stations may receive natural gas from various well sites producing from different zones in a single formation, and many receive natural gas from various well sites producing from many different formations. Some gathering compressor stations and many transmission compressor stations are located in very remote areas. As discussed previously, AQD determined 10 miles to be a reasonable distance between the actual facility and a representative facility being relied upon. However, a transmission compressor station within close proximity of another station may not be representative each other due to several factors including being located on different pipeline segments or systems. There can be tens or hundreds of miles between natural gas transmission compressor stations. Therefore, transmission compressor stations samples will not be required to meet the 10-mile distance criteria to be considered representative.

Compressor Station Product Characteristics

Throughout a gathering compressor station's life, the composition of produced liquids from the facility may change due to a number of reasons ranging from aging well sites, new well sites coming on-line, shut-in well sites, etc. AQD reviewed historical API gravity records from several facilities as a means to determine the variability in composition of produced liquids from compressor stations. From the review, AQD determined the API gravity for a typical facility normally varied plus or minus five degrees. Therefore, AQD has determined the sales oil of the representative facilities should have an API gravity within plus or minus five degrees of the actual facility. Laboratory analyses from pressurized samples shall be no older than three (3) calendar years at the time of submittal.

A review of the variability in API gravity of the condensate produced at natural gas transmission stations was determined to not be necessary since the condensate produced from these facilities are generally assumed to have similar characteristics.

Sample Averaging

If there are multiple representative facility samples provided for a given site, the sample resulting in the highest emitting emissions shall be used in order to provide a conservative emissions estimate. Upstream and midstream facilities such as natural gas gathering and transmission facilities often receive product from multiple sources; in these cases, weighted averaging of the upstream compositions will be allowed, provided a written justification, and proximity need not be considered. The sample(s) shall be recent, being no older than three (3) calendar years. Additionally, if the actual facility has conducted facility-specific sampling, this sampling should be used rather than representative sampling.

Excluded Compressor Stations

Similar to the previous well site discussion, a review of permitted compressor stations was conducted to identify potential facility oil throughputs at which the variance in emissions from tanks (working, breathing, and flashing losses), and tank truck loading will not vary significantly when comparing emissions calculated based on a facility-specific sample to emissions calculated based on a representative facility sample. AQD found that facilities with oil throughputs less than 10-bbl/day generally do not produce a significant amount of emissions.

A similar review was conducted for permitted natural gas gathering compressor stations where crude oil/condensate storage tank vapors are routed to a combustion device for control. AQD found that emissions from well sites with oil throughputs less than 1,200-bbl/day will not vary significantly whether using samples from the actual facility or a representative facility. Natural gas transmission compressor stations do not generally produce large quantities of condensate; therefore, a similar review was not determined necessary.

Therefore, AQD believes natural gas gathering and transmission compressor stations with a facility oil or condensate throughput of less than 10-bbl/day will not be required to conduct facility-specific sampling or meet the criteria to justify the use of a representative facility sample. Furthermore, AQD believes that natural gas gathering compressor stations with a facility oil or condensate throughput of less than 1,200-bbl/day that utilize a vapor recovery unit upstream of the storage tanks and/or where the storage tank vapors are routed to a combustion device will not be required to conduct facility-specific sampling, or meet the criteria to justify use of a representative facility sample. However, if the actual facility has facility-wide VOC emissions within 20% of a permit category threshold as discussed previously, facility-specific sampling will be required.

Considerations for Natural Gas Processing Plants

Natural gas processing plants gather natural gas from several compressor stations and could gather natural gas from several formations. Generally, the composition of the gas treated at the natural gas processing plant will vary greatly compared to other gas plants located within the same area. Therefore, AQD requires the facility to conduct facility-specific sampling of the pressurized condensate unless the condensate is treated in a condensate stabilizer prior to the tanks or the tank emissions are reduced by 95% or greater with a VRU and/or combustion device.

