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Dominion Energy

December 19, 2019

BY U.S. MAIL, RETURN RECEIPT REQUESTED
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John Artes
Air Quality Permits Program
Air and Radiation Management Administration
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, MD 21230

RE: Dominion Energy Cove Point LNG, LP
Liquefaction Facility, CPCN Case 9318, Order 88565
LDAR Plan Submittal – Revision 4 Update

Dear Mr. Artes:

Dominion Energy Cove Point LNG, LP (DECP) is submitting the enclosed Revision 4 update of the Leak Detection and Repair (LDAR) Plan pertaining to the DECP Liquefaction Facility in Lusby, MD for your review and approval. The attached LDAR plan is required to be submitted and approved under the Revised Condition A-IX-3 of the February 6, 2018 amended Certificate of Public Convenience and Necessity (CPCN), updated February 23, 2018.

If you require any additional information, please contact Joseph Pietro at (804) 273-4175 or via email at Joseph.J.Pietro@dominionenergy.com.

Sincerely,

Thomas N. Effinger
Director, Environmental Services

Enclosure

cc: John Artes, MDE (john.artes@maryland.gov)
BY U.S. MAIL, RETURN RECEIPT REQUESTED
7018 2290 0000 9542 5255
Administrator, Compliance Program
Air and Radiation Management Administration
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, MD 21230

Enclosure

jjp

Document Certification

Facility Name: Dominion Energy Cove Point LNG, LP
(formerly known as Dominion Cove Point LNG, LP)

Facility Location: 2100 Cove Point Road, Lusby, Maryland 20657

County: Calvert

Type of Submittal: Dominion Energy Cove Point LNG, LP
Liquefaction Facility, CPCN Case 9318, Order 88565
LDAR Plan Submittal – Revision 4 Update

Certification: As required under COMAR 26.11.03, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name of Responsible Official: Frank N. Brayton

Title: Director, LNG Operations (Authorized Representative)

Signature: [signature]

Date: 12.16.19

Dominion Energy Cove Point LNG, LP
Lusby, Maryland

Leak Detection and Repair (LDAR) Monitoring Plan

Cove Point Liquefaction Export Facility

December 2019 (Rev. 4)

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LDAR Acronyms and Abbreviations

AVO	Audio/Visual/Olfactory
°C	degrees Celsius
°F	degrees Fahrenheit
AWP	Alternative Work Practice
BACT	Best Available Control Technology
CFR	Code of Federal Regulations
CH_4	chemical symbol for Methane
CO_2	chemical symbol for Carbon Dioxide
COMAR	Code of Maryland Regulations
CPCN	Certificate of Public Convenience and Necessity
DECP	Dominion Energy Cove Point LNG, LP
DEES	Dominion Energy Environment and Sustainability
DEGIG	Dominion Energy Gas Infrastructure Group
DOR	Delay of Repair
DTM	Difficult to monitor
E_{DOR}	Total daily mass emission rate from all components on DOR within the gas circuit multiplied by the number of days until the next scheduled shutdown of the gas circuit
E^*_{DOR}	Total daily mass emission rate from all components on DOR within the gas circuit multiplied by the number of days until the early scheduled shutdown of the gas circuit
$E_{SHUTDOWN}$	Pollutant emissions from shutdown of the gas circuit
EPA	Environmental Protection Agency
FID	Flame Ionization Detector
GHG	Greenhouse Gas
GV	Gas/Vapor
H&MB	Heat & Material Balance
HFC	Hydrofluorocarbons
kPa	kilopascal
LAER	Lowest Achievable Emission Rate
LDAR	Leak Detection and Repair
LL	Light Liquid
LMS	Learning Management System
LNG	Liquid Natural Gas
LOTO	Lock-out/tag-out
MDE	Maryland Department of the Environment
MOC	Management of Change
NEIC	National Enforcement Investigation Center
N_2O	chemical symbol for Nitrous Oxide
NSPS	New Source Performance Standards
NSR	New Source Review
O&G Avg. EF	Oil & Gas Average Emission Factor
OEL	Open-ended line
OGIC	Optical Gas Imaging Camera
P&IDs	Piping and instrumentation diagrams
PFC	Perfluorocarbons
PFD	Process Flow Diagram

PID	Photoionization Detector
PPMV	Parts per Million by Volume
QA	Quality Assurance
QC	Quality Control
RF	Response Factor
TAP	Toxic Air Pollutant
T-BACT	Best Available Control Technology for Toxics
TCEQ	Texas Commission on Environmental Quality
TOC	Total Organic Compounds
TOC ER	Total Organic Compounds Emission Rate
UTM	Unsafe to Monitor
VOC	Volatile Organic Compounds

1.1 PURPOSE

Dominion Energy Cove Point LNG, LP (DECP) operates the Cove Point Liquefied Natural Gas (LNG) Terminal (Cove Point) located in Lusby, Maryland. The Cove Point Liquefaction Facility (the Export Facility) was constructed at Cove Point under authorization of the Certificate of Public Convenience and Necessity (CPCN) Order No. 86372 (PSC Case No. 9318), issued on May 30, 2014 and amended on February 6, 2018, Order No. 88565. The Export Facility is subject to the Leak Detection and Repair (LDAR) requirements described in the CPCN under Condition A-IX, as well as the Permit to Operate (PTO), issued December 1, 2017. The CPCN requires DECP to develop and implement an LDAR Monitoring Program following the procedures outlined in the Texas Commission on Environmental Quality (TCEQ) 28LAER LDAR protocol. The procedures to be followed under the LDAR Monitoring Program for the Export Facility, including monitoring requirements, leak definitions, repair procedures, and emissions calculation methodologies, are outlined in this LDAR Monitoring Plan. DECP is required to submit the plan to the Maryland Department of the Environment (MDE) for approval within 30 days after issuance of Order No. 88565, by March 8, 2018.

This LDAR Monitoring Plan is applicable to the Cove Point Liquefaction Export Facility and does not apply to the Cove Point LNG Import Facility. More specifically, the LDAR Monitoring Program applies to piping and equipment components[1] at the Export Facility, as referenced under Condition A-IX of the CPCN, with the potential to emit fugitive emissions of volatile organic compounds (VOCs) and/or greenhouse gases (GHGs) pursuant to the requirements of CPCN Conditions A-IX-3 and A-IX-2, respectively. In addition, the VOC LDAR Monitoring Program satisfies MDE best available control technology (BACT) requirements for toxic air pollutants (TAPs)[2] (T-BACT) as required by CPCN Condition A-IX-4. For components containing TAPs in addition to VOC and/or GHG, compliance with the T-BACT will be met through compliance with the portions of the LDAR Monitoring Program applicable to VOCs and/or GHGs. For components in TAP-only service, the procedures contained in this LDAR Monitoring Plan that were designed specifically for TAP-only components will apply. These TAP-only LDAR procedures are potentially applicable to the components in TAP-only service associated with the following streams as identified in Exhibit E of the CPCN Amendment Application: booster comp feed, amine/ammonium hydroxide, aqueous ammonia, citric acid, sodium bisulfite, and sodium hypochlorite. However, only the amine/ammonium hydroxide and aqueous ammonia streams are anticipated to result in fugitive air emissions from leaking components and will continue to be monitored at the facility via the TAP-only LDAR procedures. The other TAP-only streams are low vapor pressure liquid streams and therefore are not anticipated to result in fugitive air emissions due to leaking components. These streams were monitored during the first quarter of the LDAR monitoring program to ensure the lines were installed without leaks.

A list of definitions for commonly used terms is provided at the end of the Monitoring Plan, prior to the Appendices.

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[1] "Piping and equipment components" may include, but are not limited to, valves, flanges, connectors, instruments, and other piping and mechanical installations.

[2] TAPs include a Maryland-specific list of pollutants, available in MDE's Tox-a-Matic spreadsheet which can be found online at: http://mde.maryland.gov/programs/Permits/AirManagementPermits/Documents/Tox-a-matic-2012b.xls. The specific TAPs relevant to the Export Facility and subject to T-BACT requirements are listed in Exhibit C to the September 2017 CPCN Amendment Application.

1.2 APPLICABILITY BACKGROUND

The Export Facility must implement an LDAR Monitoring Program consistent with the requirements in the CPCN, which are outlined in Table 1.2-1. The TCEQ 28LAER program and Alternative Work Practice (AWP) for Monitoring Equipment Leaks, codified at 40 CFR §60.18, were used as guides in developing this LDAR Monitoring Plan along with reasonable engineering/scientific principles. It should be noted that TCEQ 28LAER and the AWP do not prescribe exact methodologies for all situations that are encountered at the Export Facility.

Table 1.2-1 LDAR Applicability Overview

Process Area	Applicable LDAR Requirements	Component Applicability Threshold
Piping and Equipment Components Associated with the Export Facility	CPCN Condition A-IX-1 and COMAR 26.11.19.16	Any in-service components that contain VOCs
	CPCN Condition A-IX-3 and TCEQ 28LAER (VOC LAER)	Any in-service components that contain VOCs[3]
	CPCN Condition A-IX-2 and TCEQ 28LAER (GHG BACT)	Any in-service components that contain GHGs (i.e., methane and carbon dioxide)
	CPCN Condition A-IX-4 (T-BACT)	Any in-service components that contain TAPs (either applicable TAP-only components or TAP components containing VOCs or GHGs)

MDE regulations at COMAR 26.11.19.16 include requirements to visually inspect components in VOC service for leaks on a monthly basis and repair leaking components observed during the inspections within a specified timeframe. The requirements of this regulation, which are included under Condition A-IX-1 of the CPCN, may differ from the requirements of TCEQ 28LAER.[4] To limit the impact of these potential differences between COMAR 26.11.19.16 and TCEQ 28LAER, this LDAR Monitoring Plan limits the incorporation of COMAR 26.11.19.16 requirements to those leaks identified during audio, visual, and olfactory (AVO) inspections of components in VOC service, consistent with the requirement.

[3] TCEQ 28 LAER provides an exemption from certain requirements for components containing VOCs with aggregate partial pressure or vapor pressure less than 0.044 psi at 68°F. This exemption is intended to be applied to liquid streams. Details on exceptions are provided in the relevant sections of this LDAR Monitoring Program. Components excluded based on this condition will be identified in the LDAR Monitoring Database.

[4] For example, delaying the repair of a leaking component is allowed under TCEQ 28LAER when a shutdown would be required to repair the component and emissions from the shutdown would result in more emissions than allowing the component to leak until the next scheduled shutdown. If emissions from the leaking components exceed emissions from a unit shutdown, MDE must be notified and an early shutdown may be required. Under the COMAR regulations and CPCN Condition A-IX-1(g), if the repair of a leaking component would require a shutdown, the repair may be delayed until the next scheduled shutdown regardless of emissions from the leaking component.

1.3 LDAR MONITORING PROGRAM PERSONNEL

The roles and responsibilities of personnel under the LDAR Monitoring Program are outlined in Table 1.3-1.

Table 1.3-1 LDAR Monitoring Plan Roles and Responsibilities

Role	Person Responsible
Ensure overall compliance of LDAR Monitoring Plan by ensuring necessary and appropriate resources have been allocated.	Director, LNG Operations
Management of required component repairs/replacements.	Maintenance Manager/Supervisor
Performing required component repairs/replacements.	Maintenance Personnel (multiple, may be internal or contracted)
Performing audio, visual, and olfactory (AVO) inspections.	Designated Operations Personnel (multiple)
Performing Environmental Protection Agency (EPA) Method 21 and Optical Gas Imaging (OGI) instrument monitoring.	Third-Party LDAR Monitoring Contractor (LDAR Monitoring Contractor)
Managing the LDAR emissions calculation software and performing quality assurance activities.	LDAR Monitoring Contractor
Daily oversight and management of LDAR monitoring contractor.	DECP LDAR Coordinator
Performing review of monthly emissions calculations performed by LDAR emissions calculation software and performing additional calculations, as needed, using LDAR monitoring contractor data.	Dominion Energy Environment and Sustainability (DEES) Air Specialist
Assisting the LDAR Coordinator and DEES Air Specialist with LDAR Program data review and decision making.	Dominion Energy Gas Infrastructure Group (DEGIG) LDAR Coordinator, Cove Point Environmental Staff, including Environmental Compliance Coordinator(s).

2 LDAR MONITORING PROGRAM REQUIREMENTS

The primary requirements of the LDAR Monitoring Program at the Export Facility are described in this section.

2.1 LEAK MONITORING AND INSPECTION TECHNIQUES

The leak monitoring and inspection techniques that will be used under the LDAR Monitoring Program are as follows:

For VOC and/or GHG components:

- Optical Gas Imaging Camera (OGIC) – An OGIC capable of viewing fugitive emissions may be used to monitor components in VOC and/or GHG service in accordance with the AWP. The type of OGIC used will depend on the stream composition associated with the components being monitored. For example, a FLIR® GF 320 may be used to monitor components containing hydrocarbons (e.g., methane, ethane, etc.) and a FLIR® GF 343 may be used to monitor components containing CO_2.
- EPA Method 21 Monitoring – Components in VOC and/or GHG hydrocarbon service may be monitored using a gas analyzer that conforms to requirements listed in Method 21 of 40 CFR Part 60, Appendix B (Method 21). The Method 21 Soap Bubble test may be used, where appropriate, for remonitoring purposes to demonstrate that a component has been successfully repaired and is no longer leaking (See Section 4.2.4).
- AVO Inspections – Routine observations will be made to detect audible, visible, or olfactory evidence of a leak from VOC and/or GHG components.

For TAP-only components:

- AVO Inspections – Routine observations will be made to detect audible, visible, or olfactory evidence of a leak from TAP-only components.
- EPA Method 21 Soap Bubble test may be used, where appropriate, for remonitoring of TAP-only components to demonstrate that a component has been successfully repaired and is no longer leaking (See Section 4.2.4).

Each of these monitoring and inspection techniques are discussed in more detail throughout this LDAR Monitoring Plan. **The term "monitoring" (or "monitored") as used herein refers to the use of an OGIC or Method 21 instrument and the term "inspection" (or "inspected") refers to the use of an AVO inspection.**

2.2 LEAK DEFINITIONS

The Export Facility will adhere to the following leak definitions for each monitoring and inspection technique:

For GHG and/or VOC components:

- OGIC – A leak is defined as any emissions observed through the OGIC.
- EPA Method 21 monitoring – A leak is defined as any instrument reading of 500 parts per million by volume (ppmv) or greater based on an instrument calibrated with methane.[5]

[5] TCEQ 28LAER Section F requires that the Method 21 approved instrument be calibrated using methane.

- EPA Method 21 Soap Bubble Test – A leak exists if the formation of bubbles is observed when using the Method 21 Soap Bubble test for remonitoring.
- AVO inspections – A leak is defined as any audible, visible, or olfactory indications of a leak (e.g., visual indications of liquids dripping).

For TAP-only components:

- AVO inspections – A leak is defined as any audible, visible, or olfactory indications of a leak (e.g., visual indications of liquids dripping).
- EPA Method 21 Soap Bubble Test – A leak exists if the formation of bubbles is observed.

2.3 MONITORING AND INSPECTION FREQUENCY

Monitoring and inspections will be performed in accordance with the frequencies set forth in this section. Initial monitoring of all components at the Export Facility must be completed within 180 days after the first production of LNG.[6]

2.3.1 AWP Monitoring

OGIC will be used to monitor VOC and/or GHG components at the minimum frequency established under the AWP, which is dependent upon the selected detection sensitivity levels as summarized in Table 2.3-1.

Table 2.3-1. Detection Sensitivity Levels and Monitoring Frequencies for AWP[7]

Minimum Monitoring Frequency[8]	Detection Sensitivity Level (grams/hour)
Bi-Monthly	60
Semi-Quarterly	85
Monthly	100

Components that are designated for monitoring under the AWP must be monitored annually using a Method 21 instrument as required by 40 CFR §60.18(h)(7) unless inaccessible (e.g., insulated) or unsafe to monitor (UTM). Initial Method 21 instrument monitoring of the population of components designated for monitoring under the AWP must be completed within 12 calendar months after commencing monitoring under the LDAR Monitoring Program, with subsequent annual Method 21 instrument monitoring being completed every 12 calendar months thereafter.[9] A component that is monitored using a Method 21 instrument during the applicable period established pursuant to Table 2.3-1 need not be monitored with an OGIC during that period. Skip periods or reductions in monitoring frequency are not applicable to components for which the AWP is used.

[6] Reference September 17, 2015 email exchange from Duane King, MDE to Paul Dickson, DECP.
[7] 40 CFR Part 60, Subpart A, Table 1.
[8] Bi-monthly means once every two calendar months. Semi-quarterly means twice every three calendar months. Monthly means one per calendar month.
[9] For example, if monitoring under the LDAR Monitoring Program commences on June 1, 2018, initial Method 21 instrument monitoring of all affected components must be completed by June 1, 2019. Subsequent Method 21 instrument monitoring must be completed by June 1 of each year. The timeframes for completing Method 21 instrument monitoring under the AWP apply to the population of components designated for the AWP, not on an individual component basis.

2.3.2 Method 21 Monitoring

Components subject to the monitoring requirements of the LDAR Monitoring Program that are not designated for monitoring under the AWP (e.g., VOC and/or GHG components containing organic material that do not meet the minimum detection sensitivity levels of the OGIC based on stream composition) will be monitored using a Method 21 instrument on a quarterly basis. Components subject to quarterly Method 21 instrument monitoring will be designated as such in the LDAR Monitoring Database. The Method 21 Soap Bubble Test may only be used for remonitoring of components deemed appropriate following a repair attempt and may be used for VOC and/or GHG components, as well as TAP-only components.

2.3.3 AVO Inspections

AVO inspections are to be conducted on a monthly basis[10](once per calendar month) for all affected components, including TAP-only components, except for connectors, which will be inspected on a weekly basis.[11]

2.4 DIFFICULT-TO-MONITOR AND UNSAFE-TO-MONITOR COMPONENTS

Components are exempt from the monitoring frequencies of Table 2.3.1 and Section 2.3 if they are designated as difficult-to-monitor (DTM) or unsafe-to-monitor (UTM). A DTM component is one that cannot be monitored without elevating the monitoring personnel more than two meters above a permanent support surface or that requires a permit for confined space entry.[12] UTM is a component that cannot be monitored because monitoring personnel would be exposed to an immediate danger as a consequence of the monitoring activities.[13] DTM components must be monitored annually (at least once every 12 months) and safe access must be provided during the annual monitoring event. If a UTM component is not considered safe to monitor during a calendar year, it shall be monitored as soon as it is safe to do so. Components designated as DTM or UTM will be designated as such within the LDAR Monitoring Database. UTM/DTM designations will include date designated (or last monitored) and an explanation for why the components are DTM or UTM in the LDAR Monitoring Database.

