

## 7 APPENDIX – 2017 AER FIELD SAMPLING PLAN

The following sampling plan was used for the field campaign conducted between 14 August and 23 September 2017.

### 7.1 OBJECTIVE

Complete a field inventory and measurement campaign to refine models for predicting equipment/component counts and emission rates used in the determination of fugitive equipment leaks and pneumatic venting. The specific data collection tasks to be completed are:

1. Identify Petrinex Facility ID(s) and UWI corresponding to each location and equipment unit surveyed.
2. Count major process equipment (described in Section 8.4 below) and document applicable emission control type (i.e., gas conservation or gas tied into flare).
3. Count components (defined in Section 8.3 below) for each major process equipment unit and identify hydrocarbon service type (as defined in Section 8.2 below).
4. Count pneumatic instruments/pumps and identify their driver (i.e. natural gas, air, electric or other).
5. Conduct an optical gas imaging (OGI) survey and measure any detected leaks (defined in Section 8.1.1 below).

This campaign is targeting up to 500 locations to provide a sample size of at least 30 Facility IDs for each target facility subtype group.

### 7.2 SITE SELECTION

- Relevant site population is based on April 2017 Petrinex volume data.
- Random selection from facility subtype populations contributing the most to methane emissions and uncertainty (i.e., natural gas, light/medium crude and cold heavy crude production batteries and compressor stations). Selection constrained by:
  - Exclude sites that emit more than 100,000 t CO<sub>2</sub>E because these sites are already subject to SGER GHG reporting and verified by independent 3<sup>rd</sup> party.
  - Exclusion of facility subtype codes with less than 50 instances. Because these subtypes are limited in number, they have a small contribution to provincial emissions.
  - Proximity to a town with accommodation.
  - Locked gates.
- For each selected site:
  - Email notification letter to Petrinex contact that requests:

- The name, phone number and email of the production superintendent(s) or manager(s) responsible for subject locations.
- The most recent measurement schematic, showing details delineated in Directive 017 Section 1.9.1, for subject locations.
- Call production superintendent or manager to confirm site visit timing and ensure safe access (i.e., avoid locked gates). Alternatively, call company main line available in “Target Facilities.xlsx” (phone numbers for Petrinex operator and licensee are provided).

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### 7.2.1 TARGET FACILITIES

- All target facility subtypes on a location **must be surveyed** with relevant **Facility IDs** selected in the tablet. Facility IDs for target subtypes are pre-loaded onto the tablets.
  - Target Facility IDs can be identified by filtering column A in tab “FacID pivot” of “Target Facilities.xlsx” on the subject location. Target subtypes are noted in column B with relevant Facility IDs in column D (see Figure 20).
- Non-target Facility IDs are excluded from the tablet. Equipment at non-target Facility IDs should **not** be surveyed.
- Before arriving on site, select the subject “surface location” and “Petrinex Facility ID” on the tablet. **When multiple Facility IDs occur, review the measurement schematic and select the ID relevant to the area of the site being surveyed** (this should already be completed by the field coordinator and provided to the field team).
- If a target Facility ID appears in “Target Facilities.xlsx” but is not stated on the measurement schematic, equipment belonging to this Facility ID is very likely off-site. Thus, on-site equipment should not be assigned to the off-site Facility ID.
- For the 10-34-040-04W5 example, a measurement schematic is presented in measurement schematic Figure 21.
  - Equipment for the gas plant is **not** surveyed (ABGP0001456 is not available on the tablet dropdown list).
  - Equipment for the battery is surveyed and assigned to ABBT4120008 because this Facility ID is the only one listed at 10-34-040-04W5 on the measurement schematic.
  - Equipment for the gas gathering system is surveyed and assigned to ABGS0003668 because this Facility ID is the only one listed at 10-34-040-04W5 on the measurement schematic.
  - No equipment is assigned to ABGS0140581, ABBT0140582 or ABBT0140583 because corresponding equipment is actually at other physical locations and operated by other companies (see Figure 22). The physical location of these sites was incorrectly entered into Petrinex.

Facility Location	Target Facility Type?	SubType Name	FacID
10-34-040-04W5	No	Gas Plant Sweet	ABGP0001456
	Yes	Gas Gathering System	ABGS0003668
			ABGS0140581
		Gas Multiwell Group	ABBT0140582
			ABBT0140583
			ABBT4120008

**Figure 20: Example of target and non-target Facility IDs for a single location.**

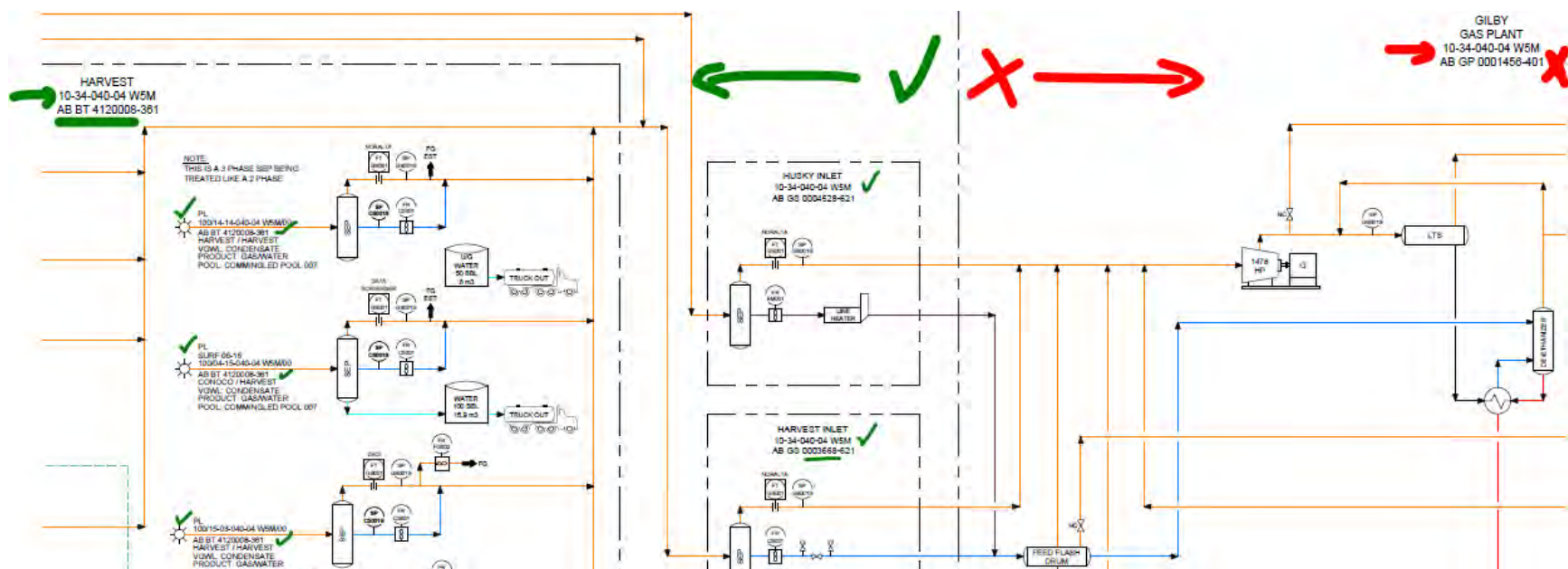


Figure 21: Example measurement schematic with target and non-target Facility IDs.

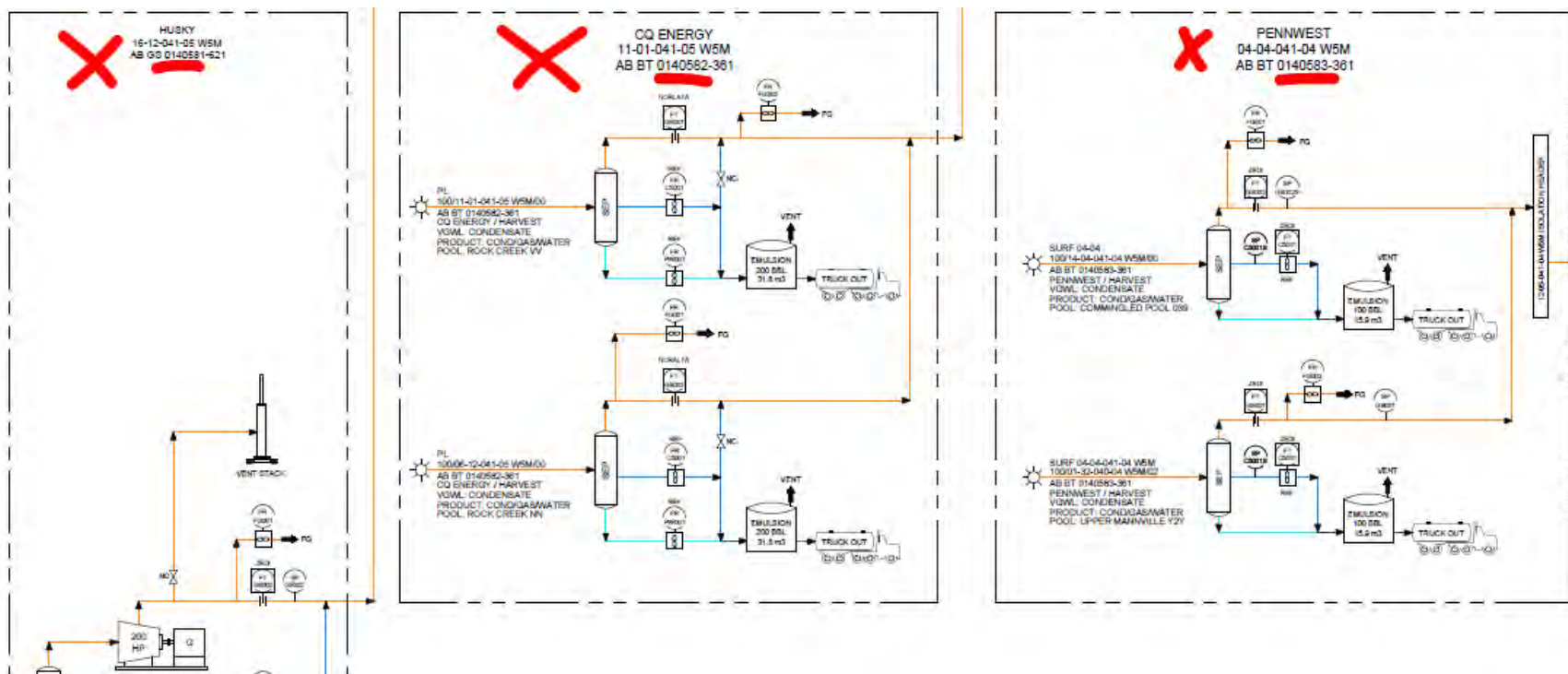


Figure 22: Example measurement schematic with incorrect Facility ID locations listed in Petrinex (equipment is not surveyed).

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## 7.2.2 TARGET WELLS

- **Rules for surveying wells:**

- All wells at a target location **must be surveyed** and assigned their corresponding Petrinex Facility ID and UWI (pre-loaded in the tablet).
- Equipment assigned to a UWI includes the wellhead and other equipment immediately downstream and dedicated to the well (e.g., separator, storage tank(s), pneumatics and pumpjack). Equipment common to multiple wells (e.g., flare, compressor, tanks, dehydrator, treater, line heater, pneumatics etc) is assigned to the Facility ID with UWI left empty (i.e., it's assigned to the battery code).
- Check whether any wells flowing to the target location are off-site. This is accomplished by:
  - Referencing the measurement schematic saved to your tablet desktop.
  - Referencing tab “allappsites” in “Survey Schedule - 2017 Inventory and Leak Measurement Campaign.xlsx” saved to your tablet desktop. All wells flowing to the target Facility ID are identified by filtering column G on the subject Facility ID. Well surface locations are presented in column A and UWI in column I.
  - Alternatively, reference “Target Wells.xlsx”. All wells flowing to the target location are identified by filtering column A in tab “Well pivot” of “Target Wells.xlsx” on the subject location. Corresponding Facility ID are listed in column B with relevant UWI in column C and well surface locations in column D (note that sometimes downhole locations are stated in error).
- **At least 5 off-site wells** (flowing into subject location) must be surveyed with relevant Facility IDs and UWIs selected in the tablet. Additional off-site wells (up to 10 total) should be surveyed if variability in equipment or pneumatic counts is observed (i.e., there is little value surveying more than 5 wells if they are all the same).
- Minimize driving time when selecting wells to survey by choosing wells within the same section (i.e., 1 mile x 1 mile). Filter column C in tab “allappsites”.

Downstream Facility Location	Reporting Facility ID	UWI	Well Surface Location	Operator name
10-34-040-04W5	ABBT0140582	ABWI10006104105W500	06-12-041-05W5	Direct Energy Marketing Limited
		ABWI100110104105W500	11-01-041-05W5	Direct Energy Marketing Limited
	ABBT0140583	ABWI100113204004W520	04-04-041-04W5	Prairie Storm Energy Corp.
		ABWI100140404104W500	04-04-041-04W5	Prairie Storm Energy Corp.
	ABBT4120008	ABWI100041504004W500	06-15-040-04W5	ConocoPhillips Canada Resources Corp.
		ABWI100042404005W520	04-25-040-05W5	Prairie Storm Energy Corp.
		ABWI100052704004W520	05-27-040-04W5	NAL Resources Limited
		ABWI100062704004W500	06-27-040-04W5	Apache Canada Ltd.
		ABWI100063204004W500	06-32-040-04W5	Harvest Operations Corp.
		ABWI100092904004W500	09-29-040-04W5	Harvest Operations Corp.
		ABWI100103404004W500	10-34-040-04W5	Harvest Operations Corp.
		ABWI100111004004W500	11-10-040-04W5	Harvest Operations Corp.
		ABWI100132504005W500	13-25-040-05W5	Prairie Storm Energy Corp.
		ABWI100141404004W500	14-14-040-04W5	Harvest Operations Corp.
		ABWI100150304004W500	15-03-040-04W5	Harvest Operations Corp.
		ABWI100162504005W500	01-25-040-05W5	Prairie Storm Energy Corp.
		ABWI102062904004W500	06-29-040-04W5	Harvest Operations Corp.
		ABWI102102804004W500	10-28-040-04W5	Harvest Operations Corp.

**Figure 23: Example of wells (UWI) that report (flow) to Petrinex Facility ID.**

### 7.3 DATA COLLECTION PROCEDURES (USING THE TABLET)

For each site surveyed:

1. Select relevant surface location, Facility ID and possibly UWI.
2. Take a photo of the site entrance placard displaying the operator name and location.

#### 7.3.1 PROCESS EQUIPMENT AND COMPONENT COUNTING

1. Take photo of equipment unit
2. Enter site tag number for equipment into [Process equipmentNotes]. For example, separators usually identified by Vxxx, compressors identified by Kxxx, tanks identified by Txxx, etc.
3. Begin component count at the first flange where process fluid enters the unit.
4. End component count at the next process equipment unit. For example, at a well site in Figure 21:
  - a. Start at the wellhead (add first equipment unit) and count components on the wellhead and along the production pipe until the separator inlet flange. Save count.
  - b. Add “separator” and count components on the separator and along production piping until the pipe leaves the site or goes underground. Save count.
5. Only count components in pressurized hydrocarbon service (i.e., those components with the potential to leak hydrocarbon vapours). Components that don’t contain volatile

hydrocarbons (e.g., instrument air, water, lubricating oil, process chemicals, diesel, glycol, etc) are much less likely to emit hydrocarbons to the atmosphere and therefore excluded from the inventory.

6. Only count components equal or greater than 0.5 inches in diameter. For example, instrumentation tubing less than 0.5 inches is not counted because they have a low leak potential (i.e., leak rates are typically very small).
7. When defining equipment units, ensure the “Emission Control” field is populated if off gassing is captured and controlled. Common examples include:
  - a. Storage tanks that are ‘blanketed’ with natural gas and connected to a flare (“Gas Flared”) or vapour recovery unit (“Gas Conserved”).
  - b. Compressor rod-packing vents tied into the flare header (“Gas Flared”) or captured by a Remvue slipstream and used as fuel (“Gas Conserved”).
  - c. Dehydrator still column tied the flare header (“Gas Flared”).
8. When counting in teams, ensure each process equipment unit is entered into one tablet (i.e., can’t have partial counts on two tablets).
9. Document these records in the tablet form “Major Equipment.”

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### 7.3.2 PNEUMATIC DEVICE COUNTING

Pneumatic devices are counted separately from process equipment because the manufacturer and model are required for each device.

1. Each pneumatic device observed is counted and the following fields populated from dropdown lists:
  - a. Driver type (natural gas, air, electric/solar or other)
  - b. Manufacturer
  - c. Model
  - d. Device type
2. Document these records in the tablet form “Pneumatics.”
3. No measurement of venting rates will be completed at this time.
4. I2P-100 pneumatics with serial number greater than F000386281 are 2<sup>nd</sup> generation low bleed devices.

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### 7.3.3 FUGITIVE AND VENT SCREENING AND MEASUREMENT

1. Conduct a leak detection survey (OGI) of equipment components in pressurized hydrocarbon service. Leak detection (or screening) is performed using a Flir GFx320 or GF320 leak-imaging infrared (IR) camera. Supplemental portable hydrocarbon gas detectors (i.e. Bascom-Turner Gas Sentry CGI-211) are available in the event an IR camera is not available (e.g., insufficient batteries, extra team member available for screening, etc).
2. Tag each detected leak with a unique ID. Leaking component tags, when used, are hung directly on the leaking component, or, if this was not practical, in close proximity, with



appropriate location information included, so the actual leaking component could be easily located for repair. The tags are uniquely numbered, weather resistant, and securely hung using either plastic zip ties.

3. Record a video of noteworthy leaks with the IR camera and document the media #.
4. Measure safely accessible leaks with the following equipment (described in Section 8.5.2):
  - a. The Hi-Flow Sampler
  - b. Calibrated Bag
  - c. VPAC (ultrasonic measurement on the upstream dump valve).
  - d. Calscan Positive Displacement Vent Meter
5. Leaks that are not safely accessible should be recorded with the IR camera and the leak rate estimated based on the intensity and size of the plume visualized using the IR camera. IR camera video files will be included with the final report.
6. Document these leak records and atmospheric temperature and pressure in the tablet form “Vents/Leaks.”
7. For tanks with gas loss from thief hatch but tied into VRU or flare (i.e., unintentional gas loss or leak), enter upstream pressure (kPa) and temperature (C) into comment field.
8. Vents (i.e., intentional gas release from pneumatics, dehydrators, atmospheric storage tanks, unlit flares, etc) are not measured during this campaign. Instead, noteworthy vents (possible super emitters) are recorded with the IR Camera and file name recorded in the tablet.
9. Special cases:
  - a. Well surface casing vent flows (SCVF) should be measured with the high-flow, with emission type = **Leak**, process equipment= “wellhead” and component = “SCVF”. When measuring, be sure you are only capturing the passive release of gas by placing the high-flow nozzle close to the vent but not fully enclosing the vent line (i.e., don’t drawdown gas from the well casing).
  - b. Gas Sample and Analysis System should be measured with the high-flow, with emission type = **Vent**.

## 7.4 TRAINING AND QAQC

### 7.4.1 CLASS TRAINING

Completed August 3, 2017 and included the following topics.

1. Introduction (15 minutes)
2. Project overview and objectives– Yori (45 minutes)
  - a. Target facility subtypes and methane emission sources.
  - b. Inventory boundaries and alignment with Petrinex Facility IDs (i.e., site selection rules).
  - c. Field data collection elements.
3. Demonstration of data collection application – Josh and Mike (45 minutes)
  - a. Each field team member will be provided a tablet to follow procedures for:
    - i. Entering site location and Petrinex Facility ID.
    - ii. Entering leak measurement results.
    - iii. Entering equipment and component counts.
    - iv. Uploading data after every day.
4. Break (15 minutes)
5. Field safety overview – Josh (45 minutes)
  - a. Field coordinator and lines of communication.
  - b. Safe work procedures.
  - c. Job Hazard Assessment (JHA).
  - d. Incident and near-miss reporting and investigation.
6. Component counting – Dave Picard (75 minutes)
  - a. Basic component categories and counting rules.
  - b. Potential issues.

### 7.4.2 FIELD TRAINING

Completed August 14, 2017 and includes:

1. Each team member complete component count of the same equipment unit. Counts compared until team agreed results were consistent with rules stated above.
2. Each team member completes a leak measurement of the same component. Results compared until team agreed results are the same.

### 7.4.3 DATA COLLECTION ERROR MANAGEMENT

Despite the training, definition standardization and tablet dropdown pick lists; data collection errors are anticipated. To identify and mitigate errors, records are reviewed daily by the field team coordinator. When observed:

1. Errors are corrected upon observation in the subject csv file with cells containing proposed changes highlighted yellow.
2. Modified data rows are saved to corresponding xlsx versions of MajorEquipment, Pneumatics and Vents. Column A of the xlsx is populated with the subject zip file epoch # and Column B is populated with the subject csv file epoch #. Columns C and greater contain records from their source file.
3. The 'error spreadsheet' is emailed to Clearstone on Friday of every week for review and confirmation that the proposed change is reasonable.
4. Systematic errors are communicated to field teams to prevent further occurrence.
5. Clearstone changes problematic records in its database.

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#### 7.4.4 DATA COMPLETENESS

It's possible that records collected by field inspectors and saved to tablets are not uploaded to the Clearstone database (e.g., dropbox upload failure). To check whether 'data leakage' has occurred, backup files saved on each tablet are parsed and imported to a back Clearstone database. Missing records are identified by comparing primary and backup database records.

This check was completed on September 19 (for data collected from August 14 to September 10) and no missing data was observed (as evidenced in P:\Alberta Energy Regulator\2017 - Phase 3 (Field Campaign)\QAQC\Review Major Equipment Aug 14 to Sept 10.xlsx).

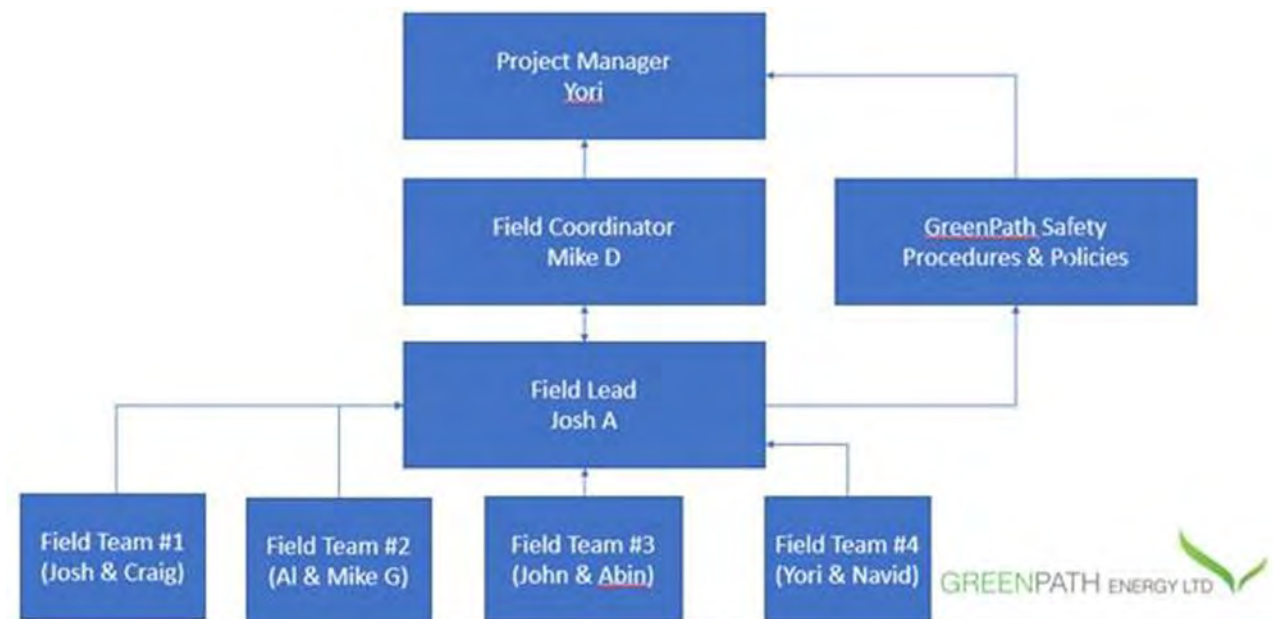
The check was completed after all field data collection was finished and no missing data was observed (as evidenced in P:\Alberta Energy Regulator\2017 - Phase 3 (Field Campaign)\QAQC\Missing Data\).

#### 7.5 INSPECTOR SAFETY AND CONDUCT

Safety is of paramount concern to the AER. Field Operations staff will conduct their work in accordance with the following field safety procedures.

1. Each field team member must review and sign (last page) the attached file "AER Field Work.pdf" (14 pages). This "standing hazard identification and assessment" prioritizes typical field work activities according to risk; identifies hazards; and the engineering, administrative and PPE controls we are responsible to implement before work can proceed. Keep a copy with you for reference during the campaign. If you have any questions, please bring them forward August 14 during our first field safety meeting (Al Duben will be present to answer questions).

2. When site conditions change (e.g., arrival at a sour site) or if there is any doubt regarding potential job hazards, your team **must** complete and sign the pre-job field level hazard assessment “AER Hazard Identification and Assessment.pdf”. We will complete this assessment August 14 at the first field location before starting any work. Signed copies must be emailed to [yori.jamin@clearstone.ca](mailto:yori.jamin@clearstone.ca) (preferably at the end of each week).
3. Our team will follow Greenpath safe work practices and procedures attached. In particular, please read the safe work procedure: “4.5 Inspecting a Facility with the IR camera.docx” before August 14. This is directly applicable to the work you will be doing (i.e., IR camera inspection, leak measurement and component counting).
4. All incidents (injury, property loss/damage, security) and near misses (event that has the potential to cause serious injury or damage) must be reported to your immediate supervisor (following supervision and reporting structure below) and documented using the appropriate form attached.



5. Contact details for all team members are provided in the following table.

The documents attached will be saved to each field tablet (Desktop “Safety” folder) and should be referenced throughout the campaign.

## 8 APPENDIX – STANDARDIZED DEFINITIONS

This glossary provides definitions relevant to the classification of venting and fugitive emissions sources.

### 8.1 EMISSION TYPES

Emission types are defined as follows:

#### 8.1.1 LEAK

It is important that an objective leak definition be established for application in a leak management program and that this definition meet or exceed common industry or regulatory standards. A leak is the unintentional loss of process fluid past a seal, mechanical connection or minor flaw at a rate that is in excess of normal tolerances allowed by the manufacturer or applicable health, safety and environmental standards. An equipment component in hydrocarbon service is commonly deemed to be leaking when the emitted gas can be visualized with an infrared (IR) leak imaging camera<sup>37</sup>, detected by an organic vapour analyzer in accordance with U.S. EPA Method 21 (i.e., hydrocarbon concentration screening value of 10,000 ppmv or more), or detected by any other techniques with similar or better detection capabilities.

#### 8.1.2 VENT

An intentional release of hydrocarbon gas directly to the atmosphere. Venting does not include partial products of combustion that might occur during flaring or other combustion activities.

To be consistent with regulatory definitions (e.g., US EPA and Western Climate Initiative jurisdictions), the following emission sources are defined as vents unless they are connected to a vapour recovery or control system and gas is observed to be leaking from corresponding equipment.

- Depressurization of process equipment (e.g., blowdowns).
- Engine and turbine starters.
- Glycol dehydrator off-gas.
- Loading hydrocarbon liquids (into truck or rail tankers).
- Pneumatic instruments and pumps.
- Storage tanks open to the atmosphere (e.g., working, breathing and flashing losses).
- Well liquid unloading.

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<sup>37</sup> The IR camera is not always as sensitive as screening using organic vapour analyzers, but has been demonstrated to be sufficiently sensitive to detect the big leaks that are contributing most of the emissions.

- Well servicing, completion and testing flows.
- Well surface casing vent flows.
- Unlit flare stacks.

## 8.2 SERVICE TYPES

Service types relevant to the classification of fugitive emission leaks are defined as follows and refer to the hydrocarbon in contact with the leaking component. A component is considered to be in hydrocarbon service when the process fluid being handled contains greater than 10 percent hydrocarbons on a mass basis.

### 8.2.1 HEAVY LIQUID

Process fluid that is a hydrocarbon liquid at the operating conditions and has a vapour pressure of less than 0.3 kPa at 15°C. Heavy crude oil and crude bitumen fall into this category.

### 8.2.2 LIGHT LIQUID

Process fluid that is a hydrocarbon liquid at the operating conditions and has a vapour pressure of 0.3 kPa or greater at 15°C. Light/medium crude oil, condensate and NGLs fall into this category.

### 8.2.3 PROCESS GAS

Process fluid that is a hydrocarbon gas at the subject operating condition.

## 8.3 COMPONENT TYPES

Component types relevant to the classification of fugitive emission leaks are defined as follows:

### 8.3.1 RECIPROCATING COMPRESSOR ROD-PACKINGS

Packing systems (seals) are used on reciprocating compressors to control leakage around the piston rod on each cylinder. A reciprocating compressor is deemed to have one seal associated with each compressor cylinder regardless of whether it is really a single or tandem seal. Controlled rod-packing vent lines that are tied into a flare header, VRU or other gas capture system have a very low probability of leaking to the atmosphere and therefore excluded from the component populations used to calculate population-average leak factors.

### 8.3.2 CENTRIFUGAL COMPRESSOR SEALS

Centrifugal compressors generally require shaft-end seals between the compressor and bearing housings. Either face-contact oil-lubricated mechanical seals or oil-ring shaft seals, or dry-gas shaft seals are used. A centrifugal compressor has two seals, one on each side of the housing

where the shaft penetration occurs. Controlled seal vent lines that are tied into a flare header, VRU or other gas capture system have a very low probability of leaking to the atmosphere and therefore excluded from the component populations used to calculate population-average leak factors.

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### 8.3.3 CONNECTORS

Each threaded, flanged, mating surface (cover) or mechanical connection is counted as a single connector. Welded or backwelded connections are not counted. Some types of components may have more than one set of connections associated with them. For example a union may have 3 sets of connecting surfaces (2 end connections and a center connection), a nipple or reducer may have 2 (one at each end), and tee may have 3 (one at each end). If all 3 connection points on a union are threaded then a union would be classified as 3 connectors. A union that has welded end connections would be counted as only one connector.

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### 8.3.4 CONTROL VALVE

A valve equipped with an actuator for automated operation to control flow, pressure, liquid level or other relevant process parameter. This category accounts for leakage from around the valve stem and from all fittings on the valve body. The end connections and any internal leakage past the valve seat are counted separately (see connectors and open-ended valves or lines, respectively).

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### 8.3.5 METERS

A flow measurement device is counted as a single component. The connections on the upstream and downstream sides of the device are counted as separate components.

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### 8.3.6 OPEN-ENDED LINES

Each valve in hydrocarbon service that has process fluid on one side and is open to the atmosphere on the other (either directly or through a line) is counted as an open-ended line. If the open side of the valve is fitted with a properly installed cap, plug, blind flange or second closed block valve, or is connected to a control device, then it is no longer considered to be open-ended. A drain valve that discharges into a free-venting storage tank or sump is counted as an open-end line. The valve stem and body, and the connector on the process side of the valve are counted as separate components.

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### 8.3.7 PRESSURE-RELIEF VALVE

Each pressure-relief valve that discharges directly to the atmosphere or through a vent system is counted as a single component. If the valve discharges to a control device (e.g., flare or thermal oxidizer), or has a rupture disk installed upstream along with a monitoring system to indicate

when the rupture disk has failed, then the valve is not counted. The connection on the upstream side of the valve is counted as a separate component. The connection on the downstream is not counted unless there is gas pressure on that side.

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#### 8.3.8 PUMP SEALS

Each pump in hydrocarbon service may leak from around the pump shaft and is typically controlled a packing material, with or without a sealant. It may be used on both the rotating and reciprocating pumps (and includes pneumatic injection pumps). Specially designed packing materials are available for different types of service. The selected material is placed in a stuffing box and the packing gland is tightened to compress the packing around the shaft.

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#### 8.3.9 REGULATORS

Most regulators are equipped with a vent where gas is released in the event the diaphragm inside becomes damaged. Often, this venting either goes unnoticed or is assumed to be normal operation of the regulator. All regulators should be checked for such leakage. Leakage from around the connections to the regulator should be classified as connectors

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#### 8.3.10 THIEF HATCH

Storage tanks connected to a VRU or flare do not emit gas unless the internal tank pressure exceeds the PRV or thief hatch set pressures (and intermittent venting occurs). When the tank pressure drops, the PRVs return to a closed position and typically don't leak. However, once opened, thief hatches remain partially open until an operator closes the hatch. Gas loss from partially open thief hatches is unintentional and therefore classified as a leak.