Proximity

Gas plants receive natural gas from many compressor stations all with varying characteristics. As discussed previously, AQD determined 10 miles to be a reasonable distance between the actual facility and a representative facility being relied upon; however, gas plants are not generally located within 10 miles of another gas plant. Therefore, the recommended 10-mile distance is not required to be relied upon when using a site specific sample; however, written justification shall be given when using a representative facility sample.

Gas Plant Product Characteristics

A review of the variability in API gravity as a means to determine the variability in composition of produced liquids from natural gas processing plants was determined to not be necessary since the condensate produced from these facilities are generally assumed to have similar characteristics.

Sample Averaging

If there are multiple representative facility samples provided for a given site, the sample resulting in the highest emitting emissions shall be used in order to provide a conservative emissions estimate. Natural gas processing plants often receive product from multiple sources; in these cases, weighted averaging of the upstream compositions will be allowed, providing a written justification, and proximity need not be considered. The sample(s) shall be recent being no older than three (3) calendar years. Additionally, if the actual facility has conducted facility-specific sampling, this sampling should be used rather than representative sampling.

ACCEPTABLE SAMPLING

All samples used (from the actual facility or a representative facility) shall be no older than three (3) calendar years at the time of submittal. Samples used to estimate emissions prior to first construction or prior to a modification with no facility-specific operational data that can be used to adequately represent emissions will not be required to meet the requirements listed below. Since different types of facilities (e.g., well sites, compressor/booster stations, gas plants, etc.) process gas and liquids differently and may have different emission points, the requirements for when representative facility sampling may be used have been separated by facility type.

Well Sites

We have separated equipment that is commonly found at well sites and have listed the type of sampling that is acceptable to AQD for existing facilities.

Glycol Dehydrators

- The facility shall conduct facility-specific sampling of the natural gas inlet to the dehydration unit for the original operating permit and subsequent modifications. The sampling shall be an extended gas analysis that includes benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds, as well as n-hexane.

Amine Units

- The facility shall conduct facility-specific sampling of the natural gas inlet to the amine unit for the original operating permit and subsequent modifications. The sampling shall be

an extended gas analysis and H₂S sampling. The H₂S sampling can be a stain tube, lab analysis, or other approved method.

Hydrocarbon Storage Tanks

- The facility may conduct facility-specific sampling of the pressurized crude oil, condensate, or intermediate hydrocarbon liquids. The sampling shall be done by the following methods: ASTM, GPA, or other AQD approved methods.
- The facility may use a representative facility sample of pressurized crude oil, condensate, or intermediate hydrocarbon liquids from another facility if all of the following conditions are met:
 - Within 10 miles, produced from the same formation(s).
 - Representative facility sales oil is within $\pm 5^\circ$ API gravity of the actual facility.
 - The representative facility sample was taken at or before the last stage of separation of the actual facility, comparatively.
 - The sample point of the representative facility must be within the following of the actual facility:
 - Within $\pm 20^\circ\text{C}$ (36°F).
 - Greater than half that of the actual facility if the actual facility operates at less than 30 psig.
 - Within ± 20 psig if the actual facility operates at greater than or equal to 30 psig.
- If the actual facility has one of the following scenarios, the facility may use a representative facility sample; however, the sample will not be required to meet the above conditions of distance, sampling point, and operating parameters:
 - Below 10 bbl/day of crude oil, condensate, or intermediate hydrocarbon liquids throughput.
 - Below 1,200 bbl/day of crude oil, condensate, or intermediate hydrocarbon liquids throughput and storage tank emissions are reduced by 95% or greater with a VRU and/or combustion device.
- If a representative facility sample cannot be identified, the facility must conduct facility-specific sampling of the pressurized crude oil, condensate, or intermediate hydrocarbon liquids. The sampling shall be done by the following methods: ASTM, GPA, or other AQD approved methods.
- The facility shall conduct facility-specific sampling of the pressurized crude oil, condensate, or intermediate hydrocarbon liquids if calculated emissions exceed the following thresholds:
 - 4.0 TPY VOC, per tank, if not controlled with a combustion device.
 - 80 TPY VOC at true minor and synthetic minor facilities, facility-wide, and storage tank and loading emissions make up more than 50% of facility-wide emissions.
 - 200 TPY VOC, facility-wide for any source described in (A)(ii) in the definition of “major stationary source” under OAC 252:100-8-31.
 - 8 TPY of a single HAP or 20 TPY of total HAPs facility-wide, excluding HAP emissions from engines.

