



Substantially Equivalent Fluid Leak Detection Plan

This document is being submitted as a substantially equivalent Fluid Leak Detection Plan for the Washington Pad Form 2A. This fluid leak detection plan was developed as a part of the operator agreement process with City of Thornton. This document complies with all requirements outlined in Colorado Oil and Gas Conservation Commission Rule 304.c.(13). For this reason, Extraction believes this satisfies the substantially equivalent information requirements and requests that it is accepted pursuant to Rule 304.e.

Best Management Practices

1. During drilling, completion, and production operations, regular Auditory, Visual, and Olfactory Monitoring (AVO) inspections are performed on equipment containing hydrocarbons, fluids, or associated chemicals. AVO inspections include taking the time to look, smell and listen for leaks.
2. Operator utilizes a polyethylene liner beneath the drilling rig during drilling operations and beneath the areas where completions equipment (including pump trucks and other heavy equipment) during completion operations to ensure there is an impermeable layer between the rig and the earth. The use of this liner prevents hydrocarbons and other fluids from reaching the soil in the unlikely event a leak does occur. The liner is inspected for integrity throughout drilling operations and maintenance/repair to the liner occurs as needed.
3. Routine SPCC inspections will be conducted and documented pursuant U.S. EPA requirements.
4. The location will have a sophisticated automation system running 24-hours per day that enables our operators, engineers, and various other personnel to monitor and manage this facility both on the ground and/or remotely. The site can also be shut down remotely via our automation system at any time. During these shutdowns automatic valves close within the facility and on each wellhead.
5. Operator has developed a robust Leak Detection and Repair (LDAR) program, which utilizes Forward Looking Infrared (FLIR®) cameras to identify and fix leaks. FLIR inspections will commence during the production phase, and will occur monthly for the first year, with the first inspection being within 30 days of when the facility commences operation. After the first year of production operations, the inspections may be reduced to quarterly should no other state or federal rule be more stringent.

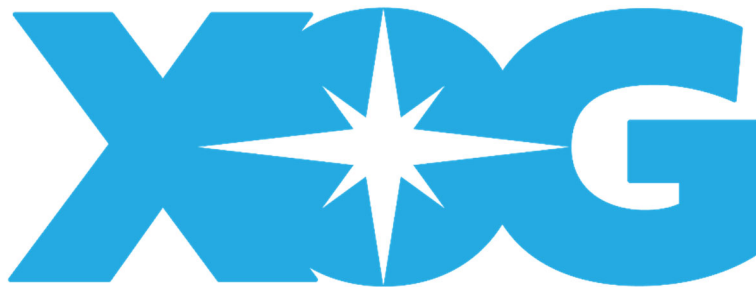
**Thornton Operator Agreement Application
Materials**

Section 18 - 870

Section f (19)

Leak Detection and Repair Plan

Washington Pad



EXTRACTION OIL & GAS

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1.0 INTRODUCTION

The following document outlines Extraction Oil & Gas, Inc.'s ("Extraction", "Operator", or "The Operator") Leak Detection and Repair Plans related to the development of minerals within the municipal boundaries of the City and County of Thornton ("Thornton", "City", or "The City") at the location described as the proposed Washington Pad Site ("Washington", "The Development").

Thornton sets forth requirements for the Leak Detection and Repair (LDAR) program in the Thornton City Code at Chapter 18, Division 2, Section 18-870(19) a. through c. as follows:

- a. Monthly infrared camera and olfactory inspections of new and existing wells, related facilities, and equipment. After one year of operation, inspections shall be made at least quarterly.*
- b. Baseline inspections within 60 days after authorization of the oil and gas operation.*
- c. Computerized monitoring and leak detection with 24-hour reporting capabilities to the operator, who will then immediately provide notice to the Thornton Fire Department and emergency and safety administrator.*

Extraction operates a robust LDAR program which utilizes Forward Looking Infrared (FLIR®) cameras to identify and fix leaks, and is enhanced by on-site automation and Audio, Visual and Olfactory (AVO) inspections.

Federal, State and Local Leak Detection and Repair regulations regularly undergo changes to improve the programs. Therefore, Extraction will always follow and implement the most stringent version of these rules for the Washington Pad.