The classification of a component as DTM depends on whether the component is designated for monitoring under the AWP or designated for monitoring using Method 21. A component that is DTM with Method 21 may not be DTM with an OGIC. As such, DTM designations within the LDAR Monitoring Database are considered specific to the monitoring approach that will be used. [14]

AVO inspections of DTM and UTM components subject to the LDAR Monitoring Program will be performed in accordance with Section 2.3.3 in a manner that ensures safety while maximizing the efficacy of the AVO inspections. For example, a component that cannot be safely accessed for visual inspection may be able to be inspected via audio and/or olfactory means.

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[10] Reference: CPCN Final License Condition A-IX-1 (a)
[11] Reference: TCEQ, Section 1.E.
[12] Reference: 30 TAC 115.352(7)
[13] Reference: 30 TAC 115.354(1)(C)
[14] see 73 FR 78205.

2.5 DESIGN, MONITORING, AND INSPECTION REQUIREMENTS BY COMPONENT TYPE

The design, monitoring, and inspection requirements applicable to components in VOC and/or GHG service under this LDAR Monitoring Plan, based on TCEQ 28LAER requirements and commitments made in the CPCN application, are summarized in Table 2.5-1. These requirements do not apply to TAP-only components.

Table 2.5-1. Affected Component Design, Monitoring, and Inspection Requirements for Components in VOC and/or GHG Service

Component Type:	Design Requirement	Applicable Monitoring/Inspection Requirement [1]
Agitator Seals Compressor Seals Pump Seals	All new and replacement pumps, compressors, and agitators shall be equipped with a shaft sealing system that prevents or detects emissions of VOC from the seal. These seal systems need not be monitored and may include (but are not limited to) dual pump seals with barrier fluid at higher pressure than process pressure, seals degassing to vent control systems kept in good working order, or seals equipped with an automatic seal failure detection and alarm system. Submerged pumps or sealless pumps (including, but not limited to, diaphragm, canned, or magnetic-driven pumps) may be used to satisfy the requirements of this condition and need not be monitored. All other pump, compressor, and agitator seals shall be monitored in accordance with the schedule set forth in Section 2.3, including all other aspects of this plan. (TCEQ 28LAER, 1.G).	AVO
Pressure Relief Valves	In accordance with TCEQ 28LAER, 1.F, relief valves vented to a control device are not subject to monitoring. Relief valves with a rupture disc and pressure-sensing device upstream are also not subject to monitoring, so long as the reading of the pressure-sensing device is checked on a quarterly basis and recorded in a maintenance log (or equivalent). The quarterly recordkeeping requirement does not apply to pressure-sensing devices that are continuously monitored and equipped with alarms to notify operators of a failure in disc integrity. All pressure relief valves subject to the LDAR Monitoring Program shall be vented to a control device, equipped with a rupture disc and pressure-sensing device, or monitored in accordance with the LDAR Monitoring Plan (CPCN application and TCEQ 28LAER, 1.F).	AVO
Leakless Valves	Sealless/leakless valves may include diaphragm valves and valves with welded bonnet bellows. Valves may not be buried. (TCEQ 28LAER, 1.C and 1.F). Note: TCEQ 28LAER does not require all valves to be sealless/leakless.	AVO
Open-ended lines	Unless an open-ended line is required for safety reasons, each open-ended valve or line shall be equipped with an appropriately sized cap, blind flange, plug, or a second valve to seal the line. Except during sampling, both valves shall be closed. See Section 3.4.5. (TCEQ 28LAER, 1.E).	AVO
Components in Vacuum Service	> 0.725 psi below ambient (TCEQ 28LAER, 1.A). Such components will be documented in the LDAR Monitoring Database.	AVO

Component Type:	Design Requirement	Applicable Monitoring/Inspection Requirement [1]
Components in Heavy Liquid Service	In accordance with TCEQ 28LAER, 1.A, components containing a liquid with a VOC aggregate partial pressure or vapor pressure of less than 0.044 psia are exempt from the monitoring requirements of the LDAR Monitoring Program and the design requirements for pumps, compressors, and agitators. Such components will be documented in the LDAR Monitoring Database.	AVO
Other, non-leakless, valves (including check valves)	Valves may not be buried. (TCEQ 28LAER, 1.C and 1.F).	AWP (or Method 21) and AVO
Connectors	Connectors shall be welded or flanged. Screwed connectors are permissible only on piping smaller than two inches in diameter. Buried connectors shall be welded. New and re-worked piping connections shall be pressure tested at no less than operating pressure prior to placing into service or monitored within 15 days of returning to service. (TCEQ 28LAER, 1.C and 1.E.).	AWP (or Method 21) and AVO (Non-Welded Connectors), AVO (Welded Connectors) [2]
Insulated Components	Not applicable.	AWP/AVO [3]
Other components with potential to emit fugitive emissions of VOCs and GHGs.	Components should be designed such that they are reasonably accessible for monitoring to the extent that good engineering practices will permit. (TCEQ 28LAER, 1.D).	AWP (or Method 21) and AVO

Notes:

[1] This table summarizes the monitoring and inspection requirements generally applicable to each type of component. Alternate monitoring and inspection requirements may apply to individual components as discussed elsewhere in this LDAR Monitoring Plan.

[2] Connectors are exempt from the monitoring if they are welded together around their circumference so that the flanges cannot be unbolted. These connectors are still subject to AVO inspection requirements.

[3] Insulated components are exempt from Method 21 monitoring insofar as the insulation inhibits the Method 21 instrument probe from accessing the potential leak interface. If the leak interface is accessible, it is subject to monitoring/inspection.

2.6 DETERMINATION OF STREAM COMPOSITIONS

The composition of individual process streams containing VOC and/or GHG has been determined based on the Heat and Material Balance (H&MB) derived from process simulation modeling performed for the Export Facility's "design" scenario. The process streams delineated on the Process Flow Diagrams (PFDs) were manually correlated with the lines on the Process and Instrumentation Diagrams (P&IDs). Stream compositions were assigned to individual components based on engineering judgement. Stream compositions for each component subject to the monitoring requirements of the LDAR Monitoring Program are stored in the LDAR Monitoring Database and will be used to:

- Calculate the detection sensitivity levels to be used in the performance of OGIC daily instrument checks (see Section 3.2.2).
- Calculate the response factor to be used in assessing the leak concentration measured with a Method 21 instrument (see Section 5.4.1).
- Calculate fugitive emissions of VOC and GHG from components subject to the LDAR Monitoring Program (see Section 5).

When a new component is added at the Export Facility, a similar approach will be followed to assign a stream composition to the new component based on the "design" scenario H&MB (see Section 6.3). [15] Updates to the stream composition database may be made periodically based on updated engineering information. Updating the stream composition information will not be retroactive, but will only apply to calculations moving forward from the update.

2.7 LDAR MONITORING DATABASE

LDAR Monitoring Program data will be stored within the LDAR Monitoring Database, which is contained and managed within LDAR software. Each VOC and/or GHG component subject to monitoring under the LDAR Monitoring Program is assigned a unique LDAR ID that corresponds to data stored within the LDAR Monitoring Database, including but not limited to: Export Facility identification numbers, physical component data (e.g., component type), stream composition information (i.e., Stream ID), monitoring method, monitoring results, and repair records. The LDAR Monitoring Database will be used to track monitoring requirements, repair schedules, emissions, and other pertinent information. As data from the field is entered into the LDAR Monitoring Database, the software has the ability to run emissions estimates based on the monitoring result and pre-defined information such as emissions factors, component gas stream composition, and previous monitoring/inspection results. TAP-only component leaks and repairs will be tracked through the LDAR Monitoring Database. Although not required under the LDAR Monitoring Program, a complete index of TAP-only components may also be included in the LDAR Monitoring Database.

[15] Note that this LDAR Monitoring Plan does not address determination of stream composition for TAP-only components.

The Export Facility must perform monitoring of components in VOC and/or GHG service in accordance with the AWP and/or Method 21. Only personnel, including 3rd party vendors, properly trained to use the OGIC or Method 21 instrument shall perform the monitoring (see Section 6.2). Additionally, the Export Facility must perform AVO inspections of components in VOC and/or GHG service, as well as components in TAP-only service. Performing AVO inspections requires limited training as it does not involve the use of any instrumentation. This section describes the procedures to be used for monitoring and inspections performed under the LDAR Monitoring Program.

3.1 COMPONENT FIELD IDENTIFICATION

Each component that is subject to monitoring under the LDAR Monitoring Program (i.e., components in VOC and/or GHG service) is assigned a unique LDAR ID that is used to identify component information stored within the LDAR Monitoring Database (see Section 2.7). Components may be identified in the field by weatherproof and readily-visible tags that are stamped with the LDAR ID. Alternatively, components may be identifiable in relation to a nearby tagged component.[16] LDAR ID tags may be physically affixed to components or hung in a location that is proximate to the component.[17] Any changes to the process or equipment will be reflected in updated P&IDs as part of the Management of Change process and appropriate changes to field tagging, database setup, and other aspects of the LDAR Monitoring Plan will be made (see Section 6.3).

TAP-only component repairs and leaks will be tracked through the LDAR Monitoring Database. Although not required under the LDAR Monitoring Program, a complete index of TAP-only components may also be included in the LDAR Monitoring Database. If a TAP-only component is included in the LDAR Monitoring Database, the database will clearly identify the component as a TAP-only component. If a leak is identified during an AVO inspection, personnel performing the inspection will take actions to confirm that the component is a TAP-only component. Such actions may include but are not limited to:

- Checking for the presence of an LDAR tag on the leaking component or on components upstream/downstream from the leaking component.
- Checking the LDAR Monitoring Database to see if the component has an LDAR ID using the leaking component's Export Facility/SAP ID number.
- Checking the LDAR Monitoring Database to see if the component has been identified as a TAP-only component using the leaking component's Export Facility/SAP ID number.
- Consulting the P&IDs.

[16] A valve that is tagged with an LDAR ID tag may be used to identify a nearby component that is not tagged. For example, the following record could be included in the LDAR database to identify a flanged connection associated with a valve that has LDAR ID 1001: *LDAR ID 1001.1, flanged connection downstream of valve 1001.*

[17] Examples of instances where a tag may not be physically affixed to the component include, but are not limited to: an LDAR ID tag for an overhead valve may be hung on the railing of the walkway beneath the valve; an LDAR ID tag for a component with moving parts may be hung upstream or downstream of the component, or some other proximate location, so as not to interfere with the operation of the component; the LDAR ID tags for the valves associated with a four-valve manifold may be clustered together and affixed to the manifold rather than to each individual valve.

3.2 OGIC MONITORING

3.2.1 OGIC Monitoring Equipment

The gas visualization functionality of OGICs is based on the absorption of electromagnetic radiation in the infrared wavelength of the gas being monitored. Given that different gases emit infrared radiation at different wavelengths, the type of OGIC that can be used depends on the characteristics of the fluid being monitored. Based on the composition of process streams subject to the LDAR Monitoring Program, two different OGICs will be required: one to monitor hydrocarbon (organic) streams and one to monitor carbon dioxide streams.

The OGICs will meet the following minimum instrument specifications from 40 CFR §60.18(i)(1).

- Provide the operator with an image of the potential leak points for each piece of equipment at the detection sensitivity level, within the distance used in the daily instrument check; and
- Provide a date and time stamp for video records of every monitoring event.

The cameras will be operated and maintained in accordance with manufacturer specification and as specified in this LDAR Monitoring Plan.

3.2.2 Daily Instrument Checks

Unlike Method 21 instruments, OGICs do not require calibration before use. Rather, a daily instrument check on days the instrument will be used is performed to verify that the OGIC is capable of imaging emissions from the components to be monitored at the detection sensitivity level, and within the maximum distance, to be encountered during the monitoring survey. The detection sensitivity level and maximum monitoring distance depend on the fluid stream being monitored. The LDAR Monitoring Contractor may repeat the daily instrument check to establish a different maximum monitoring distance for specific process streams to increase the efficiency of monitoring, as desired.

The instrument check must be performed on a daily basis, prior to beginning any leak monitoring work, for each camera configuration (e.g., different lens options) that is to be used, and for each individual operating the OGIC, during the monitoring survey. The procedures for performing daily instrument checks are provided in Appendix A. Records of the daily instrument checks will be maintained within the LDAR Monitoring Database. Records to be maintained are summarized in Appendix D.

During the daily instrument check, the camera must be used to view emissions from a gas cylinder at a flow rate calculated using the standard detection sensitivity levels for the defined monitoring frequency (see Section 2.3.1), as well as the lowest mass fraction of detectable chemicals within the stream(s) to be monitored. The mass fraction of the detectable chemicals for each stream is obtained from the H&MB described in Section 2.6. See Appendix A for further instructions on how to calculate the daily instrument check mass flow rate.

3.2.3 OGIC Monitoring Procedures

The OGIC will be operated to image every component designated for OGIC monitoring in accordance with the instrument manufacturer's operating parameters. OGIC monitoring will be performed in accordance with the AWP as outlined in this LDAR Monitoring Plan. The AWP is designed to be implemented by experienced, knowledgeable technicians and as such does not anticipate every possible monitoring scenario. The monitoring personnel must determine how to implement the monitoring to achieve the intended results, which is to identify the presence of leaks.

All emissions imaged by the OGI instrument on LDAR components in VOC and/or GHG service are considered leaks and are subject to repair. When a leak is identified with the OGIC, the leak concentration may be assessed using a Method 21 instrument.

3.3 METHOD 21 MONITORING

The Export Facility may use an appropriate Method 21 instrument for monitoring of most components in VOC and/or GHG organic material service. Method 21 instruments are unable to detect inorganic materials, such as carbon dioxide. GHG components in inorganic-only material service will be monitored using OGIC techniques (see Section 3.2).

3.3.1 Method 21 Monitoring Equipment

The Method 21 monitoring equipment used at the Export Facility will meet the requirements of Method 21 as outlined in this section.

3.3.1.1 Method 21 Monitoring Instruments

The Method 21 instruments used in the LDAR Monitoring Program will meet the following minimum criteria:

- The monitoring instrument will be capable of responding to the compounds in the process streams monitored.
- The monitoring instrument will be capable of measuring the leak definition concentration (i.e., 500 ppmv, as methane).
- The scale of the monitoring instrument meter will be readable to ±2.5 percent of the leak definition concentration (i.e., ±12.5 ppmv).
- The monitoring instrument shall be equipped with an electrically-driven pump to ensure that a sample is provided to the detector at a constant flow rate. The nominal sample flow rate, as measured at the sample probe tip, shall be 0.1 to 3.0 liters per minute (L/min) when the probe is fitted with a glass wool plug or filter that may be used to prevent plugging of the instrument. Neither Method 21 nor TCEQ 28LAER prescribe a methodology to be used to document compliance with this flow rate requirement. As such, compliance will be assumed based on manufacturer's documentation of the pump flow rate and acceptable response time test results.
- The monitoring instrument shall be equipped with a probe or probe extension that will meet the manufacturer's specifications and not exceed 6.4 millimeters (mm) (1/4 inch) in outside diameter.
- The monitoring instrument shall be intrinsically safe for operation in explosive atmospheres as defined by the National Electrical Code by the National Fire Prevention Association or other applicable regulatory code for operation in any explosive atmospheres that may be encountered during use. The instrument shall, at a minimum, be intrinsically safe for Class 1, Division 1 conditions, and/or Class 2, Division 1 conditions, as appropriate, as defined by the applicable code. The instrument shall not be operated with any safety device removed.

Types of monitoring instruments that may be used include catalytic oxidation detectors, flame ionization detectors (FIDs), infrared absorption detectors, and photoionization detectors (PIDs). All instrument(s) will be maintained in good working condition and operated according to the manufacturer's specifications.

3.3.1.2 Calibration Gases

Calibration gases used at the Export Facility shall meet the following minimum requirements.

- Zero gas that contains less than 10 ppmv VOC;
- 500 ppmv (28LAER leak definition) calibration gases of methane balanced with air;
- Calibration gases will be analyzed and certified by the manufacturer within ±2% accuracy;
- Shelf lives will be specified for all calibration gases and expired calibration gases will not be used unless reanalyzed and recertified;
- Certification sheets for each cylinder of gas will be available and maintained for at least five (5) years after the cylinder has been emptied or the expiration date of the cylinder; and
- A unique lot number will be on each cylinder that can be referenced to the certification (or recertification).

3.3.1.3 Method 21 Soap Solution

The following minimum requirements apply to soap solution used in the performance of the Method 21 Soap Bubble Test.

- The soap solution will be a commercially available leak detection solution (e.g., Snoop) or will be prepared using concentrated detergent (e.g., common dishwashing detergent) and water.
- A pressure sprayer or squeeze bottle will be used to dispense the solution.

3.3.2 Method 21 Instrument Calibration and Performance Evaluation

Instrument quality assurance activities shall be performed according to the minimum frequencies shown in Table 3.3-1.

Table 3.3-1. Frequencies of Quality Assurance Activities

Activity	Frequency	Acceptability Criteria
Instrument Calibration	At the start of each monitoring shift.	Instrument reading must be adjusted to the calibration gas value.
Calibration Precision Test	Prior to placing the instrument into service and at 3-month intervals. If instrument is not used for more than 3 months, it must be tested prior to being placed into service.	The calibration precision shall be equal to or less than 10 percent of the calibration gas value.
Response Time Test	Prior to placing the instrument into service and after any change in instrument flow configuration (e.g., extension probe).	The response time shall be less than or equal to 30 seconds.
Response Factor Test	Prior to placing the instrument into service, unless response factors are determined through published reference sources. The response factor tests do not need to be repeated at subsequent intervals.	The response factor shall be less than 10 for each individual VOC to be measured.

The procedures for performing these quality assurance activities are provided in Appendix B. These activities are recorded in the LDAR Monitoring Database. Records to be maintained are listed in Appendix D.

3.3.2.1 Calibration Drift Assessments

A calibration drift assessment is a tool that may be used to verify that the Method 21 instrument is functioning properly and helps to identify potential monitoring equipment issues. Method 21 does not specifically require the performance of calibration drift assessments. Where calibration drift assessments are required, they are prescribed by the underlying regulation, e.g., 40 CFR Part 60, Subpart VVa. The regulatory programs underpinning the LDAR Monitoring Program at the Export Facility, i.e., TCEQ 28LAER and COMAR, do not require calibration drift assessments. Therefore, calibration drift assessments are considered a best management practice to be performed at the discretion of the LDAR Monitoring Contractor rather than a regulatory requirement. Calibration drift assessments may be performed mid-way through each monitoring shift and/or at the end of the monitoring shift. The procedures for a calibration drift assessment are provided in Appendix B. The calibration drift results, if conducted, are recorded in electronic form in the LDAR Monitoring Database. Records to be maintained are listed in Appendix D.