Fugitive VOC Equipment Leaks

- The facility may conduct facility-specific sampling of the inlet gas or sales gas.

- The facility may use a representative facility sample of pressurized gas from another facility if the representative facility is within 10 miles and producing from the same formation(s).
- If a representative facility sample cannot be identified, the facility must conduct facility-specific sampling of the inlet gas or sales gas.
- Liquid service components can assume a 100% VOC content with no additional sampling, otherwise, facility-specific sampling is required

Natural Gas Gathering Compressor Stations

We have separated equipment that is commonly found at natural gas gathering compressor stations and have listed the type of sampling that is acceptable to AQD for existing facilities.

Glycol Dehydrators

- The facility shall conduct facility-specific sampling of the natural gas inlet to the dehydration unit for the original operating permit and subsequent modifications. The sampling shall be an extended gas analysis that includes BTEX compounds, as well as n-hexane.

Amine Units

- The facility shall conduct facility-specific sampling of the natural gas inlet to the amine unit for the original operating permit and subsequent modifications. The sampling shall be an extended gas analysis and H₂S sampling. The H₂S sampling can be a stain tube, lab analysis, or other approved method.

Hydrocarbon Storage Tanks

- The facility may conduct facility-specific sampling of the pressurized condensate. The sampling shall be done by the following methods: ASTM, GPA, or other AQD approved methods.
- The facility may use a representative facility sample of pressurized condensate from another facility if all of the following conditions are met:
 - Within 10 miles.
 - Representative facility sales oil is within $\pm 5^\circ$ API gravity of the actual facility.
 - The representative facility sample was taken at or before the last stage of separation of the actual facility, comparatively.
 - The sample point of the representative facility must be within the following of the actual facility:
 - Within $\pm 20^\circ\text{C}$ (36°F).
 - Greater than half that of the actual facility if the actual facility operates at less than 30 psig.
 - Within ± 20 psig if the actual facility operates at greater than or equal to 30 psig.
- If the actual facility has one of the following scenarios, the facility may use a representative facility sample; however, the sample will not be required to meet the above conditions of distance, sampling point, and operating parameters:
 - Below 10 bbl/day of condensate.

- Below 1,200 bbl/day of condensate and storage tank emissions are reduced by 95% or greater with a VRU and/or combustion device.
- If a representative facility sample cannot be identified based on the above criteria, the facility must conduct facility-specific sampling of the pressurized condensate. The sampling shall be done by the following methods: ASTM, GPA, or other AQD approved methods.
- The facility shall conduct facility-specific sampling of the pressurized condensate if calculated emissions exceed the following thresholds:
 - 4.0 TPY VOC, per tank, if not controlled with a combustion device.
 - 80 TPY VOC at true minor and synthetic minor facilities, facility-wide, and storage tank and loading emissions make up more than 50% of facility-wide emissions.
 - 200 TPY VOC, facility-wide for any source described in (A)(ii) in the definition of “major stationary source” under OAC 252:100-8-31.
 - 8 TPY of a single HAP or 20 TPY of total HAPs facility-wide, excluding HAP emissions from engines.

Fugitive VOC Equipment Leaks

- The facility may conduct facility-specific sampling of the inlet gas or sales gas.
- The facility may use a representative facility sample of pressurized gas from another facility if the representative facility is within 10 miles of the actual facility.
- If a representative facility sample cannot be identified, the facility must conduct facility-specific sampling of the inlet gas or sales gas.
- Liquid service components can assume 100% VOC content with no additional sampling, otherwise, facility-specific sampling is required.

Natural Gas Transmission Compressor Stations

We have separated equipment that could be found at natural gas transmission compressor stations and have listed the type of sampling that is acceptable to AQD for existing facilities.