Gas losses from storage tanks open to the atmosphere (i.e., not connected to a VRU or flare) are classified as a process vent (not a leak).

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#### 8.3.11 VALVES

A valve that is **not** a control valve. This category accounts for leakage from around the valve stem and from all fittings on the valve body. The end connections and any internal leakage past the valve seat are counted separately (see connectors and open-ended valves or lines, respectively).

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#### 8.3.12 WELL SURFACE CASING VENT FLOW (SCVF)

A wellhead vent port that permits the flow of gas and/or liquid out of the surface casing/casing annulus (often referred to as internal migration). This condition exists when gas enters the exterior production casing annulus from a source formation below the surface casing shoe or through a compromised section of casing wall (i.e. a casing failure).



It is important to recognize the following difference between venting from surface casing and venting from production casing.

- Production casing venting is purposely initiated by the operator, and undertaken to stimulate oil well production. This is an intentional activity and therefore **not** classified as a leak.
- Surface casing vent flows (SCVF's) are an undesirable result of wellbore leakage, and most commonly attributed to poor well cementing practices. These leaks are classified as a fugitive emission source.

## 8.4 PROCESS EQUIPMENT TYPES

Process equipment types relevant to the UOG are described in Table 20.

<b>Table 20: Process equipment descriptions.</b>	
<b>Process Equipment</b>	<b>Description</b>
Air Cooled Heat Exchangers	<p>Air cooled heat exchangers, or air coolers, use fans to move air across tube bundles to cool down the circulating fluid inside the tubes. Air coolers are categorized as either forced draft or induced draft depending on the location of the fan.</p> <p>Forced draft air coolers have fans below the tube bundles, pushing the air up across the tubes. Flow in forced draft air coolers is more turbulent than in induced draft coolers, resulting in a greater heat transfer with lower costs. The low escape velocity of the heated air results in poor distribution of the recirculated air.</p> <p>Induced draft air coolers have fans above the tube bundles, pulling air up across the tubes. Induced draft coolers use less power, have more even air distribution, and higher escape velocities, which lead to less recirculation of the heated air. However, they cost more and are noisier than forced draft air coolers.</p>
Catalytic Heater	<p>A catalytic heater is a flameless heat source that uses chemical reactions to break down molecules and produce heat. In the presence of a catalyst which is within the heater, counter current combustion or catalytic combustion occurs when natural gas (or liquid propane gas) in the presence of oxygen creates carbon dioxide, water and heat. In this situation the ignition temperature of natural gas occurs at substantially lower temperatures, therefore no flame is involved in the combustion process and far infrared wave emitters are created, producing radiant heat. Once the oxidation begins, the reaction and heating continues until either the oxygen or fuel source is eliminated.</p>

**Table 20: Process equipment descriptions.**

Process Equipment	Description
Catalytic Incinerator	Catalytic incinerators also known as catalytic oxidizers are equipment for the thermal destruction of hazardous air pollutant (HAP). Oxidizers are used to thermally destroy, by oxidization, the HAP that cannot be recovered nor burned in flares. In the ideal oxidizer, the wastes are converted to carbon dioxide and water, and when the wastes contain HAPs such as sulfur or halogenated compounds, they are converted to non-hazardous compounds. The catalysts, such as platinum, are used to enhance the reaction, resulting in lower operating temperatures and energy requirements for the process.
Centrifugal Compression	Centrifugal compressors are typically driven by natural gas fired turbines and used for large volume, high pressure and high reliability applications such as natural gas transmission or gas plant sales. Centrifugal compressors are dynamic compressors, meaning energy is transferred from a moving set of blades to the gas. This energy takes the form of velocity and pressure. Centrifugal compressors use an impeller consisting of radial or backward bending blades. As the impeller rotates, gas between the rotating blades is moved from the area near the shaft radially outward into a diffuser. Energy is transferred to the gas while it is travelling through the impeller. Some of the energy results in an increase in pressure, some contributes to the velocity of the gas. This velocity decreases in the diffuser, resulting in a higher pressure and compression of the gas.
Deepcut Plant	Deep cut is any process that recovers hydrocarbon liquids from natural gas in excess of gas transmission pipeline specifications. These processes are typically located at large gas or straddle plants and may feature turboexpander, lean oil absorption or joule Thompson (JT) technology.
Dehydrator - Desiccant	<p>Dehydrators are widely used in gas production and processing operations for removing water vapour from natural gas. Desiccant dehydrators are filled with solid desiccants which absorb water from gas stream. Examples of solid desiccants employed in the UOG industry include silica gel, activated alumina and molecular sieves. Desiccant dehydrators features at least two vessels that operate in a cyclic manner alternating between drying and regeneration. During regeneration, a heated natural gas stream passes through the desiccant to desorb water and is typically recycled back to the wet gas flow so zero venting occurs normal operation. Another desiccant example is calcium chloride that gradually dissolves into brine as water vapour is removed from the gas. Instead of regenerating, the calcium chloride is replaced when the ‘working salt bed’ depth approaches the minimum required to achieve the specified dew point.</p> <p>Natural gas is vented each time the vessel is depressurized for the desiccant refilling (i.e., <b>not</b> a source of continuous venting).</p>

<b>Table 20: Process equipment descriptions.</b>	
<b>Process Equipment</b>	<b>Description</b>
Dehydrator - Glycol	Dehydrators are widely used in gas production and processing operations for removing water vapour from natural gas. Glycol dehydrators use liquid desiccant (most commonly tri-ethylene glycol (TEG) and di-ethylene glycol (DEG)) to absorb water vapour from wet gas streams that have a tendency to absorb small amounts of hydrocarbons (primarily benzene, hexane and heavier hydrocarbons, with some methane). When the glycol is regenerated in the reboiler, the water and residual hydrocarbons not released in the flash tank are liberated and vented to the atmosphere (i.e., a source of continuous venting).
Diesel Engine	Diesel engine, any internal-combustion engine in which air is compressed to a sufficiently high temperature to ignite diesel fuel injected into the cylinder, where combustion and expansion actuate a piston. It operates on either a two-stroke or four-stroke cycle; however, unlike the spark-ignition gasoline engine, the diesel engine induces only air into the combustion chamber on its intake stroke. Diesel engines are typically constructed with compression ratios in the range 14:1 to 22:1.
External Floating Roof Tank	A typical external floating roof tank (EFRT) consists of an open-topped cylindrical steel shell equipped with a roof that floats on the surface of the stored liquid. The floating roof consists of a deck, fittings, and rim seal system.
Flare Knockout Drum	Flare Knockout Drums (FKOD) drums are used to remove liquid droplets before waste gas enters the flare stack. Drum sizing is based on the separation of liquid droplets that occurs when drag force on the droplet equals the gravitational force. Flare knockout drums are located above or below ground and can be located by following piping to the flare stack.
Fractionation Tower	Fractionation towers (or distillation column) include de-ethanizer (first stage), de-propanizer (second stage) and de-butanizer (third stage) distillation towers in a fractionation train. Further explanation provided under Fractionation Plant.
Fractionation Plant	<p>Fractionation plants process natural gas (or crude oil) through one or several fractionators and are typically part of natural gas plants, chemical plants or refineries.</p> <p>1) Fractionation or is a unit operation utilized to separate mixtures into individual products. Fractionation involves separating components by relative volatility and difference in boiling point.</p> <p>2) The recovered NGL (or crude oil) stream is sometimes processed through a fractionation train consisting of three fractional distillation towers in series: a deethanizer, a depropanizer and a debutanizer. The overhead product from the deethanizer is ethane and the bottoms are fed to the depropanizer. The overhead product from the depropanizer is propane and the bottoms are fed to the debutanizer. The overhead product from the debutanizer is a mixture of normal and iso-butane, and the bottoms product is a C5+ mixture.</p>

<b>Table 20: Process equipment descriptions.</b>	
<b>Process Equipment</b>	<b>Description</b>
Gas Sample and Analysis System	This system consists of piping and regulator to collect a slipstream of process gas for analysis by a gas chromatograph. It normally draws a continuous stream of natural gas sample with a small fraction used for analysis and then vents both the unused and spent portions to the atmosphere.
Gas Boot	Gas boots (also known as vapor recovery towers) are typically located at oil production sites and separate hydrocarbon vapor from liquid or emulsion streams. These vessels operate at low pressure (typically 3 to 5 psig) to allow final flashing of vapors after separation and prior to storage. Captured gas can be used for onsite fuel demands, incinerated/flared or directed sales line.
Gas Meter Building	Building dedicated to gas metering for downstream sales. This includes one or more meter runs with corresponding isolation valves; temperature and pressure sensors and, in some cases, pressure regulation.
Gas Pipeline Header	A header pipe having several openings through which it collects or distributes hydrocarbon gas from/to other pipes (i.e., a tie-in header).
Gas Sweetening: Amine	<p>The removal of H<sub>2</sub>S from sour gas is called sweetening. Sweetening units are typically installed at sour gas plants or at smaller sites to remove H<sub>2</sub>S from fuel gas. The process for sweetening sour gas with regenerative solvent typically features two towers (i.e. Absorber and Regenerator). The sour gas flows into the lower part of the absorber or contactor. This vessel usually contains 20 to 24 trays, but for small units, it could be a column containing packing. Lean solution containing the sweetening solvent in water is pumped into the absorber near the top. As the solution flows down from tray to tray, it is in intimate contact with the sour gas as the gas flows upward through the liquid on each tray. When the gas reaches the top of the vessel, virtually all the H<sub>2</sub>S and, depending on the solvent used, all the CO<sub>2</sub> have been removed from the gas stream. Then, the rich solution from the bottom of vessel flows to the regenerator and recirculated back to the absorber.</p> <p>Most of the chemical sweetening regenerative solvents are alkanol amines, which are compounds formed by replacing one, two, or three hydrogen atoms of the ammonia molecule with radicals of other compounds to form primary, secondary, or tertiary amines respectively. Amines are weak organic bases that are used to remove CO<sub>2</sub> and H<sub>2</sub>S from natural gas as well as from synthesis gas. These compounds combine chemically with the acid gases in the contactor to form unstable salts. The salts break down under the elevated temperature and low pressure in the still. The common amine solvents are Monoethanolamide (MEA), Diglycolamine (DGA), Diethanolamine (DEA), and Triethanolamine (TEA).</p>

**Table 20: Process equipment descriptions.**

<b>Process Equipment</b>	<b>Description</b>
Gas Sweetening: Iron Sponge	The removal of H <sub>2</sub> S from sour gas is called sweetening. Iron sponge sweetening features wood chips that are impregnated with a hydrated form of iron oxide. The material is placed in a pressure vessel through which the sour gas is flowed. Because this is a batch process, usually two vessels are installed—one in service and the other on standby. The H <sub>2</sub> S reacts with the iron oxide to form iron sulfide. While it is possible to regenerate the iron sulfide with air to restore the iron oxide, in practice this is not done. Instead, the tower containing the spent iron sponge is taken out of service, and the standby tower is placed in service. The spent iron sponge is moistened with water, removed, and disposed of at an approved disposal site, and the tower is filled with a new charge of iron sponge.
Gas Sweetening: Sulfinol	The removal of H <sub>2</sub> S from sour gas is called sweetening. The Sulfinol process is a hybrid process using a combination of a physical solvent, sulfolane, and a chemical solvent, Diisopropanolamine (DIPA) or Methyl diethanolamine MDEA. The physical solvent and one of the chemical solvents each make up about 35 to 45% of the solution with the balance being water. The sulfinol process is economically attractive for treating gases with a high partial pressure of the acid gases
Gas Sweetening: Sulfreen	The removal of H <sub>2</sub> S from sour gas is called sweetening. The Sulfreen process is a dry-bed, sub-dew point absorption process based on the extension of the Claus reaction, i.e. catalytic oxidation of H <sub>2</sub> S to S. Basically consists of two (occasionally three for large capacities) Sulfreen reactors in series with the Claus reactors. Activated Alumina is used as a catalyst. Regeneration is needed since the sulphur accumulates on the catalyst decreasing its activity.
Incinerator	Incinerators (also known as thermal oxidizers) are equipment for the thermal destruction of hazardous air pollutants (HAP). They consist of a chamber through which waste gas flows with sufficient air and fuel to obtain high combustion temperatures. Oxidizers are used to thermally destroy, by oxidization, the HAP that cannot be recovered nor burned in flares.
Internal Floating Roof Tank	An internal floating roof tank (IFRT) has both a permanent fixed roof and a floating roof inside. There are two basic types of internal floating roof tanks: tanks in which the fixed roof is supported by vertical columns within the tank, and tanks with a self-supporting fixed roof and no internal support columns.
Joule Thomson Refrigeration Plant	Joule Thomson unit is used to lower the gas temperature by using the Joule Thomson effect (expansion cooling). Gas cooling is performed by forcing gas through a valve or porous plug while kept insulated so that no heat is exchanged with the environment. JT unit usually contains a gas to gas heat exchanger, JT valve (control or motor valve) and a two phase separator. In order to increase its effectiveness cooled gas is used to lower the temperature of the gas intake. In this manner very low temperatures can be achieved in high purity gases by constantly recirculating them with the use of a compressor.

<b>Table 20: Process equipment descriptions.</b>	
<b>Process Equipment</b>	<b>Description</b>
LACT Unit	A Lease Automatic Custody Transfer (LACT) unit measures the net volume and quality of liquid hydrocarbons. This system provides for the automatic measurement, sampling, and transfer of oil from the lease location into a pipeline when custody transfer occurs.
Liquid Pipeline Header	A header pipe having several openings through which it collects or distributes hydrocarbon liquids from/to other pipes (i.e., a tie-in header).
Line Heater	Line Heaters are installed on pipelines and typically used to prevent hydrate or wax formation. Natural gas heating may also be done to prevent liquids from condensing in the gathering line or to facilitate subsequent fluid separations.
Liquid Pump	A liquid pump is a device that moves liquids by mechanical action. Pumps can be classified into three major groups according to the method they use to move the fluid: direct lift, displacement, and gravity pumps.
Pig Trap	<p>Pig launchers and receivers are referred to as pig traps. Pig launchers are vessels used for launching a pipe tool (i.e., the pig) into a pipeline for cleaning or inspection purposes. The pig tool is driven through the pipeline by the process fluid and cleans the pipe surface with brushes. Pig receivers are located at the other end of the subject pipeline. Gas is released from pig traps when they are depressurized to load or remove a pig.</p> <p>Pig traps can be of horizontal, vertical or inclined type. For ease of operation, horizontal pig traps are preferred. When space constraints become critical, vertical or inclined pig traps are installed instead of horizontal.</p>
Pop Tank	Pop tanks are atmospheric tanks that receive fluids during pressure relief events.
Power Generator - Natural Gas Driver	A natural gas driven power generator combusts natural gas in a reciprocating engine or turbine to generate electricity.
Process Boiler	A boiler is an enclosed vessel that uses controlled flame combustion and has the primary purpose of recovering and exporting thermal energy in the form of steam, hot water or hot glycol.
Production Tank (fixed roof)	Fixed roof, hydrocarbon production tanks consist of a cylindrical steel shell with a permanently affixed roof, which may vary in design from cone or dome shaped to flat. Losses from fixed roof tanks are caused by changes in temperature, pressure and liquid level or during flashing.
Propane Fuel Tank	Horizontal pressure vessels used for storing propane.
Propane Heater	Propane heaters refer to small space or line heaters fueled by propane.

<b>Table 20: Process equipment descriptions.</b>	
<b>Process Equipment</b>	<b>Description</b>
Propane Refrigeration	Propane refrigeration plants consist of a refrigeration cycle to cool natural gas and remove hydrocarbon liquids or provide dew point control. Ethylene glycol is injected to achieve the required water dew point and prevent hydrates in the gas stream. The water rich glycol is regenerated to an 80% EG/water mix and re-injected.
Reciprocating Compressor - Natural Gas Driver	Reciprocating compressors are positive displacement compressors that use pistons driven by a crankshaft to deliver high pressure gas. The intake gas enters the suction manifold, then flows into the compression cylinder where it gets compressed by a piston driven in a reciprocating motion via a crankshaft, and is then discharged. Compressors are typically skid mounted, driven by a natural gas fired engine or electric motor, include an air cooled heat exchangers and enclosed by a shed.
Reciprocating Compressor - Electric Driver	
Salt Bath Heater	A salt bath heater utilizes molten salt as a transfer media in lieu of water or thermal oil. The salt liquefies at ~390° allowing a process stream outlet temperature of 300° to 650° to be achieved. Salt Bath Heaters are designed for high temperatures at low operating pressures
Screw Compressor - Natural Gas Driver	Screw compressors utilize a rotary positive displacement mechanism that compresses gas between intermeshing helical lobes and chambers in the compressor housing. As the mechanism rotates, the meshing and rotation of the two helical rotors produces a series of volume-reducing cavities. Gas is drawn in through an inlet port in the casing, captured in a cavity, compressed as the cavity reduces in volume, and then discharged through another port in the casing. They are usually used for boosting the gas from wells to reciprocating compressors in the field or gas plants. Screw compressors are typically skid mounted, driven by a natural gas fired engine or electric motor and enclosed by a shed.
Screw Compressor - Electric Driver	
Scrubber	Vessel containing a catalytic or adsorption substance designed to remove problematic compounds (often H <sub>2</sub> S or other odourous compounds) from the gas stream.
Separator	A vessel used to separate a mixed-phase stream into gas and liquid phases that are "relatively" free of each other. This includes 2-phase and 3-phase separators.
Shell and Tube Heat Exchanger	Shell and tube heat exchangers are horizontal vessels that take the energy from a hot stream (shell side) and transfer it to a cool stream (tube site), or vice versa. Most of the heat exchangers used in industry are shell and tube, air cooled or plate and frame.

<b>Table 20: Process equipment descriptions.</b>	
<b>Process Equipment</b>	<b>Description</b>
Stabilization Tower	Stabilization Tower (or stabilizer) is a unit used to stabilize condensate in order to reduce tank venting emissions and recover dissolved gas. It is usually a vertical separator type of vessel with operating conditions at low (atmospheric or lower) pressure and temperature in a region of 70-80 C°. High pressure feed enters in the mid region and momentarily expands. Pressure reduction reduces the boiling point of the feed which causes sudden evaporation (flashing). Stabilizer is heated at bottom, thus creating a reflux which allows condensate with less dissolved gas. Liquids are boiled off of gases and exit at bottom and gases on top. In this manner flash losses are avoided of the top of the tanks.
Storage Bullet	Storage bullets are horizontal pressure vessels used for storing hydrocarbon liquids with high vapour pressures.
Sulphur Recovery Plant	Sulfur Recovery Units, also known as Claus Units, use a feedstock of acid gases from sweetening units and sour-water strippers. The feedstock is sent into a proprietary burner system, where it is burnt sub-stoichiometrically with air. The resulting mixture of hydrogen sulfide and sulfur dioxide reacts to form elemental sulfur ("Claus reaction"), which is then removed through condensation. This initial combustion section is followed by two or three catalytic sections to increase sulfur recovery rates to 94.5% – 97.5%.
Tank Heater	A tank heater also known as immersion heater is installed in a tank to maintain liquid temperature at a certain controlled set point.
Thermal Electric Generator	A thermoelectric generator (TEG) is a solid state device that converts heat flux (temperature differences) directly into electrical energy through a phenomenon called the Seebeck effect (a form of thermoelectric effect).
Treater	A vessel used to break oil-water emulsions and achieve oil pipeline specifications. A treater can use several mechanisms. These include heat, gravity segregation, chemical additives and electric current to break emulsions. There are vertical and horizontal treaters. The main difference between them is the residence time, which is shorter in the vertical configuration compared with the horizontal one. A treater can be called a heater treater or an emulsion treater.
Turbo Expander	Turbo expansion plant is where a turboexpander is used. A turboexpander is a centrifugal or axial flow turbine through which a high pressure gas is expanded to produce work that is often used to drive a compressor or generator. Turboexpanders are very widely used as sources of refrigeration in industrial processes such as the extraction of ethane and natural gas liquids (NGLs) from natural gas, the liquefaction of gases (such as oxygen, nitrogen, helium, argon and krypton) and other low-temperature processes.
Unit Heater	A unit heater is a natural gas or propane fired space heater (such as an office furnace or hot water heater).



<b>Table 20: Process equipment descriptions.</b>	
<b>Process Equipment</b>	<b>Description</b>
Wellhead	A wellhead is the surface equipment (valves, chokes and pressure gauges) used to maintain control of a well and to regulate well production.
Well Pump	A well pump may be a surface pump jack or down-hole progressing cavity pump designed to extract crude oil from a well where there is not enough reservoir pressure to force oil to the surface. Well pumps include natural gas or propane fired engines to create artificial lift. This process of creating artificial lift simply increases the pressure within an oil well to pull oil to the surface.

## 8.5 TECHNOLOGY TYPES

Technology types used in this study are described in the following subsection.

### 8.5.1 LEAK DETECTION

#### 8.5.1.1 PORTABLE CATALYTIC/THERMAL CONDUCTIVITY LEAK DETECTOR

Portable catalytic gas sensors are capable of measuring the combustible gas content of a sample. The core of the sensor (pellistor) comprises two platinum wires, one wire (termed the catalytic bead) is coated with a catalytically-treated metal oxide and the other (termed reference bead) is coated with a compound to inhibit catalytic oxidization. These beads are arranged in series on the “unknown leg” of a Wheatstone bridge circuit, and are electrically heated. In the presence of ambient air (i.e. no combustible gases), the sensor is zeroed by adjusting the electrical resistivity of the “known leg” of the Wheatstone bridge so the circuit is balanced (i.e. zero voltage across the bridge). This zeroing operation is automatically done by the instrument when it is turned on, and takes approximately 30 seconds. Once the sensor has been zeroed and a sample of combustible gas and air is supplied, the electrical heating promotes catalytic oxidization of the sample’s combustible gases and oxygen in the air, on the surface of the catalytic bead. This oxidation creates additional heat on the catalytic bead and increases the electrical resistivity of the platinum wire within the bead. This change in electrical resistance can be measured as a voltage difference across the bridge, and is nearly linearly proportional to the combustible gas content of the sample for the 0 to 3% of methane (0 to 60% LEL) range, and slightly less linearly proportional in 3-5% methane (60 to 100% LEL) range. Beyond 100% LEL, the reducing oxygen content of the sample will result in a non-linear sensor response and the signal will fall-off at compositions beyond stoichiometric.

A thermal conductivity sensor (as known as a Katharometer) is required to reliably measure samples with the combustible gas content beyond 100% LEL. The thermal conductivity sensor comprises a balanced Wheatstone bridge of electrically heated resistors. A reference gas (ambient air) is flowed across resistors on opposite legs of the bridge. While a sample gas (methane and ambient air mixture) is flowed across the other pair of resistors on opposite legs of the bridge. The differences in thermal conductivity of the reference and sample flows will affect the cooling rates of the heated resistors and change their resistivity, which is measured as a voltage difference across the bridge. The technique is reliable across a whole range of gas mixture, provided that mixture comprises only two gases and the two gases have different thermal conductivities (e.g. methane and air).

The handheld gas Bascom Turner CGI-201 and 211 Class 1, Division 1 hazardous location compliant instruments which can accurately quantify methane composition, as well as other hydrocarbons which reduced certainty. It is equipped with catalytic combustion sensor to measure hydrocarbon content from 0.05% up to 4% and a thermal conductivity sensor to measure methane 4% to 100%. The CGI-211 has a “Track Gas” mode which is ideal for finding leaks as it has a very fast response time and a beeper/alarm when the instrument detects combustible gases in excess of a user adjustable set point. However using the instrument in “Track Gas” mode only uses the catalytic gas sensor which restricts the operational range to 0 to 4% methane. The catalytic sensor is susceptible to catalyst poisoning from silicon compounds (common in oil and lubricants), sulfur compounds, chlorine and heavy metals. Also, halogen or halide compounds (used in fire extinguishers) and Freon (used in refrigerants) can inhibit the catalytic sensor. However, the sensor should return to normal functionality with 24 to 48 hours of exposure to the ambient air. Finally, the catalytic bead of the sensor is susceptible to thermal stress cracking when exposed to high concentration combustible gases, which generate a lot of catalytic oxidation heat on the bead.

The methane sensor in the instrument should be replaced when sensitivity changes substantially since the last calibration. The instrument can be manually calibrated by supplying a calibration gas to the instrument at atmospheric pressures and adjusting a potentiometer until the correct concentration is displayed by the instrument. Typically, this instrument is calibrated once every six months.

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#### **8.5.1.2 PORTABLE ACOUSTICAL LEAK DETECTOR**

Portable acoustical leak detectors (e.g., VPAC Model 5131) can estimate the internal leakage past the seat of a valve (through valve leakage). These instruments require the operator to enter the valve type, size and differential pressure (pressure upstream vs downstream of the valve), and place a hand held acoustic probe with some gel on the body of the valve. The acoustic signal observed by the instrument and valve properties are used to estimate the through valve leak rate from an empirical derived database of laboratory tested valves with known through valve leak rates.

While this type of leak detector is easy to use it is only appropriate for valves and can only estimate the through valve leak rate. This instrument cannot estimate the valve stem leak rate and does not give an indication of the hydrocarbon emissions if the valve is in gas service. This instrument is not appropriate for screening an area for fugitive emissions.

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#### **8.5.1.3 INFRARED CAMERA**

Gas detecting infrared (“IR”) cameras are a fast and easy to use tool for screening fugitive emissions sources. However, IR cameras have limited performance in rain, snow, or fog; and an inability to distinguish between natural gas and hot gases. Also, since IR camera video recording equipment is not rated for usage in Class I, Division 1 hazardous locations, a hot work permit is required, and the screening area must be monitored for LEL concentrations.

IR cameras operate on the principle that all matter emits infrared radiation (light) at different frequencies, depending on its temperature. Gas detecting IR cameras are equipped with an optical filter which only lets through a narrow portion of the infrared spectrum that target gases (e.g. hydrocarbons) are known to have stronger absorption than the other gases in ambient air. Hydrocarbon emissions are registered by the camera as a deficit in the infrared light intensity relative to that of the background. The captured infrared light intensity is processed by the camera, and displayed as a false coloured image in the visible part of the spectrum.

The deficit in infrared light intensity will be more pronounced if the target gas is colder than the background or if the target gas contains heavy hydrocarbons (e.g. C2 to C6). Similarly, an opposite response can be observed when the emission source is much hotter than the background, such as a flare with a cold sky background.

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## 8.5.2 LEAK AND VENT MEASUREMENT

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### 8.5.2.1 CALIBRATED BAG

A calibrated bag is a bag for measuring the emission rate from a vent or opened line. The bag has a known volume and a neck sized to fit over vent openings. The leak rate is determined as the volume of the calibrated bag divided by the time it took to fill. The emissions are also sampled to determine the concentration of target gases. The product of the leak rate and target gas concentration give the emission rate of the vent. This method is capable of measuring leaks up to 408 m<sup>3</sup>/hr of natural gas and is accurate to within ±10% (Health Consultants Inc., 2009).

### 8.5.2.2 FULL-FLOW FLOW METERS

If possible to fully capture leak emissions, the leak rate can be determined by from the product of the flow rate and the concentration of the target gas in the sampling stream. The target gas concentration can be measured with a vapour analyzer presented in Section 8.5.1 or lab analysis of a grab sample. The sample stream flow rate can be measured with a variety of instruments such as a diaphragm flow meter, rotary meter, orifice meters and ultrasonic flow meter. At

higher flow rates the target gas concentration in the flow stream will be reduced due to additional dilution by ambient air being drawn from around the leak site that is being measured. However, the product of the measured flow rate and target gas concentration should give a consistent estimate of the leak emission rate. A flow rate should be selected such that all the emissions from the leak are captured but not so high that the target gas concentration in the sampling stream is approaching the detectable limit of the instrument. The Hi-Flow Sampler (Section 8.5.2.3) is an example of a product which estimates a hydrocarbon leak rate by capturing all the emissions from a leak. The Calscan positive displacement meter is another example, however, this device measures whole gas flow and is not equipped with a hydrocarbon sensor.

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#### 8.5.2.3 HI-FLOW SAMPLER

The Hi-Flow Sampler is an intrinsically safe instrument manufactured and sold by Bacharach, for measuring methane emission rates from leaking components. The instrument is portable (9 kg) and fits inside a backpack. The Hi-Flow Sampler comprises a sampling hose which the operator places on a leak site, an instrumentation box containing a blower and catalytic/thermal conductivity natural gas sensors, a battery pack, and a control pad/display. The Hi-Flow Sampler attempts to capture all the emissions from a leak by continuously drawing a sample of the air around a leak site at a relatively high (up to 17 m<sup>3</sup>/hr), but adjustable flow rate. The flow rate is determined by the measured pressure differential across an orifice restrictor, and the methane concentration is determined by directing a portion of the flow to a catalytic oxidation/thermal conductivity combustible gas sensor (see Section 8.5.1.1). An identical sensor also measures the background concentration of methane within the vicinity of the leak site. The background methane concentration is discounted from the sampled methane concentration in the assessment of the component leak rate. Finally, a blower which draws the sample through the instrument, exhausts to atmosphere.

This instrument is capable of determining leak rates from 0.085 to 13.6 m<sup>3</sup>/hr  $\pm 10\%$ . The manufacture recommends monthly calibration at a minimum, and more frequent calibration depending on how often the instrument is used and the amount of gas that has been sampled. Since this instrument uses a catalytic/thermal conductivity combustible gas sensor to quantify the sample's methane concentrations, it is susceptible to sensor flooding and poisoning (see Section 8.5.1.1).

Sensor flooding occurs when a high concentration (greater than 5%) of methane is quickly introduced to the sensor methane sensor. Under ideal conditions the instrument would transition from the catalytic sensor (valid for 0% to 5% methane) to the thermal conductivity sensor (valid 5% to 100% methane). However, when too great a methane concentration is quickly introduced to the catalytic sensor, the instrument will report erroneously low reading because the catalytic reaction is oxygen starved and will not trigger the thermal conductivity sensor. To prevent

sensor flooding a source with combustible gas content greater than stoichiometric (approximately 9% methane) must be approached slowly so as to trigger the transition to the thermal conductivity sensor.

## 8.6 FACILITY SUBTYPE CODES

When operators apply for a production accounting facility identifier (Facility ID), the AER requires that a facility subtype be specified according to the descriptions listed in Tables 2 and 3 of Manual 011 (AER, 2016). Facility subtype codes are presented in Table 21 and grouped according to UOG industry segments. Although these facility descriptions don't provide complete or definitive explanations of process equipment installed, they do provide some insight on the nature of processing activities at subject sites. When combined with volumetric flow data and field inventory statistics, the quantity and size of equipment at discrete sites can be estimated.