The Cove Point Environmental Staff or DECP LDAR Coordinator shall be notified if any drift assessment results in a greater than 10% variance from the previous calibration value. Re-monitoring of components monitored since the later of the most recent calibration or calibration drift assessment may be performed at the discretion of the Export Facility.

3.3.3 Method 21 Monitoring Procedure

When Method 21 is used, the component monitoring at the Export Facility will be performed according to *Type I - Leak Definition Based on Concentration* shown in section 8.3.1 of EPA Method 21, which states:

Place the probe inlet at the surface of the component interface where leakage could occur. Move the probe along the interface periphery while observing the instrument readout. If an increased meter reading is observed, slowly sample the interface where leakage is indicated until the maximum meter reading is obtained. Leave the probe inlet at this maximum reading location for approximately two times the instrument response time

Provided below are some technical clarifications on the method described above.

3.3.3.1 Leak Interfaces

It is important to correctly identify and monitor at the interfaces "where leakage could occur". The leak interfaces are generally definable and not subjective. Monitoring personnel must be familiar with the leak interfaces of the components that are being monitored. If the LDAR Monitoring Contractor is unsure if an interface encountered is a leak interface, the interface is to be monitored until the personnel obtain clarification that it is not a leak interface. In addition, monitoring personnel should not monitor unnecessary interfaces (i.e., interfaces with no potential to leak). Openings on devices that are intended to vent as a part of their normal operation (e.g., pneumatic equipment) are not considered leak interfaces for the purposes of this LDAR Monitoring Plan, and should not be monitored.

3.3.3.2 Probe Placement

The intent of Method 21 is to utilize a probe placement and orientation that provides for the highest possible concentration reading. To this end, the probe should be positioned so that it is touching the leak interface unless doing so would present a safety hazard, the interface is wet, or the interface is moving. Where these conditions exist, attempts should be made to place the probe inlet no farther than 1 centimeter (cm) (0.4 inches) away from the leak interface. The probe should not be inserted into a location that cannot be visually observed to assess the presence of potential safety hazards, wet or moving parts, or materials that could contaminate the probe/instrument. If a leak interface is observed to be contaminated to a degree that would interfere with monitoring, monitoring personnel should first attempt to remove the contamination, and if unable to adequately remove the contamination, schedule maintenance to remove the contamination.

3.3.3.3 Probe Movement

The rate of probe movement should be considered when monitoring based on the equipment size and the response rate of the instrument to the process fluid. Method 21 does not prescribe a required probe movement rate, nor would it be feasible to establish one under this LDAR Monitoring Plan. The probe movement rate used in practice will be up to the discretion of the LDAR Monitoring Contractor.

3.3.3.4 Increased and Maximum Meter Readings

Both "increased meter reading" and "maximum meter reading" are referred to in the Type I procedure in EPA Method 21. Whether an increased meter reading is observed should be decided by trained monitoring personnel considering the components being monitored and the conditions encountered during the monitoring survey. It is not feasible to set a specific threshold that correlates to an "increased meter reading". The technician must be aware of the level of background "noise" and allow the meter to reach a maximum when an increase has occurred.

When an increased meter reading is observed, the LDAR Monitoring Contractor should slowly move the probe along the leak interface in the vicinity of the increased meter reading until the location of the highest meter reading is identified. The probe must be left at this location for approximately two (2) times the instrument's response time and until the maximum meter reading is obtained at that location.

3.3.3.5 Background Correction

Instrument readings may be corrected for background, as appropriate, for Method 21 monitoring performed at the Export Facility. Any concentration adjustments will be performed in accordance with the "no detectable emissions" provisions in Section 8.3.2 of Method 21. Background correction is to be performed by monitoring personnel for instances where zero emissions are occurring, but where the Method 21 instrument is detecting low organic compound concentrations during Method 21 due to organic material in the ambient air or general equipment fluctuations. Background correction is performed at the discretion of monitoring personnel.

3.4 COMPONENT-SPECIFIC CLARIFICATIONS

The following subsections describe specific component clarifications for the Export Facility. These clarifications are in no way intended to limit the scope of the LDAR Monitoring Program. Refer to Section 2.5 for LDAR Monitoring Program requirements specific to component type.

3.4.1 Valves

Valves are considered to include the valve body, stem, bonnet, gate, packing, and handle. Valves do not include the connector(s) on either side of the valve. Those connectors are separate components for monitoring purposes. The bonnet is not to be identified separately as a connector in the LDAR Monitoring Database. Any interfaces resulting from anything inserted into the valve body is subject to monitoring and inspection.

3.4.2 Second Valves

Second valves following normally closed valves are included in the LDAR Monitoring Plan and are not considered exempt from monitoring and/or inspection.

3.4.3 Check Valves

Check valves are considered valves under the LDAR Monitoring Program, even though they have no stem. Most check valves have a bonnet, and this is included as part of the valve. There may be connectors at the points where the check valve is attached to the piping. These connectors are separate components for monitoring and inspection purposes.

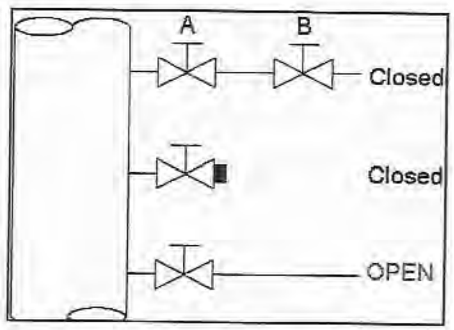
3.4.4 Plugs and Caps

Plugs and caps attached to normally closed valves are identified in the LDAR Monitoring Database as components but are not required to be monitored. Such plugs and caps are subject only to the AVO inspection requirements of the LDAR Monitoring Program. See Section 3.4.5 for the requirements applicable to open-ended lines. Plugs and caps other than those downstream of a normally closed valve must be monitored as per this monitoring plan.

3.4.5 Open-Ended Lines

An open-ended line is any valve having one side of the valve seat in contact with process fluid and one side open to the atmosphere, either directly or through piping.[18] Except for those that are part of an emergency shutdown system, each open-ended line shall be equipped with a cap, blind flange, plug, or a second valve as shown in the illustration below (Figure 3.4-1).

Figure 3.4-1: Open-Ended Line Example



The cap, blind flange, plug, or second valve shall seal the open end at all times except during operations requiring process fluid flow through the open-ended line, or during maintenance. If a second valve or cap/plug is installed, the component is not an open-ended line. DECP's policy is to not permit open-ended lines, unless necessary for safety systems.

If the isolation of equipment for hot work or the removal of a component for repair or replacement results in an open-ended line, it is exempt from the requirement to install a cap, blind flange, plug, or second valve for 72 hours during maintenance activities. If the repair or replacement is not completed within 72 hours, either of the following actions must be completed:

- A cap, blind flange, plug, or second valve must be installed on the line; or
- The OEL shall be monitored once for leaks for a plant or unit turnaround lasting up to 45 days with an approved gas instrument and the results recorded. For all other situations, the OEL shall be monitored once by the end of the 72 hour period following the creation of the OEL and once per month thereafter with an approved gas instrument and the results recorded. For all situations, leaks are indicated by readings of 500 ppmv and must be repaired within 24 hours, or a cap, blind flange, plug, or second valve must be installed on the line or valve.

If any open-ended lines are discovered on subject lines, a cap, blind flange, plug, or a second valve will be placed upon discovery at the end of the open-ended line unless: operations are occurring that require process

[18] This definition of "open-ended line" is not provided in TCEQ 28LAER. The definition given herein is from 40 CFR Part 60, Subpart VV. A similar definition is used in other regulatory programs requiring LDAR.

fluid flow through the line; maintenance is occurring on the line; or, the open-ended line is a part of the emergency shutdown system. Note that these requirements only apply to VOC and/or GHG components and do not apply to TAP-only components.

3.4.6 Connectors

Connectors have many different configurations. The LDAR Monitoring Contractor must be familiar with the different shapes and configurations of connectors at the Export Facility to understand where leakage could occur. The complete circumference of each interface must always be monitored. Connectors (including tubing connections) in streams containing VOCs and/or GHGs as well as TAP-only components will be monitored and inspected regardless of size.

3.4.7 Insulated Components

Insulated components are generally not accessible for monitoring using a Method 21 instrument. As such, insulated components that are inaccessible for monitoring using Method 21 (i.e., leak interface is not accessible due to insulation materials) will be monitored using an OGIC. If the OGIC indicates a leak passing through an opening in the insulation, the insulation in the vicinity of the leak will be removed, if practicable, and the underlying components monitored in an attempt to identify the leaking component. A component that has a non-leak interface penetration (e.g., valve handle) in the insulation is not required to be monitored via Method 21 at the penetration. Monitoring with a Method 21 instrument at a penetration in insulation may be done for investigative purposes.

3.5 AVO INSPECTIONS

AVO inspections involve the use of sensory methods (i.e., audio, visual, and/or olfactory) to identify a potential leak to the atmosphere. AVO inspections apply to all components subject to the LDAR Monitoring Program, even if such components are exempt from Method 21 and/or OGIC monitoring (e.g., TAP-only components). The repair requirements applicable to leaks identified during AVO inspections are discussed in Section 4. The procedure for AVO inspections and repair can be found in Appendix E.

When a leak is identified during an AVO inspection, the leak concentration may be assessed using a Method 21 instrument.

4 LEAK IDENTIFICATION AND REPAIR PROCEDURES

The procedures for leak identification and repair are outlined in this section. Work flow diagrams depicting the leak identification and repair requirements of this LDAR Monitoring Plan are provided in Appendix F.

4.1 LEAK IDENTIFICATION

Components found to be leaking will be identified as leaking via a weatherproof and readily visible leak tag (e.g., SAP Notification). The leak tag may be physically affixed to the leaking component or hung at a location in proximity to the leaking component.[19] In instances where the leak tag is not physically affixed to the leaking component, the tag and/or leak record in the database will contain information sufficient to identify the leaking component. Leak tags must include the following information: unique identification number (e.g. component LDAR ID or SAP ID); the name of the personnel who identified the leak; and, the date that the leak was identified. All tags will remain in place until, at a minimum, the information necessary to track and identify the leaking component has been entered into the LDAR Monitoring Software and/or SAP, as appropriate. See Section 4.2.4 for details on remonitoring.

The following procedures will be used to supplement the identification of leaking components through tagging. The intent of these procedures is to assist personnel with locating a leaking component for repair.

- For leaks identified through OGIC monitoring, a video and/or image of the leaking component will be captured and recorded in the LDAR Monitoring Database.
- For all leaks identified via monitoring or AVO inspections, the leak record uploaded into the LDAR Monitoring Database will include the unique component LDAR ID (if applicable) and a description of the leak location (e.g., upstream flange on the suction isolation valve of equipment ID XXX).
- Records to be maintained for all leaking components are identified in Section 6.6 of this LDAR Monitoring Plan and summarized in Appendix D.

4.2 LEAK REPAIRS

When a leak is identified, it shall be repaired according to the procedures outlined below. All repairs at the Export Facility are to be performed by maintenance personnel under the direction of the Maintenance Manager or Maintenance Supervisor. First attempts at repair may be made by other personnel.

If a repair of a leak cannot be successfully completed according to this plan, other than for safety reasons (see Section 4.2.2 for safety concerns), DECP shall submit a plan prior to extending a repair past allowed timeframes for MDE approval. The leaking component will remain on DOR until an MDE determination has been made. The submitted plan shall include the following:

i) An explanation of the technical difficulty;
ii) A timeline to successfully repair the leaking component; and
iii) A calculation on the additional VOC or GHG, for GHG-only components, that is expected to be released due to the extension beyond allowed timeframes, i.e. additional emissions from end of allowed timeframe to planned successful leak repair.

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[19] Examples of instances where a leak tag may not be physically affixed to the leaking component include, but are not limited to: the leak tag for a leaking overhead component may be affixed to the railing of the walkway beneath the component; the leak tag for a leaking component that is located behind other equipment such that hanging the tag on the leaking component would render it not "readily visible" may be hung in a nearby visible location.

4.2.1 Directed Maintenance

Maintenance personnel and the LDAR Monitoring Contractor should maintain close coordination/communication to address leaking components as soon as practicable. As required by TCEQ 28LAER, repair of leaking components in VOC and/or GHG service will be performed using directed maintenance. Directed maintenance may be employed, but is not specifically required for TAP-only components. Directed maintenance involves the use of monitoring concurrent with repair to assess the impact that the repair/maintenance activity has on leak magnitude. In this way, directed maintenance informs maintenance personnel on the actions that have the greatest impact on fugitive emissions from the leaking component such that a minimum concentration of fugitive emissions may be achieved. The assessment of repair activities performed under directed maintenance may be quantitative (e.g., using a Method 21 instrument) or qualitative (e.g., using an OGIC or Method 21 Soap Bubble Test).

4.2.2 First Attempt at Repair

The actions taken during a first attempt at repair may vary depending on the situation (type of component, location of the leak on the component, etc.). A first attempt at repair may include, but is not limited to, the following:

- Tightening the bonnet bolts;
- Replacing the bonnet bolts;
- Tightening the packing gland nuts; and,
- Injecting lubricant into the lubricating packing.

These actions are provided as guidance only. The appropriate action to be taken during a first attempt at repair will be determined by the personnel performing the repair attempt. For equipment required to remain insulated during operation for safety reasons, or other instances where first attempt at repair would cause a safety concern (e.g., the time needed to safely build scaffolding to safely access an elevated component), first attempt at repair will be postponed until it is safe to perform the first attempt at repair. The decision to postpone the first attempt at repair due to safety reasons will be documented, including the basis for such decision.

4.2.3 Repair Timeframe

When a leaking component is identified via monitoring or AVO inspection, the component shall be repaired in accordance with the timeframes outlined in this section unless it is placed on DOR pursuant to Section 4.3.

4.2.3.1 Leaks Identified via Monitoring

First attempts at repair for leaking components found by instrument monitoring should be performed no later than 5 calendar days after initial leak source identification, unless otherwise postponed as described in Section 4.2.2. If the first repair attempt is not successful, the component should be repaired within 15 calendar days after initial leak source identification unless the component has been depressurized or qualifies for placement on DOR (See Section 4.3). A repair is not considered successful until remonitoring has been performed to verify the success of the repair.

4.2.3.2 VOC Leaks Identified via AVO Inspection

For leaking components in VOC service that are identified by AVO inspection, a first attempt at repair must be performed no later than 48 hours after initial leak source identification, unless otherwise postponed as described in Section 4.2.2. If the first repair attempt is not successful, the component should be repaired within 15 calendar days after initial leak source identification unless the component has been depressurized. If a replacement part is required, the part must be ordered within 3 calendar days after initial leak identification and the leak shall be repaired within 48 hours after receiving the part, unless the component has been depressurized. The LDAR Monitoring Contractor may perform Method 21 monitoring prior to and following each repair attempt to assess the leak concentration for emissions calculation purposes and to evaluate the success of the repair attempt.

4.2.3.3 GHG-Only Leaks Identified via AVO Inspection

For leaking components in GHG-only service (non-VOC, non-TAP) that are identified by AVO inspection, a first attempt at repair must be performed no later than 5 calendar days after initial leak source identification, unless otherwise postponed as described in Section 4.2.2. If the first repair attempt is not successful, the component should be repaired within 15 calendar days after initial leak source identification unless the component has been depressurized. The component will be considered repaired only when it has been remonitored successfully.

4.2.3.4 TAP-Only Leaks Identified via AVO Inspection

For leaking components in TAP-only service (non-VOC, non-GHG) that are identified by AVO inspection, a first attempt at repair must be performed no later than 5 calendar days after initial leak source identification, unless otherwise postponed as described in Section 4.2.2. If the first repair attempt is not successful, the component should be repaired within 15 calendar days after initial leak source identification unless the component has been depressurized. A follow-up AVO inspection or Method 21 Soap Bubble Test will be performed to evaluate the success of each repair attempt.

4.2.4 Leak Repair Verification

The procedures to be followed for verifying that a leak has been repaired are outlined below. No component shall be deemed repaired until it has been remonitored or reinspected.

4.2.4.1 VOC and GHG Remonitoring

After performing a repair attempt of a VOC and/or GHG component from which a leak has been identified by means of monitoring and/or inspection, the component will be remonitored using a Method 21 instrument, an OGIC, or the Method 21 Soap Bubble Test. For leaks discovered via an AVO inspection for low vapor pressure, liquid systems (e.g., glycol), remonitoring will be conducted using a follow up AVO inspection. A leak is considered repaired when the results of remonitoring indicate that the leak has been eliminated (refer to the leak definitions in Section 2.2).

4.2.4.2 TAP-Only Reinspection

After repairing a TAP-only component from which a leak has been identified, the component will be reinspected. Either a follow-up AVO inspection or a Method 21 Soap Bubble Test will be used for reinspection. A leak is considered repaired when the results of reinspection indicate that the leak has been eliminated (refer to the leak definitions in Section 2.2).

4.3 DELAY OF REPAIR

Leaking components that cannot be repaired without a process unit/gas circuit shutdown may be placed on DOR until the next scheduled shutdown if an early shutdown would create more emissions than the repair would eliminate. A leaking component may also be placed on DOR if approved for DOR status under Section 4.2 or was determined to be a safety concern under Section 4.2.2. In the event of a safety concern, the DOR will not be extended beyond 24 months. The following process will be used to determine if a component is eligible for DOR based on emission calculations:

- Export Facility engineering personnel, the Environmental Compliance Coordinator, and/or the DECP LDAR Coordinator will coordinate with the lock-out/tag-out (LOTO) team to define the boundary of the gas circuit (i.e., the "LOTO boundary") that would need to be shutdown to repair the component being considered for DOR.
- A list of all components currently on DOR within the gas circuit will be obtained by conducting a walkthrough of the gas circuit to look for DOR tags, review of the LDAR Monitoring Database to look for DOR records, or other available methods.
- The total VOC or GHG, for GHG-only service, daily mass emission rate from the component being considered for DOR, as well as all other leaking components on DOR within the gas circuit, will be calculated using the methodologies described in Section 5. Emission rates for all components on DOR are calculated and maintained within the LDAR Software or a similar database.
- The total daily pollutant mass emission rate from all components on DOR within the gas circuit will be multiplied by the number of days until the next scheduled shutdown of the gas circuit (E_{DOR}).
- Pollutant emissions from shutdown of the gas circuit ($E_{SHUTDOWN}$) will be estimated by Export Facility engineering personnel in coordination with the LOTO team, the Environmental Compliance Coordinator, the DECP LDAR Coordinator, and the DEGIG LDAR Coordinator, as needed. $E_{SHUTDOWN}$ will be calculated taking into account control device efficiency, and emissions from subsequent clearing and startup of the gas circuit, as applicable. Emissions of nitrogen oxides (NOx) that may be generated as a result of the action (e.g., flaring of emissions during a gas circuit shutdown) may be considered during the evaluation. NOx and VOC emissions will be treated as having a one-to-one tradeoff for the purposes of this evaluation.[20]

If $E_{SHUTDOWN}$ is greater than or equal to E_{DOR}, the component may be placed on DOR. If E_{DOR} is greater than $E_{SHUTDOWN}$, DECP will either make a decision to shut down the associated gas circuit for repairs within 15 days or will notify MDE within 15 days of completing the DOR emissions calculations. During this time of MDE review, the component will be placed on DOR, pending MDE determination. DECP will coordinate with MDE to determine whether an early shutdown or other appropriate action is required, based on the severity of leaks from components on DOR awaiting shutdown of the gas circuit. If the MDE determines that an early shutdown is needed, the date for the early shutdown of the gas circuit will be established such that E^*_{DOR}[21] remains below $E_{SHUTDOWN}$, as practicable. Records of calculations of $E_{SHUTDOWN}$, E_{DOR}, and E^*_{DOR} including the basis for the calculations, any assumptions made, as well as any related communications between DECP and MDE, will be maintained.