Glycol Dehydrators

- The facility shall conduct facility-specific sampling of the natural gas inlet to the dehydration unit for the original operating permit and subsequent modifications. The sampling shall be an extended gas analysis that includes BTEX compounds, as well as n-hexane.

Amine Units

- The facility shall conduct facility-specific sampling of the natural gas inlet to the amine unit for the original operating permit and subsequent modifications. The sampling shall be an extended gas analysis and H₂S sampling. The H₂S sampling can be a stain tube, lab analysis, or other approved method.

Hydrocarbon Storage Tanks

- The facility may conduct facility-specific sampling of the pressurized condensate. The sampling shall be done by the following methods: ASTM, GPA, or other AQD approved methods.

- The facility may use a representative facility sample of pressurized condensate from another facility if the representative facility is upstream on the same pipeline from the actual facility.
- If the actual facility has one of the following scenarios, the facility may use a representative facility sample; however, the sample is not required to be from a facility upstream on the same pipeline from the actual facility:
 - Below 10 bbl/day of crude oil, condensate, or hydrocarbon liquids throughput.
 - If a facility is permitted greater than 10 bbl/day, but never produces over this level, written justification shall be provided and a representative facility sample may be used.
- If a representative facility sample cannot be identified based on the above criteria, the facility must conduct facility-specific sampling of the pressurized condensate. The sampling shall be done by the following methods: ASTM, GPA, or other AQD approved methods.

Fugitive VOC Equipment Leaks

- The facility may conduct facility-specific sampling of the inlet gas or sales gas.
- The facility may use a representative facility sample of pressurized gas from another facility if the representative facility is upstream on the same pipeline from the actual facility.
- If a representative facility sample cannot be identified, the facility must conduct facility-specific sampling of the inlet gas or sales gas.
- Liquid service components can assume 100% VOC content with no additional sampling, otherwise, facility-specific sampling is required.

Natural Gas Processing Plants

We have separated equipment that is commonly found at natural gas processing plants and have listed the type of sampling that is acceptable to AQD for existing facilities.

Glycol Dehydrators

- The facility shall conduct facility-specific sampling of the natural gas inlet to the dehydration unit for the original operating permit and subsequent modifications. The sampling shall be an extended gas analysis that includes BTEX compounds, as well as n-hexane.

Amine Units

- The facility shall conduct facility-specific sampling of the natural gas inlet to the amine unit for the original operating permit and subsequent modifications. The sampling shall be an extended gas analysis and H₂S sampling. The H₂S sampling can be a stain tube, lab analysis, or other approved method.

Hydrocarbon Storage Tanks

- The facility shall conduct facility-specific sampling of the pressurized condensate unless the condensate is treated in a condensate stabilizer prior to the tanks or the storage tank emissions are reduced by 95% or greater with a VRU and/or combustion device. The