<b>Table 21: Facility Subtypes defined in AER Manual 011.</b>			
<b>UOG Industry Segment</b>	<b>SubType Code</b>	<b>Facility Type</b>	<b>Facility SubType</b>
Well drilling, testing and servicing	381	Battery	Drilling and completing
	371	Battery	Gas test
Light and Medium Crude Oil Production	311	Battery	Crude Oil (Medium) Single
	321	Battery	Crude Oil (Medium) Multiwell Group
	322	Battery	Crude Oil Multiwell Proration
	501	Injection	Enhanced recovery scheme
	502	Injection	Concurrent production-cycling scheme
	508	Injection	Enhanced recovery scheme (issued by AER). No License Required.
Cold Heavy Crude Oil Production	331	Battery	Crude bitumen single-well
	341	Battery	Crude bitumen multiwell group
	342	Battery	Crude bitumen multiwell proration
	343	Battery	Crude bitumen/heavy oil administrative grouping
	611	Custom Treating	Custom Treating Facility
Thermal Heavy Crude Oil Production	344	Battery	In-Situ Oil Sands battery
	345	Battery	In-Situ Oil Sands battery (Sulphur Reporting)
	506	Injection	In-Situ oil sands
	902	Battery	Water Source
Natural Gas Production	351	Battery	Gas Single
	361	Battery	Gas Multiwell Group
	362	Battery	Gas Multiwell effluent

**Table 21: Facility Subtypes defined in AER Manual 011.**

UOG Industry Segment	SubType Code	Facility Type	Facility SubType
	363	Battery	Gas Multiwell proration SE AB
	364	Battery	Gas Multiwell proration outside SE AB
	365	Battery	Gas Multiwell Group (issued by AER). No License Required.
	366	Battery	Gas Multiwell proration SE AB (issued by AER). No License Required.
	367	Battery	Gas Multiwell proration outside SE AB (issued by AER). No License Required.
Natural Gas Gathering	601	Compressor Station	Compressor Station
	621	Gas Gathering	Gas Gathering System
	622	Gas Gathering	Gas Gathering System (compression < 75 kW. Issued by AER). No License Required.
Natural Gas Processing	401	Gas Plant	Gas Plant Sweet
	402	Gas Plant	Gas Plant Sour (receives <1 t/d sulphur) - Flaring
	403	Gas Plant	Gas Plant Sour (receives >1 t/d sulphur) - Flaring
	404	Gas Plant	Gas Plant Sour - Injection
	405	Gas Plant	Gas Plant Sour - Recovery
	406	Gas Plant	Gas Plant Sweet - Straddle
	407	Gas Plant	Gas Plant fractionation
	504	Injection	Acid Gas Disposal
Natural gas transmission, storage and distribution	204	Pipeline	Gas transporter
	206	Pipeline	Gas distributor
	505	Injection	Underground gas storage
	631	Gas Gathering	Field Receipt meter station
	632	Gas Gathering	Disposition meter station
	633	Gas Gathering	Interconnected meter station
	634	Gas Gathering	Border crossing meter station
	637	Gas Gathering	NEB field receipt meter station
	638	Gas Gathering	NEB interconnect receipt meter station
	639	Gas Gathering	NEB interconnect disposition meter station

**Table 21: Facility Subtypes defined in AER Manual 011.**

UOG Industry Segment	SubType Code	Facility Type	Facility SubType
	640	Gas Gathering	Interconnect PL to PL disposition meter station
Petroleum Liquids Transportation	207	Pipeline	Oil pipeline
	208	Pipeline	NGL pipeline
	209	Pipeline	NEB Regulated Pipeline
	671	Tank Farm-Terminal	Tank loading and unloading terminal
	672	Tank Farm-Terminal	NEB regulated terminal
	673	Tank Farm-Terminal	Third-party tank loading and unloading terminal
Disposal and Waste Treatment	675	Tank Farm-Terminal	RailCar/Oil Loading And Unloading Terminal
	503	Injection	Water Disposal
	507	Injection	Disposal (approved as waste plant)
	509	Injection	Disposal (issued by AER). No License Required.
	612	Custom Treating	Custom Treating Facility (approved as waste plant)

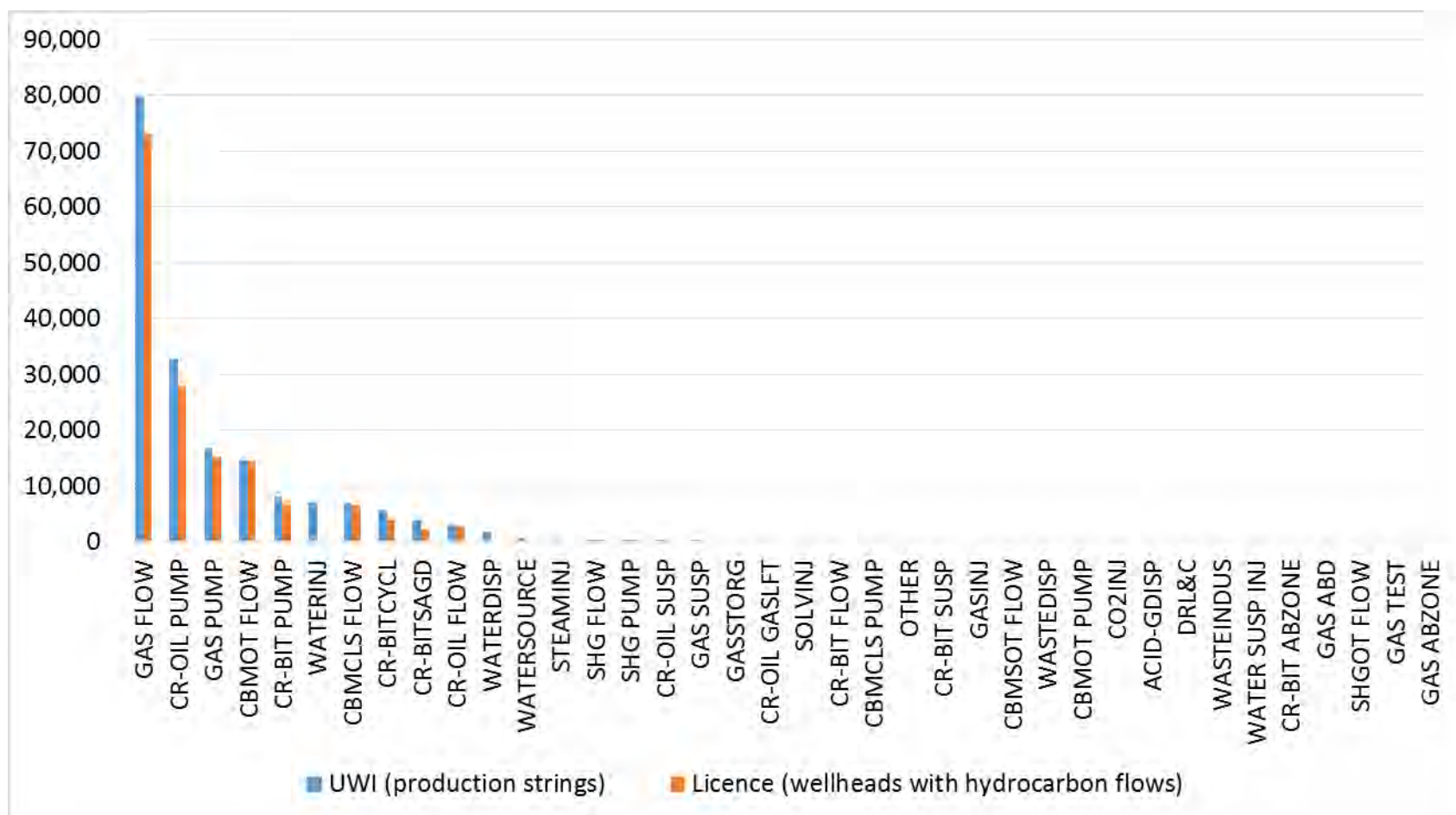
## 8.7 WELL STATUS CODES

Well status codes are defined for each UWI in Alberta. They feature the following categories that identify the activity and classification of a well and its fluid.

- Fluid - the primary fluid the well produces or injects, such as oil or gas.
- Mode - the mechanism the well uses to produce or inject, such as flowing or pumping, or the inactive phases of a well, such as suspended or abandoned.
- Type - the well type reflects the well's purpose, such as injection or disposal.
- Structure - the well structure reflects when a well has multiple wells that have commingled production, or when a well is completed horizontal and the producing interval is open and draining into a common wellbore.

All four categories may not apply to every UWI. Non-null records are concatenated to form a single well status code for each UWI. The most common well status records are presented in Figure 24 with example counts from December 2017. Emission inventory refinements should focus on the top 9 well status codes that represent 99 percent of the relevant well population.





**Figure 24: Number of UWIs (representing production strings) and well licences (representing wellheads with hydrocarbon flows) for each well status code reported in Petrinex for December 2017.**



## 9 APPENDIX - METHODOLOGY FOR ASSESSING UNCERTAINTIES

Uncertainties in emission inventories arise through at least three different processes (IPCC, 2000):

- Uncertainties from definitions (e.g., meaning incomplete, unclear, or faulty definition of an emission or uptake).
- Uncertainty from natural variability of the process that produces the emission.
- Uncertainties from the assessment of the process or quantity, including, depending on the method used: (i) uncertainties from measuring, (ii) uncertainties from sampling, (iii) uncertainties from reference data that may be incompletely described, and (iv) uncertainties from expert judgment.

For most purposes it is reasonable to assume that uncertainties from definitions are adequately controlled through the applied QA/QC procedures, and therefore, are negligible. Quantitative uncertainty estimates to account for the latter two contributions may be developed using the Tier 1 approach published by IPCC (2000). This approach employs simple error propagation equations based on the assumption of uncorrelated normally distributed uncertainties under addition and multiplication.

### 9.1 ERROR PROPAGATION EQUATIONS

An emission inventory may be viewed as the sum of emission estimates for multiple equipment units where the estimate for each equipment is typically the product of an emission factor and a corresponding activity value. For example, emissions from a single source are typically estimated using a relation of the form:

$$ER = EF \cdot A \cdot (1 - CF) \cdot OT$$

**Equation 11**

Where,

ER	= average emission rate,
EF	= average emission factor,
A	= activity value,
CF	= control factor,
OT	= fraction of the time the source is in service.

Total aggregate emissions from multiple sources are then calculated using the relation:

$$ER_{Total} = ER_1 + ER_2 + \cdots + ER_n$$

**Equation 12**

At a lower calculation level, individual input parameters to Equation 11 may also be determined through a series of multiplication and addition steps. For instance, an emission factor for total fugitive emissions per compressor unit may be expressed by the relation:

$$ER_{Compressor} = ER_{Valves} \cdot N_{Valves} + ER_{Connectors} \cdot N_{Connectors} + ER_{Seals} \cdot N_{Seals}$$

**Equation 13**

Where, N denotes the number of components and the subscripts denote the type of components. Similarly, in the absence of metered values, fuel usage may be estimate as the production of engine size, engine efficiency, load factor, operating time, and fuel heating value.

Thus, the development of an emissions inventory may be divided in to a series of multiplication and addition steps where uncertainties are aggregated accordingly.

#### 9.1.1 COMBINING UNCERTAINTIES IN MULTIPLICATION AND DIVISION STEPS

Where the activity parameter for a source is continuous (e.g., gas throughput or fuel gas consumption), the IPCC Tier-1 relation for combining uncertainties in multiplication steps is (this is approximate for all random variables):

$$U_{Total} = \sqrt{U_1^2 + U_2^2 + \dots + U_n^2}$$

**Equation 14**

Where,

$U_{Total}$  = the percentage uncertainty in the sum of the quantities.  
 $U_1, U_2, U_n$  = the uncertainties in the individual quantities being multiplied.

Thus, the uncertainty in an emission rate calculated using Equation 11 is given by the relation:

$$U_{ER} = \sqrt{U_{EF}^2 + U_A^2 + U_{1-CF}^2 + U_{OT}^2}$$

**Equation 15**

#### 9.1.2 COMBINING UNCERTAINTIES IN ADDITION AND SUBTRACTION STEPS

Where the activity parameter for a source is a count or integer value (e.g., number of equipment components, number of pneumatic devices, number of compressors, etc.), Equation 16 is used to evaluate the aggregate uncertainty for N sources of the same type (this expression is exact for uncorrelated or independent variables).

$$U_{Total} = \frac{\sqrt{(U_1 \cdot x_1)^2 + (U_2 \cdot x_2)^2 + \dots + (U_n \cdot x_n)^2}}{x_1 + x_2 + \dots + x_n}$$

**Equation 16**

Where:

$x_1, x_2, x_n$  = are the uncertain quantities being added.

Thus, the uncertainty in an emission rate calculated using Equation 12 is given by the relation:

$$U_{ER_{Total}} = \frac{\sqrt{(U_{ER_1} \cdot ER_1)^2 + (U_{ER_2} \cdot ER_2)^2 + \dots + (U_{ER_n} \cdot ER_n)^2}}{ER_1 + ER_2 + \dots + ER_n}$$

**Equation 17**

## 9.2 LIMITATIONS TO RULES OF COMBINATION OF UNCERTAINTIES

The rules stated above are derived below in Section 9.3. These rules have two limitations. First, they can be used only when there is a combination of multiplication and/or addition. Second, the variables in the equations are assumed independent of one another. In case of any dependency between variables, covariance terms must be incorporated in the uncertainty calculations as presented in Equation 20.

## 9.3 DERIVATION OF ERROR PROPAGATION EQUATIONS

Uncertainty in this work is defined as 95% confidence interval. The uncertainty of a variable may be calculated using Equation 18 which is a linear function of standard deviation.

$$U_{x_i} = \frac{c}{\sqrt{n}} \frac{\sigma_{x_i}}{x_i}$$

**Equation 18**

Where

$U_{x_i}$  = uncertainty of  $x_i$ ,

$\sigma_{x_i}$	= standard deviation of $x_i$ ,
$x_i$	= an arbitrary variable,
$c$	= 95% confidence level critical value,
$n$	= number of data points.

Equation 18 is generally used to calculate the uncertainty of variables from measurement data; however, when a variables is calculated as a function of other variables, its uncertainty shall be calculated as an aggregation of other variables' uncertainties. Since the uncertainty is a linear function of standard deviation, rule of propagation of standard deviation shall be used to calculate the uncertainty of a function.

For function  $x$  defined as

$$x = f(\chi_1, \dots, \chi_i, \dots, \chi_n)$$

**Equation 19**

where  $n$  is the number of variables, the standard deviation is calculated in terms of standard deviation of its variables,  $\chi_i$ , using the rule of propagation of standard deviation as express by Equation 20.

$$\sigma_x = \sqrt{\sum_{i=1}^n \sum_{j=1}^n \frac{\partial x}{\partial \chi_i} \sigma_{\chi_i \chi_j} \frac{\partial x}{\partial \chi_j}}$$

**Equation 20**

In the above equation,  $\sigma_{\chi_i \chi_j}$  is covariance of  $\chi_i$  and  $\chi_j$  which is defined as:

$$\sigma_{\chi_i \chi_j} = \frac{\sum d\chi_i d\chi_j}{N - 1}$$

**Equation 21**

where  $N$  is the population of data. If  $\chi_i$  are independent, Equation 20 simplifies to

$$\sigma_x = \sqrt{\sum_{i=1}^n \left( \frac{\partial x}{\partial \chi_i} \sigma_{\chi_i} \right)^2}$$

**Equation 22**

where  $\sigma_{\chi_i}$  is the standard deviation of  $\chi_i$ .

Equation 20 and Equation 22 could be proved by an example. Consider an arbitrary equation  $x$  which is a function of three parameters  $a$ ,  $b$ , and  $c$ :

$$x = f(a, b, c)$$

**Equation 23**

The standard deviation of  $x$  is defined as

$$\sigma_x = \sqrt{\frac{\sum dx_i^2}{N - 1}}$$

**Equation 24**

where  $dx$  is differential of  $x$  and is calculated by Equation 25.

$$dx = \left(\frac{\partial x}{\partial a}\right)_{b,c} da + \left(\frac{\partial x}{\partial b}\right)_{a,c} db + \left(\frac{\partial x}{\partial c}\right)_{a,b} dc$$

**Equation 25**

Inserting Equation 25 into Equation 24 leads to Equation 26, which aggregates the standard deviations.

$$\begin{aligned}
\sigma_x &= \left( \frac{1}{N-1} \left( \sum \left( \frac{\partial x}{\partial a} \right)_{b,c}^2 da_i^2 + \sum \left( \frac{\partial x}{\partial b} \right)_{a,c}^2 db_i^2 + \sum \left( \frac{\partial x}{\partial c} \right)_{a,b}^2 dc_i^2 \right. \right. \\
&\quad + \sum 2 \left( \frac{\partial x}{\partial a} \right)_{b,c} \left( \frac{\partial x}{\partial b} \right)_{a,c} da_i db_i + \sum 2 \left( \frac{\partial x}{\partial a} \right)_{b,c} \left( \frac{\partial x}{\partial c} \right)_{a,b} da_i dc_i \\
&\quad \left. \left. + \sum 2 \left( \frac{\partial x}{\partial b} \right)_{a,c} \left( \frac{\partial x}{\partial c} \right)_{a,b} db_i dc_i \right) \right)^{1/2} \\
&= \left( \left( \frac{\partial x}{\partial a} \right)_{b,c}^2 \sum \frac{da_i^2}{N-1} + \left( \frac{\partial x}{\partial b} \right)_{a,c}^2 \sum \frac{db_i^2}{N-1} + \left( \frac{\partial x}{\partial c} \right)_{a,b}^2 \sum \frac{dc_i^2}{N-1} \right. \\
&\quad + 2 \left( \frac{\partial x}{\partial a} \right)_{b,c} \left( \frac{\partial x}{\partial b} \right)_{a,c} \sum \frac{da_i db_i}{N-1} + 2 \left( \frac{\partial x}{\partial a} \right)_{b,c} \left( \frac{\partial x}{\partial c} \right)_{a,b} \sum \frac{da_i dc_i}{N-1} \\
&\quad \left. + 2 \left( \frac{\partial x}{\partial b} \right)_{a,c} \left( \frac{\partial x}{\partial c} \right)_{a,b} \sum \frac{db_i dc_i}{N-1} \right)^{1/2} \\
&= \left( \left( \frac{\partial x}{\partial a} \right)_{b,c}^2 \sigma_a^2 + \left( \frac{\partial x}{\partial b} \right)_{a,c}^2 \sigma_b^2 + \left( \frac{\partial x}{\partial c} \right)_{a,b}^2 \sigma_c^2 + 2 \left( \frac{\partial x}{\partial a} \right)_{b,c} \left( \frac{\partial x}{\partial b} \right)_{a,c} \sigma_{a,b} \right. \\
&\quad \left. + 2 \left( \frac{\partial x}{\partial a} \right)_{b,c} \left( \frac{\partial x}{\partial c} \right)_{a,b} \sigma_{a,c} + 2 \left( \frac{\partial x}{\partial b} \right)_{a,c} \left( \frac{\partial x}{\partial c} \right)_{a,b} \sigma_{b,c} \right)^{1/2}
\end{aligned}$$

**Equation 26**

If parameters are independent, covariance terms are zero, and Equation 26 becomes

$$\sigma_x = \sqrt{\left( \frac{\partial x}{\partial a} \right)_{b,c}^2 \sigma_a^2 + \left( \frac{\partial x}{\partial b} \right)_{a,c}^2 \sigma_b^2 + \left( \frac{\partial x}{\partial c} \right)_{a,b}^2 \sigma_c^2}$$

**Equation 27**

Equation 27 correspond to Equation 22 for  $x$  as defined by Equation 23.

Assuming all the parameters are independent, Equation 22 and Equation 1 may be used to develop rules for calculating the standard deviations and uncertainties of the mathematical operations. This is delineated in the following sections.

---

### 9.3.1 UNCERTAINTY OF MULTIPLICATION AND DIVISION

Consider  $x$  defined as



$$x = \frac{a \cdot b}{c}$$

**Equation 28**

The standard deviation of  $x$  may be calculate using Equation 22 as follows

$$\frac{\sigma_x}{x} = \sqrt{\left(\frac{\sigma_a}{a}\right)^2 + \left(\frac{\sigma_b}{b}\right)^2 + \left(\frac{\sigma_c}{c}\right)^2}$$

**Equation 29**

Inserting Equation 1 into above equation leads to a rule for calculating the uncertainty of multiplications and divisions:

$$U_x = \sqrt{(U_a)^2 + (U_b)^2 + (U_c)^2}$$

**Equation 30**

---

### 9.3.2 UNCERTAINTY OF ADDITION AND SUBTRACTION

Consider  $x$  defined as

$$x = a + b - c$$

**Equation 31**

The standard deviation of  $x$  may be calculate using Equation 22 as follows

$$\sigma_x = \sqrt{\sigma_a^2 + \sigma_b^2 + \sigma_c^2}$$

**Equation 32**

Inserting Equation 1 into above equation leads to a rule for calculating the uncertainty of additions and subtractions:

$$U_x = \frac{\sqrt{(U_a \cdot a)^2 + (U_b \cdot b)^2 + (U_c \cdot c)^2}}{a + b + c}$$

**Equation 33**

---

### 9.3.3 UNCERTAINTY OF COMBINED OPERATIONS

The standard deviation and uncertainty when mathematical operations are combined shall be calculated using Equation 22 in the same fashion demonstrated above. For example, consider

$$x = a \cdot b$$

**Equation 34**

where

$$a = \alpha + \beta$$

**Equation 35**

The standard deviation of  $x$  using Equation 22 is calculated as

$$\frac{\sigma_x}{x} = \sqrt{\left(\frac{\sigma_a}{a}\right)^2 + \left(\frac{\sigma_b}{b}\right)^2} = \sqrt{\left(\frac{\sqrt{\sigma_\alpha^2 + \sigma_\beta^2}}{\alpha + \beta}\right)^2 + \left(\frac{\sigma_b}{b}\right)^2}$$

**Equation 36**

To obtain the uncertainty of  $x$ , Equation 1 shall be inserted into the above equation, which leads to

$$U_x = \sqrt{\left(\frac{\sqrt{(U_\alpha \cdot \alpha)^2 + (U_\beta \cdot \beta)^2}}{\alpha + \beta}\right)^2 + (U_b)^2}$$

**Equation 37**

## 10 APPENDIX - LEAK FACTORS BY SECTOR

Figures Figure 25 to Figure 37 in this appendix provide a graphical comparison of the average emission factors by sector for compressor rod-packings, connectors, control valves, meters, open-ended lines, PRV/PSVs, pump seals, regulators, SCVFs, and thief hatches respectively. Each figure presents bars showing the average emission factor, whisker plots of the 95 percent confidence limits plus the number of components surveyed. In all cases, the confidence limits for the oil and gas sector overlap so distinguishing separate sector factors is not necessary (EPA, 1995) and the value corresponding to “All” sectors should be applied by users.

To support the combination of records into a single sector population, one-way analysis of variance (ANOVA method) is used to confirm there is no statistically significant difference between the means of these two independent groups. This test is conducted by considering “sector” as the main factor of the analysis with two levels (Oil and Gas). Each level is assigned 12 leak rate “responses” as delineated in Table 22 which correspond to the component types identified in this study.

<b>Table 22: Arrangement of data for one-way ANOVA testing.<sup>a</sup></b>		
<b>Response Categories (Component – Service)</b>	<b>Sector Factor (kg/hr)<sup>a</sup></b>	
	<b>Level 1 (Oil)</b>	<b>Level 2 (Gas)</b>
Compressor Seal - Process Gas	0.761199	0.167356
Connector - Process Gas	0.000191	0.000116
Control Valve - Process Gas	0.00962	0.003012
Meter - Process Gas	0.00039	0.001493
Open-ended Line - Process Gas	0.011516	0.096298
PRV/PSV -Process Gas	0.007561	0.001527
Pump Seal - Process Gas	0.020611	0.002614
Regulator - Process Gas	0.001543	0.000769
SCVF - Process Gas	0.007103	0.17126
Valve - Process Gas	0.000089	0.000623
Connector - Light Liquid	0.000007	0.000007
Valve - Light Liquid	0.000209	0.000023

<sup>a</sup> Thief hatch is excluded as no data is available for the gas sector.

The results of ANOVA testing are presented in Table 23 and indicate the null hypothesis is true, and the true means of the populations are the same. This means the difference between the observed means and the variation between the data in the oil and gas sectors are caused only by random error. Thus, a single factor for each component type with sector = “All” is presented in Section 3 Table 9 and Table 10.

Table 23 summarizes sum of squares, degree of freedom, and mean of square as well as the output of F-test in terms of  $F$ ,  $F$  critical, and  $P$ -value. The results reflect the variation of data within and between the levels. Moreover, they provides F-test outputs that assess the null hypothesis that the population means are equal.  $F$  critical is calculated to be 4.3 when a significance level of 0.05 is considered, while  $F$  value of the test is only 0.22. As  $F$  is much smaller than  $F$  critical, the null hypothesis cannot be rejected. Additionally,  $F$  corresponds to a  $P$ -value of 0.64, which is much higher than the significance level so the null hypothesis cannot be rejected.

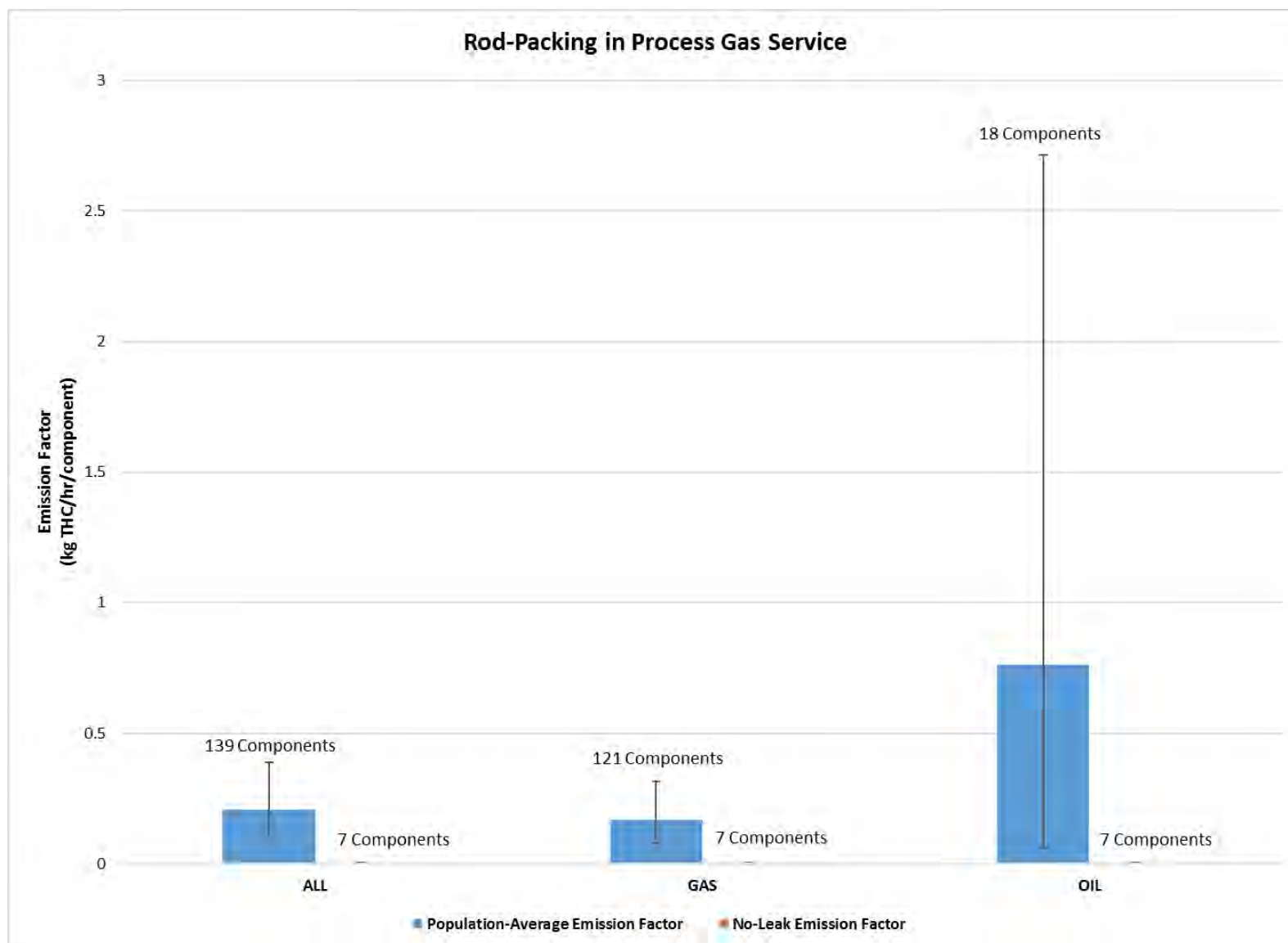
<b>Table 23: Results of ANOVA.</b>						
<b>Source of Variation</b>	<b>Sum of Squares (SS)</b>	<b>Degree of Freedom (df)</b>	<b>Mean Square (MS)</b>	<b>F</b>	<b>P-value</b>	<b>F critical</b>
Between Levels	0.005858	1	0.005858	0.2244	0.6404	4.3009
Within Levels	0.5742	22	0.02610			
Total	0.5801	23				

The following assumptions are made to perform the ANOVA test:

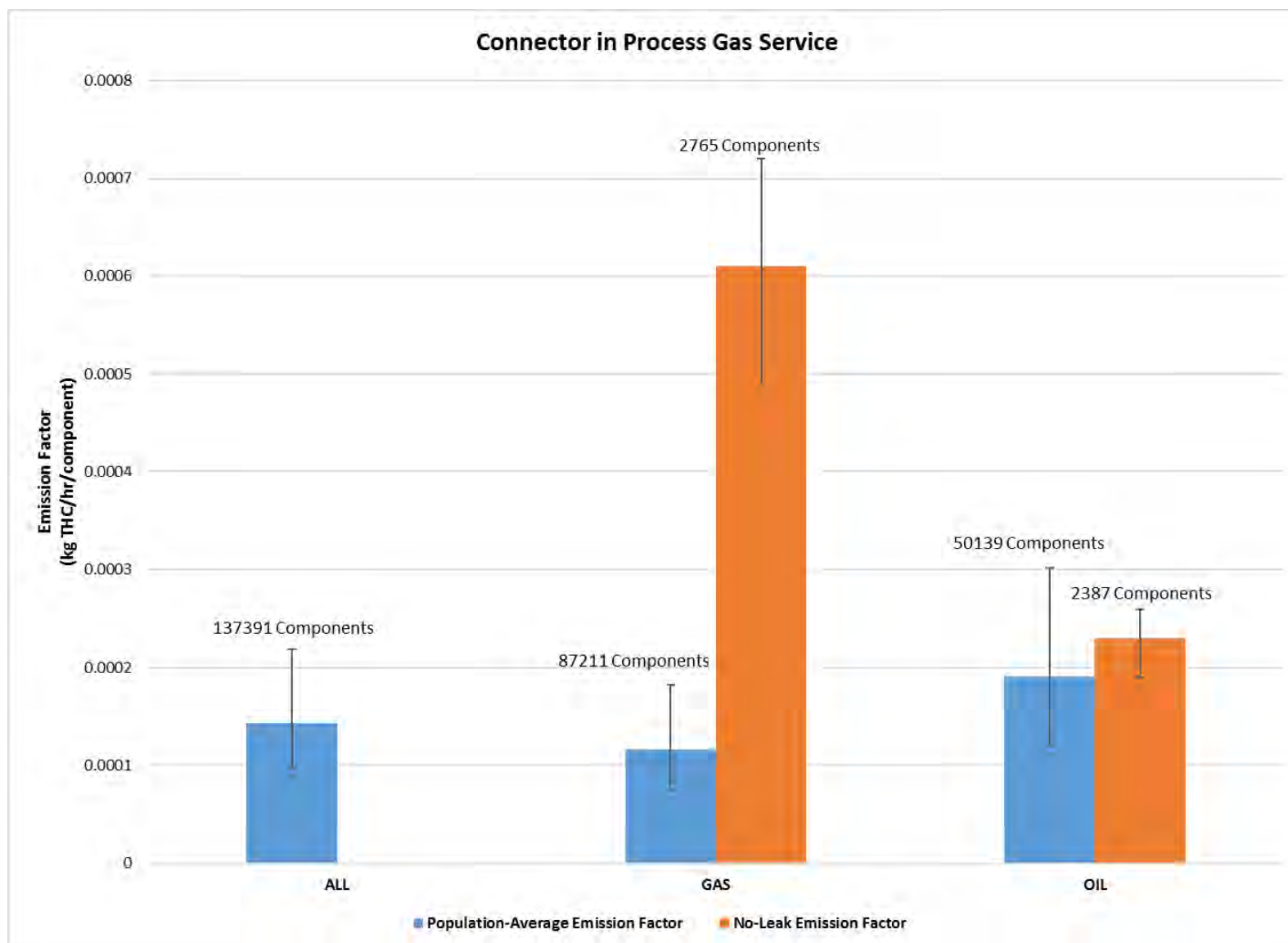
1. Responses and observations are chosen randomly and independently.
2. The levels have a common variance.
3. The distributions of the residuals are normal.

The first assumption is true based on the observations in the study were made. The second assumption also was shown to be true by F test. The last assumption is not true since the distributions are skewed; however, as long as number of observation are sufficiently large, the normality can be violated if the distributions have similar shape.

No-leak factors are also presented below to illustrate their contribution to fugitive emissions for each component type. No-leak factors are less important for component populations featuring lots of leaks but as fewer and smaller leaks are detected, the no-leak contribution to total fugitive emissions becomes more important. This is the case for connectors and valve where the no-leak factor is actually greater than the population average factor. In fact, the no-leak contribution to total fugitive emissions from connectors and valves is approximately 74 percent.