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[20] For example, if E_{DOR} is estimated to be 10 pounds of VOC and flaring of the gas vented from the gas circuit during shutdown would result in 25 pounds of NOx emissions, there is a net environmental impact of 15 pounds of NOx associated with the shutdown. As such, the components should remain on delay of repair until the next scheduled shutdown of the gas circuit.

[21] E^*_{DOR} is the total daily mass emission rate from all components on DOR within the gas circuit multiplied by the number of days until the early scheduled shutdown of the gas circuit.

The calculations, analyses, and reporting process described above are not required if leaking components are isolated from the process and do not remain in service (depressurized). Such components may be placed on the DOR list indefinitely. Components that are depressurized to atmospheric pressure need not be purged to meet this criterion. All DOR components will be identified by tagging in the field, as described in Section 4.1, and within the LDAR Monitoring Database. Upon repressurization of the system, the leaking component will be remonitored within 15 days to confirm leak(s) have been repaired.

Emissions from shutdown of certain gas circuits may be routed to a flare, which will reduce VOC and increase GHG due to the CO_2 generated from the combustion process. As such, in some instances $E_{SHUTDOWN}$ may be higher than E_{DOR} for GHG while the opposite may be true for VOC. Thus, in performing the analysis described in this section, the following approach will be employed depending on the composition of the process stream:

- Components in VOC and GHG service – The analysis will be completed for VOC only.
- Components in VOC-only service – The analysis will be completed for VOC only.
- Components in GHG-only service – The analysis will be completed for GHG only. GHG mass emissions will be converted to a CO_2 equivalent basis for comparison of $E_{SHUTDOWN}$ to E_{DOR}.
- Components in TAP-only service – The analysis will be completed for TAPs only.

Given that emissions from TAP-only components are not quantified as a part of the LDAR Monitoring Program, the evaluation of $E_{SHUTDOWN}$ and E_{DOR} will be performed qualitatively using engineering judgement for components in TAP-only service.

In addition to the above, leaking component repairs not covered for requiring parts under Section 4.2.3.2 may be placed on DOR for a period of up to one year due to requiring replacement parts or specialty equipment or services. The leaking component must be repaired within 7 days of receiving the required parts or specialty equipment or services unless otherwise eligible for DOR status under other aspects of the LDAR Monitoring Program.

5.1 EMISSION CALCULATION REQUIREMENTS

Fugitive emissions of VOC and GHG from components subject to the LDAR Monitoring Program will be estimated to satisfy the following requirements:

- Assess when an early process unit shutdown may be required based on total emissions from all components on the DOR list within the process unit exceeding emissions from early shutdown of the process unit (see Section 4.3).
- Maintain a 12-month rolling sum of VOC and GHG emissions from components subject to the LDAR Monitoring Program for comparison to the applicable emission limits (CPCN Conditions A-III-4, A-IX-2, and A-IX-3, PTO conditions B(4)).

Procedures to be used to satisfy these requirements are outlined below. Note that emissions estimates for TAP-only components are not required under the LDAR Monitoring Program.

Pursuant to TCEQ guidance, components in liquid service where the liquid has an aggregate VOC partial pressure of less than 0.002 psia at 68 °F are expected to have such low emissions that emissions quantification is not required.[22, 23] Such components are exempt from the emissions quantification requirements of this LDAR Monitoring Plan and may be placed on DOR as necessary without emissions quantification. These components will be designated as exempt from emissions quantification requirements in the LDAR Monitoring Database based on the process stream assignment. These components are also exempt from Method 21 and/or OGI monitoring per TCEQ 28LAER.

5.2 EMISSION CALCULATION METHODOLOGIES

CPCN Condition A-IX-5 stipulates that emissions from component leaks will be calculated based on the results of gas analyzer monitoring and through the use of emission factors in Table 2-4 of the EPA document entitled "Protocol for Equipment Leak Emission Estimates" ("EPA Protocol", EPA-453/R-95-017). The calculation methodologies from the EPA Protocol to be used under the LDAR Monitoring Program include:

- **EPA Correlation Equations:** The Petroleum Industry Leak Rate/Screening Value Correlations (Correlation Equations) from Table 2-10 of the EPA Protocol will be used to estimate the mass emission rate from individual components based on component type and the concentration of emissions measured via a Method 21 instrument. The use of the Correlation Equations is the preferred approach and will be used to estimate fugitive emissions of VOC and GHG under this LDAR Monitoring Program, except as follows:
  - When the Method 21 instrument reading is zero (i.e. Zero Leak Factors).
  - When the Method 21 instrument reading is "pegged" (e.g., ≥100,000 ppmv).
  - When a component is not monitored using a Method 21 instrument.

The methodologies to be used under these scenarios are outlined below.

[22] Air Permit Technical Guidance for Chemical Sources: Fugitive Guidance, TCEQ (APDG 6422v1, Revised 12/17)

[23] An example of components taking this exemption includes, but is not limited to, components in water/glycol service, where the aggregate VOC partial pressure is approximately 0.0004 psia at 68°F.

- **Average Emission Factors:** The Oil and Gas Average Emission Factors (O&G Avg. EFs) from Table 2-4 of the EPA Protocol can be used to estimate the mass emission rate from a population of components based on component type and service type. No monitoring data is required to estimate emissions using this approach. This approach will be used to estimate emissions from components that are not monitored using a Method 21 instrument.

- **Pegged Emission Factors:** The 100,000 ppmv Screening Value Pegged Emission Rates for the Petroleum Industry (Pegged Emission Factors) from Table 2-14 of the EPA Protocol are used to estimate the mass emission rate from components where the Method 21 instrument reading is "pegged". The 100,000 ppmv Pegged Emission Factors should be used to estimate emissions where the Method 21 instrument reading is above the upper range of the Method 21 instrument where it can still meet the detection resolution required by Method 21. For example, the Bascom-Turner Gas Rover meter can measure the VOC concentration up to 40,000 ppmv, at which time the resolution decreases to greater than 2.5% of the leak definition. Therefore, above 40,000 ppmv, the 100,000 ppmv Screening Value Pegged Emission Rate are used for measurements using the Bascom-Turner Gas Rover meter.

- **Zero-Leak Factors:** The Default-Zero Values: Petroleum Industry (Zero-Leak Factors) from Table 2-12 of the EPA Protocol are used to estimate the mass emission rate from components where the concentration measured using a Method 21 instrument is zero. The Zero-Leak Factors may only be used when the minimum detection limit of the Method 21 instrument is less than or equal to one ppmv. If the minimum detection limit of the Method 21 instrument is greater than one ppmv, emissions will be estimated using the Correlation Equations and a concentration equal to one half of the Method 21 instrument minimum detection limit.

The Correlation Equations, Average Emission Factors, Pegged Emission Factors, and Zero-Leak Factors are provided in Appendix C.

The LDAR Monitoring Program at the Export Facility will utilize periodic OGIC monitoring accompanied by annual Method 21 monitoring as required by the AWP. The CPCN requires monthly VOC and GHG emission calculations. The specific emission calculation approach used to estimate VOC and GHG emissions from components will depend on the methods used for component monitoring and the results of such monitoring as outlined in Table 5.2-1.

Table 5.2-1. Calculation Approach Summary for Components in VOC and/or GHG Service

Monitoring Result	Calculation Approach	Duration of Emissions
Non-Leaking	• Utilize O&G Avg. EFs and the TCEQ 28LAER control efficiencies until a Method 21 instrument reading is collected (e.g., during annual Method 21 monitoring, if applicable). • Once a Method 21 instrument reading is collected for a component, use the Correlation Equations or Factors, as applicable, to estimate emissions from the component.	• Assume that emissions have occurred at the calculated rate since the last monitoring event. • Once a Method 21 instrument reading is collected for the component, the rate calculated using the Correlation Equations or Zero-Leak Factors will be used until such time that a leak is identified from the component or the next annual Method 21 monitoring event, whichever comes first.
Leaking	• Emissions from leaking components identified during OGIC monitoring or AVO inspections may be monitored with a Method 21 instrument. Emissions would then be estimated using the Correlation Equations or Pegged Emission Factors, as applicable. • Emissions from leaking components identified during annual Method 21 monitoring will be estimated using the Correlation Equations or Pegged Emission Factors, as applicable. • Emissions from leaking components that are not monitored using a Method 21 instrument (e.g., components in CO_2 service) will be estimated using the O&G Avg. EFs and the TCEQ 28LAER control efficiencies.[3]	• Per TCEQ policy[1] assume that emissions have occurred at the calculated rate since the midpoint between the last monitoring event and the current monitoring event and until the time the component is remonitored to verify successful repair. A necessary outcome from applying this TCEQ policy and the CPCN requirement to calculate fugitive emissions on a monthly basis is that emission calculations are subject to change based on the results of future monitoring events.[2] Past emissions calculated from a leak will be attributed to the facility wide rolling emissions on the day the leak was found. Previous monthly facility totals will not be updated with past emissions.

Note:
[1] *Technical Supplement 3: Fugitive Emissions from Piping Components*, TCEQ Publication RG-360/17, January 2018 Revision.
[2] As an example, assume that a component is monitored during a bi-monthly monitoring event and no leaks are observed. At the end of the month (Month 1), emissions from the component would be estimated based on the daily emission rate (calculated using the "non-leaking" calculation approach described above) and the number of days during the month since the monitoring event. The same calculation would be performed in the following month (Month 2). Assume that the same component is found to be leaking during the next bi-monthly monitoring event (e.g., 60 days from the previous monitoring event). The Export Facility would estimate emissions from the component using the daily emission rate (calculated using the "leaking" calculation approach described above) and assuming a leak duration from the mid-point between the current monitoring event and the previous monitoring event (30 days) to the date that the repair is made and component remonitored (e.g., 15 days from leak identification). Thus, emissions from the component calculated for Month 2 would change.
[3] If a component is found to be leaking and is placed on DOR, the TCEQ 28LAER control efficiencies will not be applied.

5.3 LDAR MONITORING PROGRAM CONTROL EFFICIENCIES

The O&G Avg. EFs are used to estimate "uncontrolled emissions", or emissions from a population of components without LDAR requirements. TCEQ has developed control efficiencies that can be applied to emissions estimated using the O&G Avg. EFs for the purposes of estimating emissions from a population of components subject to LDAR in accordance with TCEQ 28LAER. The use of the TCEQ 28 LAER control efficiencies is subject to the following limitations:

- Control efficiencies will only be used when the O&G Avg. EFs are used to estimate uncontrolled emissions. The use of control efficiencies does not apply to emission estimates performed using the Correlation Equations, Pegged Emission Factors, or Zero-Leak Factors.
- Control efficiencies will not be applied to unmonitored components, except that 100% control efficiencies may be assumed for the following component types that are exempt from monitoring based on applicable design requirements as outlined in Table 2.5-1[24].
    - Relief valves that are routed to a properly operating control device, or equipped with a rupture disc and pressure sensing device (between the valve and the disc) to monitor for disc integrity;
    - Pumps that are designed to be leakless, such as canned pumps, magnetic drive pumps, diaphragm-type pumps, pumps with double mechanical seals and the use of a barrier fluid at a higher pressure than the process fluid pressure, or pumps with double mechanical seals and that vent the barrier fluid seal pot to a control device;
    - Valves that are: bellows valves with bellows welded to both the bonnet and stem, diaphragm-type valves, or seal-welded, magnetically actuated, packless, hermetically sealed control valves;
    - Connections that are welded together around their circumference so that the flanges cannot be unbolted; and
    - Compressors designed with enclosed distance pieces and if the crankcase vents to a control device.
- A 75% control efficiency may be applied for components that are designated as DTM as long as those components are monitored using Method 21 at least once per 12-month period and repaired if found to be leaking, as required by this LDAR Monitoring Plan.[25]
- Control efficiencies will not be applied to components placed on the DOR list or components designated as UTM, as such components are not subject to routine monitoring and repair. The incidental monitoring or inspection of a UTM component (OGIC monitoring or AVO inspections) does not qualify for the application of a control efficiency insofar as the components are unsafe to access for repair.

The TCEQ 28LAER control efficiencies are included in Appendix C of this LDAR Monitoring Plan.

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[24] TCEQ Technical Supplement 3: Fugitive Emissions from piping Components, TCEQ Publication RG-360/17, January 2018 Revision

[25] Reference – Air Permit Technical Guidance for Chemical Sources Fugitive Guidance, Air Permits Division Texas Commission on Environmental Quality (TCEQ (APDG 6422v1, Revised December 2017)

5.4 CORRECTIONS BASED ON STREAM COMPOSITION

Data corrections that are applied during the emissions calculation process are outlined in this section.

5.4.1 Response Factor Correction

A response factor is the ratio of the actual concentration of a VOC to the concentration reading of a Method 21 instrument calibrated with methane. The response factor of the instrument for specific VOCs will be determined pursuant to the requirements of Method 21. If a mixture of VOCs is being monitored, the response factor of the mixture will be calculated for the average composition of the process fluid. A calculated average response factor of the mixture is not required when all of the compounds in the mixture have a response factor less than 10 using methane. Calculation of average response factors of mixtures is further discussed in Appendix B.

Response factors may be obtained for specific gases and Method 21 instrument types from reference sources, instrument manufacturers, or via the performance of reference factor tests. In accordance with the EPA Protocol, if the response factor of a mixture of gases is below three (3) at 500 ppmv and 10,000 ppmv, the response factors need not be applied unless otherwise desired. If the response factor is above three (3) at either 500 ppmv or 10,000 ppmv, the Method 21 instrument reading should be adjusted using the response factor prior to using the concentration in the Correlation Equations. A response factor curve may be used to account for variability across a range of gas concentrations.

5.4.2 Normalizing Stream Compositions

The O&G Avg. EFs provide estimates of total leak emission rates. In this case, average total organic compound (TOC) emission rates can be calculated using the weight fraction of TOC in the streams, using the following equation:

$$E_{TOC} = F_A \times WF_{TOC}$$

E_{TOC} = Emission rate of TOC from all equipment in the stream of a given equipment type (kg/hr);
F_A = Applicable O&G Avg. EFs for the equipment type (kg/hr/source)
WF_{TOC} = Average Weight Fraction of TOC in the stream

Correlation Equations, Pegged Emission Factors, and Zero-Leak Factors all provide estimates of TOC emission rates.

To estimate VOC and GHG emissions using the calculated TOC emission rate, the process stream composition information must be normalized to remove any non-TOC chemicals (e.g., nitrogen, water, etc.). The example provided in Table 5.4-1 illustrates the stream normalization process.

Table 5.4-1. Example Normalized Stream Composition

Total Stream Composition		TOC Constituents		Normalized TOC Stream	
Propane	30%	Propane	30%	Propane	31.58%
Methane	50%	Methane	50%	Methane	52.63%
Butane	15%	Butane	15%	Butane	15.79%
Carbon Dioxide	5%				
Total =	100%	Total =	95%	Total =	100%
Example Calculation: Propane = 30% * 100%/95% = 31.58%					

Once the stream has been normalized, the normalized individual VOC component concentrations are summed and multiplied by the estimated TOC emission rate to estimate the VOC emission rate. Similarly, the methane emission rate is estimated by multiplying the normalized methane concentration by the TOC emission rate.

In cases where the process stream contains very little hydrocarbon, this normalization process may result in an overestimate of emissions. Engineering judgement will be used to identify process streams that need not be normalized.

5.4.3 Estimating CO_2 Emissions

CO_2 emissions are not accounted for in the TOC emission estimates produced using the O&G Avg. EFs, Correlation Equations, Pegged Emission Factors, and Zero-Leak Factors. As such, CO_2 emissions will need to be calculated in accordance with the following equation:

$$CO_2\ emissions = TOC\ ER * \frac{CO_2\ concentration}{TOC\ concentration}$$

Where:

- TOC ER is the TOC emission rate estimated using the O&G Avg. EFs, Correlation Equations, Pegged Emission Factors, or Zero-Leak Factors, as applicable.
- The CO_2 concentration is the concentration, by weight, of CO_2 in the process stream (5% in the example provided in Table 5.4-1).
- The TOC concentration is the sum of the concentrations, by weight, of all constituents in the process stream that are considered organic compounds (95% in the example provided in Table 5.4-1).

This approach does not apply in streams containing no organic compounds as the denominator in the above equation would be zero. In such cases, the O&G Avg. EFs may be assumed to represent the total leak rate, with CO_2 emissions estimated by multiplying the total leak rate by the concentration, by weight, of CO_2 in the process stream.

6.1 QUALITY ASSURANCE (QA)/QUALITY CONTROL (QC)

The Quality Assurance (QA)/Quality Control (QC) procedures employed by the Export Facility may include the following:

- The development of and adherence to this written LDAR Monitoring Plan (Note: revisions are documented in Appendix G);
- Training of affected/involved personnel as described in Section 6.2 (this is considered a best management practice, not a requirement, as it is not required under TCEQ 28LAER);
- Periodic third-party or internal assessments/audits of the LDAR Monitoring Plan as described in Section 6.4 (this is considered a best management practice, not a requirement, as it is not required under TCEQ 28LAER).

6.2 TRAINING

Two types of training may be performed at or provided by the Export Facility, as described below. This training may be classroom, online, or self-study training.

- General training to inform all personnel who may have an impact on or be affected by the LDAR Monitoring Plan of the general requirements contained therein.
- More detailed training for those personnel actually performing the day-to-day operations of the LDAR Monitoring Plan, including: LDAR contractors, maintenance personnel responsible for compliance with leak repair requirements, environmental staff responsible for oversight, and others, as necessary, based on job responsibilities.