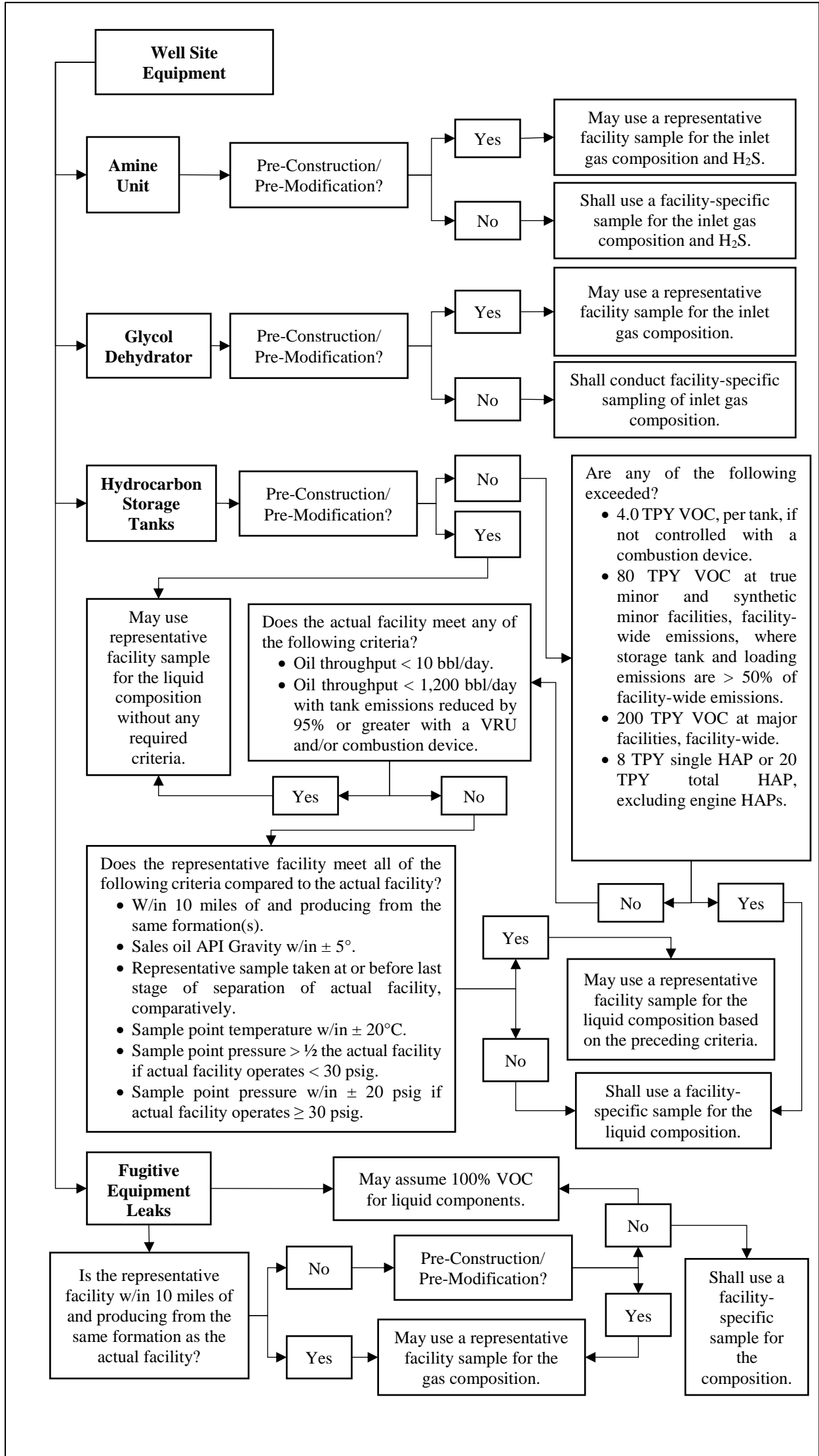
sampling shall be done by the following methods: ASTM, GPA, or other AQD approved methods.

- Even if the condensate is treated in a condensate stabilizer prior to the tanks or the storage tank emissions are reduced by 95% or greater with a VRU and/or combustion device, the facility shall conduct facility-specific sampling of the pressurized condensate if calculated emissions exceed the following thresholds:
 - 80 TPY VOC at true minor and synthetic minor facilities, facility-wide, and storage tank and loading emissions make up more than 50% of facility-wide emissions.
 - 200 TPY VOC, facility-wide for any source described in (A)(ii) in the definition of “major stationary source” under OAC 252:100-8-31.
 - 8 TPY of a single HAP or 20 TPY of total HAPs facility-wide, excluding HAP emissions from engines.