**Figure 25: Population-average leak rates for rod-packings in process gas service by sector.**



**Figure 26: Population-average leak rates for connectors in process gas service by sector.**

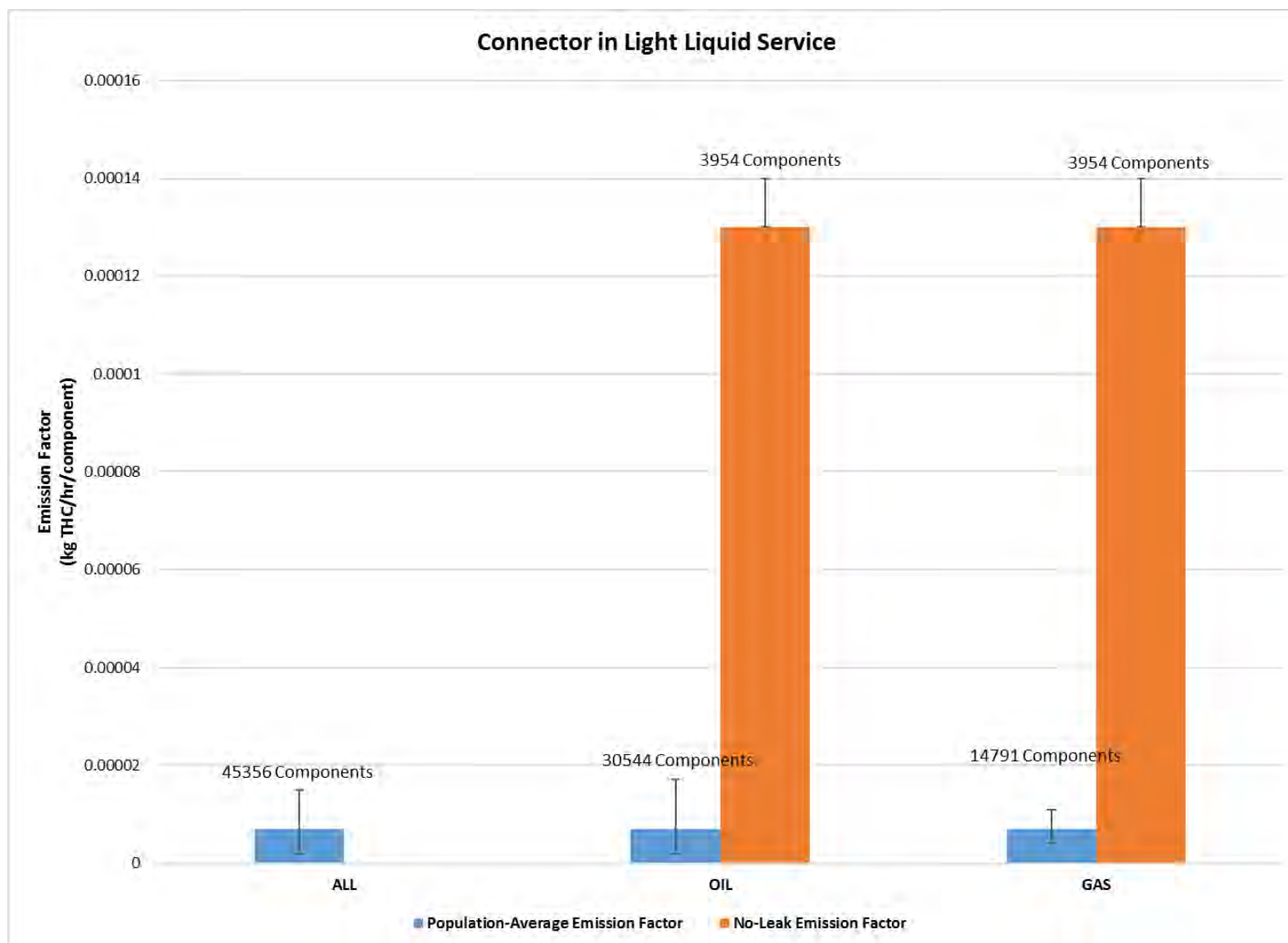
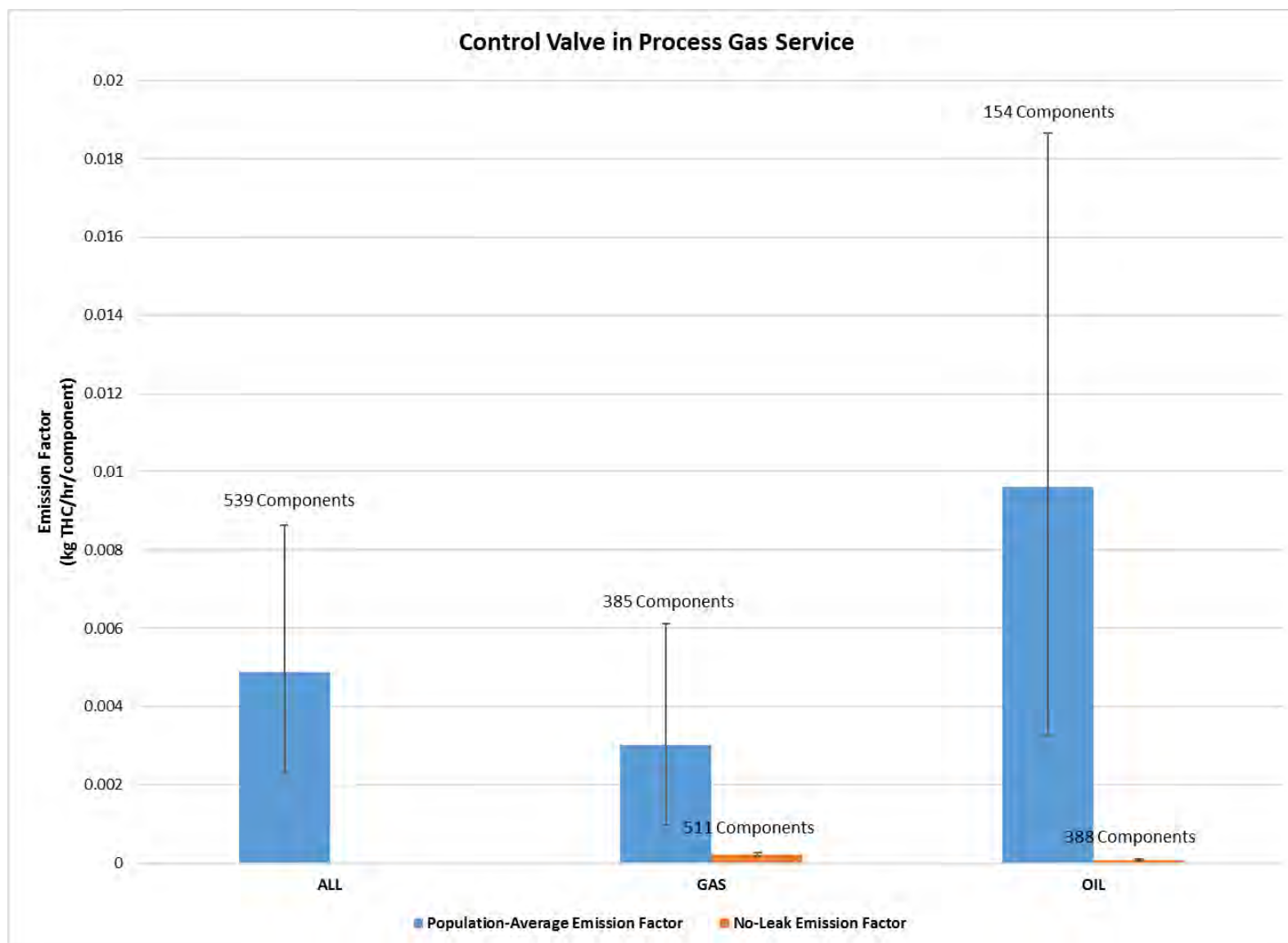
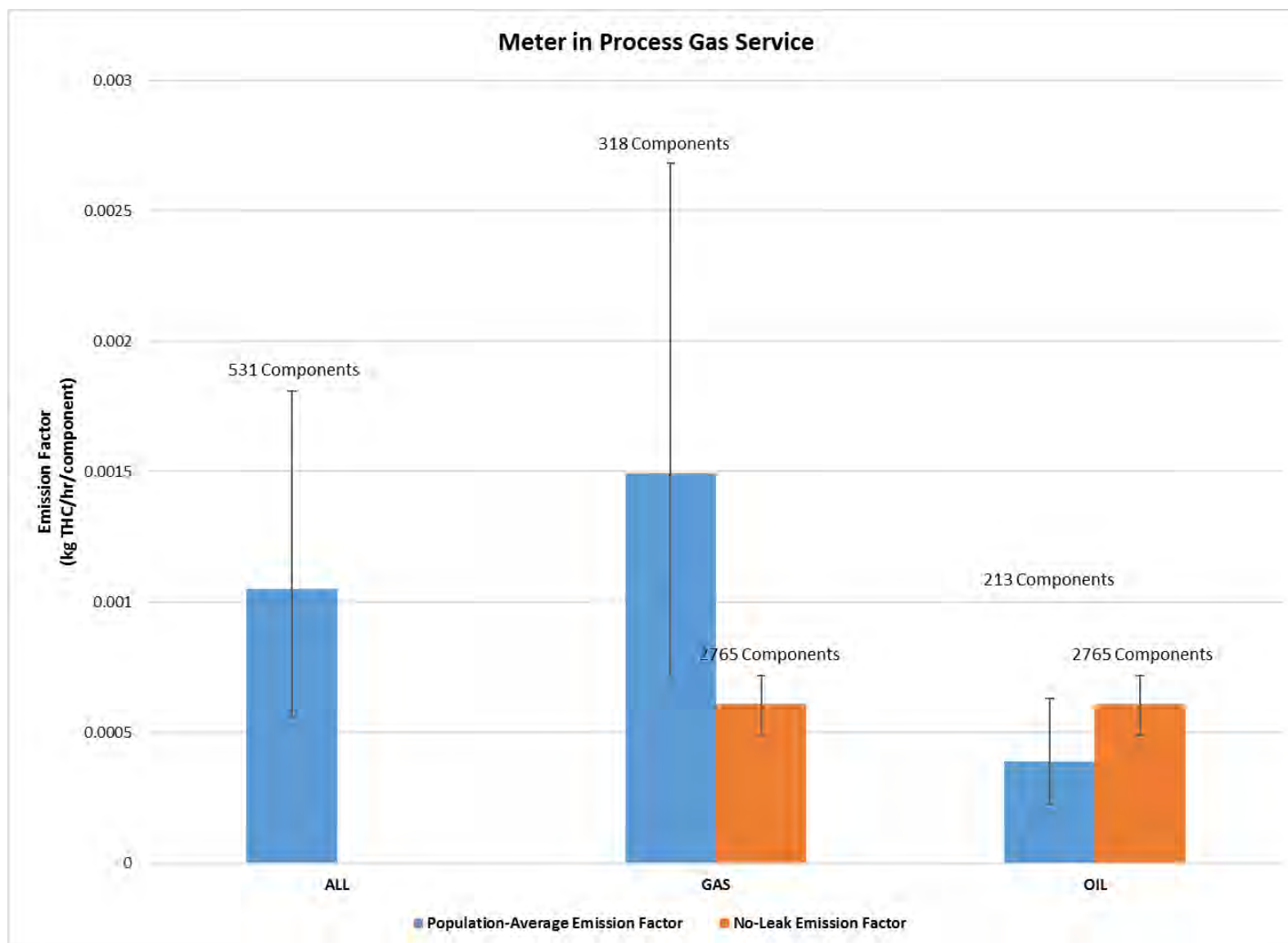


Figure 27: Population-average leak rates for connectors in light liquid service by sector.



**Figure 28: Population-average leak rates for control valves in process gas service by sector.**





**Figure 29: Population-average leak rates for meters in process gas service by sector.**

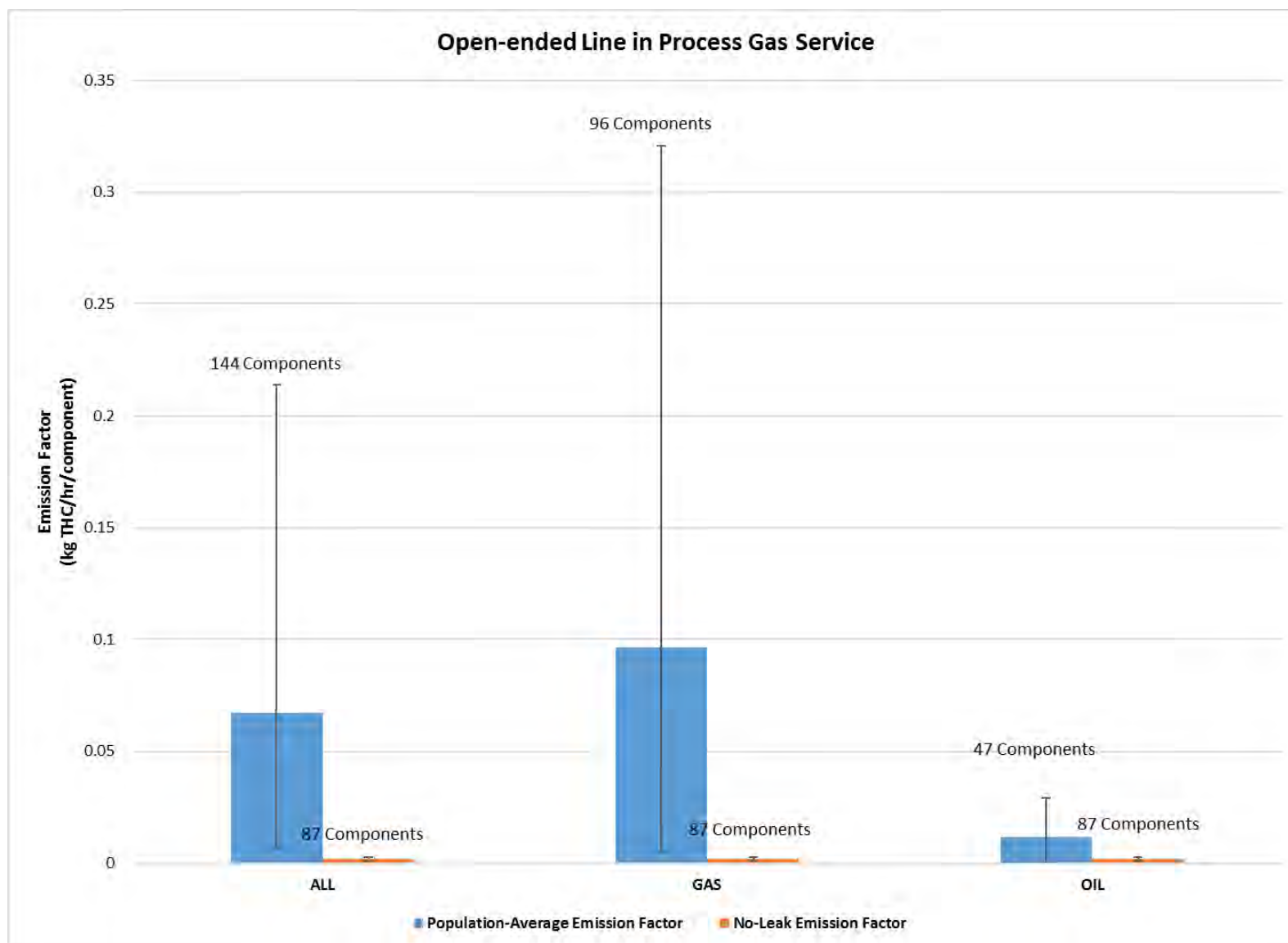
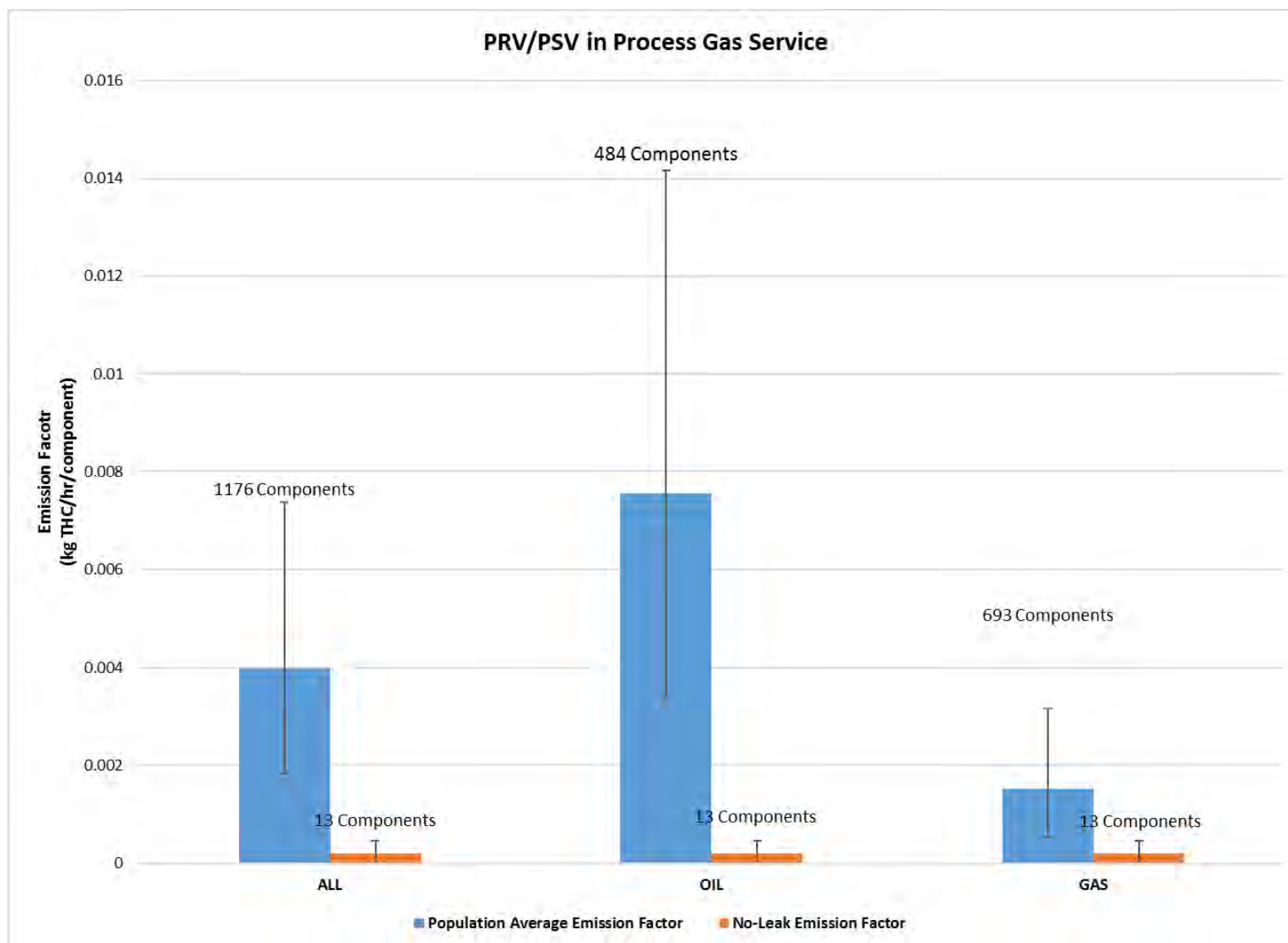
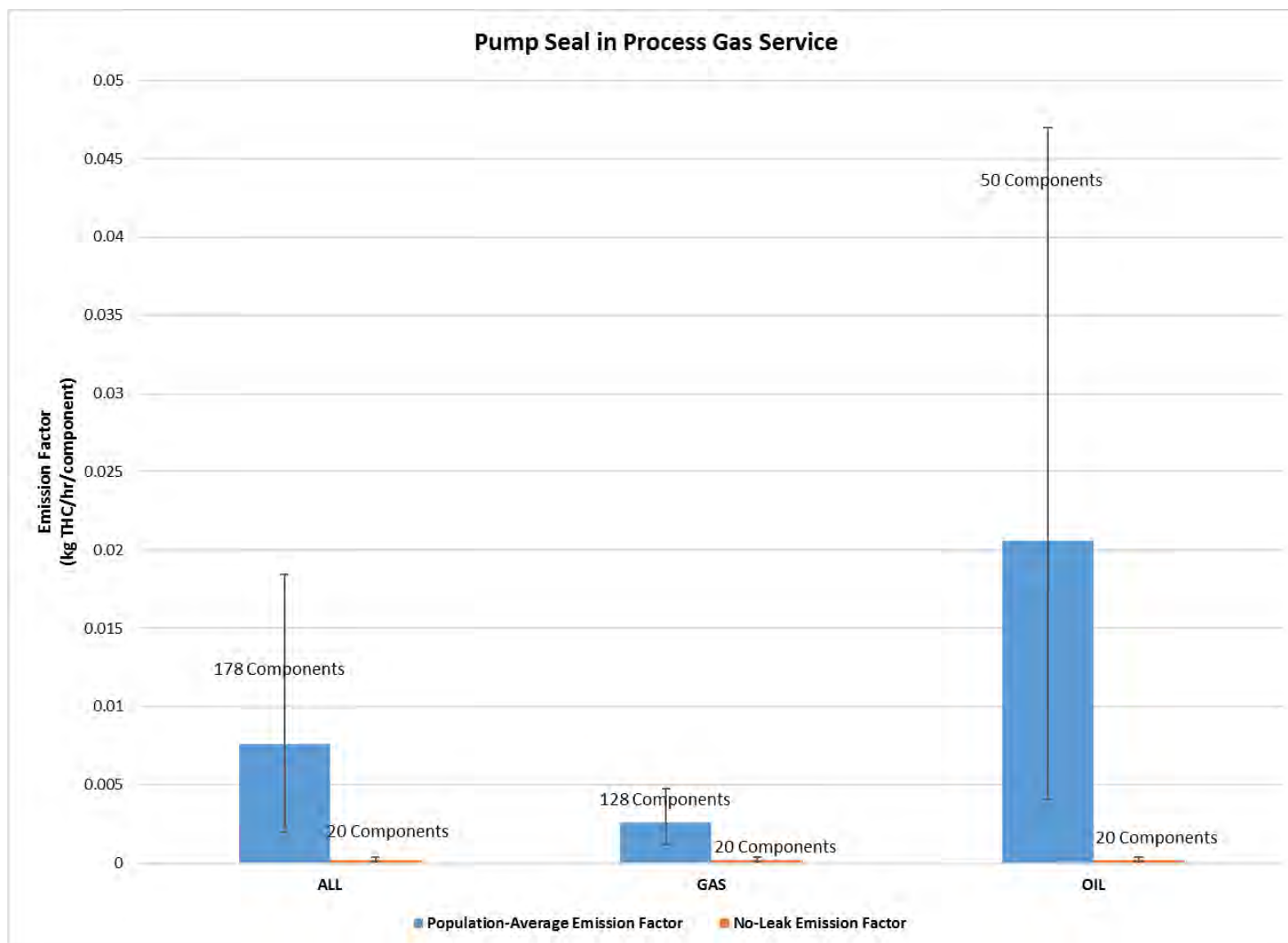


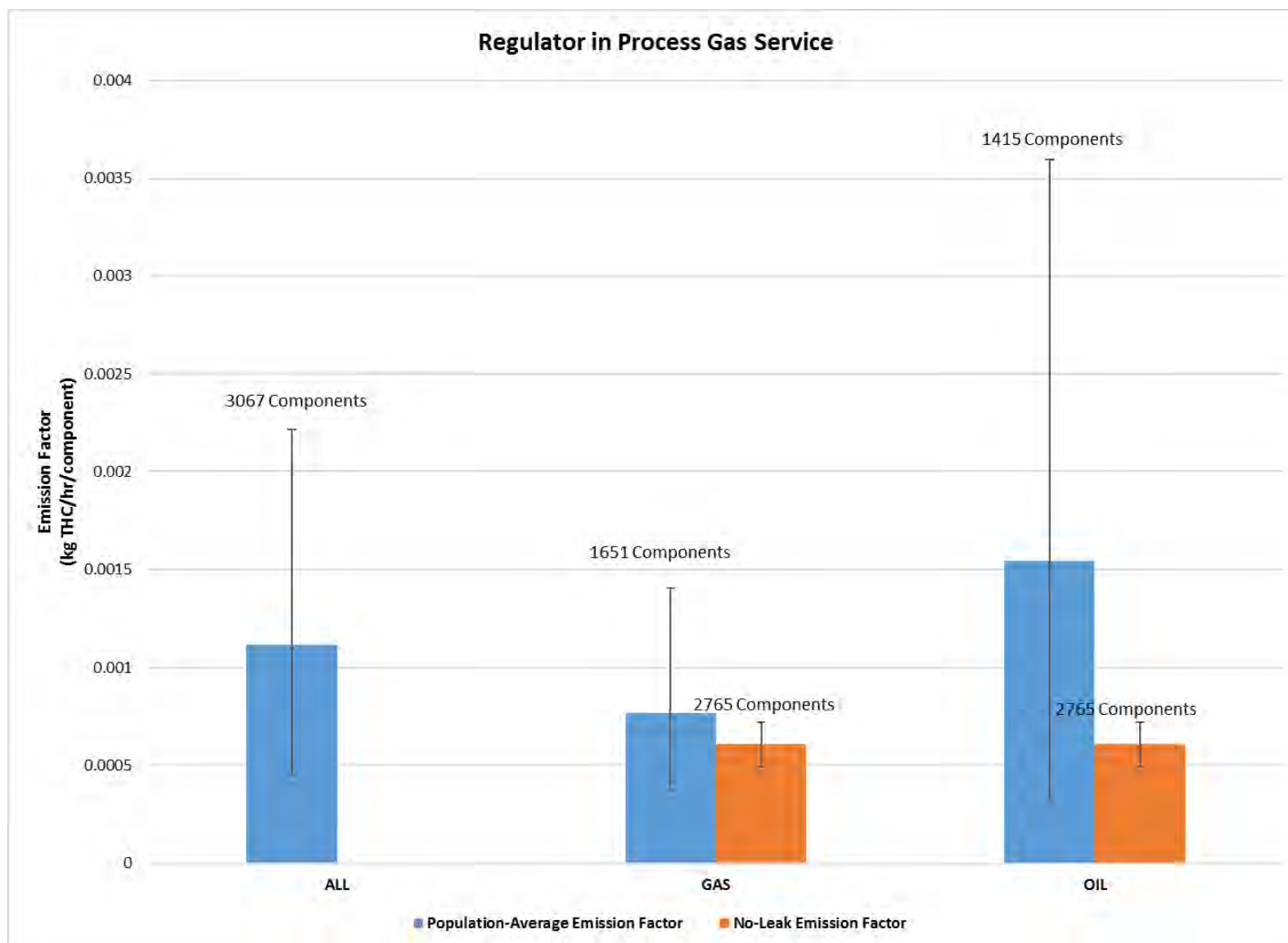
Figure 30: Population-average leak rates for open-ended lines in process gas service by sector.



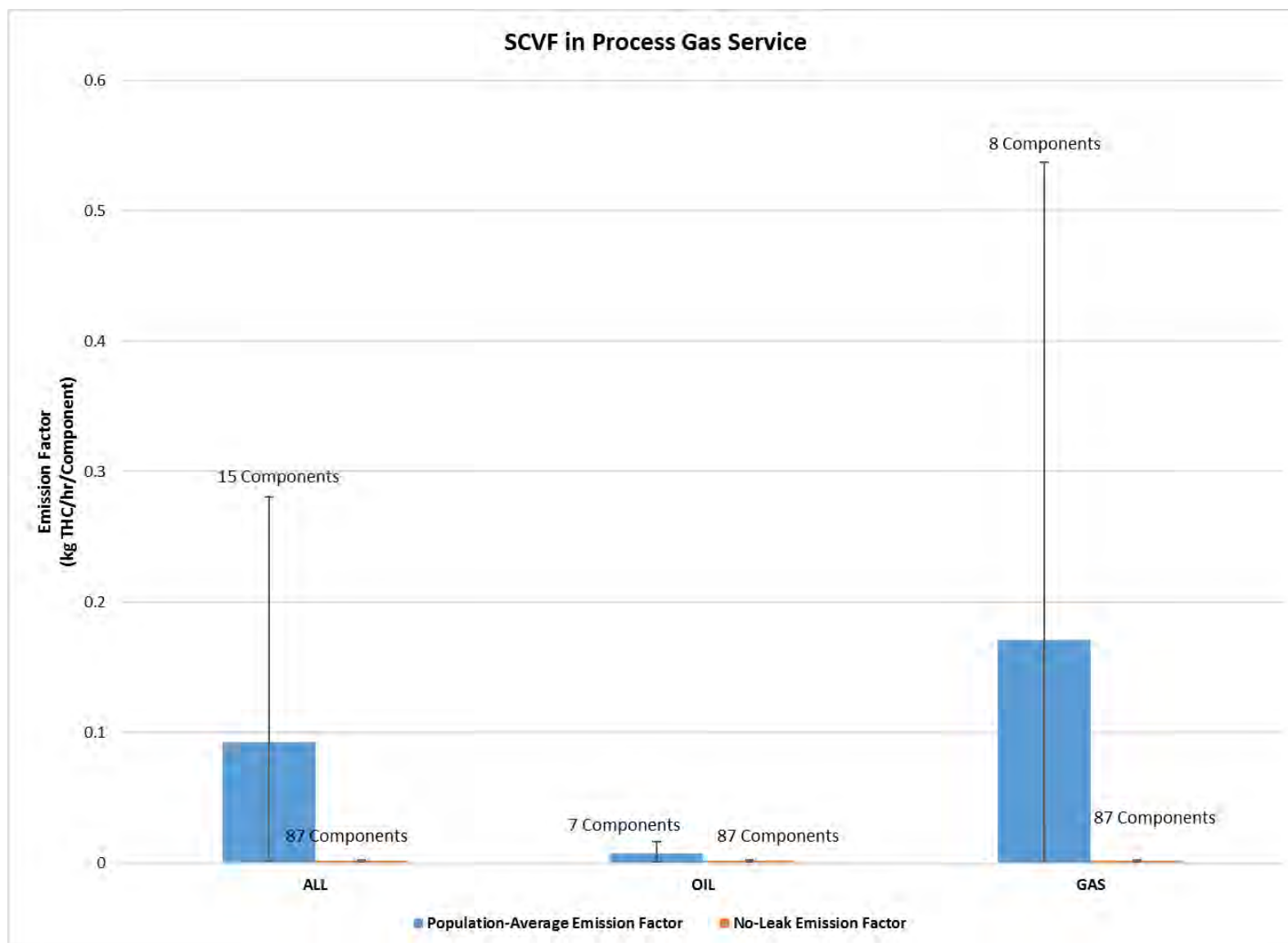
**Figure 31: Population-average leak rates for PRV/PSVs in process gas service by sector.**