Impacted personnel may be assigned the required training in DECP's Learning Management System (LMS) upon employment or a change in job requiring LDAR training. Note that the training requirements of this LDAR Monitoring Plan are considered a Best Management Practice and are not a regulatory requirement.

6.3 MANAGEMENT OF CHANGE

Management of Change (MOC) at the Export Facility in the context of this LDAR Monitoring Plan involves the updating of this document and ancillary information, such as component inventories, calculation procedures, stream compositions, etc. as changes occur at the Export Facility. The Export Facility will utilize the MOC process in line with standard company procedures. These procedures apply to equipment added or removed from service and the LDAR Monitoring Plan. The specific form includes line items related to additions, deletions, and other changes made to equipment in the LDAR Monitoring Plan. All changes will be evaluated for impacts to the LDAR Monitoring Plan and must be approved by the DECP LDAR Coordinator, Senior Environmental Compliance Coordinator, Director, LNG Operations, and/or other appropriate DECP personnel.

With reference to new and reworked piping connections, TCEQ 28LAER prescribes that gas or hydraulic testing of the new and reworked piping connections at no less than operating pressure shall be performed prior to initiating or returning the components to service or they shall be monitored for leaks using an approved gas analyzer within 15 days of the components being initiated or returned to service. Adjustments shall be made as necessary to obtain leak-free performance.

There are cases where initial monitoring is required for existing components that have a change of service and are now required to be monitored as per the applicable frequency. These components will typically be associated with a specific portion of a process line or plant. For implementing this LDAR Monitoring Plan, a monitoring team will typically work its way through the various sections of the plant by adhering to a schedule that will ensure that every component is monitored as per applicable frequency. It is conceivable that a component will re-enter service after the monitoring team has departed that portion of the plant. In this particular case, it is acceptable that this particular component is not monitored until the monitoring team is scheduled to monitor that portion of the plant again, as long as it is monitored within the next cycle of monitoring, as per applicable frequency.[26]

6.4 LDAR AUDITS

The scope of the LDAR Monitoring Plan assessments/audits at the Export Facility may include, but is not limited to the following:

- Reviewing whether any pieces of equipment that are required to be in the LDAR Monitoring Plan are not included;
- Observing Method 21 instrument calibration and monitoring techniques;
- Observing OGIC daily instrument checks and monitoring techniques;
- Verifying that equipment was monitored at the appropriate frequency, including normal, inaccessible, DTM, and UTM components;
- Analyzing monitoring data and equipment counts (e.g., number of pieces of equipment monitored per day, time between monitoring events) for feasibility and unusual trends;
- Ensuring that repairs have been performed within the required time periods;
- Verifying that proper documentation and sign-offs have been recorded for equipment placed on the DOR list;
- Reviewing the Export Facility's MOC procedures to ensure that LDAR components are being added, deleted, or changed appropriately;
- Verifying that proper calibration records and monitoring instrument maintenance information are maintained;
- Evaluating LDAR Monitoring Plan equipment, software, training records, and workspace resources; and
- Verifying that other LDAR Monitoring Plan records are maintained, as required.

As previously mentioned, assessments/audits of the LDAR Monitoring program are considered a BMP as they are not specifically required by any applicable regulation.

6.5 ELECTRONIC MONITORING AND STORAGE OF DATA

The Export Facility will maintain LDAR monitoring software for collection, management, storage, analysis, and reporting of the LDAR data.

6.6 RECORDKEEPING

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[26] Reference – Air Permit Technical Guidance for Chemical Sources Fugitive Guidance, Air Permits Division Texas Commission on Environmental Quality (TCEQ (APDG 6422v1, Revised December 2017)

Records of instrument monitoring will indicate dates, times, name of the person conducting the monitoring, the monitoring and inspection methods employed, and instrument readings. The instrument monitoring record will include the time that monitoring took place for no less than 95% of the instrument readings recorded[27]. OGIC video records, including each daily instrument check, must be kept for five years. Records of AVO inspections shall be noted in the operator's log or an equivalent hardcopy or electronic form and shall be maintained for at least five years. Records of calibration, instrument performance, response factors, and maintenance, as applicable, will be maintained by the LDAR Monitoring Contractor for at least five years. Examples of the types of information that will be recorded are provided in Appendix D.

For any leaks identified during monitoring, the following information will be recorded in the LDAR software by the LDAR Monitoring Contractor for not less than five years from the date of their occurrence:

- The instrument and the component identification numbers and the operator name, initials, or identification number. The SAP notification number should also be recorded, if available.
- If using a Method 21 instrument, the maximum instrument reading.
- The date the leak source was detected and the date of the first attempt to repair. A first attempt is required within 5 days of leaks source identification for all leaks identified by monitoring, for TAP-only and GHG-only leak sources identified via AVO inspection, and 48 hours of leak source identification for a VOC leak identified by AVO inspection.
- If a decision is taken to postpone the first attempt at repair due to safety reasons, the decision will be documented, including the basis for the decision.
- The date of successful repair of the leak.
- Results of remonitoring after the component is successfully repaired or when determined to be non-repairable.
- Indication if the component is given the status of "repair delayed" and the reason for the delay if a leak is not repaired within 15 calendar days after discovery of the leak source. This may be recorded in a DOR list outside of the LDAR software.

Records of repairs shall include date of repairs, repair results, justification for delay of repairs, and corrective actions taken for components. All component repair records are managed in SAP and electronic records are maintained to demonstrate compliance.

6.7 REPORTING

The Export Facility will incorporate component fugitive emissions data calculated pursuant to this LDAR Monitoring Plan in its rolling 12-month emission calculations and will report this data in quarterly reports to the MDE, as required under the CPCN and PTO. The rolling 12-month emission calculations are compared to Project-wide GHG and VOC limits in CPCN Condition A-III-4. The CPCN does not contain emission limits specific to component fugitive emissions.

A record will be developed by the 15th of each month showing the monthly mass emissions of VOCs and GHGs from fugitive emissions during the prior monthly period. The record will be generated using data from the LDAR monitoring software and validated by the LDAR Monitoring Contractor.

[27] Reference: TCEQ 28 LAER, Section 1.I.

Starting in 2019, by April 1st of each year DECP shall notify the MDE of any updates to or deviations from this LDAR Monitoring Plan occurring during the previous calendar year unless an alternative reporting schedule is approved by MDE.

6.8 MONITORING PLAN REVISIONS LOG

A log to track all revisions made to this LDAR Monitoring Plan is provided in Appendix G. The controlled copy of this LDAR Monitoring Plan will be managed by the DECP LDAR Coordinator in accordance with the Export Facility's document control procedures. All hardcopies of the LDAR Monitoring Plan are considered uncontrolled. Records and logs may be maintained in hardcopy or electronic form.

As mentioned in Section 6.7, DECP must notify the MDE of any updates to this LDAR Monitoring Plan on an annual basis starting in 2019. This LDAR Monitoring Plan, and any subsequent revisions, are considered final and effective on the date of issuance. DECP will issue revisions to the LDAR Monitoring Plan, incorporating changes requested by MDE, within 90 days of receiving a request for changes.

DEFINITIONS

LDAR Definitions Notes:

- Definitions are taken verbatim from the referenced regulation, unless specified otherwise.
- If a definition varies between or among the different applicable LDAR regulations, each regulatory definition is provided. When definitions are the same in different regulations, each regulation utilizing that definition is referenced in the table.
- Not all potentially applicable definitions are included.
- Regulations identified in the table are the *source* of the definition, which may not be the only regulation for which the definition is applicable.
- Definitions are provided for reference only. Inclusion of a definition herein does not necessarily suggest applicability of the referenced regulation(s).

Legend:

Regulatory Source Definition Legend	
TCEQ	Texas Administrative Code Chapter 115
28LAER	TCEQ's 28LAER Control Efficiencies for TCEQ Leak Detection and Repair Programs
VV	40 CFR Part 60, Subpart VV
KKK	40 CFR Part 60, Subpart KKK
COMAR	Code of Maryland Regulations 26.11.19.16
M21	EPA Method 21 of Appendix A
NA	Non-Regulatory Definition
GHG	Title 40, Chapter I, Subchapter C, Part 98

Term	Definition	Regulatory Source of Definition
Audio, visual, olfactory (AVO)	A method of sensory leak detection that anyone can use to detect the presence of a leak based on sight, sound, and/or smell.	NA
Calibration Drift	The difference in the reading from the initial calibration response to a calibration value after a period of operation during which no maintenance, repair, or adjustment took place (i.e., shift in the instrument's reference point).	NA
Calibration Gas	The VOC compound used to adjust the instrument meter reading to a known value. The calibration gas is usually the reference compound at a known concentration approximately equal to the leak definition concentration.	M21
Calibration Precision	The degree of agreement between measurements of the same known value, expressed as the relative percentage of the average difference between the meter readings and the known concentration to the known concentration.	M21
Connector	A flanged, screwed, or other joined fitting used to connect two pipe lines or a pipe line and a piece of equipment. The term connector does not include joined fittings welded completely around the circumference of the interface. A union connecting two pipes is considered to be one connector.	TCEQ
Component	Equipment which has the potential to leak volatile organic compounds (VOCs), including process equipment, storage tanks, pumps, compressors, valves, flanges and other pipeline fittings, pressure relief valves, process drains, and open-ended pipes.	COMAR
Delay of Repair (DOR)	This targets equipment for which leaks have been identified but cannot be repaired within the 15-day requirement because the repair would require shutting down a process unit or causing an increase in emissions during the repair. Any equipment that is placed on DOR generally must be repaired by the end of the next process unit shutdown in which the leak is located.	NA
Difficult-to-monitor (DTM)	DTM is a component that cannot be inspected without elevating the monitoring personnel more than two meters above a permanent support surface or that requires a permit for confined space entry.	TCEQ
Distance piece	An open or enclosed casing through which the piston rod travels, separating the compressor cylinder from the crankcase.	VV
Double block and bleed system	Two block valves connected in series with a bleed valve or line that can vent the line between the two block valves.	VV
Equipment	Each pump, pressure relief device, open-ended valve or line, valve, agitator, compressor, and flange or other connector.	28LAER
First attempt at repair	To take action for the purpose of stopping or reducing leakage of organic material to the atmosphere using best practices.	VV
Flame Ionization Detector	A flame ionization detector (FID) is a scientific instrument that measures the concentration of organic species in a gas stream using a hydrogen-air flame.	NA

Term	Definition	Regulatory Source of Definition
Fugitive Emissions	Fugitive emissions means those emissions that could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening.	COMAR
Greenhouse Gas	Means carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and other fluorinated greenhouse gases.	GHG
Heavy Liquid	Volatile organic compounds that have a true vapor pressure equal to or less than 0.044 pounds per square inch absolute (0.3 kilopascal) at 68 °F (20 degrees Celsius).	TCEQ
Hydrocarbon	A compound of hydrogen and carbon, such as any of those that are the chief components of petroleum and natural gas.	NA
In vacuum service	Equipment's operating pressure is at least 5 kilopascals (0.725 psi) below ambient pressure.	28LAER
Leak	An unintended liquid or vapor release of VOC from a component into the ambient air or into a building.	COMAR
Leak definition concentration	The local VOC concentration at the surface of a leak source that indicates that a VOC emission (leak) is present. The leak definition is an instrument meter reading based on a reference compound.	M21
Light Liquids	Volatile organic compounds that have a true vapor pressure greater than 0.044 pounds per square inch absolute (0.3 kilopascal) at 68 degrees Fahrenheit (20 degrees Celsius), and are a liquid at operating conditions.	TCEQ
Liquids dripping	Any visible leakage from the seal including spraying, misting, clouding, and ice formation	VV
Management of Change (MOC)	A procedure used to provide the process for initiating, reviewing, and approving proposed changes within the Export Facility. The procedure is a requirement for covered processes under OSHA 1910.119 and within the Process Safety Code of Responsible Care. This procedure applies to all covered changes that may affect the safety of the community or Export Facility personnel, compliance with laws and regulations, or the quality of the product. It is designed to "manage" the change process and to ensure the impact of a change is properly reviewed and approved before the change is implemented.	NA
National Enforcement Investigation Center (NEIC)	The only environmental forensic center accredited for environmental data measurement activities. The Center has a unique role in conducting complex criminal and civil enforcement investigations and applied research and development to support science for enforcement. (http://www.epa.gov/compliance/neic/index.html)	NA
Natural gas liquids	The hydrocarbons, such as ethane, propane, butane, and pentane, that are extracted from field gas.	KKK
Natural gas processing Facility (gas plant)	Any processing site engaged in the extraction of natural gas liquids from field gas, fractionation of mixed natural gas liquids to natural gas products, or both.	KKK
Open-ended valve or line	Any valve, except safety relief valves, having one side of the valve seat in contact with process fluid and one side open to the atmosphere, either directly or through open piping.	VV
Percent Leaking	The percentage of any given equipment type that is found to be leaking according to the leak definition of the applicable regulation. Some regulations allow the frequency of monitoring to vary based on percent leaking performance. For actual calculation, see the TCEQ 28LAER permit.	NA

Term	Definition	Regulatory Source of Definition
Pressure release	The emission of materials resulting from system pressure being greater than set pressure of the pressure relief device.	VV
Process improvement	The smallest set of process equipment that can operate independently and includes all operations necessary to achieve its process objective.	VV
Process unit	Equipment assembled for the extraction of natural gas liquids from field gas, the fractionation of the liquids into natural gas products, or other operations associated with the processing of natural gas products. A process unit can operate independently if supplied with sufficient feed or raw materials and sufficient storage facilities for the products.	TCEQ
Process unit shutdown	Shutdown or turnaround- For the purposes of this chapter, a work practice or operational procedure that stops production from a process unit or part of a unit during which time it is technically feasible to clear process material from a process unit or part of a unit consistent with safety constraints, and repairs can be accomplished. The term shutdown or turnaround does not include a work practice that would stop production from a process unit or part of a unit: for less than 24 hours; or for a shorter period of time than would be required to clear the process unit or part of the unit and start up the unit. Operation of a process unit or part of a unit in recycle mode (i.e., process material is circulated, but production does not occur) is not considered shutdown.	TCEQ
Quality assurance/quality control (QA/QC)	Those activities you undertake to demonstrate the accuracy (how close to the real result you are) and precision (how reproducible your results are) of your monitoring. Quality Assurance (QA) generally refers to a broad plan for maintaining quality in all aspects of a program. Quality Control (QC) consists of the steps you will take to determine the validity of specific monitoring procedures.	NA
Quarter	A 3-month period with the first month being of the calendar quarter.	NA
Reciprocating compressor	A piece of equipment that increases the pressure of a process gas by positive displacement, employing linear movement of the driveshaft.	KKK
Reference compound	The VOC species selected as the instrument calibration basis for specification of the leak definition concentration. For the TCEQ 28LAER permit, a leak definition concentration is 500 ppm as methane, so that any source emission that results in a local concentration that yields a meter reading of 500 or greater on an instrument meter calibrated with methane would be classified as a leak. The leak definition concentration is 500 ppm and the reference compound is methane.	M21
Repaired	For the purposes of this subpart, equipment is adjusted, or otherwise altered, in order to eliminate a leak as defined in the applicable sections of this subpart and, except for leaks identified in accordance with 40 CFR §§60.482-2(b)(2)(ii) and (d)(6)(ii) and (iii), 60.482-3(f), and 60.48210(f)(1)(ii), is re-monitored as specified in 40 CFR §60.485(b) to verify that emissions from the equipment are below the applicable leak definition.	VV
Replacement cost	The capital needed to purchase all the depreciable components in a Facility.	VV

Term	Definition	Regulatory Source of Definition
Response factor (RF)	The ratio of the known concentration of a VOC compound to the observed meter reading when measured using an instrument calibrated with the reference compound specified in the applicable regulation.	M21
Response time	The time interval from a step change in VOC concentration at the input of the sampling system to the time at which 90 percent of the corresponding final value is reached as displayed on the instrument readout meter.	M21
Rupture Disk	A diaphragm held between flanges for the purpose of isolating a volatile organic compound from the atmosphere or from a downstream pressure relief valve.	TCEQ
Sampling connection system	An assembly of equipment within a process unit used during periods of representative operation to take samples of the process fluid. Equipment used to take non-routine grab samples is not considered a sampling connection system.	VV
Sensor	A device that measures a physical quantity or the change in a physical quantity such as temperature, pressure, flow rate, pH, or liquid level.	VV
Title V permit	Any permit issued, renewed, or revised pursuant to Federal or State regulations established to implement title V of the Act (42 U.S.C. 7661). A title V permit issued by a State permitting authority is called a part 70 permit in this part.	A
Unsafe-to-monitor (UTM)	Classification determined by the owner or operator for certain equipment because monitoring personnel would be exposed to an immediate danger as a consequence of complying with the applicable LDAR monitoring, inspection, and/or repair requirements.	VV
Volatile organic compound (VOC)	For the purposes of this subpart, any reactive organic compounds as defined in 40 CFR §60.2 Definitions, and further clarified in 40 CFR §51.100(s).	EPA/VV

APPENDIX A: OGIC REFERENCE INFORMATION AND DOCUMENTS

Daily Instrument Check Procedure

1. An OGIC performance check will be performed on a daily basis prior to OGIC monitoring surveys, and at other times as needed, in accordance with the following procedure.

2. Start the OGIC according to the manufacturer's instructions, ensuring that all appropriate settings conform to the manufacturer's instructions.

3. After the OGIC start-up process is completed and the OGIC is set to the intended settings, view the viewfinder to ensure that the image is clear. If the image is unclear or grainy, follow proper lens cleaning procedure from the manufacturer, if necessary.

4. Calculate the mass flow rate to be used in the daily instrument check by the following method:
    a. Determine the piece of equipment in contact with the lowest mass fraction of detectable chemicals, within the distance at or below the standard detection sensitivity level.
    b. Multiply the standard detection sensitivity level by the mass fraction of chemicals from the stream to determine the mass flow rate to be used in the daily instrument check using the following equation:

    $$E_{DIC} = (E_{SDS}) \cdot \Sigma(X)$$

    Where:

    E_{DIC} = Mass flow rate for the daily instrument check (grams per hour)
    E_{SDS} = Standard detection sensitivity level from Table 1 to Subpart A, (grams per hour)
    X = Mass fraction of detectable chemical(s) seen by the optical gas imaging instrument, within the operating distance at or below the E_{SDS}.
    c. To determine the daily instrument check mass flow rate for streams with multiple constituents, refer to the memo at the end of this appendix (Appendix A).