2.0 PROCEDURES

2.1 Methodology

Extraction operates a robust Leak Detection and Repair program, which utilizes automation, Audio, Visual and Olfactory inspections and Forward Looking Infrared (FLIR®) cameras to identify and fix leaks.

The Washington facility will have a sophisticated automation system running 24-hours per day that enables our operators, engineers, and various other personnel to monitor and manage this facility both on the ground and/or remotely. The site can also be shut down remotely via our automation system at any time. During these shutdowns automatic valves close within the facility and on each wellhead.

Auditory, Visual, and Olfactory (AVO) monitoring will be routinely conducted by trained operators at the site. Operators are required to walk the site and look, smell, and listen for leaks at any time they are on location at the facility. Operators will also be required to report any AVO findings that are noticed during their work.

Extraction utilizes the FLIR GF320 and GFx320 Infrared (IR) Camera to conduct all LDAR surveys. These cameras have been independently tested and determined to be compliant with NSPS 40 CFR 60, Subpart OOOOa and CDPHE Alternative Instrument Monitoring Methods (AIMM) sensitivity standards for Oil and Gas Inspection (OGI) survey equipment.

2.2 Inspection Frequency

AVO inspections are required at least monthly and are often performed much more frequently as a standard practice.

FLIR inspections will commence during the production phase, and will occur monthly for the first year, with the first inspection being within 30 days of when the facility commences operation. After the first year of production operations, the inspections may be reduced to quarterly should no other state or federal rule be more stringent.

In addition to the monthly or quarterly FLIR inspection program, leaks will be monitored using equipment automation and continuous pressure monitoring at each facility, as described in section 2.1.

Extraction has also proposed in its *Draft Regulation 7 Part D VI.C Air Quality Monitoring Plan* response actions for the pre-production and early-production ambient monitoring program which commences prior to drilling wells. Two levels of alerts will be defined; Level 1 will trigger an internal investigation and notification to EHS staff, the field supervisor, and foremen. Level 2 will initiate the deployment of the LDAR team to the facility to ensure there are not correlations

to active leaks. A Level 2 notification will also include notifications to local governments, CDPHE, and the COGCC.

2.3 Recordkeeping and Reporting

It is Extraction's policy that routine LDAR teams have capabilities to make immediate onsite repairs, with the goal being that no leaks remain after the initial discovery. Should further efforts, tools, or parts be necessary to implement a repair beyond the initial discovery, the repair will occur within five working days. Extraction will then reinspect within 15 working days of the first attempt of repair to ensure all leaks are eliminated.

All AVO and LDAR records will be kept in accordance with EPA and Colorado regulations. Annual reports to the EPA and the Colorado Department of Public Health and Environment can be made available to the City of Thornton upon request.

Significant leaks at the Washington pad should be eliminated through layers of automation systems intended to shut in a pad before large leaks may occur, either through SCADA, operator shut-in, or fire-eyes. However, should a Grade 1¹ gas leak occur, Extraction will notify the Thornton Fire Department, COGCC and CDPHE, as well as other safety channels that are relevant to the facility.

¹ **GRADE 1 GAS LEAK** means a gas leak that ignites or represents an existing or probable hazard to persons or property and requires immediate repair or continuous action until the conditions are no longer hazardous. *COGCC Rules and Regulations, Definitions (100 Series)*.

3.0 REFERENCES

Colorado Department of Public Health and Environment. Colorado Regulation 7. *Control of Ozone via Ozone Precursors and Control of Hydrocarbons via Oil and Gas Emissions (Emissions of Volatile Organic Compounds and Nitrogen Oxides)* Adopted 12/16/2019, effective 02/14/2020. https://drive.google.com/file/d/16qTQLSTX1T49DYWp3voXRNl4_g-vbhQT/view Accessed April 13, 2020.

Environmental Protection Agency. 40 CFR Part 60. *Subpart OOOOa Oil and Natural Gas Sector: Emission Standards for New, Reconstructed and Modified Sources*. Final 6/3/2016. <https://www.epa.gov/stationary-sources-air-pollution/crude-oil-and-natural-gas-facilities-which-construction> Accessed April 13, 2020.

Oil and Gas Development in Thornton. *Oil and Gas Regulations*. Published August 17, 2017. <https://www.thorntonco.gov/government/citydevelopment/Documents/oil-gas/Finalsigned%20regulationordinance.pdf> Accessed April 13, 2020.