Fugitive VOC Equipment Leaks

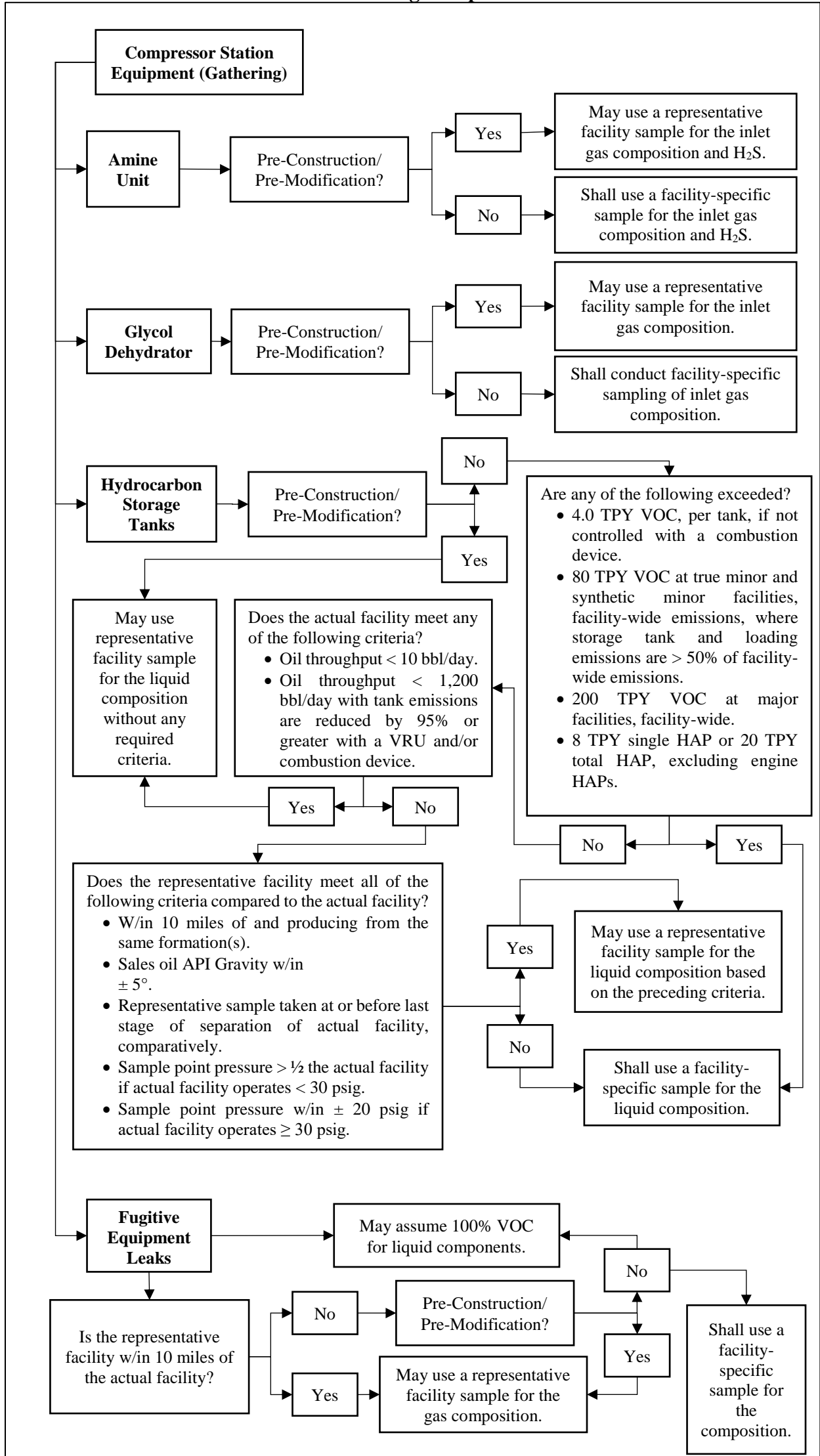
- The facility shall conduct facility-specific sampling of the inlet gas.
- Liquid service components can assume 100% VOC content with no additional sampling, otherwise, facility-specific sampling is required.