5. Prior to the beginning of the monitoring survey, test the OGIC as follows:
    a. As a best management practice, the technician may choose to record ambient air temperature as measured from an onsite temperature gauge or local weather station.
    b. As a best management practice, the technician may choose to record average, estimated local wind speed or the recorded average wind speed from an onsite or local weather station.
    c. Install a regulator on a gas cylinder containing a gas that is visible by the OGIC (e.g., methane or CO2). The regulator flow rate and gas cylinder composition shall be selected to represent the process stream(s) to be surveyed on that day. Place the cylinder in the area where the OGIC monitoring survey will take place or where similar environmental (wind, rain, etc.) conditions exist. If the wind speed increases during the monitoring survey, repeat the OGIC daily verification check.
    d. Set up the OGIC at a distance (D_{max}) from the outlet of the cylinder regulator that is less than or equal to the actual distance between the OGIC and the components that will be encountered during the monitoring survey. Refer to the defined observation path for assistance determining D_{max}.

e. Open the valve on the regulator and set the flow rate to the flow calculated in Step 3 while observing the gas flow through the OGIC instrument viewfinder. When an image of the emission is seen through the viewfinder for a minimum duration of 10 seconds, the OGIC daily verification check is complete.

TORA CONSULTING

Confidential Memorandum

Date:	16 August 2018
To:	Matthew Ballantine – Dominion Energy Cove Point (DECP)
From:	Brandon Mogan, PE – Tora Consulting LLC
Subject:	Determining the Mass Flow Rate for Daily Instrumentation Check

BACKGROUND

Dominion Energy Cove Point (DECP) is using the Alternative Work Practice (AWP) for leak monitoring at the liquefaction facility. At a selected detection sensitivity level of 60 grams per hour, the AWP requires bi-monthly monitoring using an optical gas imaging camera (OGIC). Prior to each monitoring day when the OGIC is used, monitoring personnel must perform a daily instrument check following the procedure in Appendix A of the Leak Detection and Repair (LDAR) Monitoring Plan. During the daily instrument check, personnel use the OGIC to observe gas being emitted from a pressurized gas cylinder at a mass flow rate equal to or less than the rate calculated using the procedures in 40 CFR §60.18(i)(2)(i), which are incorporated into Appendix A of the LDAR Monitoring Plan.

The purpose of this memorandum is to document the mass flow rates from gas cylinders of varying composition and equipped with varying flow regulators.

DETERMINATION OF MASS FLOW RATE FOR DAILY INSTRUMENT CHECKS

The mass flow rate emitted from a gas cylinder equipped with a flow regulator can be calculated using the ideal gas law (Equation 1).

$$P \times V = \frac{mass}{MW} \times R \times T \qquad \text{(Equation1)}$$

Where,

P =	Pressure (atm)
V =	Volume (l)
mass =	mass of CH_4 (g)
MW =	Molecular weight of CH4 (g/mol).
R =	Gas Constant $\left(\frac{atm \times l}{mol \times K}\right)$
T =	Temperature (K)

Dividing Equation 1 by time (t), gives:

$$P \times Q = \frac{M}{MW} \times R \times T \qquad \text{(Equation 2)}$$

Where,

Q =	Volumetric Flow Rate (l/hr)
M =	Mass Flow Rate (g/hr)

Rearranging Equation 2 to solve for mass flow rate (M) results in:

$$M = \frac{P \times Q \times MW}{R \times T} \qquad \text{(Equation 3)}$$

The results of these calculations for various methane (CH_4) and carbon dioxide (CO_2) gas cylinder compositions and volumetric flow rates are summarized in Table 1.

Calculations have been performed to determine the maximum allowable daily instrument check mass flow rates for all process streams identified in the heat and material balance. These calculations are included in the version of the HMB provided to Dominion by Geosyntec (dated 17 April 2018). A summary of these calculated mass flow rates is included herewith as Table 2.

The calculations summarized in Table 1 indicate that a daily instrument check performed using a 100% pure CH_4 gas cylinder with a 0.5 l/min flow regulator would be valid for all process streams where the requisite hydrocarbon mass flow rate is equal to or greater than 20 g/hr. The only non-exempt process streams with a required hydrocarbon mass flow rate less than 20 g/hr, based on the Geosyntec HMB, are: 14 (Amine Regen OH), 17 (Amine Reboiler Vapor), 22 (Acid Gas to Blower), 23 (SRU Effluent to Thermal Oxidizer), and 59 (GT Exhaust). Of these, the stream with the lowest mass fraction of CO_2 is 17 (Amine Reboiler Vapor), with a calculated maximum daily instrument check mass flow rate of 3.89 g/hr CO_2. DECP could utilize a FLIR GF343 (CO2 OGIC) to monitor these streams. According to the data in Table 1, CO2 cylinder composition and regulator combinations that would be sufficient for streams 14, 17, 22, 23, and 59 include but are not limited to: a 35% CO2 gas cylinder equipped with a 0.1 l/min flow regulator and a 6% CO2 gas cylinder equipped with a 0.5 l/min regulator.

Table 1: CH_4 and CO_2 Mass Flow Rates For Various Gas Cylinders

Gas		CH4	CO2				
Concentration		100%	100%	50%	35%	25%	7%
Flow Rate (Q)		Mass Flow (M)	Mass Flow (M)				
(l/min)	(l/hr)	(g/hr)	(g/hr)				
0	**0**	0.00	0.00	0.00	0.00	0.00	0.00
0.1	**6**	4.00	10.98	5.49	3.84	2.74	0.66
0.25	**15**	10.00	27.44	13.72	9.61	6.86	1.65
0.5	**30**	20.01	54.89	27.44	19.21	13.72	3.29
0.75	**45**	30.01	82.33	41.17	28.82	20.58	4.94
1	**60**	40.01	109.78	54.89	38.42	27.44	6.59
1.25	**75**	50.01	137.22	68.61	48.03	34.31	8.23
1.5	**90**	60.02	164.67	82.33	57.63	41.17	9.88
1.75	**105**	70.02	192.11	96.06	67.24	48.03	11.53
2	**120**	80.02	219.56	109.78	76.85	54.89	13.17
2.25	**135**	90.02	247.00	123.50	86.45	61.75	14.82
2.5	**150**	100.03	274.45	137.22	96.06	68.61	16.47
2.75	**165**	110.03	301.89	150.95	105.66	75.47	18.11
3	**180**	120.03	329.34	164.67	115.27	82.33	19.76
3.25	**195**	130.03	356.78	178.39	124.87	89.20	21.41
3.5	**210**	140.04	384.23	192.11	134.48	96.06	23.05
3.75	**225**	150.04	411.67	205.84	144.08	102.92	24.70

TABLE 2: Maximum Daily Instrument Check Flow Rates From Geosyntec HMB

Stream No.	Stream Name	Maximum Flow Rate for TOC (e.g., when using GF320 camera) (TOC * Detection Sensitivity)	Maximum Flow Rate for CO2 (e.g., when using GF343 camera) (CO2 * Detection Sensitivity)
1	Feed Gas at B/L	55.56	2.96
2	Heated Feed Gas	55.56	2.96
3	HP Makeup Fuel Gas	55.56	2.96
4	Feed to Pretreat- ment	55.56	2.96
5	Demer-curizer Feed	55.56	2.96
6	AGRU Feed	55.56	2.96
7	Sweet Gas	58.34	0.00
8	Cooled Sweet Gas	58.35	0.00
9	Sweet Gas Conden- sate	EXEMPT	EXEMPT
10	Dehydra-tion Filter Separator Feed	58.40	0.00
11	AGRU Flash Gas	55.53	1.62
12	Flashed Rich Amine	EXEMPT	EXEMPT
13	Heated Rich Amine	27.96	4.76
14	Amine Regen OH	0.07	43.70
15	Amine Regen Reflux	EXEMPT	EXEMPT
16	Amine Reboiler Feed	EXEMPT	EXEMPT
17	Amine Reboiler Vapor	0.69	3.89
18	Lean Amine (Regen Btm)	EXEMPT	EXEMPT
19	Lean Amine (from HX)	EXEMPT	EXEMPT
20	Lean Amine (to filters)	EXEMPT	EXEMPT
21	Lean Amine (to Absorber)	EXEMPT	EXEMPT
22	Acid Gas to Blower	0.10	58.94
23	SRU Effluent to Thermal Oxidizer	0.10	58.95
50	BOG from Existing Facility (Note 2)	48.07	0.00
51	Heated BOG (Note 2)	48.07	0.00
52	LP Fuel Gas from KO Drum (Note 2)	41.37	0.00
53	LP Fuel Gas to Users (Note 2)	41.37	0.00
54	Fuel Gas Compres-sor Suction (Note 2)	41.37	0.00
55	Stabilizer OH to Fuel Gas Comp.	59.98	0.02
56	Fuel Gas Compres- sor Disch. (Note 2)	42.85	0.00
57	HP Makeup Fuel after letdown (Note 2)	55.56	2.96
58	Fuel Gas to Gas Turbines (Note 2)	47.42	1.07
59	GT Exhaust	0.00	4.87
60	Fuel gas to Flare Pilot	55.56	2.96
101	Feed to HRU (APCI, Note 1)	58.45	0.01
103	Rich Gas from 5E507	58.45	0.01
104	HRU Separator Vapor	58.42	0.01
105	HRU Separator Liquid	59.89	0.00
107	HRU Reflux Feed	58.42	0.01
115	Lean Gas Booster Comp Feed	58.41	0.01

Stream No.	Stream Name	Maximum Flow Rate for TOC (e.g., when using GF320 camera) (TOC * Detection Sensitivity)	Maximum Flow Rate for CO2 (e.g., when using GF343 camera) (CO2 * Detection Sensitivity)
116	NG Feed to MCHE	58.43	0.01
117	Booster Comp Feed	EXEMPT	EXEMPT
121	Lean Gas Booster Compr Discharge	58.41	0.01
122	HRU Side Reboiler Feed	59.99	0.01
123	HRU Side Reboiler Effluent	59.99	0.01
124	HRU Bottoms	60.00	0.00
126	Stabilizer OH Liquid	60.00	0.00
127	Stabilizer OH to Fuel	59.98	0.02
130	Stabilized NGL Conden- sate	60.00	0.00
132	Rich Gas from 5E523	58.45	0.01
133	CH4 Makeup to MR	58.41	0.01
134	HRU OH	58.41	0.01
135	HRU Turbo Exp Disch.	58.42	0.01
136	Feed Gas to C3 Chillers	58.43	0.01
137	HRU Reboiler Inlet	59.99	0.01
138	HRU Reboiler Effluent	59.99	0.01
139	Stabilizer Reboiler Inlet	60.00	0.00
140V	Stabilizer Reboiler Vapor Effluent	60.00	0.00
140L	Stabilizer Reboiler Liquid Effluent	60.00	0.00
141	Stabilizer OH	60.00	0.00
142	Stabilizer Reflux Drum Inlet	60.00	0.00
154	LNG Exit MCHE	58.43	0.01
156	N2 Stripper Feed	58.43	0.01
158	N2 Stripper Reboiler Inlet	59.13	0.01
159	N2 Stripper Reboiler Outlet	59.07	0.01
160	LNG Product to Storage	59.50	0.01
170	N2 Stripper OH	38.42	0.00
171	End Flash Gas to Fuel	38.42	0.00
201	MR Return from MCHE	57.54	0.00
202	Combined MR Makeup	57.54	0.00
204	LP MR Comp A Suction	57.54	0.00
207	MP MR Comp A Suction (Note 5)	57.54	0.00
211	HP MR Comp A Suction (Note 5)	57.54	0.00
214	HP MR Comp A Discharge (Note 5)	57.54	0.00
217	MR Comp A Losses (Note 5)	57.54	0.00
219	MR to HHP C3 Cooler	57.54	0.00
220	MR to HP C3 Cooler	57.53	0.00
221	MR to MP C3 Cooler	57.50	0.00
222	MR to LP C3 Cooler	57.46	0.00
223	MR To MR Separator	57.42	0.00
225	MRV to MCHE Bottom	52.40	0.00
227	MRL to MCHE Bottom	58.95	0.00

Stream No.	Stream Name	Maximum Flow Rate for TOC (e.g., when using GF320 camera) (TOC * Detection Sensitivity)	Maximum Flow Rate for CO2 (e.g., when using GF343 camera) (CO2 * Detection Sensitivity)
230	MRV to Flash Gas Exchanger	52.40	0.00
231	MRV from Flash Gas Exchanger	52.40	0.00
250	MRL to MR Expander	58.95	0.00
301	C3 Comp A Dicharge (Note 4)	60.00	0.00
302	C3 Comp A Losses	60.00	0.00
305	C3 Cond Inlet (Note 4)	60.00	0.00
306	C3 Cond Outlet (Note 4)	60.00	0.00
310	C3 Subcooler Outlet (Note 4)	60.00	0.00
311	C3 to 5E514 LC Valve (Note 4)	60.00	0.00
312	C3 to 5E514 (Note 4)	60.00	0.00
314	C3 Liquid from 5E514 (Note 4)	60.00	0.00
315	C3 Vapor from 5E514 (Note 4)	60.00	0.00
316	C3 to 5E515 (Note 4)	60.00	0.00
317	C3 Vapor from 5E515 (Note 4)	60.00	0.00
318	C3 Liquid from 5E515	60.00	0.00
320	C3 to 5E516	60.00	0.00
321	C3 Vapor from 5E516	60.00	0.00
323	C3 Liquid from 5E516	60.00	0.00
324	C3 to 5E517	60.00	0.00
325	C3 Vapor from 5E517	60.00	0.00
326	C3 to BOG Heater (Note 4)	60.00	0.00
330	C3 to 5E501 LC Valve	60.00	0.00
331	C3 to 5E501	60.00	0.00
334	C3 Vapor from 5E501	60.00	0.00
335	C3 Liquid from 5E501	60.00	0.00
336	C3 to 5E502	60.00	0.00
337	C3 Vapor from 5E502	60.00	0.00
339	C3 Liquid from 5E502	60.00	0.00
340	C3 to 5E503	60.00	0.00
341	C3 Vapor from 5E503	60.00	0.00
343	C3 Liquid from 5E503	60.00	0.00
344	C3 to 5E504	60.00	0.00
345	C3 Vapor from 5E504	60.00	0.00
378	C3 Makeup	60.00	0.00
381	LP C3 Comp A Suction	60.00	0.00
382	MP C3 Comp A Suction	60.00	0.00
385	HP C3 Comp A Suction (Note 4)	60.00	0.00
388	HHP C3 Comp A Suction (Note 4)	60.00	0.00
HHCA	Heavy Hydrocarbon with Amine	EXEMPT	EXEMPT
GLYW	Water/Glycol Stream	EXEMPT	EXEMPT
LPF	Low Pressure Flare	55.33	2.40
HPF	High Pressure Flare	56.57	1.29

Stream No.	Stream Name	Maximum Flow Rate for TOC (e.g., when using GF320 camera) (TOC * Detection Sensitivity)	Maximum Flow Rate for CO2 (e.g., when using GF343 camera) (CO2 * Detection Sensitivity)
CF	Cold Flare	58.51	0.26

APPENDIX B: METHOD 21 REFERENCE INFORMATION AND DOCUMENTS

Instrument Calibration Procedure

1. Visually inspect filters. Clean and replace, as needed.
2. Verify that filters are in place, clean, and not damaged.
3. Make sure connections, both sample line and electrical, are secure and not damaged. It is important that the sample line connections are tightened.
4. Check that the detector cap and flame arrestor are in place, if applicable.
5. Ensure that the battery is adequately charged. Refer to instrument manufacturer's specifications for the appropriate charge and how to determine the charge. (For FIDs: Ensure there is sufficient hydrogen supply (>1,500 psi preferably). Do not calibrate when the hydrogen is <500 psi.)
6. Turn on the pump and the detector.
7. Perform a quick qualitative leak check by briefly blocking the probe tip with a finger. Listen for the sound of the pump to indicate the need for air or allow the pump to come to a near stop and then release finger. If the sound of the pump doesn't change or if the pump doesn't stop, this indicates that there may be a leak, or the probe fittings aren't tight.
8. Allow the instrument to warm up per manufacturer's specifications. Performing zero air warm up may be done with a zero air gas cylinder if there is concern about target gases in the ambient environment and is recommended, but not required for daily calibrations.
9. Prepare the calibration gases for use. Gases must be certified to ± 2% accuracy of the requested ppmv value and not past their expiration date.
10. If using sample bags, make sure each bag is completely empty and then fill it to no more than 90% of the bag capacity with fresh calibration gas prior to each calibration.
11. Once the warm-up period is complete, calibrate using the manufacturer's specific instructions using the zero air and the selected methane/air standard(s). Using zero gas between the different calibration gases is recommended to clear the instrument of calibration gas between calibration points, but is not a requirement. Allow sufficient duration during calibration to ensure each calibration is cleared before placing next gas in line for calibration.
12. Record calibration gas lot numbers, expiration dates, and other information contained on the calibration record.
13. If the calibration fails, as indicated by the meter, do not perform monitoring. Troubleshoot the cause. Monitoring will not be done with the meter until a passing calibration is obtained.

Performance Evaluation Procedure - Calibration Precision Test

1. Perform the calibration precision test prior to placing an instrument in service, whenever maintenance is performed on the instrument, and at subsequent 3-month intervals.
2. Complete the calibration procedure.
3. Perform this evaluation with the 500 ppmv calibration gas.
4. Introduce the zero gas into the instrument at the probe tip.
5. Once the instrument response has stabilized, quickly introduce the 500 ppmv calibration gas into the instrument at the probe tip.
6. Allow the instrument to stabilize to the 500 ppmv calibration gas.
7. Record the stable instrument response to the calibration gas on the performance evaluation form.
8. Perform steps 4 through 6 with the 500 ppmv calibration gas for a total of three times.
9. Subtract each actual calibration gas value from each stable instrument response and record this value. If a negative actual is calculated, record the reading as a positive value (i.e., take the absolute value).
10. Average the three absolute value differences for the calibration gas vs. instrument reading and record this value.
11. Divide the average difference by the actual calibration gas value and multiply by 100 to obtain the calibration precision as a percentage. The calibration precision is required to be within ±10% per EPA Method 21.
12. Perform steps 4 through 11 with the 10,000 ppmv calibration gas rather than 500 ppmv calibration gas, if necessary, based on the required leak definition utilized.