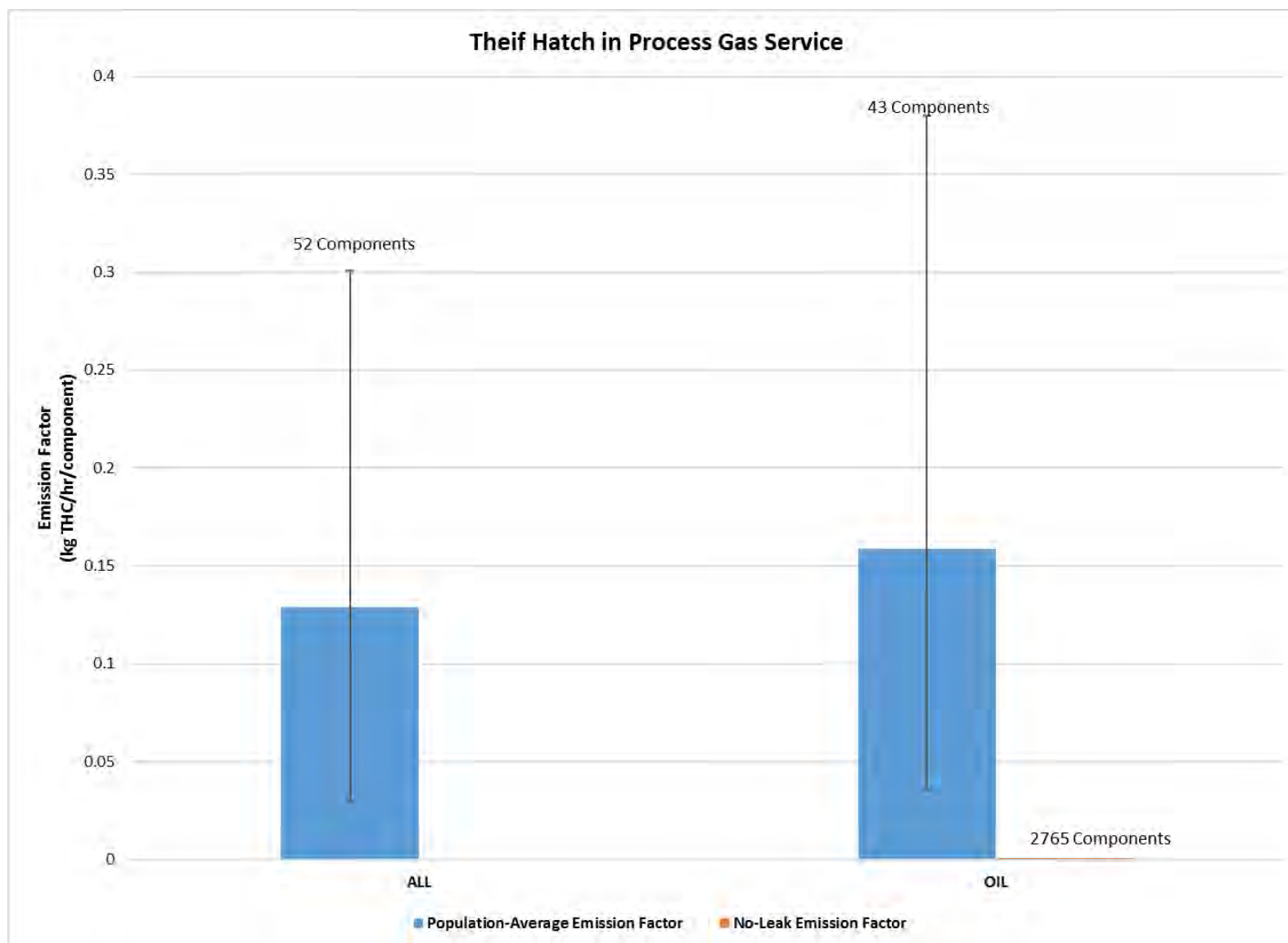
**Figure 32: Population-average leak rates for pump seal in process gas service by sector.**



**Figure 33: Population-average leak rates for regulators in process gas service by sector.**



**Figure 34: Population-average leak rates for SCVFs in process gas service by sector.**



**Figure 35: Population-average leak rates for thief hatches in process gas service by sector.**

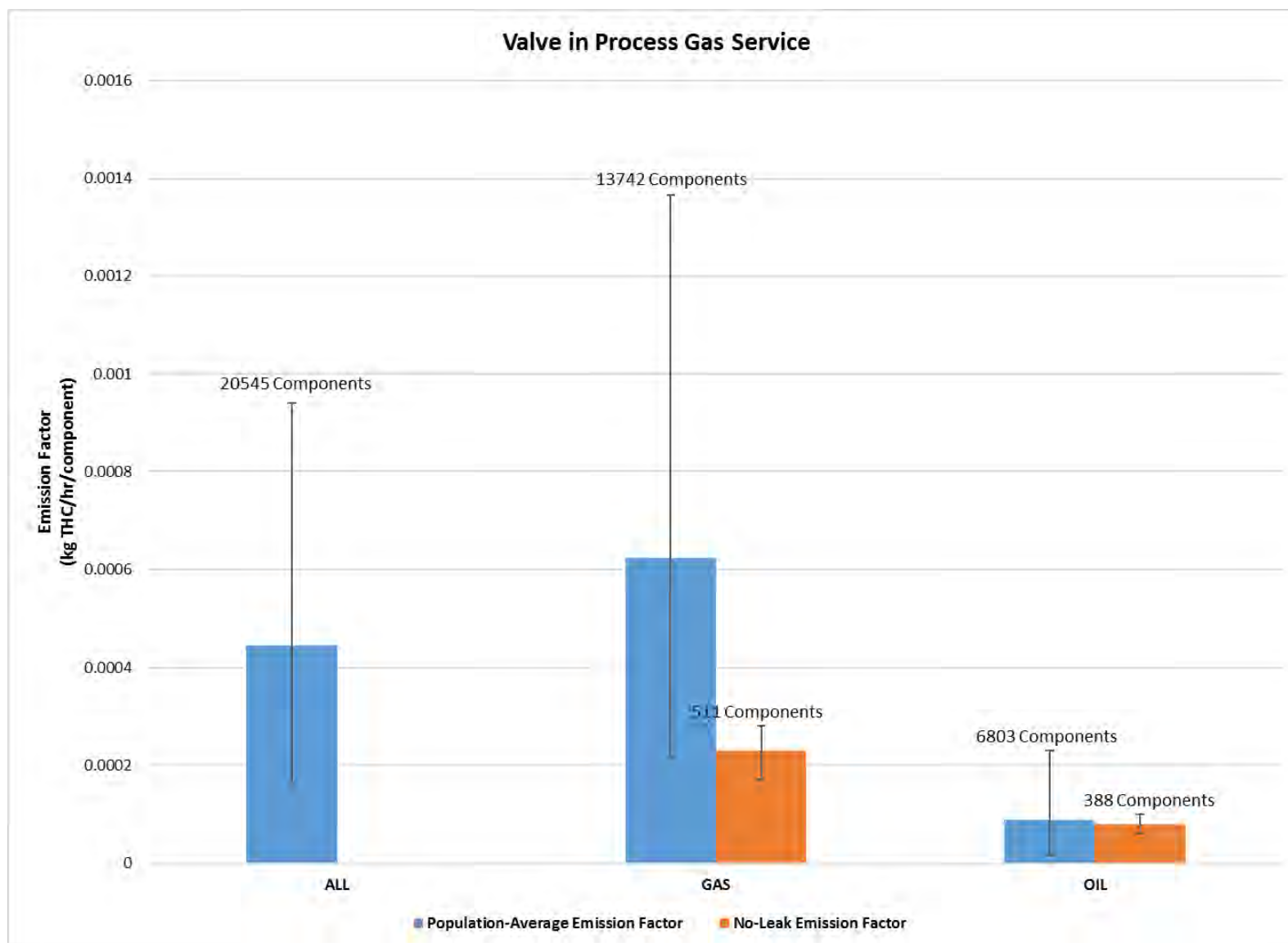
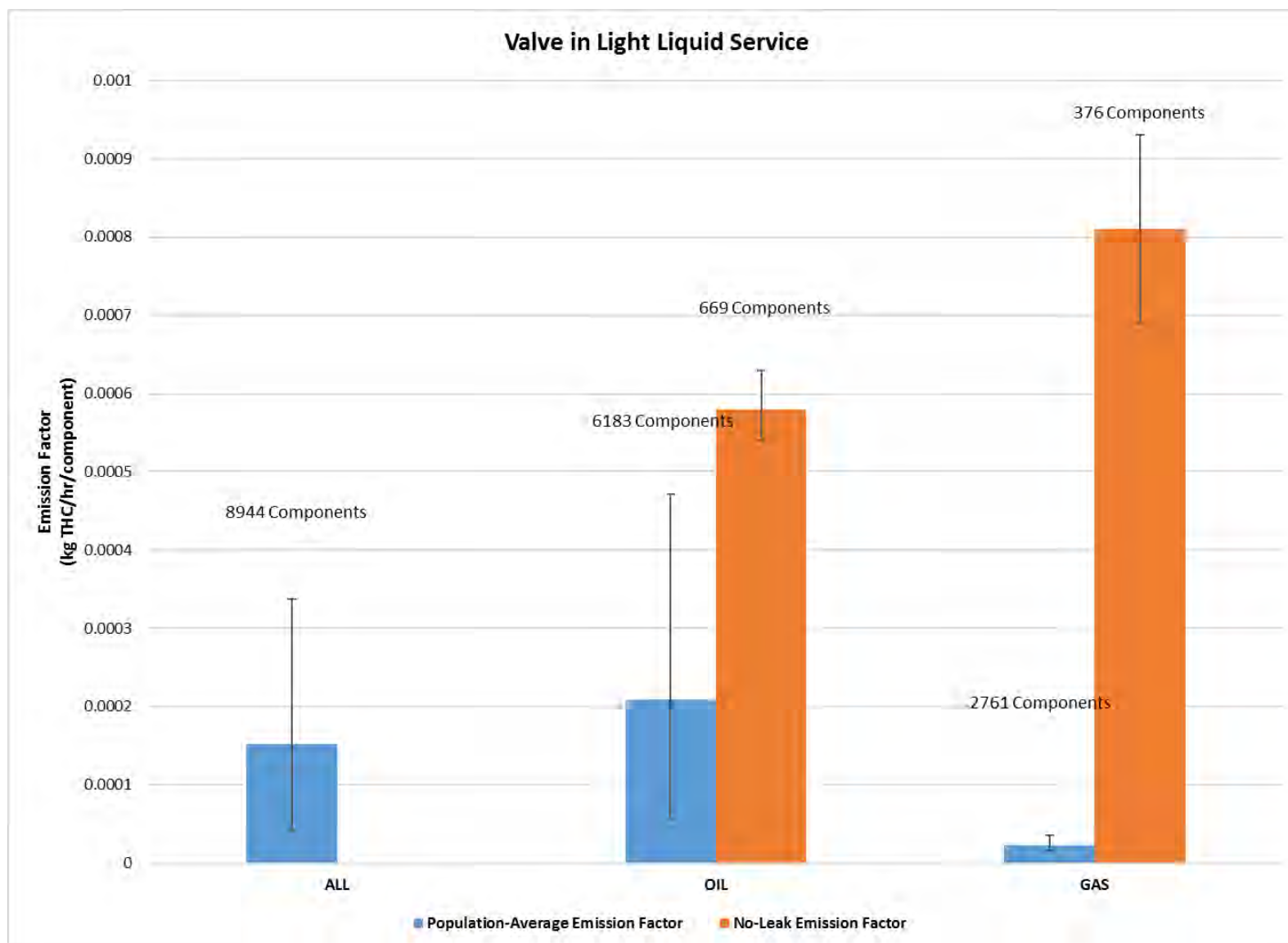


Figure 36: Population-average leak rates for valves in process gas service by sector.





**Figure 37: Population-average leak rates for valves in light liquid service by sector.**



## 11 APPENDIX - RAW DATA (BLINDED)

Table 24: Process equipment and component count records from the field campaign conducted at Alberta upstream oil and natural gas (UOG) sites from 14 August to 23 September 2017.

PIT/PROCESS FACILITY SUBTYPE			Well Status	MAJOR EQUIPMENT		COUNT COMPRESSOR SEAL PROCESS GAS	COUNT CONNECTOR PROCESS GAS	COUNT CONNECTOR HEAVY LIQUID	COUNT CONNECTOR LIGHT LIQUID	COUNT OPEN END LINE PROCESS GAS	COUNT OPEN END LINE HEAVY LIQUID	COUNT OPEN END LINE LIGHT	COUNT PSV PROCESS GAS	COUNT PSV HEAVY LIQUID	COUNT PUMP SEAL PROCESS GAS	COUNT PUMP SEAL HEAVY LIQUID	COUNT PUMP SEAL LIGHT LIQUID	COUNT REGULATOR PROCESS GAS	COUNT THIEF HATCH PROCESS	COUNT THIEF HATCH LIGHT	COUNT VALVE PROCESS GAS	COUNT VALVE HEAVY LIQUID	COUNT VALVE LIGHT LIQUID	COUNT METER PROCESS GAS	COUNT METER HEAVY LIQUID	COUNT CONTROL PROCESS GAS	COUNT CONTROL VALVE HEAVY LIQUID	COUNT CONTROL VALVE LIGHT LIQUID
Battery Bitumen 1	Cude bitumen multiwell group		Production Tank (fixed roof - heavy oil)	0	0	51	0	33	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0
Battery Bitumen 1	Cude bitumen multiwell group		Tank Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Battery Bitumen 10	Cude bitumen multiwell group		Screw Compressor	0	0	500	0	0	47	0	0	0	5	0	0	0	0	6	0	0	38	0	4	2	0	1	0	0
Battery Bitumen 10	Cude bitumen multiwell group		Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Battery Bitumen 11	Cude bitumen multiwell group		Pogane Fuel Tank	0	0	24	0	0	0	0	0	0	0	0	0	0	0	1	0	0	7	0	0	0	0	0	0	0
Battery Bitumen 11	Cude bitumen multiwell group		Tank Heater	0	0	47	0	0	0	0	0	0	0	0	0	0	0	5	0	0	7	0	0	0	0	0	0	0
Battery Bitumen 11	Cude bitumen multiwell group		Tank Heater	0	0	47	0	0	0	0	0	0	0	0	0	0	0	5	0	0	7	0	0	0	0	0	0	0
Battery Bitumen 11	Cude bitumen multiwell group		Production Tank (fixed roof - heavy oil)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Battery Bitumen 11	Cude bitumen multiwell group		Production Tank (fixed roof - heavy oil)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Battery Bitumen 11	Cude bitumen multiwell group		Production Tank (fixed roof - heavy oil)	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0
Battery Bitumen 12	Cude bitumen multiwell proration		Pogane Fuel Tank	0	0	14	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0
Battery Bitumen 12	Cude bitumen multiwell proration		Tank Heater	0	0	47	0	0	0	0	0	0	0	0	0	0	0	5	0	0	7	0	0	0	0	0	0	0
Battery Bitumen 12	Cude bitumen multiwell proration		Production Tank (fixed roof - heavy oil)	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0
Battery Bitumen 12	Cude bitumen multiwell proration		Screw Compressor	0	0	168	0	0	0	0	0	0	5	0	0	0	0	5	0	0	22	0	0	2	0	0	0	0
Battery Bitumen 13	Cude bitumen multiwell proration		Pogane Fuel Tank	0	0	10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0
Battery Bitumen 13	Cude bitumen multiwell proration		Pogane Fuel Tank	0	0	10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0
Battery Bitumen 13	Cude bitumen multiwell proration		Pogane Fuel Tank	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0
Battery Bitumen 13	Cude bitumen multiwell proration		Production Tank (fixed roof - heavy oil)	0	0	92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0
Battery Bitumen 13	Cude bitumen multiwell proration		Screw Compressor	0	0	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Battery Bitumen 13	Cude bitumen multiwell proration		Screw Compressor	0	0	220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Battery Bitumen 14	Cude bitumen multiwell proration		Pogane Fuel Tank	0	0	15	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0
Battery Bitumen 14	Cude bitumen multiwell proration		Pogane Fuel Tank	0	0	15	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0
Battery Bitumen 14	Cude bitumen multiwell proration		Pogane Fuel Tank	0	0	9	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0
Battery Bitumen 14	Cude bitumen multiwell proration		Production Tank (fixed roof - heavy oil)	0	0	0	0	55	0	0	0	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0
Battery Bitumen 14	Cude bitumen multiwell proration		Production Tank (fixed roof - heavy oil)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Battery Bitumen 14	Cude bitumen multiwell proration		Screw Compressor	0	0	86	0	0	22	0	0	0	3	0	0	0	0	1	0	0	5	0	2	1	0	0	0	0
Battery Bitumen 14	Cude bitumen multiwell proration		Tank Heater	0	0	36	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0
Battery Bitumen 14	Cude bitumen multiwell proration		Tank Heater	0	0	86	0	0	0	0	0	0	0	0	0	0	0	6	0	0	4	0	0	0	0	0	0	0
Battery Bitumen 15	Cude bitumen multiwell proration		Tank Heater	0	0	47	0	0	0	0	0	0	0	0	0	0	0	5	0	0	7	0	0	0	0	0	0	0
Battery Bitumen 15	Cude bitumen multiwell proration		Production Tank (fixed roof - heavy oil)	0	0	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0
Battery Bitumen 15	Cude bitumen multiwell proration		Screw Compressor	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Battery Bitumen 16	Cude bitumen multiwell proration		Heavy Liquid Pipeline Header	0	0	0	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
Battery Bitumen 16	Cude bitumen multiwell proration		Tank Heater	0	0	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Battery Bitumen 16	Cude bitumen multiwell proration		Production Tank (fixed roof - heavy oil)	0	0	0	0	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Battery Bitumen 16	Cude bitumen multiwell proration		Screw Compressor	0	0	110	0	0	0	1	0	0	3	0	0	0	0	3	0	0	11	0	0	3	0	0	0	0
Battery Bitumen 17	Cude bitumen multiwell proration		Pogane Fuel Tank	0	0	15	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Battery Bitumen 17	Cude bitumen multiwell proration		Pogane Fuel Tank	0	0	15	0	0	0																			



Battery Gas 35	Gas Multiwell proration outside SE AB	Separator	0	175	0	42	0	0	0	0	2	0	0	0	0	1	0	66	0	19	2	1	4	1
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Header	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	41	0	0	0	1	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Gas Pipeline Header	8	0	0	0	0	0	0	0	0	0	0	2	0	0	0	4	0	0	0	0	1	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	17	0	0	0	0	0	0	0	0	0	2	0	0	0	4	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Power Generator (natural gas fired)	0	132	0	0	0	0	0	0	0	0	0	2	0	0	0	14	0	0	0	2	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Header	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Reciprocating Compressor	0	406	0	110	0	0	0	3	0	7	0	0	0	16	0	8	0	0	0	2	1	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Flare KnockOut Drum	0	40	0	50	0	0	0	0	0	0	0	1	0	0	69	0	7	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Flare KnockOut Drum	0	40	0	50	0	0	0	0	0	0	0	1	0	0	69	0	7	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Flare KnockOut Drum	0	40	0	50	0	0	0	0	0	0	0	1	0	0	69	0	7	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Flare KnockOut Drum	0	40	0	50	0	0	0	0	0	0	0	1	0	0	69	0	7	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Flare KnockOut Drum	0	40	0	50	0	0	0	0	0	0	0	1	0	0	69	0	7	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Flare KnockOut Drum	0	40	0	50	0	0	0	0	0	0	0	1	0	0	69	0	7	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Flare KnockOut Drum	0	40	0	50	0	0	0	0	0	0	0	1	0	0	69	0	7	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Flare KnockOut Drum	0	40	0	50	0	0	0	0	0	0	0	1	0	0	69	0	7	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Flare KnockOut Drum	0	40	0	50	0	0	0	0	0	0	0	1	0	0	69	0	7	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Flare KnockOut Drum	0	40	0	50	0	0	0	0	0	0	0	1	0	0	69	0	7	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Flare KnockOut Drum	0	40	0	50	0	0	0	0	0	0	0	1	0	0	69	0	7	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Flare KnockOut Drum	0	40	0	50	0	0	0	0	0	0	0	1	0	0	69	0	7	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Flare KnockOut Drum	0	40	0	50	0	0	0	0	0	0	0	1	0	0	69	0	7	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Flare KnockOut Drum	0	40	0	50	0	0	0	0	0	0	0	1	0	0	69	0	7	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Flare KnockOut Drum	0	40	0	50	0	0	0	0	0	0	0	1	0	0	69	0	7	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Flare KnockOut Drum	0	40	0	50	0	0	0	0	0	0	0	1	0	0	69	0	7	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6	1	0	0	0	0	0	0
Battery Gas 35	Gas Multiwell proration outside SE AB	Catalytic Heater	0	0	0	0	0	0	0	0	0	0												











Gas Gathering 2	Compressor Station	Recompressing Compressor	0	619	0	0	0	4	0	0	0	3	0	0	0	0	9	0	0	70	0	0	1	0	0	0
Gas Gathering 2	Compressor Station	Recompressing Compressor	0	574	0	0	0	2	0	0	0	2	0	0	0	0	7	0	0	35	0	0	1	0	0	0
Gas Gathering 2	Compressor Station	Recompressing Compressor	0	521	0	0	0	4	0	0	0	3	0	0	0	0	9	0	0	55	0	0	1	0	4	0
Gas Gathering 20	Gas Gathering System	Production Tank (fixed roof - Light/Medium Oil)	0	0	0	0	0	3	0	0	0	6	6	0	0	0	12	12	59	0	0	1	0	0	0	0
Gas Gathering 20	Gas Gathering System	Production Tank (fixed roof - Light/Medium Oil)	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Production Tank (fixed roof - Light/Medium Oil)	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Pig Trap (Gas Service)	0	150	0	0	0	0	0	0	0	0	0	0	0	0	49	0	0	0	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Recompressing Compressor	3	706	0	0	0	302	0	0	0	2	0	0	0	0	0	0	10	0	18	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Dehydrator - Glycol	0	176	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	12	0	0	1	0	2	0
Gas Gathering 20	Gas Gathering System	Gas Pipeline Header	0	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Separator	0	81	0	0	0	26	0	0	0	0	1	0	0	0	0	0	8	0	19	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Separator	0	347	0	0	0	124	0	0	0	0	2	0	0	0	0	5	0	40	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Recompressing Compressor	0	520	0	0	0	277	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Gas Gathering 20	Gas Gathering System	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1</						



[illegible]







[illegible]



Well Gas 79	Gas Multiswell Effluent	GAS FLOW	Gas Meter Building	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	1	0	0	0
Well Gas 8	Gas Multiswell Effluent	GAS FLOW	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
Well Gas 8	Gas Multiswell Effluent	GAS FLOW	Wellhead (Gas Flow)	0	95	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	0	0	0	0	
Well Gas 8	Gas Multiswell Effluent	GAS FLOW	Gas Meter Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	
Well Gas 80	Gas Multiswell Proration SE AB	GAS FLOW	Wellhead (Gas Flow)	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	
Well Gas 81	Gas Multiswell Proration outside SE AB	GAS FLOW	Wellhead (Gas Flow)	0	55	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	
Well Gas 82	Gas Multiswell Proration outside SE AB	GAS FLOW	Wellhead (Gas Flow)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	
Well Gas 83	Gas Multiswell Proration SE AB	GAS FLOW	Wellhead (Gas Flow)	0	27	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	
Well Gas 84	Gas Multiswell Group	GAS FLOW	Separator	0	110	0	95	0	0	2	0	0	0	0	0	7	0	0	32	0	27	2	1	1	
Well Gas 84	Gas Multiswell Group	GAS FLOW	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0		
Well Gas 84	Gas Multiswell Group	GAS FLOW	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0		
Well Gas 84	Gas Multiswell Group	GAS FLOW	Separator	0	110	0	95	0	0	2	0	0	0	0	0	7	0	0	32	0	27	2	1		
Well Gas 84	Gas Multiswell Group	GAS FLOW	Wellhead (Gas Flow)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0		
Well Gas 84	Gas Multiswell Group	GAS FLOW	Production Tank (fixed roof - Light/Medium Oil)	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0		
Well Gas 85	Gas Multiswell Proration outside SE AB	GAS FLOW	Wellhead (Gas Flow)	0	27	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	
Well Gas 86	Gas Multiswell Proration SE AB	GAS FLOW	Wellhead (Gas Flow)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	
Well Gas 87	Gas Multiswell Proration outside SE AB	GAS FLOW	Wellhead (Gas Flow)	0	31	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	
Well Gas 88	Gas Multiswell Proration outside SE AB	GAS FLOW	Separator	0	145	0	40	0	0	0	2	2	0	0	0	0	0	0	61	0	16	2	1	3	
Well Gas 88	Gas Multiswell Proration outside SE AB	GAS FLOW	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0		
Well Gas 88	Gas Multiswell Proration outside SE AB	GAS FLOW	Wellhead (Gas Flow)	0	55	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	
Well Gas 89	Gas Multiswell Effluent	GAS FLOW	Wellhead (Gas Flow)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	
Well Gas 89	Gas Multiswell Effluent	GAS FLOW	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	
Well Gas 9	Gas Multiswell Effluent	GAS FLOW	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
Well Gas 9	Gas Multiswell Effluent	GAS FLOW	Wellhead (Gas Flow)	0	95	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	0	0	0	0	
Well Gas 90	Gas Multiswell Effluent	GAS FLOW	Wellhead (Gas Flow)	0	95	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	0	0	0	0	
Well Gas 90	Gas Multiswell Effluent	GAS FLOW	Gas Meter Building	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	1	0	0	
Well Gas 91	Gas Multiswell Proration outside SE AB	GAS FLOW	Separator	0	175	0	42	0	0	0	2	0	0	0	0	0	0	0	66	0	19	2	1	4	
Well Gas 91	Gas Multiswell Proration outside SE AB	GAS FLOW	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
Well Gas 91	Gas Multiswell Proration outside SE AB	GAS FLOW	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
Well Gas 91	Gas Multiswell Proration outside SE AB	GAS FLOW	Wellhead (Gas Flow)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Well Gas 92	Gas Multiswell Proration outside SE AB	GAS FLOW	Separator	0	175	0	42	0	0	0	2	0	0	0	0	0	0	0	76	0	19	2	1	5	
Well Gas 92	Gas Multiswell Proration outside SE AB	GAS FLOW	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
Well Gas 92	Gas Multiswell Proration outside SE AB	GAS FLOW	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Gas 92	Gas Multiswell Proration outside SE AB	GAS FLOW	Wellhead (Gas Flow)	0	55	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	0	0	0	0	
Well Gas 93	Gas Multiswell Effluent	GAS FLOW	Wellhead (Gas Flow)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	
Well Gas 94	Gas Single	GAS FLOW	Gas Practice Header	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Gas 94	Gas Single	GAS FLOW	Separator	0	71	0	48	0	0	2	0	0	0	0	0	4	0	0	9	0	5	0	0	0	
Well Gas 94	Gas Single	GAS FLOW	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0		
Well Gas 94	Gas Single	GAS FLOW	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Well Gas 94	Gas Single	GAS FLOW	Wellhead (Gas Flow)	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	
Well Gas 94	Gas Single	GAS FLOW	Production Tank (fixed roof - Light/Medium Oil)	0	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Gas 95	Gas Multiswell Group	GAS FLOW	Separator	0	136	0	51	0	0	0	2	0	0	0	0	4	0	0	13	0	8	1	0	0	
Well Gas 95	Gas Multiswell Group	GAS FLOW	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Gas 95	Gas Multiswell Group	GAS FLOW	Wellhead (Gas Flow)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	
Well Gas 95	Gas Multiswell Group	GAS FLOW	Production Tank (fixed roof - Light/Medium Oil)	0	1	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
Well Gas 96	Gas Multiswell Group	GAS FLOW	Wellhead (Gas Flow)	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	
Well Gas 96	Gas Multiswell Group	GAS FLOW	Pig Trap (Gas Service)	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Gas 96	Gas Multiswell Group	GAS FLOW	Production Tank (fixed roof - Light/Medium Oil)	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	
Well Gas 96	Gas Multiswell Group	GAS FLOW	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Gas 96	Gas Multiswell Group	GAS FLOW	Separator	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Gas 97	Gas Multiswell Proration SE AB	GAS FLOW	Wellhead (Gas Flow)	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	
Well Gas 98	Gas Multiswell Proration outside SE AB	GAS FLOW	Wellhead (Gas Flow)	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Gas 99	Gas Multiswell Group	GAS FLOW	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Gas 99	Gas Multiswell Group	GAS FLOW	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Gas 99	Gas Multiswell Group	GAS FLOW	Separator	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	16	0	0	0	0	0	
Well Gas 99	Gas Multiswell Group	GAS FLOW	Wellhead (Gas Flow)	0	29	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	
Well Gas 99	Gas Multiswell Group	GAS FLOW	Production Tank (fixed roof - Light/Medium Oil)	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	
Well Oil 1	Cude Oil Multiswell Proration	CR-OIL FLOW	Well Pump (Electric)	0	0	0	44	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	
Well Oil 10	Cude Oil Multiswell Proration	CR-OIL FLOW	Wellhead (Oil Flow)	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	8	0	0	0	
Well Oil 100	Cude Oil Multiswell Proration	CR-OIL PUMP	Wellhead (Oil Pump)	0	0	0	58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Oil 100	Cude Oil Multiswell Proration	CR-OIL PUMP	Well Pump (Electric)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Oil 101	Cude Oil Multiswell Proration	CR-OIL PUMP	Separator	0	44	0	69	0	0	0	1	0	0	0	0	0	0	0	23	0	28	1	0	0	
Well Oil 101	Cude Oil Multiswell Proration	CR-OIL PUMP	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Oil 101	Cude Oil Multiswell Proration	CR-OIL PUMP	Wellhead (Oil Pump)	0	0	0	44	0	0	0	0	0	0	0	0	1	0	0	0	0	14	0	0	0	
Well Oil 101	Cude Oil Multiswell Proration	CR-OIL PUMP	Liquid Pipeline Header	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Oil 101	Cude Oil Multiswell Proration	CR-OIL PUMP	Catalytic Heater	0	0	0	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Oil 101	Cude Oil Multiswell Proration	CR-OIL PUMP	Catalytic Heater	0	0	0	83	1	0	0	0	1	0	0	0	0	0	0	12	0	18	2	0	1	
Well Oil 101	Cude Oil Multiswell Proration	CR-OIL PUMP	Separator	0	53	0	83	1	0	0	0	1	0	0	0	0	0	0	0	0	18	2	0	1	
Well Oil 101	Cude Oil Multiswell Proration	CR-OIL PUMP	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Oil 101	Cude Oil Multiswell Proration	CR-OIL PUMP	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Oil 101	Cude Oil Multiswell Proration	CR-OIL PUMP	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Oil 101	Cude Oil Multiswell Proration	CR-OIL PUMP	Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Well Oil 102	Cude Oil Multiswell Proration	CR-OIL PUMP	Wellhead (Oil Pump)	0	0	0	54	0	0	0	0	0													