Well Sites*



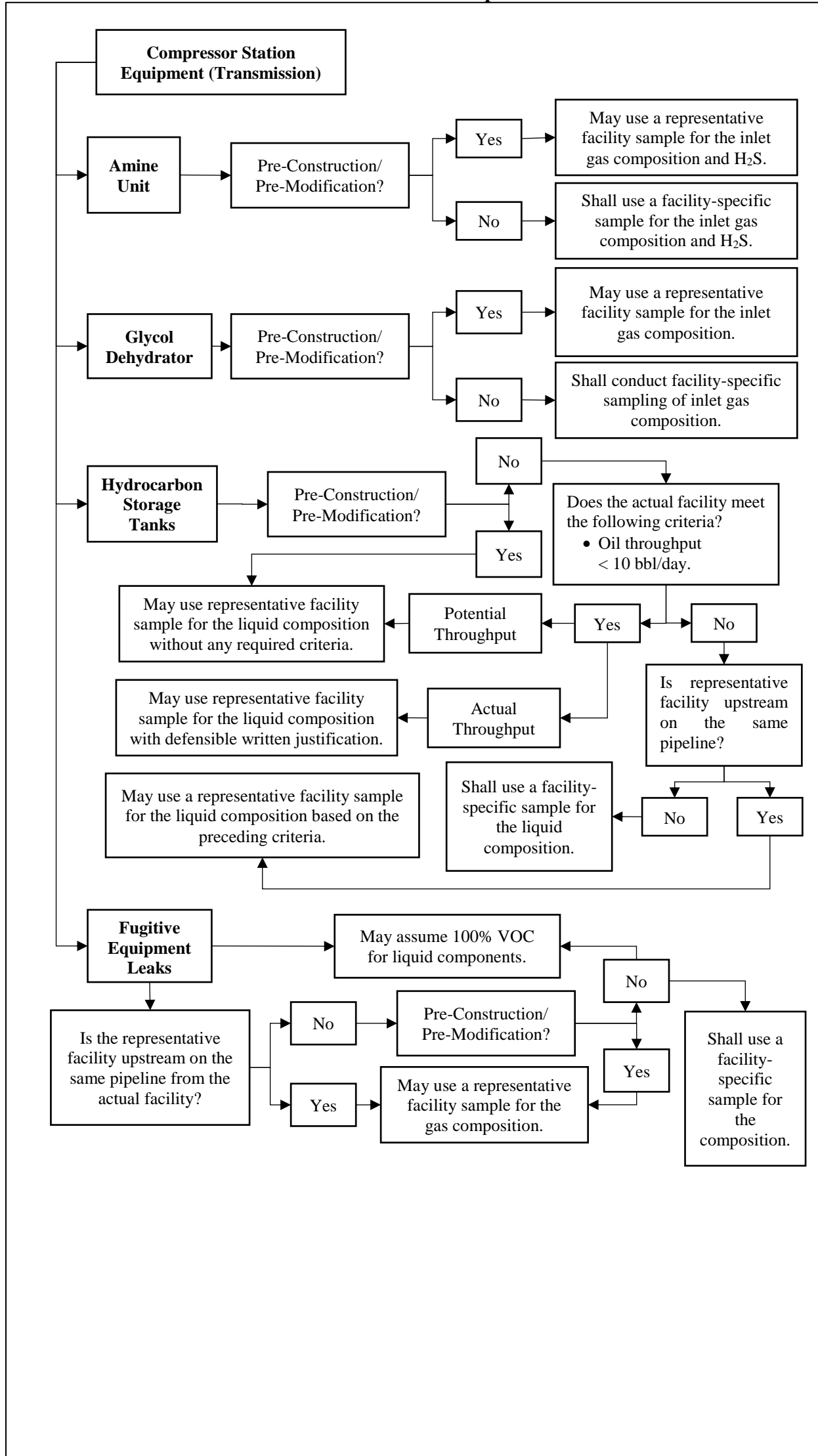
*case-by-case determinations may be requested for samples not meeting the criteria listed.