Performance Evaluation Procedure - Response Time Test

1. Perform the response time test prior to placing an instrument in service and any time changes or maintenance is performed on the instrument pump or a probe extension is added/changed.
2. Complete the calibration procedure.
3. Perform this evaluation with the 500 ppmv calibration gas.
4. Introduce the zero gas into the instrument at the probe tip.
5. Once the instrument response has stabilized to approximately zero, quickly introduce the 500 ppmv calibration gas into the instrument at the probe tip.
6. Measure the time required to attain 90% of the final stable reading (or 450 ppmv).
7. Record this time on the performance evaluation form. This is the response time.
8. Perform steps 4 through 7 with the 500 ppmv calibration gas for a total of three times.
9. Average the three response times for the calibration gas and record this value. The average response time is required to be equal to or less than 30 seconds per EPA Method 21.
10. Perform steps 4 through 9 with the 10,000 ppmv calibration gas rather than 500 ppmv calibration gas, if necessary, based on the required leak definition utilized.
11. If an extension probe will be used periodically, perform this entire procedure again with the probe attached as if performing the procedure for a separate instrument.

Response Factor Test

1. Complete the calibration procedure.
2. Introduce the calibration gas mixture to the analyzer at the probe tip and record the observed meter reading.
3. Introduce the zero gas into the instrument at the probe tip.
4. Once the instrument response has stabilized, reintroduce the calibration gas into the instrument at the probe tip and record the observed meter reading.
5. Make a total of three measurements by alternating between the calibration gas and zero gas.
6. Calculate the response factor for each repetition by taking the actual concentration of the calibration gas and dividing it by the instrument reading. Average the response factors from each repetition to get the response factor for the calibration gas.
7. The response factor shall be less than 10.
8. For Process Streams/Mixtures:

   a. Repeat steps 2 through 7 for each VOC to be measured within the process stream.
   b. Each response factor shall be less than 10 for each individual VOC to be measured. If Response factor of any individual VOC is greater than 10, then calculate the response factor of the mixture.
   c. To find the response factor for a specific process stream or gas mixture, use the following equation:

$$RF_m = \frac{1}{\sum_{i=1}^{n}\left(\frac{x_i}{RF_i}\right)}$$

Where:

RF_m=Response factor of the process stream;
n=Number of components in the mixture;
x_i=Mole fraction of constituent i in the mixture;
RF_i=Response factor of constituent i in the mixture.

Note: If response factors have been published for the compounds of interest for the instrument or detector type, the response factor determination is not required, and existing results may be referenced.

Calibration Drift Assessment

1. Prepare the certified 500 ppmv calibration gas for use.
2. Without making any adjustments or recalibrations of the instrument, introduce the gas at the probe tip until a stable instrument response is obtained.
3. Record the stable instrument response. Take off the calibration gas and introduce zero gas at the probe tip.
4. Repeat steps 2 and 3 two more times recording each reading.
5. Average the three readings.
6. Calculate the calibration drift for the average response as shown below:

$$CD = ((C_F - C_I) \div C_I) \times 100$$

Where:

CD = Calibration Drift (%)
C_F = Final Calibration Value (ppmv) from Step 3 of the calibration drift assessment procedure
C_I = Initial Calibration Value (ppmv) from daily calibration performed at the beginning of the monitoring shift
100 = Percentage conversion factor

7. If the calculated calibration drift for any of the calibration gases shows a negative drift of more than 10%, perform some or all of the following:
   a. All connections and ensure the probe is tightly secured.
   b. Check and clean filters. Replace filters if necessary.
   c. Check the probe for cleanliness and use pipe cleaner to clean the probe tip.
   d. Check the sample line for signs of contamination and damage, especially near the connection at the instrument.
   e. Check the battery level and plug instrument in if low.
   f. Check the hydrogen supply and refill if low.
   g. Repeat Steps 2 through 6 after making adjustments.
8. If the calculated calibration drift still shows a negative drift of more than 10% following Step 5, re-monitor in accordance with section 9 and 10 below equipment that was monitored since the last daily calibration or a successful calibration drift assessment.
9. If there is a negative drift of more than 10%, record the drift result and perform re-monitoring for any component with a Method 21 reading within the calibration drift percentage of the applicable leak threshold (i.e., for a leak definition of 500 ppmv and a calibration drift of 10%, re-monitor all components measured at 450 to 499 ppmv). After completing the necessary re-monitoring, make a note on the calibration record showing that the necessary equipment was re-monitored.
10. If there is a positive drift, record the drift result on the calibration record. Re-monitoring is not required because results in the field would have been biased too high. However, re-monitoring may be warranted to ensure over reporting of leaks does not occur. If re-monitoring is conducted, note on the calibration record that the re-monitoring was conducted.

APPENDIX C: EMISSION CALCULATION INFORMATION

Oil & Gas Average Emission Factors Table (EPA-453/R-95-017 Page 2-15)

TABLE 2-4. OIL AND GAS PRODUCTION OPERATIONS AVERAGE EMISSION FACTORS (kg/hr/source)

Equipment Type	Service[a]	Emission Factor (kg/hr/source)[b]
Valves	Gas	4.5E-03
	Heavy Oil	8.4E-06
	Light Oil	2.5E-03
	Water/Oil	9.8E-05
Pump seals	Gas	2.4E-03
	Heavy Oil	NA
	Light Oil	1.3E-02
	Water/Oil	2.4E-05
Others[c]	Gas	8.8E-03
	Heavy Oil	3.2E-05
	Light Oil	7.5E-03
	Water/Oil	1.4E-02
Connectors	Gas	2.0E-04
	Heavy Oil	7.5E-06
	Light Oil	2.1E-04
	Water/Oil	1.1E-04
Flanges	Gas	3.9E-04
	Heavy Oil	3.9E-07
	Light Oil	1.1E-04
	Water/Oil	2.9E-06
Open-ended lines	Gas	2.0E-03
	Heavy Oil	1.4E-04
	Light Oil	1.4E-03
	Water/Oil	2.5E-04

[a]Water/Oil emission factors apply to water streams in oil service with a water content greater than 50%, from the point of origin to the point where the water content reaches 99%. For water streams with a water content greater than 99%, the emission rate is considered negligible.

[b]These factors are for total organic compound emission rates (including non-VOC's such as methane and ethane) and apply to light crude, heavy crude, gas plant, gas production, and off shore facilities. "NA" indicates that not enough data were available to develop the indicated emission factor.

[c]The "other" equipment type was derived from compressors, diaphrams, drains, dump arms, hatches, instruments, meters, pressure relief valves, polished rods, relief valves, and vents. This "other" equipment type should be applied for any equipment type other than connectors, flanges, open-ended lines, pumps, or valves.

Petroleum Industry Emission Factor Table for Screening Value Correlations (EPA-453/R-95-017 Page 2-27)

TABLE 2-10. PETROLEUM INDUSTRY LEAK RATE/SCREENING VALUE CORRELATIONS[a]

Equipment type/service	Correlation[b,c]
Valves/all	Leak rate (kg/hr) = 2.29E-06 × $(SV)^{0.746}$
Pump seals/all	Leak rate (kg/hr) = 5.03E-05 × $(SV)^{0.610}$
Others[d]	Leak rate (kg/hr) = 1.36E-05 × $(SV)^{0.589}$
Connectors/all	Leak rate (kg/hr) = 1.53E-06 × $(SV)^{0.735}$
Flanges/all	Leak rate (kg/hr) = 4.61E-06 × $(SV)^{0.703}$
Open-ended lines/all	Leak rate (kg/hr) = 2.20E-06 × $(SV)^{0.704}$

[a]The correlations presented in this table are revised petroleum industry correlations.

[b]SV = Screening value in ppmv.

[c]These correlations predict total organic compound emission rates (including non-VOC's such as methane and ethane).

[d]The "other" equipment type was derived from instruments, loading arms, pressure relief valves, stuffing boxes, and vents. This "other" equipment type should be applied to any equipment type other than connectors, flanges, open-ended lines, pumps, or valves.

Petroleum Industry Emission Factor Table for Pegged Screening Values (EPA-453/R-95-017 Page 2-37)

TABLE 2-14. 10,000 ppmv and 100,000 PPMV SCREENING VALUE PEGGED EMISSION RATES FOR THE PETROLEUM INDUSTRY

Equipment type/service	10,000 ppmv pegged emission rate (kg/hr/source)[a,b]	100,000 ppmv pegged emission rate (kg/hr/source)[a]
Valves/all	0.064	0.140
Pump seals/all	0.074	0.160[c]
Others[d]/all	0.073	0.110
Connectors/all	0.028	0.030
Flanges/all	0.085	0.084
Open-ended lines/all	0.030	0.079

[a]The petroleum industry pegged emission rates are for total organic compounds (including non-VOC's such as methane and ethane).

[b]The 10,000 ppmv pegged emission rate applies only when a dilution probe cannot be used or in the case of previously-collected data that contained screening values reported pegged at 10,000 ppmv. The 10,000 ppmv pegged emission rate was based on components screened at greater than or equal to 10,000 ppmv; however, in some cases, most of the data could have come from components screened at greater than 100,000 ppmv, thereby resulting in similar pegged emission rates for both the 10,000 and 100,000 pegged levels (e.g., connector and flanges).

[c]Only 2 data points were available for the pump seal 100,000 pegged emission rate; therefore the ratio of the pump seal 10,000 pegged emission rate to the overall 10,000 ppmv pegged emission rate was multiplied by the overall 10,000 ppmv pegged emission rate to approximate the pump 100,000 ppmv pegged emission rate.

[d]The "other" equipment type was developed from instruments, loading arms, pressure relief valves, stuffing boxes, vents, compressors, dump lever arms, diaphrams, drains, hatches, meters, and polished rods. This "other" equipment type should be applied to any equipment type other than connectors, flanges, open-ended lines, pumps, and valves.

TCEQ 28 LAER Control Efficiencies (TCEQ Air Permit Technical Guidance for Chemical Sources: Fugitive Guidance)

Table V: Control Efficiencies for LDAR

Equipment/Service	28M	28RCT	28VHP	28MID	28LAER	28CNTQ	28CNTA	28PI	28AVO[9]
Valves[1]									97%
Gas/Vapor	75%	97%	97%	97%	97%			30%	
Light Liquid	75%	97%	97%	97%	97%			30%	
Heavy Liquid[5]	0%[5]	0%[5]	0%[6]	0%[5]	30%[6, 8]			30%[8]	
Pumps[1]									93%
Light Liquid	75%	75%	85%	93%	93%			30%	
Heavy Liquid[5]	0%	0%[7]	0%[7]	0%[8, 10]	30%[8]			30%[8]	
Flanges/Connectors[1]	30%	30%	30%	30%				30%	97%
Gas/Vapor					97%	97%	75%		
Light Liquid					97%	97%	75%		
Heavy Liquid[8]					30%	30%	30%		
Compressors[1]	75%	75%	85%	95%	95%			30%	95%
Relief Valves[1, 2] (Gas/Vapor)	75%	97%	97%	97%	97%			30%	97%
Sampling Connection[3] (pounds per hour per sample taken)	0%	0%	0%	0%	0%			0%	0%
Open Ended Lines[1, 4]									

It should be noted in the application and added to the permit conditions if any of the footnotes are applicable. For example, if components in heavy liquid service are monitored, then the application should include the monitored concentration and the concentration of saturation, in ppmv and such monitoring will be added as a separate condition.

Endnotes Table V

1 **Control efficiencies apply only to components that are actually monitored. Control efficiencies do not apply to components that are difficult or unsafe-to-monitor on the standard schedule. However, difficult-to-monitor gas or light liquid valves under the 28RCT, 28VHP, 28MID, or 28LAER programs that are monitored once per year may apply a 75% reduction credit.**

2 **100% control may be taken if a relief valve vents to an operating control device or if it is equipped with a rupture disc and a pressure-sensing device between the valve and disc to monitor for disc integrity. For new facilities, BACT guidelines generally require that all relief valves vent to a control device. When there are safety reasons that the relief valve cannot achieve 100% control, the relief valve can be monitored under the LDAR programs for the credit listed. This monitoring must be performed regardless of whether the relief valve is considered accessible, difficult-to-monitor or unsafe-to-monitor. Relief valves that do not achieve 100% control should not be built in locations that are unsafe-to-monitor.**

3 **Sampling connection control efficiencies are covered under other equipment and services. Sampling emissions are based on the number of samples taken per year as opposed to the number of connections. Fugitives for a closed loop sampling system are based on the component count.**

4 **Good design criteria for special chemicals handling and most LDAR programs require open-ended lines to be equipped with an appropriately sized cap, blind flange, plug, or a second valve. If so equipped, open-ended lines may be given a 100% control credit. Regardless of the lines given 100% credit, these lines should be mentioned in permit applications. Exceptions to the LDAR program criteria may be made for safety reasons with the approval of TCEQ management.**

EPA Protocol Control Efficiencies (EPA-453/R-95-017 Page 5-3)

TABLE 5-1. SUMMARY OF EQUIPMENT MODIFICATIONS

Equipment type	Modification	Approximate control efficiency (%)
Pumps	Sealless design	100[a]
	Closed-vent system	90[b]
	Dual mechanical seal with barrier fluid maintained at a higher pressure than the pumped fluid	100
Compressors	Closed-vent system	90[b]
	Dual mechanical seal with barrier fluid maintained at a higher pressure than the compressed gas	100
Pressure relief devices	Closed-vent system	c
	Rupture disk assembly	100
Valves	Sealless design	100[a]
Connectors	Weld together	100
Open-ended lines	Blind, cap, plug, or second valve	100
Sampling connections	Closed-loop sampling	100

[a]Sealless equipment can be a large source of emissions in the event of equipment failure.

[b]Actual efficiency of a closed-vent system depends on percentage of vapors collected and efficiency of control device to which the vapors are routed.

[c]Control efficiency of closed vent-systems installed on a pressure relief device may be lower than other closed-vent systems, because they must be designed to handle both potentially large and small volumes of vapor.

APPENDIX D: TYPES OF INFORMATION TO BE RECORDED

The following records associated with the LDAR Monitoring Program will be maintained in hardcopy or electronic form. Electronic records will be maintained in the LDAR Monitoring Database or other electronic systems:

- Records of the daily instrument checks and calibration drift results:
    - Instrument type (OGIC or M21) and make/model.
    - Test type, such as Daily Calibration, Calibration Precision Test, Response Time and Factor Test, and Calibration Drift Test.
    - Type of test gas, test gas concentration, and cylinder ID and expiration date.
    - Time of test,
    - Result of test, and
    - Other comments.
- AVO inspections:
    - Date and time that the AVO inspection was performed.
    - Name of the individual performing the AVO inspection.
    - Description of the area(s) included in the AVO inspection.
    - If a leak is found during the AVO inspection:
        - Date and Time the leak was found.
        - Name of the individual who found the leak.
        - LDAR ID (or other identifying information) and description of the leak location.
- Method 21 and OGIC monitoring:
    - For annual or quarterly (where required) Method 21 monitoring:
        - The LDAR ID of each component monitored.
        - The Method 21 measured concentration, in ppmv, for each component monitored.
        - If adjusting for background (optional), the background concentration reading, in ppmv, for each component monitored (if and when applicable).
    - For all monitoring:
        - The type of monitoring instrument used (e.g., OGIC, CO_2 OGIC, M21).
        - Make/model of the instrument used.
        - Name of personnel performing the monitoring.
        - Date of monitoring event.
        - Any deviations from the LDAR Monitoring Plan.
    - For all OGIC monitoring:
        - Complete video record of each monitoring event and daily instrument check.
    - When a leak is identified:
        - Date and time the leak was identified.
        - The type of equipment used to identify the leak.
        - The LDAR ID and/or other identifying information and description of the leak location.
    - For each repair attempt:
        - Date of repair attempt.
        - Methods employed to affect the repair.
        - Methods used to verify the success of the repair attempt (e.g., OGIC, M21 Soap Bubble Test, etc.) and the associated result.
        - Date of component remonitoring that verifies the repair was successful.

- Information on DOR components will be maintained in the LDAR Monitoring Database or other electronic recordkeeping system:
  - The LDAR ID and/or other identifying information (Component ID, SAP Notification, etc.).
  - Name of person approving the DOR.
  - Date that the component was placed on DOR.
  - Date of the next scheduled shutdown of the gas circuit.
  - Documentation of the analysis performed to determine whether emissions from leaking components within a gas circuit exceed emissions from gas circuit shutdown.
  - Records of correspondence with MDE related to DOR.

- A list of DTM and UTM components will be maintained within the LDAR Monitoring Database:
  - LDAR ID and/or other identifying information.
  - Whether component is DTM or UTM.
  - Justification for DTM or UTM designation.

- A list of components that are exempt from the monitoring requirements of this plan (e.g., in vacuum service, in heavy liquid service). The list shall include the LDAR ID and basis for exemption.

- A list of components that are exempt from calculation requirements because they are in liquid service and the liquid contains VOC with an aggregate partial pressure or vapor pressure of less than 0.002 psia at 68 °F.

APPENDIX E: AVO INSPECTION AND REPAIR PROCEDURES

AVO Inspections, and repair of leaking components identified during AVO inspections, will be performed in accordance with the following procedures:

- AVO inspections will be documented in electronic or hardcopy forms or logs. Records to be maintained are included in Appendix D of this LDAR Monitoring Plan.
- AVO inspections can be performed by the LDAR Monitoring Contractor or Designated Operations Personnel familiar with and trained in the LDAR Monitoring Plan.
- During an AVO inspection:
  - Observe components that may have visible leakage including dripping, spraying, misting, clouding, puddling, or staining. Observe all necessary safety practices and do not enter an area if you suspect a hazardous condition due to a leak.
  - Listen for abnormal hissing or other sounds that may indicate a leak. Do not remove any required hearing protection.
  - Use the olfactory senses to detect abnormal odors that may indicate a leak of process fluids. Olfactory observations should be performed in the course of normal breathing.
- A leak notification tag shall be attached to leaking components identified during an AVO inspection (see Section 4.1).
- All completed AVO inspections will be documented and such documentation will be filed electronically or in hardcopy form and the DECP LDAR Coordinator will review them periodically.
- The Operations personnel or the DECP LDAR Coordinator or their designee will generate an SAP notification to track repairs for all components identified as leaking and they will be identified in the notification based on component ID and/or location.
- A work order will be generated in SAP for each leak identified during an AVO inspection based on the notification. The SAP work order(s) will be assigned to the appropriate maintenance personnel.
- Maintenance personnel may coordinate with the LDAR Monitoring Contractor to have the leaking component monitored with a Method 21 instrument or OGIC prior to, during, and/or after repair attempts for the purposes of assessing the leak concentration (if applicable) and/or verifying the success of the repair.
- After successful repair, maintenance personnel will close the work order. Information to be included in work history should include a description of work performed to repair the leak and the leak monitoring results following repair.
- Maintenance will close the SAP work order, record the completion of the repair, and provide a copy of the completed work order to the LDAR Monitoring Contractor.
- The LDAR Monitoring Contractor will document the leak and associated repair(s) within the LDAR Monitoring Database.
- The DECP LDAR Coordinator will maintain a hardcopy or electronic log that includes the name of the person conducting each inspection, the date on which leak inspections are made, the findings of the inspections, and a list of leaks by tag identification number. The log shall be made available to regulatory agencies upon request.