Well Oil 63	Cude Oil (Medium) Multiswell Group	CR-OIL PUMP Separator	0	89	0	57	0	0	0	2	0	0	0	2	0	0	17	0	9	1	1	1	1
Well Oil 64	Cude Oil (Medium) Single	CR-OIL PUMP Wellhead (Oil Pump)	0	0	0	22	0	0	0	0	0	0	1	1	0	0	1	0	15	0	0	0	0
Well Oil 65	Cude Oil (Medium) Single	CR-OIL PUMP Wellhead (Oil Pump)	0	93	0	45	0	0	0	0	0	0	1	1	0	0	13	0	9	1	0	0	0
Well Oil 65	Cude Oil (Medium) Single	CR-OIL PUMP Well Pump	0	61	0	0	0	0	0	0	0	0	0	3	0	0	2	0	0	0	0	0	0
Well Oil 65	Cude Oil (Medium) Single	CR-OIL PUMP Production Tank (fixed roof - Light/Medium Oil)	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0
Well Oil 65	Cude Oil (Medium) Single	CR-OIL PUMP Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Well Oil 66	Cude Oil (Medium) Single	CR-OIL PUMP Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Well Oil 66	Cude Oil (Medium) Single	CR-OIL PUMP Production Tank (fixed roof - Light/Medium Oil)	0	0	0	15	0	0	0	0	0	0	0	0	0	1	0	0	4	0	0	0	0
Well Oil 66	Cude Oil (Medium) Single	CR-OIL PUMP Wellhead (Oil Pump)	0	53	0	90	0	0	0	0	0	1	0	0	0	0	0	18	0	0	0	0	0
Well Oil 66	Cude Oil (Medium) Single	CR-OIL PUMP Well Pump	0	0	0	0	0	0	0	1	0	0	0	1	0	0	3	0	0	0	0	0	0
Well Oil 66	Cude Oil (Medium) Single	CR-OIL PUMP Separator	0	212	0	192	0	0	0	2	0	0	0	8	0	0	26	0	29	1	2	0	0
Well Oil 67	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Well Oil 67	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump	0	47	0	0	0	0	0	1	0	0	0	1	0	0	2	0	0	0	0	0	0
Well Oil 68	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump (Electric)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 68	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	0	0	43	0	0	0	0	0	1	0	0	0	0	10	0	0	0	0	0	0
Well Oil 69	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump	0	42	0	0	0	0	0	1	0	0	0	2	0	0	4	0	0	0	0	0	0
Well Oil 69	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	50	0	0	0	0	0	0	0	1	0	0	0	0	8	0	0	0	0	0	0
Well Oil 69	Cude Oil Multiswell Proantion	CR-OIL PUMP Screw Compressor	0	145	0	0	0	0	0	2	0	0	0	1	0	0	8	0	0	0	0	0	0
Well Oil 7	Cude Oil (Medium) Proantion	CR-OIL FLOW Wellhead (Oil Flow)	0	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 70	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	6	0	24	0	0	0	0	0	1	0	0	0	0	4	0	8	0	0	0	0
Well Oil 70	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump (Electric)	0	0	0	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 71	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	0	0	26	0	0	0	0	0	1	0	0	0	0	0	0	8	0	0	0	0
Well Oil 71	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump (Electric)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 72	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	0	0	75	0	0	0	0	0	1	0	0	0	0	0	14	0	0	0	0	0
Well Oil 72	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump (Electric)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 73	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	0	0	66	0	0	0	0	0	1	0	0	0	0	0	13	0	0	0	0	0
Well Oil 73	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump (Electric)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 74	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	0	0	44	0	0	0	0	0	1	0	0	0	0	0	0	11	0	0	0	0
Well Oil 75	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	0	0	75	0	0	0	0	0	1	0	0	0	0	0	12	0	0	0	0	0
Well Oil 75	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump (Electric)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 76	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	0	0	54	0	0	0	0	0	1	0	0	0	0	0	0	11	0	0	0	0
Well Oil 76	Cude Oil Multiswell Proantion	CR-OIL PUMP Pig Tap (Liquid Service)	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
Well Oil 76	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump (Electric)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 77	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	23	0	46	0	0	0	0	0	1	0	0	0	0	5	0	10	0	0	0	0
Well Oil 77	Cude Oil Multiswell Proantion	CR-OIL PUMP Pig Tap (Liquid Service)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 77	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump (Electric)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 78	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	0	0	59	0	0	0	0	0	1	0	0	0	0	0	11	0	0	0	0	0
Well Oil 79	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	46	0	56	0	0	0	0	0	1	0	0	0	0	0	9	0	0	0	0	0
Well Oil 79	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump	0	39	0	0	0	0	0	1	0	0	0	2	0	0	4	0	0	0	0	0	0
Well Oil 8	Cude Oil (Medium) Single	CR-OIL FLOW Separator	0	77	0	43	0	0	0	2	0	0	0	4	0	0	14	0	0	1	0	0	0
Well Oil 8	Cude Oil (Medium) Single	CR-OIL FLOW Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 8	Cude Oil (Medium) Single	CR-OIL FLOW Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Well Oil 8	Cude Oil (Medium) Single	CR-OIL FLOW Production Tank (fixed roof - Light/Medium Oil)	0	5	0	7	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
Well Oil 8	Cude Oil (Medium) Single	CR-OIL FLOW Wellhead (Oil Flow)	0	47	0	61	0	0	0	0	0	0	0	0	0	0	9	0	6	0	0	0	0
Well Oil 8	Cude Oil (Medium) Single	CR-OIL FLOW Well Pump	0	58	0	0	0	0	0	0	1	0	0	0	2	0	0	6	0	0	0	0	0
Well Oil 80	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	0	0	71	0	0	0	0	0	1	0	0	0	0	0	12	0	0	0	0	0
Well Oil 80	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump (Electric)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 81	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	0	0	74	0	0	0	0	0	1	0	0	0	0	0	10	0	0	0	0	0
Well Oil 81	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump (Electric)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 82	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	0	0	75	0	0	0	0	0	1	0	0	0	0	0	13	0	0	0	0	0
Well Oil 82	Cude Oil Multiswell Proantion	CR-OIL PUMP Pig Tap (Liquid Service)	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
Well Oil 82	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump (Electric)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 83	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump	0	40	0	0	0	0	0	1	0	0	0	2	0	0	4	0	0	0	0	0	0
Well Oil 83	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	73	0	14	0	0	0	2	0	0	1	2	0	0	10	0	6	0	0	0	0
Well Oil 83	Cude Oil Multiswell Proantion	CR-OIL PUMP Screw Compressor	0	237	0	5	0	0	0	4	0	0	0	2	0	0	9	0	0	0	0	0	0
Well Oil 84	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	34	0	47	0	0	0	0	0	1	0	0	0	0	7	0	8	0	0	0	0
Well Oil 84	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump	0	33	0	0	0	0	0	0	0	0	0	2	0	0	4	0	0	0	0	0	0
Well Oil 85	Cude Oil (Medium) Single	CR-OIL PUMP Separator	0	103	0	0	0	2	0	0	0	3	0	3	0	0	23	0	0	0	0	0	0
Well Oil 85	Cude Oil (Medium) Single	CR-OIL PUMP Wellhead (Oil Pump)	0	64	0	0	0	0	0	0	0	1	1	0	0	0	12	0	0	0	0	0	0
Well Oil 86	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	0	0	98	0	0	0	0	0	1	0	0	0	0	0	16	0	0	0	0	0
Well Oil 86	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump (Electric)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 87	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	37	0	23	0	0	0	0	0	1	0	0	0	0	4	0	4	0	0	0	0
Well Oil 88	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	0	0	78	0	0	0	0	0	1	0	0	0	0	0	16	0	0	0	0	0
Well Oil 88	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump (Electric)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 89	Cude Oil Multiswell Proantion	CR-OIL PUMP Wellhead (Oil Pump)	0	0	0	64	0	0	0	0	0	1	0	0	0	0	0	25	0	0	0	0	0
Well Oil 89	Cude Oil Multiswell Proantion	CR-OIL PUMP Well Pump (Electric)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 9	Cude Oil (Medium) Proantion	CR-OIL FLOW Wellhead (Oil Flow)	0	0	0	47	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0
Well Oil 90	Cude Oil (Medium) Single	CR-OIL PUMP Separator	0	129	0	95	0	0	0	2	0	0	0	8	0	0	19	0	9	1	0	1	0
Well Oil 90	Cude Oil (Medium) Single	CR-OIL PUMP Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Well Oil 90	Cude Oil (Medium) Single	CR-OIL PUMP Catalytic Heater	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Well Oil 90	Cude Oil (Medium) Single	CR-OIL PUMP Wellhead (Oil Pump)	0	39	0	23	0	0	0	0	0	1	0	0	0	0	15	0	7	0	0	0	0
Well Oil 90	Cude Oil (Medium) Single	CR-OIL PUMP Well Pump (Electric)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Well Oil 90	Cude Oil (Medium) Single	CR-OIL PUMP Production Tank (fixed roof - Light/Medium Oil)	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
Well Oil 91	Cude Oil (Medium) Multiswell Group	CR-OIL PUMP Wellhead (Oil																					













[illegible]

[illegible]

[illegible]





[illegible]

[illegible]

Gas Gathering 8	Compressor Station		Natural Gas	Intermittent	SOR	1530B
Gas Gathering 8	Compressor Station		Natural Gas	Pump	Bruin	5100
Gas Gathering 8	Compressor Station		Natural Gas	Level Controller	Fisher	L2
Gas Gathering 8	Compressor Station		Natural Gas	Level Controller	Fisher	L2
Gas Gathering 8	Compressor Station		Natural Gas	Level Controller	Fisher	L2
Gas Gathering 8	Compressor Station		Natural Gas	Level Controller	Norriseal	1001A
Gas Gathering 8	Compressor Station		Natural Gas	Level Controller	Norriseal	1001A
Gas Gathering 8	Compressor Station		Natural Gas	Level Controller	Norriseal	1001A
Gas Gathering 8	Compressor Station		Electric	Pump	Bruin	4300
Gas Gathering 8	Compressor Station		Natural Gas	Intermittent	Kimray	HT-12
Gas Gathering 8	Compressor Station		Natural Gas	Intermittent	Kimray	HT-12
Gas Gathering 8	Compressor Station		Natural Gas	Intermittent	Kimray	HT-12
Gas Gathering 8	Compressor Station		Natural Gas	Transducer	Fisher	i2P-100(l) Serial# >F000386281
Gas Gathering 9	Compressor Station		Natural Gas	Level Controller	Fisher	L2
Gas Gathering 9	Compressor Station		Natural Gas	Level Controller	Fisher	L2
Gas Gathering 9	Compressor Station		Natural Gas	Level Controller	Fisher	L2
Gas Gathering 9	Compressor Station		Natural Gas	Level Controller	Fisher	L2
Gas Gathering 9	Compressor Station		Natural Gas	Intermittent	SOR	1530
Gas Gathering 9	Compressor Station		Natural Gas	Positioner	Fisher	3600
Gas Gathering 9	Compressor Station		Natural Gas	Positioner	Fisher	3600
Gas Gathering 9	Compressor Station		Natural Gas	Pressure Controller	Fisher	4150
Gas Gathering 9	Compressor Station		Natural Gas	Pressure Controller	Fisher	4150
Gas Gathering 9	Compressor Station		Natural Gas	Pump	Williams	P500V300
Gas Gathering 9	Compressor Station		Natural Gas	Pump	Williams	P125X125
Gas Gathering 9	Compressor Station		Natural Gas	Transducer	Fisher	546
Gas Gathering 9	Compressor Station		Natural Gas	Transducer	Fisher	546
Gas Gathering 9	Compressor Station		Natural Gas	Transducer	Fisher	546
Gas Gathering 9	Compressor Station		Natural Gas	Transducer	Fisher	546
Gas Gathering 9	Compressor Station		Natural Gas	Transducer	Fisher	546
Gas Gathering 9	Compressor Station		Natural Gas	Transducer	Fisher	546
Gas Gathering 9	Compressor Station		Natural Gas	Transducer	Fisher	546
Gas Gathering 9	Compressor Station		Natural Gas	Transducer	Fisher	i2P-100(h)
Well Bitumen 24	Crude bitumen single-well	CR-BIT PUMP	Natural Gas	Intermittent	Kimray	HT-12
Well Bitumen 24	Crude bitumen single-well	CR-BIT PUMP	Natural Gas	Intermittent	Barksdale	425x-03
Well Bitumen 24	Crude bitumen single-well	CR-BIT PUMP	Natural Gas	Intermittent	Argus	AEF-14
Well CBM 17	Gas Multiwell proration outside SE AB	CBMOT FLOW	Natural Gas	Pump	Bruin	5100
Well CBM 17	Gas Multiwell proration outside SE AB	CBMOT FLOW	Natural Gas	Level Controller	Pathway	P120
Well CBM 22	Gas Multiwell proration outside SE AB	CBMOT FLOW	Natural Gas	Intermittent	HLR	7970
Well CBM 22	Gas Multiwell proration outside SE AB	CBMOT FLOW	Natural Gas	Intermittent	HLR	7970
Well CBM 22	Gas Multiwell proration outside SE AB	CBMOT FLOW	Natural Gas	Intermittent	SOR	1530
Well CBM 22	Gas Multiwell proration outside SE AB	CBMOT FLOW	Natural Gas	Intermittent	SOR	1530
Well CBM 22	Gas Multiwell proration outside SE AB	CBMOT FLOW	Natural Gas	Intermittent	SOR	1530
Well CBM 22	Gas Multiwell proration outside SE AB	CBMOT FLOW	Natural Gas	Positioner	Fisher	DVC 6000
Well CBM 22	Gas Multiwell proration outside SE AB	CBMOT FLOW	Natural Gas	Positioner	Fisher	DVC 6000
Well CBM 22	Gas Multiwell proration outside SE AB	CBMOT FLOW	Natural Gas	Positioner	Fisher	DVC 6000
Well CBM 31	Gas Multiwell proration outside SE AB	CBMOT FLOW	Natural Gas	Level Controller	Fisher	L2
Well CBM 31	Gas Multiwell proration outside SE AB	CBMOT FLOW	Natural Gas	Pump	Texsteam	5100
Well CBM 36	Gas Multiwell proration outside SE AB	CBMOT PUMP	Natural Gas	Intermittent	Premier Integtated Tech.	ET - 12001
Well CBM 36	Gas Multiwell proration outside SE AB	CBMOT PUMP	Natural Gas	Pump	Texsteam	5100
Well Gas 1	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	SOR	1530
Well Gas 1	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	SOR	1530
Well Gas 1	Gas Multiwell Group	GAS FLOW	Natural Gas	Level Controller	Fisher	2680
Well Gas 1	Gas Multiwell Group	GAS FLOW	Natural Gas	Pump	Texsteam	5100
Well Gas 103	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	Norriseal	1001
Well Gas 103	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	Linc	282
Well Gas 103	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	Fisher	4660
Well Gas 103	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	Fisher	4660
Well Gas 103	Gas Multiwell Group	GAS FLOW	Natural Gas	Level Controller	Fisher	2660
Well Gas 103	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	ITT	130P4
Well Gas 103	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	ITT	130P4
Well Gas 103	Gas Multiwell Group	GAS FLOW	Natural Gas	Pump	Bruin	5100
Well Gas 103	Gas Multiwell Group	GAS FLOW	Natural Gas	Transducer	Fisher	546
Well Gas 105	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	CVS	7970
Well Gas 105	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	PCS Ferguson	PCS 2000
Well Gas 105	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	PCS Ferguson	PCS 2000
Well Gas 105	Gas Multiwell Group	GAS FLOW	Natural Gas	Pump	Morgan	HD312
Well Gas 106	Gas Multiwell effluent	GAS FLOW	Instrument Air	Pump	CVS	5000
Well Gas 106	Gas Multiwell effluent	GAS FLOW	Instrument Air	Pump	CVS	5000
Well Gas 106	Gas Multiwell effluent	GAS FLOW	Instrument Air	Level Controller	Fisher	L2
Well Gas 106	Gas Multiwell effluent	GAS FLOW	Instrument Air	Level Controller	Fisher	L2
Well Gas 106	Gas Multiwell effluent	GAS FLOW	Instrument Air	Positioner	Fisher	DVC 6020
Well Gas 106	Gas Multiwell effluent	GAS FLOW	Instrument Air	Positioner	Fisher	DVC 6020
Well Gas 106	Gas Multiwell effluent	GAS FLOW	Instrument Air	Pump	CVS	5100
Well Gas 106	Gas Multiwell effluent	GAS FLOW	Instrument Air	Transducer	Fisher	i2P-100(l) Serial# >F000386281
Well Gas 106	Gas Multiwell effluent	GAS FLOW	Instrument Air	Transducer	Fisher	i2P-100(l) Serial# >F000386281
Well Gas 107	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	Murphy	L1200
Well Gas 107	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	Murphy	L1200
Well Gas 107	Gas Multiwell Group	GAS FLOW	Natural Gas	Level Controller	Norriseal	1001 EVS
Well Gas 107	Gas Multiwell Group	GAS FLOW	Natural Gas	Level Controller	Norriseal	1001A
Well Gas 107	Gas Multiwell Group	GAS FLOW	Natural Gas	Level Controller	Norriseal	1001A
Well Gas 107	Gas Multiwell Group	GAS FLOW	Natural Gas	Level Controller	Norriseal	1001A
Well Gas 107	Gas Multiwell Group	GAS FLOW	Natural Gas	Level Controller	Norriseal	1001A
Well Gas 107	Gas Multiwell Group	GAS FLOW	Natural Gas	Level Controller	Fisher	L2
Well Gas 107	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	Petagon Optimization	EVO 1
Well Gas 107	Gas Multiwell Group	GAS FLOW	Natural Gas	Pressure Controller	Fisher	4150
Well Gas 107	Gas Multiwell Group	GAS FLOW	Natural Gas	Pressure Controller	Fisher	2680
Well Gas 107	Gas Multiwell Group	GAS FLOW	Natural Gas	Pump	Bruin	5100
Well Gas 107	Gas Multiwell Group	GAS FLOW	Natural Gas	Pump	Bruin	5100
Well Gas 107	Gas Multiwell Group	GAS FLOW	Natural Gas	Pump	CVS	5100
Well Gas 107	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	Kimray	HT-12
Well Gas 107	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	Kimray	HT-12
Well Gas 108	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	Linc	282





Well Gas 130	Gas Multiwell effluent	GAS PUMP	Natural Gas	Transducer	Fisher	i2P-100(h)
Well Gas 131	Gas Multiwell effluent	GAS PUMP	Natural Gas	Intermittent	SOR	1530
Well Gas 131	Gas Multiwell effluent	GAS PUMP	Natural Gas	Pump	Texsteam	5100
Well Gas 132	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	L2
Well Gas 132	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	Fisher	4660
Well Gas 132	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Bruin	5100
Well Gas 132	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Bruin	5100
Well Gas 132	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	Wellmark	ST2TP
Well Gas 132	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	SOR	1530
Well Gas 132	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	CVS	5100
Well Gas 133	Gas Multiwell proration outside SE AB	GAS PUMP	Natural Gas	Intermittent	Premier Integtated Tech.	PIT BOSS
Well Gas 134	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	SOR	1530
Well Gas 134	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	L2
Well Gas 134	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	L2
Well Gas 134	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	CVS	5100
Well Gas 136	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Texsteam	5100
Well Gas 136	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	YZ Systems Inc	282
Well Gas 136	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	L2
Well Gas 137	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	L2
Well Gas 137	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	L2
Well Gas 137	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	SOR	1530
Well Gas 137	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Bruin	5100
Well Gas 137	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Bruin	5100
Well Gas 139	Gas Multiwell effluent	GAS PUMP	Natural Gas	Transducer	Fisher	546
Well Gas 14	Gas Multiwell proration SE AB	GAS FLOW	Natural Gas	Intermittent	SOR	1530
Well Gas 14	Gas Multiwell proration SE AB	GAS FLOW	Natural Gas	Intermittent	SOR	1530
Well Gas 14	Gas Multiwell proration SE AB	GAS FLOW	Natural Gas	Intermittent	Fisher	4660
Well Gas 14	Gas Multiwell proration SE AB	GAS FLOW	Natural Gas	Level Controller	Fisher	2680
Well Gas 140	Gas Multiwell effluent	GAS PUMP	Natural Gas	Intermittent	SOR	1530
Well Gas 140	Gas Multiwell effluent	GAS PUMP	Natural Gas	Pump	Texsteam	5100
Well Gas 141	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Texsteam	5000
Well Gas 141	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	L2
Well Gas 141	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	Fisher	4660
Well Gas 141	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	2660
Well Gas 143	Gas Multiwell effluent	GAS PUMP	Natural Gas	Transducer	Fisher	i2P-100(h)
Well Gas 145	Gas Multiwell effluent	GAS PUMP	Natural Gas	Transducer	Fisher	i2P-100(h)
Well Gas 148	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	Wellmark	ST2TP
Well Gas 148	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	Other (describe in notes)	Other (describe in notes)
Well Gas 148	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Bruin	5100
Well Gas 149	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	2901
Well Gas 149	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	PCS Ferguson	AC98A20
Well Gas 149	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Texsteam	5100
Well Gas 15	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Level Controller	Fisher	L2
Well Gas 15	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Level Controller	Fisher	L2
Well Gas 15	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Level Controller	Fisher	L2
Well Gas 15	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Positioner	Fisher	DVC 6020
Well Gas 15	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Positioner	Fisher	DVC 6020
Well Gas 15	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Intermittent	CVS	7970
Well Gas 15	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Pressure Controller	CVS	4150
Well Gas 15	Gas Multiwell proration outside SE AB	GAS FLOW	Natural Gas	Transducer	Fisher	i2P-100(h)
Well Gas 15	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Pump	CVS	5100
Well Gas 15	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Pump	CVS	5100
Well Gas 15	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Transducer	Fisher	i2P-100(h)
Well Gas 15	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Transducer	Fisher	i2P-100(h)
Well Gas 151	Gas Multiwell effluent	GAS PUMP	Natural Gas	Pump	Williams	P125X125
Well Gas 151	Gas Multiwell effluent	GAS PUMP	Natural Gas	Transducer	Fisher	i2P-100(h)
Well Gas 152	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Norriseal	1001
Well Gas 152	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Texsteam	5100
Well Gas 154	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Bruin	5100
Well Gas 154	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Norriseal	1001A
Well Gas 154	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Norriseal	1001A
Well Gas 154	Gas Multiwell Group	GAS PUMP	Natural Gas	Pressure Controller	CVS	4150
Well Gas 154	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	Fisher	4660
Well Gas 154	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	CVS	5100
Well Gas 154	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	Murphy	L1200
Well Gas 154	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	SOR	1530
Well Gas 157	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Bruin	5100
Well Gas 157	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	PCS Ferguson	LIQ98B10
Well Gas 157	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	2900
Well Gas 157	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	2900
Well Gas 161	Gas Multiwell effluent	GAS PUMP	Natural Gas	Pump	Williams	P125X125
Well Gas 161	Gas Multiwell effluent	GAS PUMP	Natural Gas	Transducer	Fisher	i2P-100(h)
Well Gas 162	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Norriseal	1001 EVS
Well Gas 162	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	SOR	1530
Well Gas 162	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	Mega Lift Systems	APC 1000
Well Gas 162	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Texsteam	5100
Well Gas 162	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	CVS	5100
Well Gas 163	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	2680
Well Gas 163	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	Fisher	4660
Well Gas 163	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	CVS	5100
Well Gas 163	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	2900
Well Gas 163	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	Murphy	L1200
Well Gas 164	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	PCS Ferguson	PCS 2000
Well Gas 167	Gas Single	GAS PUMP	Natural Gas	Level Controller	Fisher	L2
Well Gas 167	Gas Single	GAS PUMP	Natural Gas	Pump	Texsteam	5100
Well Gas 167	Gas Single	GAS PUMP	Natural Gas	Pump	Texsteam	5100
Well Gas 168	Gas Multiwell effluent	GAS PUMP	Natural Gas	Transducer	Fisher	i2P-100(h)
Well Gas 169	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	L2
Well Gas 169	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	L2
Well Gas 169	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	CVS	5100
Well Gas 17	Gas Multiwell proration outside SE AB	GAS FLOW	Natural Gas	Intermittent	SOR	1530
Well Gas 170	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	2680
Well Gas 170	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	2680
Well Gas 170	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	Extreme Telematics Corp.	ALIEN
Well Gas 170	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Texsteam	5100
Well Gas 170	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Texsteam	5100
Well Gas 170	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Texsteam	5100
Well Gas 171	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	CVS	5100
Well Gas 171	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Norriseal	1001A
Well Gas 171	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	L2
Well Gas 171	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	Petagon Optimization	EVO 1

Well Gas 171	Gas Multiwell Group	GAS PUMP	Natural Gas	Pressure Controller	Fisher	4150
Well Gas 173	Gas Single	GAS PUMP	Natural Gas	Level Controller	Norriseal	1001A
Well Gas 173	Gas Single	GAS PUMP	Natural Gas	Level Controller	Norriseal	1001
Well Gas 173	Gas Single	GAS PUMP	Natural Gas	Level Controller	Norriseal	1001A
Well Gas 173	Gas Single	GAS PUMP	Natural Gas	Pump	Arrow	5100
Well Gas 173	Gas Single	GAS PUMP	Natural Gas	Pump	Arrow	5100
Well Gas 173	Gas Single	GAS PUMP	Natural Gas	Pump	Arrow	5100
Well Gas 174	Gas Multiwell effluent	GAS PUMP	Natural Gas	Transducer	Fisher	i2P-100(h)
Well Gas 174	Gas Multiwell effluent	GAS PUMP	Natural Gas	Transducer	Fisher	i2P-100(h)
Well Gas 176	Gas Single	GAS PUMP	Instrument Air	Pump	CVS	5000
Well Gas 176	Gas Single	GAS PUMP	Instrument Air	Transducer	Fisher	i2P-100(h)
Well Gas 176	Gas Single	GAS PUMP	Instrument Air	Transducer	Fisher	i2P-100(h)
Well Gas 176	Gas Single	GAS PUMP	Instrument Air	Transducer	Fisher	i2P-100(h)
Well Gas 177	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Bruin	5100
Well Gas 177	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Bruin	5100
Well Gas 177	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	Fisher	4660
Well Gas 177	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	L2
Well Gas 179	Gas Multiwell effluent	GAS PUMP	Natural Gas	Transducer	Fisher	i2P-100(h)
Well Gas 180	Gas Multiwell effluent	GAS PUMP	Natural Gas	Transducer	Fisher	i2P-100(h)
Well Gas 181	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Bruin	5100
Well Gas 181	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Fisher	2900
Well Gas 181	Gas Multiwell Group	GAS PUMP	Natural Gas	Pressure Controller	Fisher	Wizard
Well Gas 182	Gas Multiwell effluent	GAS PUMP	Natural Gas	Intermittent	SOR	1530
Well Gas 182	Gas Multiwell effluent	GAS PUMP	Natural Gas	Pump	Bruin	5100
Well Gas 183	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	Wellmark	ST2TP
Well Gas 183	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Norriseal	1001A
Well Gas 183	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Texsteam	5100
Well Gas 185	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Norriseal	1001A
Well Gas 185	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	Wellmark	ST2TP
Well Gas 185	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Texsteam	5100
Well Gas 185	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	Argus	AEF-14
Well Gas 188	Gas Multiwell Group	GAS PUMP	Natural Gas	Intermittent	SOR	1530
Well Gas 19	Gas Multiwell proration outside SE AB	GAS FLOW	Natural Gas	Level Controller	Fisher	L2
Well Gas 19	Gas Multiwell proration outside SE AB	GAS FLOW	Natural Gas	Level Controller	Fisher	L2
Well Gas 19	Gas Multiwell proration outside SE AB	GAS FLOW	Natural Gas	Positioner	Fisher	DVC 6020
Well Gas 19	Gas Multiwell proration outside SE AB	GAS FLOW	Natural Gas	Pump	CVS	5100
Well Gas 19	Gas Multiwell proration outside SE AB	GAS FLOW	Natural Gas	Pump	CVS	5100
Well Gas 19	Gas Multiwell proration outside SE AB	GAS FLOW	Natural Gas	Transducer	Fisher	i2P-100(h)
Well Gas 19	Gas Multiwell proration outside SE AB	GAS FLOW	Natural Gas	Transducer	Fisher	i2P-100(h)
Well Gas 190	Gas Multiwell effluent	GAS STORG	Electric	Pump	Sunpumper	113 SST
Well Gas 191	Gas Single	GAS STORG	Instrument Air	Level Controller	Fisher	L2
Well Gas 191	Gas Single	GAS STORG	Instrument Air	Positioner	Fisher	3600
Well Gas 191	Gas Single	GAS STORG	Instrument Air	Transducer	Fisher	546
Well Gas 192	Gas Single	SHG FLOW	Instrument Air	Level Controller	Fisher	L2
Well Gas 192	Gas Single	SHG FLOW	Instrument Air	Level Controller	Fisher	L2
Well Gas 192	Gas Single	SHG FLOW	Instrument Air	Pump	Williams	P500
Well Gas 192	Gas Single	SHG FLOW	Instrument Air	Positioner	Fisher	DVC 6020
Well Gas 192	Gas Single	SHG FLOW	Instrument Air	Intermittent	SOR	1530
Well Gas 192	Gas Single	SHG FLOW	Instrument Air	Level Controller	Fisher	L2
Well Gas 192	Gas Single	SHG FLOW	Instrument Air	Positioner	Fisher	DVC 6020
Well Gas 192	Gas Single	SHG FLOW	Instrument Air	Positioner	Fisher	DVC 6020
Well Gas 193	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	Murphy	L1200
Well Gas 193	Gas Multiwell Group	GAS FLOW	Natural Gas	Pressure Controller	Fisher	4150
Well Gas 193	Gas Multiwell Group	GAS FLOW	Natural Gas	Pump	Bruin	5100
Well Gas 194	Gas Multiwell Group	GAS PUMP	Natural Gas	Level Controller	Murphy	L1200 NDVO
Well Gas 194	Gas Multiwell Group	GAS PUMP	Natural Gas	Pump	Bruin	5100
Well Gas 20	Gas Single	GAS FLOW	Natural Gas	Intermittent	SOR	1530
Well Gas 20	Gas Single	GAS FLOW	Natural Gas	Intermittent	SOR	1530
Well Gas 20	Gas Single	GAS FLOW	Natural Gas	Level Controller	Fisher	2680
Well Gas 20	Gas Single	GAS FLOW	Natural Gas	Level Controller	Fisher	2680
Well Gas 20	Gas Single	GAS FLOW	Natural Gas	Pressure Controller	CVS	4150
Well Gas 20	Gas Single	GAS FLOW	Natural Gas	Pump	CVS	5100
Well Gas 20	Gas Single	GAS FLOW	Natural Gas	Pump	Timberline	2515
Well Gas 22	Gas Single	GAS FLOW	Natural Gas	Level Controller	Norriseal	1001 EVS
Well Gas 22	Gas Single	GAS FLOW	Natural Gas	Level Controller	Fisher	L2
Well Gas 22	Gas Single	GAS FLOW	Natural Gas	Positioner	Siemens	760
Well Gas 22	Gas Single	GAS FLOW	Natural Gas	Pump	Texsteam	5100
Well Gas 22	Gas Single	GAS FLOW	Natural Gas	Pump	CVS	5100
Well Gas 22	Gas Single	GAS FLOW	Natural Gas	Transducer	Fisher	i2P-100(h)
Well Gas 22	Gas Single	GAS FLOW	Natural Gas	Transducer	Fisher	i2P-100(h)
Well Gas 24	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	SOR	1530
Well Gas 24	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	SOR	1530
Well Gas 24	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	Fisher	4660
Well Gas 24	Gas Multiwell Group	GAS FLOW	Natural Gas	Level Controller	Fisher	L2
Well Gas 24	Gas Multiwell Group	GAS FLOW	Natural Gas	Level Controller	Fisher	L2
Well Gas 24	Gas Multiwell Group	GAS FLOW	Natural Gas	Pump	Bruin	5100
Well Gas 24	Gas Multiwell Group	GAS FLOW	Natural Gas	Pump	Bruin	5100
Well Gas 26	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	SOR	1530
Well Gas 27	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	Wellmark	ST2TP
Well Gas 28	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Intermittent	CVS	7970
Well Gas 28	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Level Controller	Fisher	L2
Well Gas 28	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Level Controller	Fisher	L2
Well Gas 28	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Level Controller	Fisher	L2
Well Gas 28	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Positioner	Fisher	DVC 6020
Well Gas 28	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Positioner	Fisher	DVC 6020
Well Gas 28	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Pressure Controller	CVS	4150
Well Gas 28	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Pump	Bruin	5100
Well Gas 28	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Pump	CVS	5100
Well Gas 28	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Transducer	Fisher	i2P-100(h)
Well Gas 28	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Transducer	Fisher	i2P-100(h)
Well Gas 28	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Transducer	Fisher	i2P-100(h)
Well Gas 30	Gas Multiwell proration outside SE AB	GAS FLOW	Natural Gas	Level Controller	Fisher	L2
Well Gas 30	Gas Multiwell proration outside SE AB	GAS FLOW	Natural Gas	Level Controller	Fisher	L2
Well Gas 30	Gas Multiwell proration outside SE AB	GAS FLOW	Natural Gas	Positioner	Fisher	DVC 6020
Well Gas 30	Gas Multiwell proration outside SE AB	GAS FLOW	Natural Gas	Pump	CVS	5100
Well Gas 30	Gas Multiwell proration outside SE AB	GAS FLOW	Natural Gas	Pump	CVS	5100
Well Gas 30	Gas Multiwell proration outside SE AB	GAS FLOW	Natural Gas	Transducer	Fisher	i2P-100(h)
Well Gas 30	Gas Multiwell proration outside SE AB	GAS FLOW	Natural Gas	Transducer	Fisher	i2P-100(h)
Well Gas 32	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Pump	CVS	5000
Well Gas 32	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Intermittent	CVS	7970
Well Gas 32	Gas Multiwell proration outside SE AB	GAS FLOW	Instrument Air	Level Controller	Fisher	L2

[illegible]



[illegible]