Natural Gas Gathering Compressor Station*



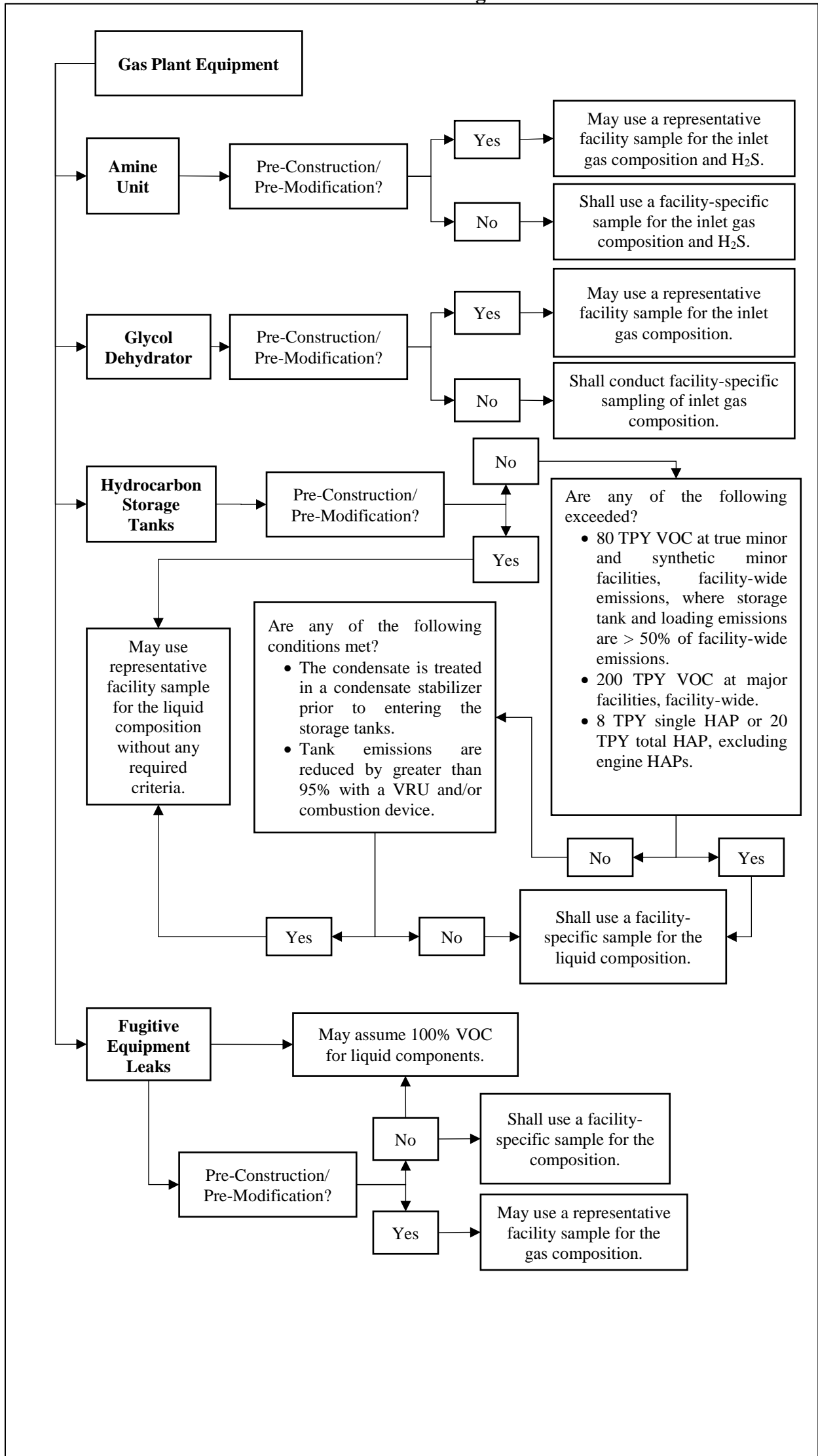
*case-by-case determinations may be requested for samples not meeting the criteria listed.

Natural Gas Transmission Compressor Station*



*case-by-case determinations may be requested for samples not meeting the criteria listed.

Natural Gas Processing Plant*



*case-by-case determinations may be requested for samples not meeting the criteria listed.