Leak records shall be maintained for a period of not less than 5 years from the date of their occurrence.

APPENDIX F: LEAK IDENTIFICATION AND REPAIR WORK FLOW DIAGRAMS

LDAR WORK FLOW PROCESS

LDAR Coordinator (LC)

Operations

Planner/Scheduler

Maintenance Personnel (MP)

LOTO Coordinator

Environmental Personnel

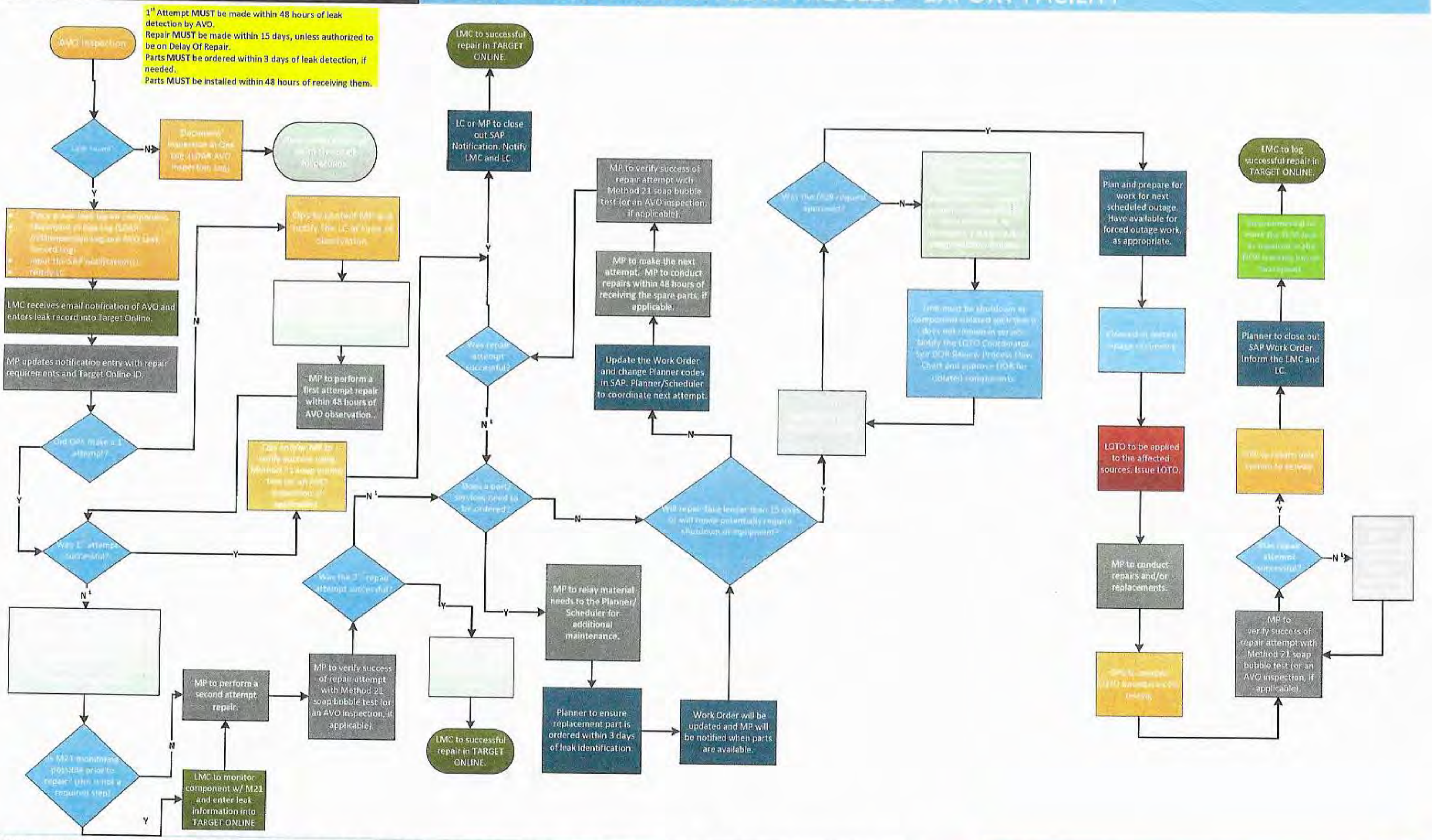
Engineering

LDAR Monitoring Contractor (LMC)

Key Repair Milestones:

- 1st Attempt **MUST** be made within 5 days of leaks detected via monitoring and 48 hours for leaks detected via an AVO inspection.
- Repair **MUST** be made within 15 days, unless authorized to be on Delay Of Repair.
- Parts **MUST** be ordered within 3 days of leak detection for AVO-discovered leaks, where a replacement part is required.
- Parts **MUST** be installed within 48 hours of receiving them for AVO-discovered leaks.

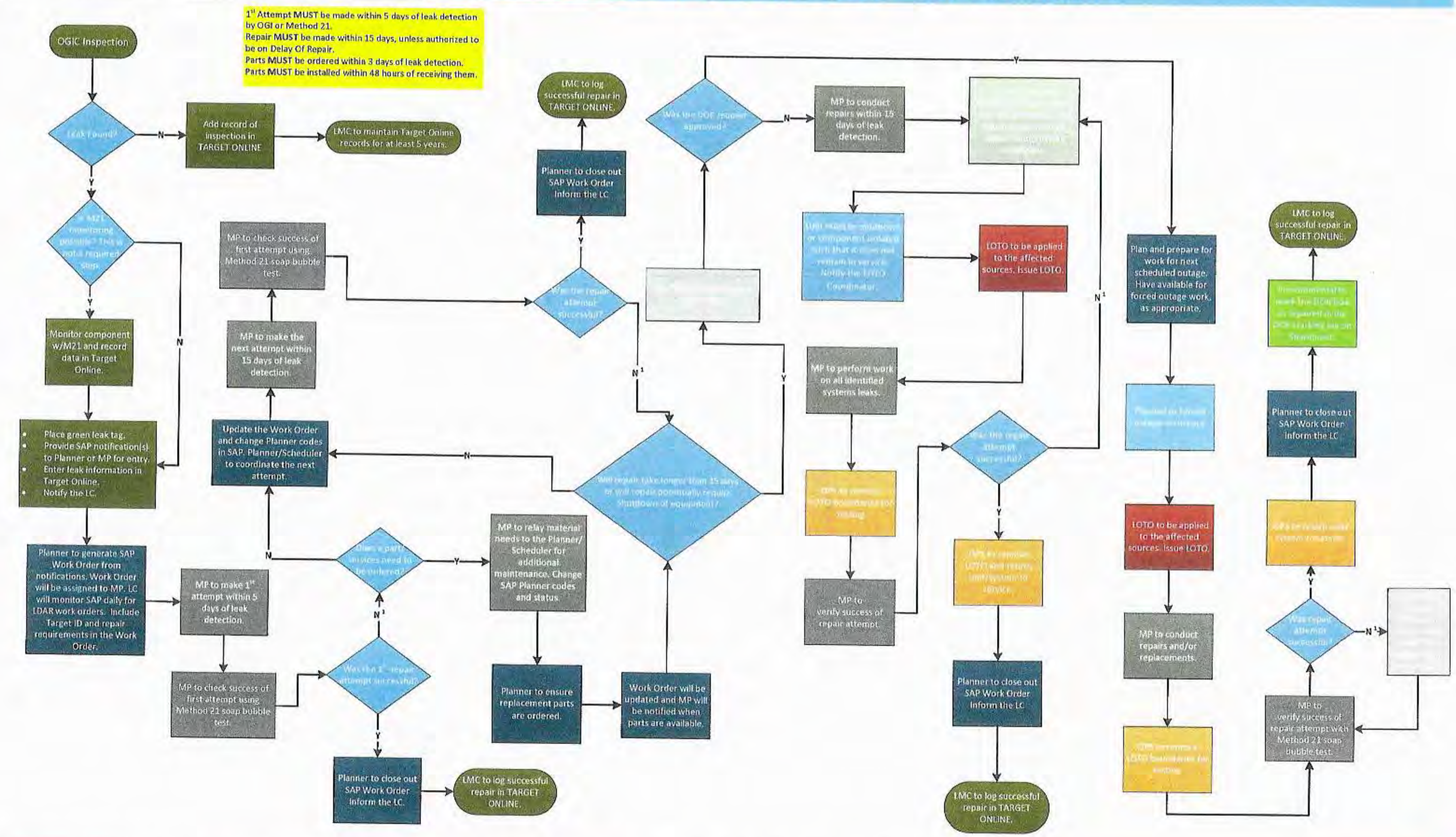
AVO INSPECTION WORK FLOW PROCESS – EXPORT FACILITY



[1] For each unsuccessful attempt at repair, the LC will update the work order with repair details. MP will perform evaluation of additional actions required and updated the work order. The LC will work with Operations to develop repair plan, understand LOTO requirements, etc. and will relay this to the Planner. The Planner will coordinate all field work and schedule MP based on repair requirements and due dates. The Planner will submit LOTO request, if required.

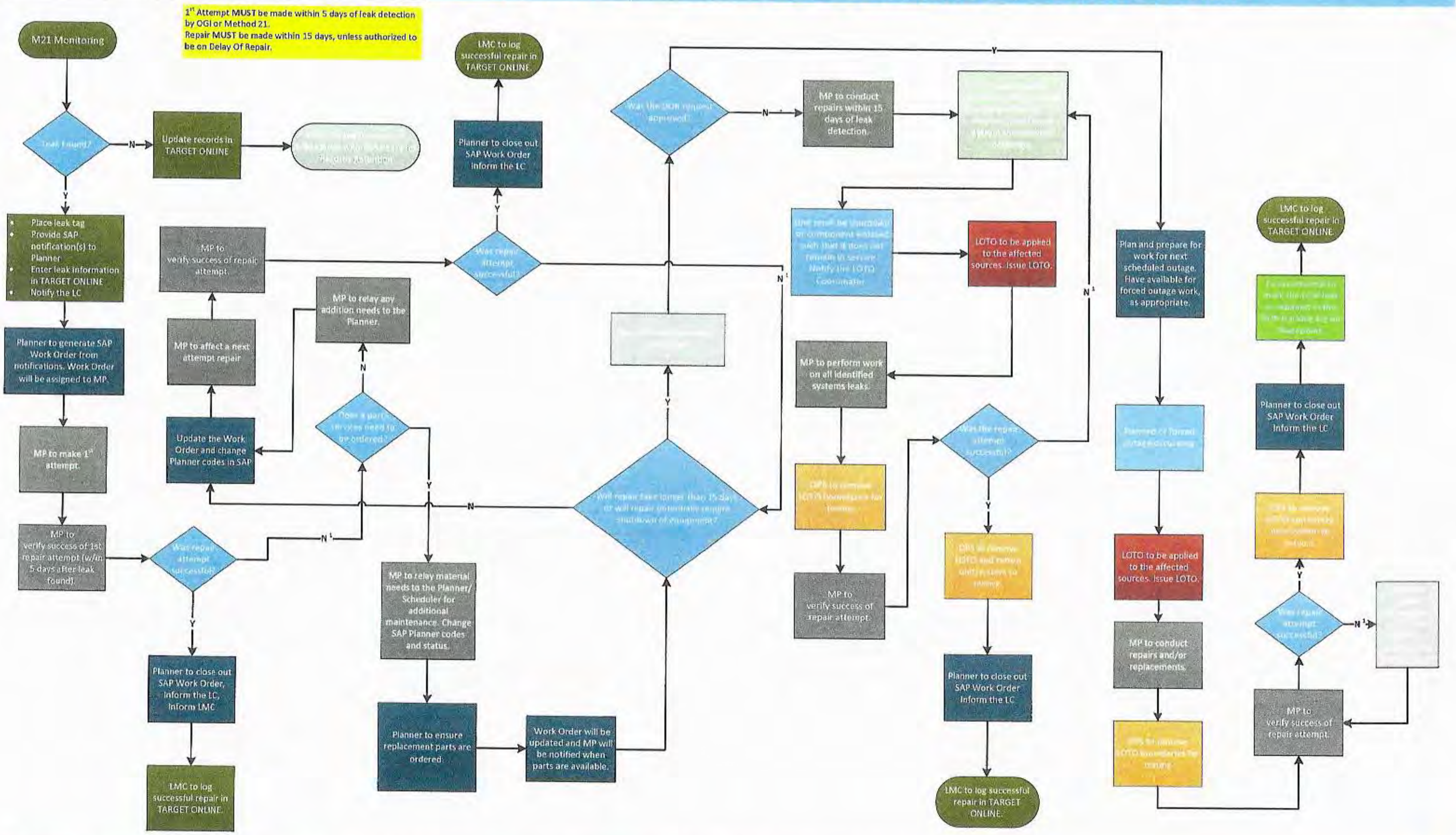
DOMINION ENERGY COVE POINT

OGIC LDAR MONITORING WORK FLOW – EXPORT FACILITY



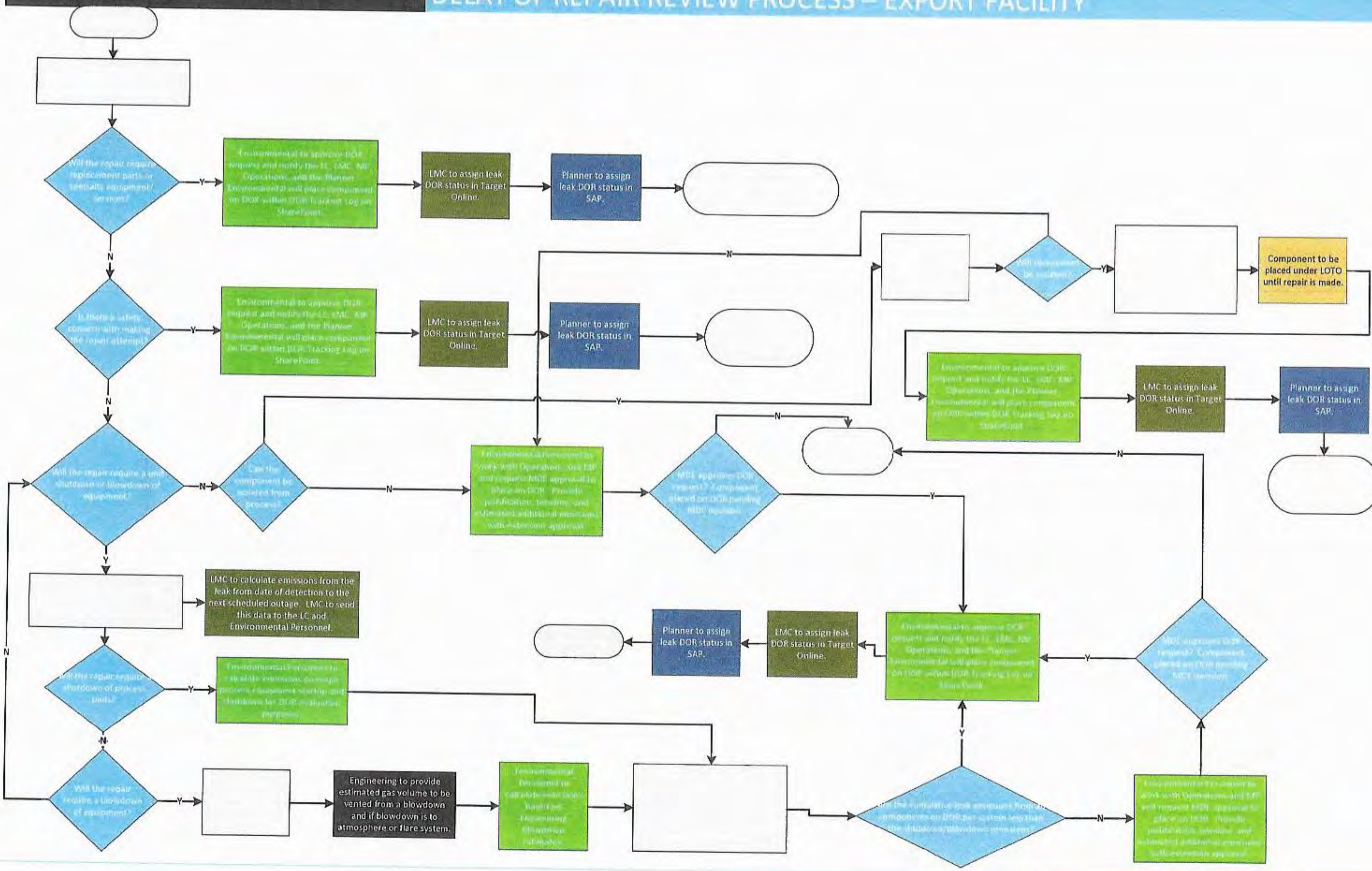
[1] For each unsuccessful attempt at repair, the LC will update the work order with repair details. MP will perform evaluation of additional actions required and updated the work order. The LC will work with Operations to develop repair plan, understand LOTO requirements, etc. and will relay this to the Planner. The Planner will coordinate all field work and schedule MP based on repair requirements and due dates. The Planner will submit LOTO request, if required.

METHOD 21 MONITORING WORK FLOW PROCESS – EXPORT FACILITY



[1] For each unsuccessful attempt at repair, the LC will update the work order with repair details. MP will perform evaluation of additional actions required and updated the work order. The LC will work with Operations to develop repair plan, understand LOTO requirements, etc. and will relay this to the Planner. The Planner will coordinate all field work and schedule MP based on repair requirements and due dates. The Planner will submit LOTO request, if required.

DELAY OF REPAIR REVIEW PROCESS – EXPORT FACILITY



Appendix G: LDAR Monitoring Plan Revision Log

Revision Number	Date	Revised by:	Comments
0	March 2018	Geosyntec Consultants, Inc.	Final (Rev. 0) Submitted to MDE for Approval.
1	June 2018	Dominion Energy, Inc.	General format corrections; update to Table 2.5-1 and Section 5.1. Final (Rev. 1) Submitted to MDE for Approval.
2	September 2018	Dominion Energy, Inc.	Updated Acronyms, Sections 1.1 & 4.1, Tables 1.2-1 & 5.2-1, and Appendices A & D. Submitted to MDE for Approval.
3	February 2019	Dominion Energy, Inc.	Updated Section 3.4.7, 4.2.4.1, and Appendices A, B, and F. Submitted to MDE in Annual Report
4	December 2019	Dominion Energy, Inc.	Updated Sections 3.3.1.2, 4.2, 4.2.2, 4.2.3.1, 4.3, 5.2, Table 2.5-1, & Appendices B, D, & E. Submitted to MDE for Approval.