Well Gas 94	Gas Single	GAS FLOW	Natural Gas	Pressure Controller	Fisher	4150
Well Gas 94	Gas Single	GAS FLOW	Natural Gas	Pump	Texsteam	5100
Well Gas 95	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	Fisher	4660
Well Gas 95	Gas Multiwell Group	GAS FLOW	Natural Gas	Pump	CVS	5100
Well Gas 95	Gas Multiwell Group	GAS FLOW	Natural Gas	Pump	CVS	5100
Well Gas 95	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	SOR	1530
Well Gas 95	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	Fisher	4660
Well Gas 96	Gas Multiwell Group	GAS FLOW	Natural Gas	Intermittent	Wellmark	ST2TP
Well Gas 96	Gas Multiwell Group	GAS FLOW	Natural Gas	Level Controller	Fisher	L2
Well Gas 97	Gas Multiwell proration SE AB	GAS FLOW	Natural Gas	Intermittent	Linc	282
Well Oil 101	Crude Oil Multiwell Proration	CR-OIL PUMP	Instrument Air	Intermittent	CVS	7970
Well Oil 101	Crude Oil Multiwell Proration	CR-OIL PUMP	Instrument Air	Intermittent	CVS	7970
Well Oil 101	Crude Oil Multiwell Proration	CR-OIL PUMP	Instrument Air	Intermittent	Fisher	4660
Well Oil 101	Crude Oil Multiwell Proration	CR-OIL PUMP	Instrument Air	Pump	Bruin	5100
Well Oil 101	Crude Oil Multiwell Proration	CR-OIL PUMP	Instrument Air	Pressure Controller	Fisher	Wizard
Well Oil 101	Crude Oil Multiwell Proration	CR-OIL PUMP	Instrument Air	Level Controller	Fisher	L2
Well Oil 101	Crude Oil Multiwell Proration	CR-OIL PUMP	Instrument Air	Level Controller	Fisher	L2
Well Oil 101	Crude Oil Multiwell Proration	CR-OIL PUMP	Instrument Air	Pressure Controller	CVS	4150
Well Oil 106	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	SOR	1530
Well Oil 106	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	CVS	7970
Well Oil 106	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Fisher	L2
Well Oil 106	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pressure Controller	Fisher	C1
Well Oil 106	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Texsteam	5100
Well Oil 106	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Texsteam	5100
Well Oil 107	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	SOR	1530
Well Oil 107	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	CVS	7970
Well Oil 107	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Arrow	ASC252
Well Oil 107	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	CVS	5100
Well Oil 110	Crude Oil (Medium) Single	CR-OIL PUMP	Instrument Air	Level Controller	Mallard	3200
Well Oil 110	Crude Oil (Medium) Single	CR-OIL PUMP	Instrument Air	Intermittent	PCS Ferguson	PCS 2000
Well Oil 110	Crude Oil (Medium) Single	CR-OIL PUMP	Instrument Air	Pressure Controller	CVS	4150
Well Oil 117	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	Norriseal	1001A
Well Oil 117	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	HLR	7970
Well Oil 117	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	HLR	7970
Well Oil 117	Crude Oil (Medium) Single	CR-OIL PUMP	Propane	Intermittent	HLR	7970
Well Oil 117	Crude Oil (Medium) Single	CR-OIL PUMP	Propane	Intermittent	HLR	7970
Well Oil 117	Crude Oil (Medium) Single	CR-OIL PUMP	Propane	Intermittent	HLR	7970
Well Oil 117	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Norriseal	1001A
Well Oil 117	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Norriseal	1001A
Well Oil 117	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pressure Controller	Fisher	C1
Well Oil 118	Crude Oil (Medium) Multiwell Group	CR-OIL PUMP	Natural Gas	Level Controller	Norriseal	1001A
Well Oil 118	Crude Oil (Medium) Multiwell Group	CR-OIL PUMP	Natural Gas	Level Controller	Norriseal	1001A
Well Oil 118	Crude Oil (Medium) Multiwell Group	CR-OIL PUMP	Natural Gas	Pump	Texsteam	5100
Well Oil 12	Crude Oil (Medium) Single	CR-OIL FLOW	Instrument Air	Level Controller	Norriseal	1001A
Well Oil 12	Crude Oil (Medium) Single	CR-OIL FLOW	Instrument Air	Level Controller	Fisher	L2
Well Oil 12	Crude Oil (Medium) Single	CR-OIL FLOW	Instrument Air	Level Controller	Fisher	L2
Well Oil 12	Crude Oil (Medium) Single	CR-OIL FLOW	Instrument Air	Pressure Controller	CVS	4150
Well Oil 120	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Texsteam	5100
Well Oil 120	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pressure Controller	Fisher	4150
Well Oil 120	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Fisher	L2
Well Oil 120	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	SOR	1530
Well Oil 120	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	Fisher	4660
Well Oil 123	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	Norriseal	1001A
Well Oil 123	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	HLR	7970
Well Oil 123	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	HLR	7970
Well Oil 123	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Norriseal	1001A
Well Oil 123	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Norriseal	1001A
Well Oil 123	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pressure Controller	Fisher	C1
Well Oil 125	Crude Oil (Medium) Multiwell Group	CR-OIL PUMP	Natural Gas	Intermittent	SOR	1530
Well Oil 13	Crude Oil Multiwell Proration	CR-OIL FLOW	Instrument Air	Positioner	CVS	YT-3400
Well Oil 14	Crude Oil Multiwell Proration	CR-OIL FLOW	Instrument Air	Positioner	CVS	YT-3400
Well Oil 14	Crude Oil Multiwell Proration	CR-OIL FLOW	Instrument Air	Pump	Williams	P250
Well Oil 14	Crude Oil Multiwell Proration	CR-OIL FLOW	Instrument Air	Pump	Williams	P250
Well Oil 14	Crude Oil Multiwell Proration	CR-OIL FLOW	Instrument Air	Pump	Williams	P250
Well Oil 16	Crude Oil (Medium) Multiwell Group	CR-OIL FLOW	Natural Gas	Intermittent	HLR	7970
Well Oil 16	Crude Oil (Medium) Multiwell Group	CR-OIL FLOW	Natural Gas	Level Controller	Fisher	L2
Well Oil 16	Crude Oil (Medium) Multiwell Group	CR-OIL FLOW	Natural Gas	Pressure Controller	Fisher	C1
Well Oil 16	Crude Oil (Medium) Multiwell Group	CR-OIL FLOW	Natural Gas	Pump	Texsteam	5100
Well Oil 16	Crude Oil (Medium) Multiwell Group	CR-OIL FLOW	Natural Gas	Pump	Texsteam	5100
Well Oil 17	Crude Oil Multiwell Proration	CR-OIL FLOW	Natural Gas	Level Controller	Fisher	L2
Well Oil 17	Crude Oil Multiwell Proration	CR-OIL FLOW	Natural Gas	Level Controller	Fisher	L2
Well Oil 17	Crude Oil Multiwell Proration	CR-OIL FLOW	Natural Gas	Intermittent	SOR	1530
Well Oil 17	Crude Oil Multiwell Proration	CR-OIL FLOW	Natural Gas	Pressure Controller	Fisher	4150
Well Oil 17	Crude Oil Multiwell Proration	CR-OIL FLOW	Natural Gas	Pump	CVS	5100
Well Oil 19	Crude Oil Multiwell Proration	CR-OIL FLOW	Instrument Air	Positioner	CVS	YT-3400
Well Oil 2	Crude Oil Multiwell Proration	CR-OIL FLOW	Instrument Air	Positioner	CVS	YT-3400
Well Oil 20	Crude Oil Multiwell Proration	CR-OIL FLOW	Instrument Air	Positioner	CVS	YT-3400
Well Oil 21	Crude Oil Multiwell Proration	CR-OIL FLOW	Instrument Air	Positioner	CVS	YT-3400
Well Oil 29	Crude Oil (Medium) Single	CR-OIL PUMP	Propane	Intermittent	Fisher	4660
Well Oil 29	Crude Oil (Medium) Single	CR-OIL PUMP	Propane	Level Controller	Norriseal	1001
Well Oil 29	Crude Oil (Medium) Single	CR-OIL PUMP	Propane	Level Controller	Fisher	2660
Well Oil 31	Crude Oil (Medium) Single	CR-OIL PUMP	Electric	Pump	Texsteam	5100
Well Oil 31	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Fisher	L2
Well Oil 31	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas      Pneumatic	Pressure Controller	Fisher	4150

Well Oil 31	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	Fisher	4660
Well Oil 32	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Fisher	L2
Well Oil 32	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Fisher	L2
Well Oil 32	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Linc	84T-12-42
Well Oil 32	Crude Oil (Medium) Single	CR-OIL PUMP	Instrument Air	Pump	Timberline	2515
Well Oil 32	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Timberline	2515
Well Oil 34	Crude Oil Multiwell Proration	CR-OIL PUMP	Natural Gas	Intermittent	Mega Lift Systems	APC 1000
Well Oil 34	Crude Oil Multiwell Proration	CR-OIL PUMP	Natural Gas	Pump	Bruin	5100
Well Oil 40	Crude Oil (Medium) Single	CR-OIL PUMP	Electric	Pump	Texsteam	5100
Well Oil 40	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Fisher	L2
Well Oil 40	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	SOR	1530
Well Oil 40	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pressure Controller	Fisher	C1
Well Oil 51	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Linc	84T-12-42
Well Oil 51	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Linc	84T-12-42
Well Oil 51	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Timberline	2515
Well Oil 51	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Timberline	2515
Well Oil 52	Crude Oil Multiwell Proration	CR-OIL PUMP	Natural Gas	Intermittent	Mega Lift Systems	APC 1000
Well Oil 56	Crude Oil Multiwell Proration	CR-OIL PUMP	Natural Gas	Intermittent	PCS Ferguson	PCS 2000
Well Oil 57	Crude Oil Multiwell Proration	CR-OIL PUMP	Natural Gas	Intermittent	PCS Ferguson	PCS 2000
Well Oil 58	Crude Oil Multiwell Proration	CR-OIL PUMP	Natural Gas	Intermittent	Mega Lift Systems	APC 1000
Well Oil 58	Crude Oil Multiwell Proration	CR-OIL PUMP	Natural Gas	Pump	Bruin	5100
Well Oil 63	Crude Oil (Medium) Multiwell Group	CR-OIL PUMP	Natural Gas	Intermittent	Petagon Optimization	EVO 1
Well Oil 63	Crude Oil (Medium) Multiwell Group	CR-OIL PUMP	Natural Gas	Pump	Morgan	HD312
Well Oil 65	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	Amot	4023
Well Oil 65	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Arrow	ASC252
Well Oil 65	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Arrow	ASC252
Well Oil 66	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Bruin	5100
Well Oil 66	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Bruin	5100
Well Oil 66	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Transducer	Fisher	i2P-100(I) Serial# >F000386281
Well Oil 66	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Fisher	L2
Well Oil 66	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Fisher	L2
Well Oil 7	Crude Oil Multiwell Proration	CR-OIL FLOW	Instrument Air	Positioner	CVS	YT-3400
Well Oil 8	Crude Oil (Medium) Single	CR-OIL FLOW	Natural Gas	Pump	Texsteam	5100
Well Oil 8	Crude Oil (Medium) Single	CR-OIL FLOW	Natural Gas	Intermittent	SOR	1530
Well Oil 8	Crude Oil (Medium) Single	CR-OIL FLOW	Electric	Pump	Texsteam	5100
Well Oil 85	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pressure Controller	Fisher	4150
Well Oil 85	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Norriseal	1001A
Well Oil 85	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Murphy	L1200 NDVO
Well Oil 90	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Fisher	L2
Well Oil 90	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pressure Controller	CVS	4150
Well Oil 90	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	CVS	5100
Well Oil 90	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Norriseal	1001A
Well Oil 92	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	Extreme Telematics Corp.	ET - 12000
Well Oil 92	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Fisher	L2
Well Oil 92	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Fisher	L2
Well Oil 92	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Bruin	5100
Well Oil 92	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Bruin	5100
Well Oil 93	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Texsteam	5100
Well Oil 95	Crude Oil (Medium) Multiwell Group	CR-OIL PUMP	Natural Gas	Intermittent	Murphy	L1200
Well Oil 95	Crude Oil (Medium) Multiwell Group	CR-OIL PUMP	Natural Gas	Intermittent	Amot	4023
Well Oil 96	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	Linc	282
Well Oil 96	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Texsteam	5000
Well Oil 96	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	Fisher	4660
Well Oil 96	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Intermittent	Extreme Telematics Corp.	PIT BOSS
Well Oil 96	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pressure Controller	Fisher	2900
Well Oil 99	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pressure Controller	Dyna-Flo	4000
Well Oil 99	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Fisher	L2
Well Oil 99	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Fisher	L2
Well Oil 99	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Fisher	L2
Well Oil 99	Crude Oil (Medium) Single	CR-OIL PUMP	Instrument Air	Intermittent	Fisher	4660
Well Oil 99	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pump	Bruin	5100
Well Oil 99	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pressure Controller	Fisher	4150
Well Oil 99	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Pressure Controller	Fisher	4150
Well Oil 99	Crude Oil (Medium) Single	CR-OIL PUMP	Natural Gas	Level Controller	Norriseal	1001A

Table 26: Leak and vent measurement records from the field campaign conducted at Alberta upstream oil and natural gas (UOG) sites from 14 August to 23 September 2017.

Site ID	PETRINEX FACILITY SUBTYPE	Well Status	EMISSION TYPE	MAJOR EQUIPMENT	COMPONENT SERVICE TYPE	COMPONENT TYPE	MEASUREMENT DEVICE	Leak TAG	THC Leak Rate (sm3/hr)
Battery Bitumen 12	Crude bitumen multiwell proration		Vent	Production Tank (fixed roof)	Heavy Liquid	Open-Ended Line	Estimate	1	4.0953
Battery Bitumen 12	Crude bitumen multiwell proration		Leak	Other (describe in notes)	Process Gas	Connector	Highflow	201938	0.1178
Battery Bitumen 12	Crude bitumen multiwell proration		Leak	Other (describe in notes)	Light Liquid	Connector	Highflow	201936	0.1683
Battery Bitumen 13	Crude bitumen multiwell proration		Leak	Storage Bullet	Process Gas	Connector	Highflow	201937	0.2092
Battery Bitumen 14	Crude bitumen multiwell proration		Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	1.6251
Battery Bitumen 14	Crude bitumen multiwell proration		Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	1.6251
Battery Bitumen 14	Crude bitumen multiwell proration		Leak	Screw Compressor	Process Gas	Connector	Highflow	201212	0.5842
Battery Bitumen 15	Crude bitumen multiwell proration		Vent	Production Tank (fixed roof)	Heavy Liquid	Open-Ended Line	Estimate	1	1.6326
Battery Bitumen 15	Crude bitumen multiwell proration		Unlit Flare	Flare KnockOut Drum	Process Gas	Open-Ended Line	Highflow	201939	13.5999
Battery Bitumen 16	Crude bitumen multiwell proration		Leak	Other (describe in notes)	Process Gas	Connector	Highflow	201940	0.1999
Battery Bitumen 17	Crude bitumen multiwell proration		Vent	Production Tank (fixed roof)	Heavy Liquid	Thief Hatch	Estimate	1	5.0167
Battery Bitumen 17	Crude bitumen multiwell proration		Vent	Production Tank (fixed roof)	Heavy Liquid	Thief Hatch	Estimate	1	3.3444
Battery Bitumen 17	Crude bitumen multiwell proration		Vent	Production Tank (fixed roof)	Heavy Liquid	Thief Hatch	Estimate	1	13.2784
Battery Bitumen 17	Crude bitumen multiwell proration		Vent	Production Tank (fixed roof)	Heavy Liquid	Thief Hatch	Estimate	1	8.3611
Battery Bitumen 17	Crude bitumen multiwell proration		Leak	Screw Compressor	Process Gas	Connector	Highflow	200730	0.0346
Battery Bitumen 17	Crude bitumen multiwell proration		Leak	Screw Compressor	Process Gas	Connector	Highflow	200731	0.1210
Battery Bitumen 17	Crude bitumen multiwell proration		Leak	Storage Bullet	Process Gas	Connector	Highflow	200734	0.0531
Battery Bitumen 17	Crude bitumen multiwell proration		Leak	Storage Bullet	Process Gas	Connector	Highflow	200733	0.0797
Battery Bitumen 19	Crude bitumen multiwell proration		Leak	Other (describe in notes)	Process Gas	PRV/PSV	Highflow	201941	0.6996
Battery Bitumen 19	Crude bitumen multiwell proration		Vent	Production Tank (fixed roof)	Heavy Liquid	Open-Ended Line	Estimate	1	8.3487
Battery Bitumen 20	Crude bitumen multiwell proration		Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	0.0000
Battery Bitumen 21	Crude bitumen multiwell proration		Vent	Production Tank (fixed roof)	Heavy Liquid	Thief Hatch	Estimate	1	8.0807
Battery Bitumen 22	Crude bitumen multiwell proration		Leak	Other (describe in notes)	Process Gas	Connector	Highflow	201945	0.2465
Battery Bitumen 22	Crude bitumen multiwell proration		Vent	Production Tank (fixed roof)	Heavy Liquid	Open-Ended Line	Estimate	1	3.2001
Battery Bitumen 22	Crude bitumen multiwell proration		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	201944	6.7384
Battery Bitumen 22	Crude bitumen multiwell proration		Leak	Other (describe in notes)	Process Gas	Connector	Highflow	201946	0.3451
Battery Bitumen 23	Crude bitumen multiwell proration		Vent	Wellhead	Process Gas	Regulator	Estimate	1	16.2508
Battery Bitumen 23	Crude bitumen multiwell proration		Vent	Wellhead	Process Gas	Regulator	Estimate	1	16.2508
Battery Bitumen 23	Crude bitumen multiwell proration		Vent	Wellhead	Process Gas	casing vent	Estimate	1	32.5016
Battery Bitumen 23	Crude bitumen multiwell proration		Vent	Wellhead	Process Gas	casing vent	Estimate	1	32.5016
Battery Bitumen 24	Crude bitumen multiwell proration		Leak	Other (describe in notes)	Process Gas	Connector	Highflow	201942	0.2301
Battery Bitumen 24	Crude bitumen multiwell proration		Leak	Other (describe in notes)	Process Gas	Connector	Highflow	201943	0.1808
Battery Bitumen 24	Crude bitumen multiwell proration		Vent	Production Tank (fixed roof)	Heavy Liquid	Open-Ended Line	Estimate	1	3.2001
Battery Bitumen 4	Crude bitumen multiwell group		Leak	Screw Compressor	Process Gas	Connector	Highflow	201213	0.5602
Battery Bitumen 6	Crude bitumen multiwell group		Leak	Wellhead	Process Gas	Valve	Highflow	200736	0.0347
Battery Bitumen 6	Crude bitumen multiwell group		Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	3.3230
Battery Bitumen 7	Crude bitumen multiwell group		Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	0.1690
Battery Bitumen 7	Crude bitumen multiwell group		Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	0.1690
Battery Bitumen 9	Crude bitumen multiwell group		Leak	Other (describe in notes)	Process Gas	Connector	Highflow	201948	0.1188
Battery Bitumen 9	Crude bitumen multiwell group		Leak	Other (describe in notes)	Process Gas	Connector	Highflow	201949	0.1358
Battery Gas 10	Gas Multiwell effluent		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	1	0.0342
Battery Gas 10	Gas Multiwell effluent		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	201459	0.1898
Battery Gas 10	Gas Multiwell effluent		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Calibrated bag	201458	0.5770
Battery Gas 10	Gas Multiwell effluent		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	201460	0.6211
Battery Gas 14	Gas Multiwell Group		Leak	Separator	Process Gas	Regulator	Highflow	204029	0.1430
Battery Gas 22	Gas Multiwell Group		Leak	Separator	Process Gas	Valve	Estimate	201925	0.1701
Battery Gas 24	Gas Multiwell Group		Leak	Separator	Process Gas	Pump Seal	Highflow	200851	0.0323
Battery Gas 25	Gas Multiwell Group		Leak	Separator	Process Gas	Pump Seal	Highflow	201921	0.0864
Battery Gas 35	Gas Multiwell proration outside SE AB		Leak	Separator	Process Gas	Connector	Highflow	200827	0.0172
Battery Gas 35	Gas Multiwell proration outside SE AB		Leak	Separator	Process Gas	Connector	Highflow	200828	0.0172
Battery Gas 35	Gas Multiwell proration outside SE AB		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	200829	0.0859
Battery Gas 35	Gas Multiwell proration outside SE AB		Leak	Reciprocating Compressor	Process Gas	Valve	Highflow	200830	0.6874
Battery Gas 35	Gas Multiwell proration outside SE AB		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	200831	0.0344
Battery Gas 35	Gas Multiwell proration outside SE AB		Leak	Dehydrator - Glycol	Process Gas	Connector	Highflow	200832	0.0859
Battery Gas 35	Gas Multiwell proration outside SE AB		Vent	Production Tank (fixed roof)	Light Liquid	Open-Ended Line	Estimate	200833	0.2337
Battery Gas 35	Gas Multiwell proration outside SE AB		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	200834	0.0516
Battery Gas 35	Gas Multiwell proration outside SE AB		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	8934	0.0172
Battery Gas 35	Gas Multiwell proration outside SE AB		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	200837	0.0859
Battery Gas 35	Gas Multiwell proration outside SE AB		Leak	Reciprocating Compressor	Light Liquid	Valve	Highflow	200836	0.0516
Battery Gas 4	Gas Multiwell effluent		Leak	Screw Compressor - Electric Driver	Process Gas	Connector	Highflow	200840	0.0163
Battery Gas 40	Gas Multiwell proration outside SE AB		Leak	Separator	Process Gas	Connector	Highflow	200858	0.2475
Battery Gas 40	Gas Multiwell proration outside SE AB		Vent	Production Tank (fixed roof)	Light Liquid	Open-Ended Line	Estimate	200859	1.5579
Battery Gas 47	Gas Multiwell proration outside SE AB		Leak	Flare KnockOut Drum	Process Gas	Connector	Highflow	200857	0.0655
Battery Gas 66	Gas Multiwell proration outside SE AB		Vent	Production Tank (fixed roof)	Light Liquid	Thief Hatch	Estimate	1	0.8108
Battery Gas 9	Gas Multiwell effluent		Leak	Separator	Process Gas	Connector	Highflow	200849	0.0488
Battery Gas 9	Gas Multiwell effluent		Leak	Wellhead	Process Gas	Valve	Highflow	200841	0.0326
Battery Gas 9	Gas Multiwell effluent		Leak	Wellhead	Process Gas	Connector	Highflow	200843	0.2442
Battery Gas 9	Gas Multiwell effluent		Leak	Wellhead	Process Gas	Regulator	Highflow	200846	0.0326
Battery Gas 9	Gas Multiwell effluent		Leak	Wellhead	Process Gas	Connector	Highflow	200847	0.0814
Battery Gas 9	Gas Multiwell effluent		Leak	Wellhead	Process Gas	Connector	Highflow	8946	0.1302
Battery Gas 9	Gas Multiwell effluent		Leak	Wellhead	Process Gas	Connector	Highflow	200842	0.4884
Battery Gas 9	Gas Multiwell effluent		Leak	Wellhead	Process Gas	Meter	Highflow	200844	0.0488
Battery Oil 1	Crude Oil (Medium) Multiwell Group		Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	0.1699
Battery Oil 1	Crude Oil (Medium) Multiwell Group		Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	2	0.1699
Battery Oil 2	Crude Oil (Medium) Multiwell Group		Leak	Line Heater	Process Gas	Regulator	Highflow	200815	0.0483
Battery Oil 2	Crude Oil (Medium) Multiwell Group		Leak	Line Heater	Process Gas	Connector	Highflow	200814	0.3379
Battery Oil 2	Crude Oil (Medium) Multiwell Group		Leak	Line Heater	Process Gas	Connector	Estimate	200813	0.0770
Battery Oil 2	Crude Oil (Medium) Multiwell Group		Leak	Wellhead	Process Gas	Connector	Estimate	200817	0.0616
Battery Oil 2	Crude Oil (Medium) Multiwell Group		Leak	Line Heater	Process Gas	Control Valve	Estimate	200816	0.0616
Battery Oil 22	Crude Oil Multiwell Proration		Leak	Reciprocating Compressor - Electric Driver	Process Gas	Compressor Seal	Highflow	201461	0.2416
Battery Oil 22	Crude Oil Multiwell Proration		Leak	Reciprocating Compressor - Electric Driver	Process Gas	Compressor Seal	Highflow	201462	0.1725
Battery Oil 22	Crude Oil Multiwell Proration		Leak	Reciprocating Compressor - Electric Driver	Process Gas	Compressor Seal	Highflow	201463	0.3278
Battery Oil 23	Crude Oil Multiwell Proration		Vent	Production Tank (fixed roof)	Light Liquid	Open-Ended Line	Estimate	201392	3.6450
Battery Oil 23	Crude Oil Multiwell Proration		Leak	Liquid Pump	Process Gas	Pump Seal	Highflow	201393	0.9156
Battery Oil 24	Crude Oil Multiwell Proration		Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	201395	0.5793
Battery Oil 25	Crude Oil Multiwell Proration		Leak	Reciprocating Compressor	Process Gas	Valve	Highflow	201435	0.0341
Battery Oil 25	Crude Oil Multiwell Proration		Leak	Reciprocating Compressor	Process Gas	Connector	Estimate	201467	0.0489
Battery Oil 25	Crude Oil Multiwell Proration		Leak	Other (describe in notes)	Process Gas	Connector	Estimate	201470	0.0649
Battery Oil 25	Crude Oil Multiwell Proration		Leak	Production Tank (fixed roof)	Process Gas	Connector	Estimate	201471	0.4074
Battery Oil 25	Crude Oil Multiwell Proration		Leak	Production Tank (fixed roof)	Process Gas	Thief Hatch	Estimate	201472	0.5703
Battery Oil 25	Crude Oil Multiwell Proration		Leak	Production Tank (fixed roof)	Process Gas	Connector	Estimate	201473	0.3259
Battery Oil 25	Crude Oil Multiwell Proration		Leak	Reciprocating Compressor	Process Gas	Connector	Estimate	201474	0.0507
Battery Oil 25	Crude Oil Multiwell Proration		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Estimate	201476	0.8147
Battery Oil 25	Crude Oil Multiwell Proration		Leak	Production Tank (fixed roof)	Process Gas	Thief Hatch	Estimate	201477	1.2221
Battery Oil 25	Crude Oil Multiwell Proration		Leak	Other (describe in notes)	Process Gas	Regulator	Highflow	201478	0.0333
Battery Oil 25	Crude Oil Multiwell Proration		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	201464	0.3406
Battery Oil 25	Crude Oil Multiwell Proration		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	201468	0.1352
Battery Oil 25	Crude Oil Multiwell Proration		Leak	Reciprocating Compressor	Process Gas	Control Valve	Highflow	201469	0.1734
Battery Oil 25	Crude Oil Multiwell Proration		Leak	Reciprocating Compressor	Light Liquid	Connector	Estimate	201466	0.0163
Battery Oil 27	Crude Oil Multiwell Proration		Leak	Line Heater	Process Gas	Connector	Estimate	201978	0.0294
Battery Oil 28	Crude Oil Multiwell Proration		Leak	Treater	Process Gas	Connector	Highflow	201406	0.0161
Battery Oil 28	Crude Oil Multiwell Proration		Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	201407	3.8355
Battery Oil 29	Crude Oil Multiwell Proration		Vent	Production Tank (fixed roof)	Light Liquid	Open-Ended Line	Estimate	201415	2.2742
Battery Oil 29	Crude Oil Multiwell Proration		Leak	Treater	Process Gas	Connector	Highflow	201386	0.0316
Battery Oil 29	Crude Oil Multiwell Proration		Leak	Reciprocating Compressor - Electric Driver	Process Gas	Connector	Highflow	201418	0.7717
Battery Oil 3	Crude Oil (Medium) Multiwell Group		Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	201976	2.1970
Battery Oil 3	Crude Oil (Medium) Multiwell Group		Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	201976	2.1970
Battery Oil 30	Crude Oil Multiwell Proration		Leak	Separator	Process Gas	Connector	Highflow	200854	0.1044
Battery Oil 30	Crude Oil Multiwell Proration		Leak	Line Heater	Process Gas	Connector	Highflow	200855	0.0337
Battery Oil 32	Crude Oil Multiwell Proration		Leak	Treater	Process Gas	Regulator	Estimate	201211	0.0254
Battery Oil 33	Crude Oil Multiwell Proration		Leak	Separator	Process Gas	Control Valve	Highflow	201977	0.0159
Battery Oil 35	Crude Oil Multiwell Proration		Leak	Treater	Process Gas	Connector	Highflow	200825	0.0350
Battery Oil 36	Crude Oil Multiwell Proration		Leak	Treater	Process Gas	Connector	Highflow	201414	0.0317
Battery Oil 36	Crude Oil Multiwell Proration		Leak	Treater	Process Gas	Connector	Highflow	201969	0.0317
Battery Oil 36	Crude Oil Multiwell Proration		Leak	Production Tank (fixed roof)	Process Gas	Thief Hatch	Estimate	201970	0.5289



Battery Oil 38	Crude Oil Multiwell Proration		Vent	Production Tank (fixed roof)	Light Liquid	Open-Ended Line	Estimate	201350	1.4628
Battery Oil 38	Crude Oil Multiwell Proration		Vent	Production Tank (fixed roof)	Light Liquid	Open-Ended Line	Estimate	201351	2.9383
Battery Oil 38	Crude Oil Multiwell Proration		Leak	Treater	Process Gas	Control Valve	Estimate	201349	0.0146
Battery Oil 39	Crude Oil Multiwell Proration		Leak	Treater	Process Gas	Connector	Highflow	201328	0.0323
Battery Oil 39	Crude Oil Multiwell Proration		Leak	Other (describe in notes)	Process Gas	Connector	Highflow	201329	0.0162
Battery Oil 39	Crude Oil Multiwell Proration		Leak	Other (describe in notes)	Light Liquid	Connector	Estimate	201330	0.0144
Battery Oil 39	Crude Oil Multiwell Proration		Leak	Reciprocating Compressor	Process Gas	Regulator	Estimate	201331	0.4315
Battery Oil 39	Crude Oil Multiwell Proration		Leak	Flare KnockOut Drum	Light Liquid	Valve	Estimate	201332	0.1438
Battery Oil 40	Crude Oil Multiwell Proration		Leak	Separator	Process Gas	Connector	Highflow	201909	0.0703
Battery Oil 40	Crude Oil Multiwell Proration		Leak	Production Tank (fixed roof)	Process Gas	Thief Hatch	Highflow	201832	2.1850
Battery Oil 42	Crude Oil Multiwell Proration		Leak	Separator	Process Gas	Valve	Estimate	201839	0.0433
Battery Oil 43	Crude Oil Multiwell Proration		Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	281409	0.0756
Battery Oil 43	Crude Oil Multiwell Proration		Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	201411	1.4975
Battery Oil 44	Crude Oil Multiwell Proration		Vent	Production Tank (fixed roof)	Process Gas	Thief Hatch	Estimate	201973	3.8942
Battery Oil 45	Crude Oil Multiwell Proration		Vent	Production Tank (fixed roof)	Light Liquid	Open-Ended Line	Estimate	201397	1.4401
Battery Oil 46	Crude Oil Multiwell Proration		Vent	Pop Tank	Light Liquid	Open-Ended Line	Estimate	201398	0.0720
Battery Oil 46	Crude Oil Multiwell Proration		Leak	Line Heater	Process Gas	Connector	Highflow	201399	0.7536
Battery Oil 46	Crude Oil Multiwell Proration		Leak	Line Heater	Process Gas	PRV/PSV	Highflow	201400	1.8087
Battery Oil 46	Crude Oil Multiwell Proration		Leak	Line Heater	Process Gas	Connector	Highflow	201401	0.4522
Battery Oil 46	Crude Oil Multiwell Proration		Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	201403	0.7281
Battery Oil 46	Crude Oil Multiwell Proration		Leak	Line Heater	Process Gas	Regulator	Highflow	201402	0.2261
Battery Oil 48	Crude Oil Multiwell Proration		Leak	Separator	Process Gas	Meter	Highflow	201930	0.0854
Battery Oil 49	Crude Oil Multiwell Proration		Leak	Treater	Process Gas	Connector	Estimate	1	0.0836
Battery Oil 49	Crude Oil Multiwell Proration		Leak	Treater	Process Gas	Connector	Highflow	200819	0.0875
Battery Oil 49	Crude Oil Multiwell Proration		Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	16.7222
Battery Oil 49	Crude Oil Multiwell Proration		Leak	Screw Compressor	Process Gas	Connector	Highflow	200824	0.1400
Battery Oil 49	Crude Oil Multiwell Proration		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	200822	0.0700
Battery Oil 49	Crude Oil Multiwell Proration		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	200820	0.3676
Battery Oil 49	Crude Oil Multiwell Proration		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	200821	0.1050
Battery Oil 49	Crude Oil Multiwell Proration		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	200823	0.1400
Custom Treat 1	Custom Treating Facility		Leak	Treater	Process Gas	Connector	Highflow	204354	0.0626
Custom Treat 1	Custom Treating Facility		Leak	Production Tank (fixed roof)	Process Gas	Thief Hatch	Estimate	201355	0.2242
Custom Treat 1	Custom Treating Facility		Leak	Production Tank (fixed roof)	Process Gas	Thief Hatch	Estimate	201353	0.1505
Custom Treat 1	Custom Treating Facility		Leak	Screw Compressor - Electric Driver	Process Gas	Open-Ended Line	Estimate	201356	0.5230
Gas Gathering 10	Compressor Station		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	201931	0.6027
Gas Gathering 10	Compressor Station		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	201932	2.5830
Gas Gathering 12	Compressor Station		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	1	0.0888
Gas Gathering 13	Compressor Station		Leak	Separator	Process Gas	Connector	Highflow	201374	0.0936
Gas Gathering 13	Compressor Station		Leak	Separator	Process Gas	Connector	Highflow	201373	0.1828
Gas Gathering 13	Compressor Station		Leak	Separator	Process Gas	Connector	Highflow	201375	0.0312
Gas Gathering 13	Compressor Station		Leak	Separator	Process Gas	Control Valve	Highflow	201376	0.3119
Gas Gathering 14	Compressor Station		Vent	Production Tank (fixed roof)	Light Liquid	Thief Hatch	Estimate	1	0.2235
Gas Gathering 15	Compressor Station		Leak	Reciprocating Compressor	Process Gas	Valve	Highflow	201475	0.1729
Gas Gathering 16	Compressor Station		Leak	Screw Compressor	Process Gas	Regulator	Highflow	201919	0.2038
Gas Gathering 16	Compressor Station		Leak	Screw Compressor	Process Gas	PRV/PSV	Highflow	201918	0.1359
Gas Gathering 17	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	201835	1.1657
Gas Gathering 17	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	201836	0.3835
Gas Gathering 17	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Estimate	201837	3.6296
Gas Gathering 2	Compressor Station		Leak	Reciprocating Compressor	Process Gas	Connector	Estimate	1	0.2408
Gas Gathering 2	Compressor Station		Leak	Other (describe in notes)	Process Gas	Connector	Estimate	201910	0.0646
Gas Gathering 20	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	201333	0.0781
Gas Gathering 20	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	201334	0.0156
Gas Gathering 20	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	201336	0.1381
Gas Gathering 20	Gas Gathering System		Leak	Dehydrator - Glycol	Process Gas	Connector	Highflow	201338	0.0614
Gas Gathering 20	Gas Gathering System		Leak	Dehydrator - Glycol	Process Gas	Connector	Highflow	201339	0.0921
Gas Gathering 20	Gas Gathering System		Leak	Dehydrator - Glycol	Process Gas	Control Valve	Highflow	201340	0.1995
Gas Gathering 20	Gas Gathering System		Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	201342	0.1506
Gas Gathering 20	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	201335	1.6380
Gas Gathering 20	Gas Gathering System		Unlit Flare	Flare KnockOut Drum	Process Gas	Open-Ended Line	Estimate	201341	3.7783
Gas Gathering 20	Gas Gathering System		Leak	Reciprocating Compressor	Light Liquid	Connector	Highflow	201337	0.1097
Gas Gathering 21	Gas Gathering System		Leak	Screw Compressor	Process Gas	Control Valve	Highflow	201357	0.5186
Gas Gathering 21	Gas Gathering System		Leak	Dehydrator - Glycol	Process Gas	Regulator	Highflow	201360	0.0453
Gas Gathering 21	Gas Gathering System		Unlit Flare	Flare KnockOut Drum	Process Gas	Open-Ended Line	Estimate	201361	1.4715
Gas Gathering 22	Gas Gathering System		Leak	Reciprocating Compressor - Electric Driver	Process Gas	PRV/PSV	Highflow	201980	0.6930
Gas Gathering 22	Gas Gathering System		Leak	Reciprocating Compressor - Electric Driver	Process Gas	Valve	Highflow	201979	0.3080
Gas Gathering 25	Gas Gathering System		Leak	Pig Trap	Process Gas	Open-Ended Line	Highflow	201345	0.3269
Gas Gathering 25	Gas Gathering System		Leak	Gas Pipeline Header	Process Gas	Connector	Highflow	201346	0.1401
Gas Gathering 25	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	201347	0.5448
Gas Gathering 25	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	201348	0.1541
Gas Gathering 25	Gas Gathering System		Leak	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	201344	7.4354
Gas Gathering 26	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	204046	0.0317
Gas Gathering 26	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	204045	0.0159
Gas Gathering 26	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	204044	0.0159
Gas Gathering 26	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	204047	0.5390
Gas Gathering 30	Gas Gathering System		Leak	Gas Pipeline Header	Process Gas	Control Valve	Highflow	204000	0.0785
Gas Gathering 30	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Open-Ended Line	Highflow	204001	1.0118
Gas Gathering 30	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	2004001	0.0641
Gas Gathering 30	Gas Gathering System		Leak	Gas Pipeline Header	Process Gas	Connector	Highflow	2004002	0.0465
Gas Gathering 30	Gas Gathering System		Leak	Gas Pipeline Header	Process Gas	Connector	Highflow	204003	0.0155
Gas Gathering 30	Gas Gathering System		Leak	Gas Pipeline Header	Process Gas	Connector	Highflow	204004	0.0310
Gas Gathering 30	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	204007	0.6399
Gas Gathering 30	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	PRV/PSV	Highflow	204008	0.2625
Gas Gathering 30	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	204009	0.0634
Gas Gathering 30	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Connector	Estimate	204010	0.1475
Gas Gathering 30	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	204011	0.0492
Gas Gathering 30	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	204012	0.5297
Gas Gathering 30	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	204013	0.6871
Gas Gathering 31	Gas Gathering System		Leak	Gas Pipeline Header	Process Gas	Regulator	Highflow	204006	0.1850
Gas Gathering 31	Gas Gathering System		Leak	Dehydrator - Glycol	Process Gas	Connector	Highflow	204014	0.0310
Gas Gathering 31	Gas Gathering System		Leak	Dehydrator - Glycol	Process Gas	Connector	Highflow	204015	0.0928
Gas Gathering 31	Gas Gathering System		Leak	Flare KnockOut Drum	Process Gas	Connector	Highflow	204014	0.0150
Gas Gathering 31	Gas Gathering System		Leak	Separator	Process Gas	Meter	Highflow	204005	0.0942
Gas Gathering 34	Gas Gathering System		Leak	Screw Compressor	Process Gas	Connector	Highflow	201964	0.0150
Gas Gathering 34	Gas Gathering System		Leak	Screw Compressor	Process Gas	Connector	Highflow	201965	0.0150
Gas Gathering 35	Gas Gathering System		Leak	Screw Compressor	Process Gas	Connector	Highflow	201966	0.0297
Gas Gathering 35	Gas Gathering System		Leak	Screw Compressor	Process Gas	Regulator	Highflow	201967	0.0297
Gas Gathering 37	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	201325	0.0160
Gas Gathering 37	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	201326	0.7186
Gas Gathering 37	Gas Gathering System		Leak	Dehydrator - Glycol	Process Gas	Connector	Highflow	201327	0.0159
Gas Gathering 38	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Connector	Highflow	11	0.0334
Gas Gathering 38	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Estimate	201911	0.0780
Gas Gathering 39	Gas Gathering System		Leak	Flare KnockOut Drum	Process Gas	Valve	Highflow	6821	0.0469
Gas Gathering 39	Gas Gathering System		Leak	Flare KnockOut Drum	Process Gas	Valve	Highflow	204038	0.0469
Gas Gathering 4	Compressor Station		Vent	Reciprocating Compressor	Process Gas	Open-Ended Line	Estimate	201358	1.0999
Gas Gathering 4	Compressor Station		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	201359	0.2153
Gas Gathering 41	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	201378	0.8903
Gas Gathering 41	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	1	2.5691
Gas Gathering 41	Gas Gathering System		Unlit Flare	Flare KnockOut Drum	Process Gas	Open-Ended Line	Estimate	1	2.2351
Gas Gathering 45	Gas Gathering System		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	201834	0.3844
Gas Gathering 47	Gas Gathering System		Leak	Other (describe in notes)	Process Gas	Connector	Estimate	204043	0.0149
Gas Gathering 47	Gas Gathering System		Leak	Reciprocating Compressor - Electric Driver	Process Gas	Connector	Estimate	204042	0.0745
Gas Gathering 47	Gas Gathering System		Leak	Reciprocating Compressor - Electric Driver	Process Gas	Connector	Estimate	204041	0.0745
Gas Gathering 47	Gas Gathering System		Leak	Reciprocating Compressor - Electric Driver	Process Gas	Connector	Estimate	204040	0.0298
Gas Gathering 5	Compressor Station		Vent	Production Tank (fixed roof)	Light Liquid	Open-Ended Line	Estimate	1	16.1613
Gas Gathering 5	Compressor Station		Leak	Screw Compressor	Process Gas	Regulator	Highflow	201920	0.3868
Gas Gathering 9	Compressor Station		Leak	Separator	Process Gas	Regulator	Highflow	201447	0.0487
Gas Gathering 9	Compressor Station		Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	201448	0.2600
Well Bitumen 11	Crude bitumen multiwell proration	CR-BIT PUMP	Vent	Wellhead	Process Gas	casing vent	Other	1	0.0000

Well Bitumen 12	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	1.6219
Well Bitumen 12	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Wellhead	Process Gas	casing vent	Estimate	1	1.6219
Well Bitumen 13	Crude bitumen single-well	CR-BIT PUMP	Vent	Wellhead	Process Gas	Regulator	Estimate	1	1.6722
Well Bitumen 16	Crude bitumen multiwell group	CR-BIT PUMP	Leak	Well Pump	Process Gas	Connector	Highflow	200735	0.0479
Well Bitumen 17	Crude bitumen single-well	CR-BIT PUMP	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	3.2431
Well Bitumen 17	Crude bitumen single-well	CR-BIT PUMP	Vent	Wellhead	Process Gas	casing vent	Hawk Meter	1	3.2431
Well Bitumen 2	Crude bitumen multiwell proration	CR-BIT PUMP	Vent	Wellhead	Process Gas	casing vent	Estimate	200729	0.2512
Well Bitumen 22	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Wellhead	Process Gas	Regulator	Highflow	201947	0.3904
Well Bitumen 23	Crude bitumen multiwell proration	CR-BIT PUMP	Vent	Wellhead	Process Gas	casing vent	Estimate	200728	0.3684
Well Bitumen 24	Crude bitumen single-well	CR-BIT PUMP	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	0.1653
Well Bitumen 25	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Wellhead	Process Gas	casing vent	Estimate	1	0.8109
Well Bitumen 28	Crude bitumen single-well	CR-BIT PUMP	Vent	Wellhead	Process Gas	casing vent	Estimate	1	1.6780
Well Bitumen 30	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	1.6168
Well Bitumen 39	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Wellhead	Process Gas	Regulator	Highflow	200727	0.1867
Well Bitumen 40	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	0.8084
Well Bitumen 44	Crude bitumen multiwell proration	CR-BIT PUMP	Vent	Wellhead	Process Gas	casing vent	Other	1	0.0000
Well Bitumen 46	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	0.1638
Well Bitumen 47	Crude bitumen multiwell group	CR-BIT PUMP	Leak	Wellhead	Process Gas	Connector	Highflow	201952	0.2376
Well Bitumen 47	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Wellhead	Process Gas	Regulator	Highflow	201951	0.1867
Well Bitumen 56	Crude bitumen multiwell proration	CR-BIT PUMP	Vent	Wellhead	Process Gas	Regulator	Highflow	201935	0.2498
Well Bitumen 59	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	0.8109
Well Bitumen 6	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	0.1638
Well Bitumen 6	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	1.6383
Well Bitumen 61	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	0.3277
Well Bitumen 63	Crude bitumen multiwell group	CR-BIT PUMP	Leak	Wellhead	Process Gas	Valve	Highflow	201214	0.5368
Well Bitumen 63	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	0.8084
Well Bitumen 63	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Wellhead	Process Gas	Regulator	Estimate	1	0.4786
Well Bitumen 64	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Production Tank (fixed roof)	Process Gas	Thief Hatch	Estimate	1	0.8108
Well Bitumen 64	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Production Tank (fixed roof)	Process Gas	Thief Hatch	Estimate	1	0.8108
Well Bitumen 70	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Wellhead	Process Gas	Regulator	Highflow	201950	0.3734
Well Bitumen 76	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Wellhead	Process Gas	casing vent	Estimate	1	5.1046
Well Bitumen 84	Crude bitumen multiwell proration	CR-BIT PUMP	Leak	Well Pump	Process Gas	Regulator	Highflow	8728	0.0876
Well Bitumen 85	Crude bitumen multiwell group	CR-BIT PUMP	Vent	Wellhead	Process Gas	Regulator	Estimate	1	3.2330
Well CBM 15	Gas Single	CBMOT FLOW	Leak	Wellhead	Process Gas	Connector	Highflow	204067	0.0159
Well CBM 18	Gas Multiwell proration outside SE AB	CBMOT FLOW	Leak	Gas Pipeline Header	Process Gas	Open-Ended Line	Highflow	201830	0.0000
Well CBM 2	Gas Multiwell Group	CBMCLS FLOW	Leak	Wellhead	Process Gas	Meter	Highflow	204076	0.0304
Well CBM 25	Gas Multiwell proration outside SE AB	CBMOT FLOW	Leak	Wellhead	Process Gas	Valve	Highflow	201827	0.0149
Well CBM 3	Gas Multiwell Group	CBMCLS FLOW	Leak	Wellhead	Process Gas	Meter	Highflow	204075	0.0153
Well CBM 30	Gas Multiwell proration outside SE AB	CBMOT FLOW	Leak	Gas Pipeline Header	Process Gas	Open-Ended Line	Highflow	201830	0.0155
Well CBM 32	Gas Multiwell proration outside SE AB	CBMOT FLOW	Leak	Wellhead	Process Gas	Open-Ended Line	Highflow	201828	0.0149
Well CBM 32	Gas Multiwell proration outside SE AB	CBMOT FLOW	Leak	Wellhead	Process Gas	Open-Ended Line	Highflow	201829	0.0298
Well CBM 37	Gas Multiwell Group	CBMCLS FLOW	Leak	Pig Trap	Process Gas	Connector	Highflow	204068	0.0773
Well CBM 38	Gas Multiwell Group	CBMCLS FLOW	Leak	Catalytic Heater	Process Gas	Connector	Highflow	204069	0.0155
Well CBM 39	Gas Multiwell Group	CBMCLS FLOW	Leak	Wellhead	Process Gas	Valve	Highflow	204070	0.0153
Well CBM 40	Gas Multiwell Group	CBMCLS FLOW	Leak	Wellhead	Process Gas	Meter	Highflow	204077	0.0608
Well Gas 102	Gas Single	GAS FLOW	Leak	Wellhead	Process Gas	Open-Ended Line	Highflow	201971	0.0153
Well Gas 107	Gas Multiwell Group	GAS FLOW	Leak	Wellhead	Process Gas	Connector	Highflow	201208	0.4764
Well Gas 107	Gas Multiwell Group	GAS FLOW	Leak	Centrifugal Compressor	Process Gas	Connector	Highflow	201209	0.2593
Well Gas 108	Gas Multiwell Group	GAS FLOW	Vent	Wellhead	Process Gas	Open-Ended Line	Highflow	204072	0.0304
Well Gas 11	Gas Multiwell Group	GAS FLOW	Leak	Wellhead	Process Gas	SCVF	Highflow	204066	0.0151
Well Gas 111	Gas Multiwell Group	GAS FLOW	Leak	Separator	Process Gas	Pump Seal	Highflow	200850	0.1615
Well Gas 112	Gas Multiwell proration outside SE AB	GAS FLOW	Leak	Gas Pipeline Header	Process Gas	Open-Ended Line	Highflow	201831	0.3089
Well Gas 114	Gas Multiwell Group	GAS FLOW	Leak	Wellhead	Process Gas	Valve	Estimate	1	2.8387
Well Gas 120	Gas Multiwell Group	GAS FLOW	Leak	Separator	Process Gas	Connector	Highflow	201370	0.0463
Well Gas 120	Gas Multiwell Group	GAS FLOW	Leak	Separator	Process Gas	Regulator	Highflow	201371	0.0154
Well Gas 120	Gas Multiwell Group	GAS FLOW	Leak	Separator	Process Gas	Control Valve	Highflow	201372	0.0309
Well Gas 129	Gas Multiwell Group	GAS PUMP	Leak	Separator	Process Gas	Regulator	Highflow	204082	0.0156
Well Gas 129	Gas Multiwell Group	GAS PUMP	Leak	Separator	Process Gas	Regulator	Highflow	204083	0.0157
Well Gas 13	Gas Single	GAS FLOW	Leak	Production Tank (fixed roof)	Process Gas	Connector	Estimate	1	0.3280
Well Gas 131	Gas Multiwell effluent	GAS PUMP	Leak	Wellhead	Process Gas	Connector	Highflow	204050	0.0157
Well Gas 131	Gas Multiwell effluent	GAS PUMP	Leak	Wellhead	Process Gas	Regulator	Highflow	204049	0.0470
Well Gas 132	Gas Multiwell Group	GAS PUMP	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	204084	0.3747
Well Gas 132	Gas Multiwell Group	GAS PUMP	Leak	Wellhead	Process Gas	SCVF	Highflow	204085	3.4021
Well Gas 133	Gas Multiwell proration outside SE AB	GAS PUMP	Leak	Wellhead	Process Gas	Valve	Highflow	201912	0.3664
Well Gas 136	Gas Multiwell Group	GAS PUMP	Leak	Wellhead	Process Gas	Valve	Highflow	204089	0.1254
Well Gas 140	Gas Multiwell effluent	GAS PUMP	Leak	Wellhead	Process Gas	Control Valve	Highflow	204048	0.0634
Well Gas 141	Gas Multiwell Group	GAS PUMP	Leak	Wellhead	Process Gas	Valve	Highflow	204086	0.1702
Well Gas 141	Gas Multiwell Group	GAS PUMP	Leak	Wellhead	Process Gas	Valve	Highflow	204087	0.0153
Well Gas 141	Gas Multiwell Group	GAS PUMP	Leak	Separator	Process Gas	Connector	Highflow	204088	0.0305
Well Gas 148	Gas Multiwell Group	GAS PUMP	Leak	Wellhead	Process Gas	Connector	Highflow	204090	0.0759
Well Gas 148	Gas Multiwell Group	GAS PUMP	Vent	Production Tank (fixed roof)	Light Liquid	Open-Ended Line	Estimate	204091	0.3624
Well Gas 152	Gas Multiwell Group	GAS PUMP	Leak	Separator	Process Gas	Connector	Highflow	204055	0.3585
Well Gas 155	Gas Multiwell Group	GAS PUMP	Vent	Separator	Process Gas	Connector	Highflow	204060	0.3608
Well Gas 155	Gas Multiwell Group	GAS PUMP	Leak	Wellhead	Process Gas	Valve	Highflow	204061	0.0628
Well Gas 155	Gas Multiwell Group	GAS PUMP	Leak	Wellhead	Process Gas	SCVF	Highflow	204062	0.0471
Well Gas 163	Gas Multiwell Group	GAS PUMP	Leak	Wellhead	Process Gas	Valve	Highflow	204092	1.8814
Well Gas 165	Gas Multiwell Group	GAS PUMP	Leak	Wellhead	Process Gas	Valve	Highflow	201376	0.1771
Well Gas 165	Gas Multiwell Group	GAS PUMP	Leak	Wellhead	Process Gas	Valve	Highflow	201377	0.1404
Well Gas 167	Gas Single	GAS PUMP	Leak	Wellhead	Process Gas	Valve	Highflow	201968	0.3743
Well Gas 168	Gas Multiwell effluent	GAS PUMP	Leak	Wellhead	Process Gas	Connector	Estimate	201481	0.0484
Well Gas 169	Gas Multiwell Group	GAS PUMP	Leak	Wellhead	Process Gas	Valve	Highflow	201413	0.2958
Well Gas 169	Gas Multiwell Group	GAS PUMP	Leak	Separator	Process Gas	Regulator	Estimate	201385	0.0283
Well Gas 17	Gas Multiwell proration outside SE AB	GAS FLOW	Leak	Other (describe in notes)	Process Gas	Connector	Highflow	201914	0.0834
Well Gas 17	Gas Multiwell proration outside SE AB	GAS FLOW	Leak	Other (describe in notes)	Process Gas	Meter	Highflow	201915	0.0666
Well Gas 17	Gas Multiwell proration outside SE AB	GAS FLOW	Leak	Other (describe in notes)	Process Gas	Connector	Highflow	201917	0.1665
Well Gas 17	Gas Multiwell proration outside SE AB	GAS FLOW	Leak	Other (describe in notes)	Process Gas	Regulator	Highflow	201916	0.0666
Well Gas 17	Gas Multiwell proration outside SE AB	GAS FLOW	Leak	Separator	Process Gas	Regulator	Highflow	201913	0.0500
Well Gas 171	Gas Multiwell Group	GAS PUMP	Leak	Wellhead	Process Gas	SCVF	Calscan	201210	50.5476
Well Gas 177	Gas Multiwell Group	GAS PUMP	Leak	Well Pump	Process Gas	Pump Seal	Highflow	204078	0.0632
Well Gas 177	Gas Multiwell Group	GAS PUMP	Leak	Wellhead	Process Gas	Connector	Highflow	204079	0.0316
Well Gas 177	Gas Multiwell Group	GAS PUMP	Leak	Separator	Process Gas	Regulator	Highflow	204080	0.0316
Well Gas 177	Gas Multiwell Group	GAS PUMP	Leak	Separator	Process Gas	Connector	Highflow	204081	0.0468
Well Gas 178	Gas Multiwell effluent	GAS PUMP	Leak	Wellhead	Process Gas	Connector	Highflow	201479	0.1729
Well Gas 178	Gas Multiwell effluent	GAS PUMP	Leak	Wellhead	Process Gas	SCVF	Highflow	201480	0.1720
Well Gas 18	Gas Multiwell Group	GAS FLOW	Leak	Wellhead	Process Gas	Connector	Highflow	200812	0.0805
Well Gas 183	Gas Multiwell Group	GAS PUMP	Leak	Liquid Pump	Process Gas	Control Valve	Highflow	204054	0.0157
Well Gas 183	Gas Multiwell Group	GAS PUMP	Leak	Wellhead	Process Gas	Connector	Highflow	204052	0.0157
Well Gas 183	Gas Multiwell Group	GAS PUMP	Leak	Wellhead	Process Gas	Connector	Highflow	204051	0.0157
Well Gas 183	Gas Multiwell Group	GAS PUMP	Leak	Separator	Process Gas	Valve	Highflow	204053	0.0470
Well Gas 189	Gas Multiwell effluent	GAS PUMP	Leak	Wellhead	Process Gas	Connector	Highflow	204039	0.0476
Well Gas 20	Gas Single	GAS FLOW	Leak	Separator	Process Gas	Connector	Highflow	204096	0.2816
Well Gas 20	Gas Single	GAS FLOW	Leak	Separator	Process Gas	Connector	Highflow	204097	0.4694
Well Gas 20	Gas Single	GAS FLOW	Leak	Separator	Process Gas	Connector	Highflow	204099	0.0156
Well Gas 20	Gas Single	GAS FLOW	Leak	Separator	Process Gas	Connector	Highflow	204100	0.1565
Well Gas 20	Gas Single	GAS FLOW	Unlit Flare	Flare KnockOut Drum	Process Gas	Open-Ended Line	Estimate	201369	0.2203
Well Gas 20	Gas Single	GAS FLOW	Leak	Separator	Process Gas	Meter	Highflow	204098	0.1745
Well Gas 27	Gas Multiwell Group	GAS FLOW	Leak	Wellhead	Process Gas	SCVF	Highflow	204063	0.0468
Well Gas 27	Gas Multiwell Group	GAS FLOW	Leak	Separator	Process Gas	Connector	Highflow	204064	0.0623
Well Gas 37	Gas Single	GAS FLOW	Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	200852	0.1140

Well Gas 37	Gas Single	GAS FLOW	Leak	Reciprocating Compressor	Process Gas	Compressor Seal	Highflow	200853	2.3770
Well Gas 40	Gas Single	GAS FLOW	Vent	Production Tank (fixed roof)	Light Liquid	Open-Ended Line	Estimate	204095	0.0739
Well Gas 40	Gas Single	GAS FLOW	Leak	Wellhead	Process Gas	SCVF	Highflow	204094	0.0309
Well Gas 5	Gas Single	GAS FLOW	Leak	Wellhead	Process Gas	Valve	Highflow	201343	0.2568
Well Gas 57	Gas Multiwell Group	GAS FLOW	Leak	Separator	Process Gas	Connector	Highflow	204073	0.2117
Well Gas 57	Gas Multiwell Group	GAS FLOW	Vent	Wellhead	Process Gas	Open-Ended Line	Highflow	204074	1.2249
Well Gas 58	Gas Multiwell Group	GAS FLOW	Leak	Separator	Process Gas	Connector	Highflow	204056	0.3086
Well Gas 61	Gas Single	GAS FLOW	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	0.0331
Well Gas 63	Gas Multiwell effluent	GAS FLOW	Leak	Line Heater	Process Gas	Regulator	Highflow	204057	0.0313
Well Gas 63	Gas Multiwell effluent	GAS FLOW	Leak	Line Heater	Process Gas	Connector	Highflow	204058	0.0627
Well Gas 63	Gas Multiwell effluent	GAS FLOW	Leak	Wellhead	Process Gas	SCVF	Highflow	204059	0.0313
Well Gas 66	Gas Single	GAS FLOW	Leak	Production Tank (fixed roof)	Process Gas	Connector	Highflow	201210	0.0000
Well Gas 75	Gas Multiwell Group	GAS FLOW	Leak	Wellhead	Process Gas	Valve	Highflow	204071	0.0153
Well Gas 79	Gas Multiwell effluent	GAS FLOW	Leak	Wellhead	Process Gas	Valve	Highflow	200845	0.0163
Well Gas 81	Gas Multiwell proration outside SE AB	GAS FLOW	Leak	Wellhead	Process Gas	Connector	Estimate	200826	0.4674
Well Gas 89	Gas Multiwell effluent	GAS FLOW	Leak	Wellhead	Process Gas	Connector	Highflow	201482	0.0483
Well Oil 107	Crude Oil (Medium) Single	CR-OIL PUMP	Leak	Shell and Tube Heat Exchanger	Process Gas	Connector	Highflow	201365	0.0160
Well Oil 107	Crude Oil (Medium) Single	CR-OIL PUMP	Leak	Well Pump	Process Gas	Pump Seal	Highflow	201366	0.1438
Well Oil 11	Crude Oil (Medium) Multiwell Group	CR-OIL FLOW	Leak	Screw Compressor	Process Gas	Regulator	Highflow	201387	0.0161
Well Oil 11	Crude Oil (Medium) Multiwell Group	CR-OIL FLOW	Leak	Separator	Process Gas	Connector	Highflow	201390	0.0323
Well Oil 11	Crude Oil (Medium) Multiwell Group	CR-OIL FLOW	Vent	Production Tank (fixed roof)	Process Gas	Thief Hatch	Estimate	201388	1.1013
Well Oil 11	Crude Oil (Medium) Multiwell Group	CR-OIL FLOW	Leak	Separator	Process Gas	Control Valve	Highflow	201389	0.3873
Well Oil 11	Crude Oil (Medium) Multiwell Group	CR-OIL FLOW	Leak	Separator	Process Gas	Control Valve	Highflow	201391	0.0161
Well Oil 117	Crude Oil (Medium) Single	CR-OIL PUMP	Leak	Other (describe in notes)	Process Gas	Regulator	Highflow	201206	0.0272
Well Oil 120	Crude Oil (Medium) Single	CR-OIL PUMP	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	201412	4.2339
Well Oil 27	Crude Oil (Medium) Single	CR-OIL PUMP	Vent	Production Tank (fixed roof)	Light Liquid	Open-Ended Line	Estimate	201981	0.7332
Well Oil 31	Crude Oil (Medium) Single	CR-OIL PUMP	Leak	Well Pump	Process Gas	Regulator	Highflow	204035	0.4742
Well Oil 32	Crude Oil (Medium) Single	CR-OIL PUMP	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	39.7637
Well Oil 32	Crude Oil (Medium) Single	CR-OIL PUMP	Leak	Separator	Process Gas	Connector	Highflow	1	0.0166
Well Oil 37	Crude Oil Multiwell Proration	CR-OIL PUMP	Leak	Wellhead	Process Gas	SCVF	Estimate	201396	0.2236
Well Oil 39	Crude Oil Multiwell Proration	CR-OIL PUMP	Leak	Wellhead	Process Gas	SCVF	Highflow	201907	1.1094
Well Oil 46	Crude Oil Multiwell Proration	CR-OIL PUMP	Leak	Wellhead	Light Liquid	Valve	Highflow	204394	0.3888
Well Oil 51	Crude Oil (Medium) Single	CR-OIL PUMP	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	1	7.9527
Well Oil 56	Crude Oil Multiwell Proration	CR-OIL PUMP	Leak	Wellhead	Process Gas	SCVF	Other	1	0.0000
Well Oil 59	Crude Oil Multiwell Proration	CR-OIL PUMP	Leak	Wellhead	Light Liquid	Valve	Estimate	20140818	0.6651
Well Oil 61	Crude Oil Multiwell Proration	CR-OIL PUMP	Leak	Wellhead	Light Liquid	Valve	Highflow	201410	0.0633
Well Oil 63	Crude Oil (Medium) Multiwell Group	CR-OIL PUMP	Leak	Wellhead	Process Gas	Connector	Highflow	201928	0.0344
Well Oil 63	Crude Oil (Medium) Multiwell Group	CR-OIL PUMP	Leak	Wellhead	Process Gas	Control Valve	Highflow	201929	0.2729
Well Oil 65	Crude Oil (Medium) Single	CR-OIL PUMP	Leak	Wellhead	Process Gas	Control Valve	Highflow	201364	0.4050
Well Oil 65	Crude Oil (Medium) Single	CR-OIL PUMP	Leak	Well Pump	Process Gas	Regulator	Highflow	201367	0.0320
Well Oil 65	Crude Oil (Medium) Single	CR-OIL PUMP	Leak	Well Pump	Process Gas	Connector	Highflow	201368	0.0320
Well Oil 65	Crude Oil (Medium) Single	CR-OIL PUMP	Leak	Wellhead	Process Gas	SCVF	Highflow	201363	0.0648
Well Oil 65	Crude Oil (Medium) Single	CR-OIL PUMP	Leak	Wellhead	Light Liquid	Valve	Highflow	201362	0.0639
Well Oil 69	Crude Oil Multiwell Proration	CR-OIL PUMP	Leak	Screw Compressor	Process Gas	Connector	Highflow	204026	0.4463
Well Oil 69	Crude Oil Multiwell Proration	CR-OIL PUMP	Leak	Screw Compressor	Process Gas	PRV/PSV	Highflow	204027	0.3676
Well Oil 78	Crude Oil Multiwell Proration	CR-OIL PUMP	Leak	Wellhead	Light Liquid	Connector	Highflow	201405	0.0305
Well Oil 79	Crude Oil Multiwell Proration	CR-OIL PUMP	Leak	Well Pump	Process Gas	Connector	Highflow	204031	0.0241
Well Oil 8	Crude Oil (Medium) Single	CR-OIL FLOW	Leak	Well Pump	Light Liquid	Connector	Highflow	204036	0.0154
Well Oil 9	Crude Oil Multiwell Proration	CR-OIL FLOW	Leak	Wellhead	Process Gas	SCVF	Estimate	201352	0.2217
Well Oil 90	Crude Oil (Medium) Single	CR-OIL PUMP	Vent	Production Tank (fixed roof)	Light Liquid	Open-Ended Line	Highflow	201974	1.1707
Well Oil 91	Crude Oil (Medium) Multiwell Group	CR-OIL PUMP	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	201419	0.7323
Well Oil 92	Crude Oil (Medium) Single	CR-OIL PUMP	Leak	Separator	Process Gas	Control Valve	Estimate	201924	0.0317
Well Oil 93	Crude Oil (Medium) Single	CR-OIL PUMP	Leak	Well Pump	Process Gas	PRV/PSV	Highflow	201483	0.9314
Well Oil 93	Crude Oil (Medium) Single	CR-OIL PUMP	Leak	Production Tank (fixed roof)	Process Gas	Connector	Highflow	201484	0.1606
Well Oil 94	Crude Oil Multiwell Proration	CR-OIL PUMP	Leak	Well Pump	Process Gas	Connector	Highflow	201417	0.0485
Well Oil 94	Crude Oil Multiwell Proration	CR-OIL PUMP	Leak	Wellhead	Process Gas	SCVF	Estimate	201416	0.0773
Well Oil 95	Crude Oil (Medium) Multiwell Group	CR-OIL PUMP	Vent	Turboexpander	Light Liquid	Open-Ended Line	Estimate	201449	3.1029
Well Oil 97	Crude Oil Multiwell Proration	CR-OIL PUMP	Vent	Production Tank (fixed roof)	Process Gas	Open-Ended Line	Estimate	201972	3.6492
Well Oil 98	Crude Oil Multiwell Proration	CR-OIL PUMP	Leak	Wellhead	Process Gas	SCVF	Highflow	201908	0.3882
Well Oil 99	Crude Oil (Medium) Single	CR-OIL PUMP	Leak	Screw Compressor	Process Gas	Connector	Highflow	201457	0.0999