

2022 Annual Environmental Performance – Rough Offshore Facilities



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Glossary of Abbreviations

Abbreviation	Meaning
bcf	Billion Cubic Feet
CH ₄	Methane
COB	Close of Business
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CSL	Centrica Storage Limited
EA	Environment Agency
ELV	Emissions Limit Value
HGS	Humber Gathering System
LPFG	Low Pressure Flash Gas
LPG	Liquid Petroleum Gas
MCZ	Marine Conservation Zone
Mscm	Million Standard Cubic Metres
NO _x	Oxides of Nitrogen
NPAI	Non-Permanently Attended Installation
NTS	National Transmission System
PPC	Pollution Prevention and Control
SAC	Special Area of Conservation
SNS	Southern North Sea
SPA	Special Protection Area
SSSI	Sites of Special Scientific Interest
VOC	Volatile Organic Compounds

1 Overview

Over the previous four and a half years (2017-2022) the Rough field has operated as a production only asset following the removal over the Rough Undertakings in 2017. Initially this was on a free flow model where gas was extracted using the natural well pressures, however from 2018 there was a requirement to use onshore gas compression to extract gas. The expected (Close of Business) COB was expected to be around late 2023 or early 2024.

As of September 2022, due to global market conditions in the supply of gas, the Rough field was converted back to a gas storage asset having successfully applied for a storage consent and associated permits. The consent allows the Rough facility to operate for up to ten years (to 2032) albeit at a lower pressure and storage volume than previously. Throughout the second half of 2022 the maximum storage of the field was around 20% compared with previous capacity at 59 bcf of gas.

Recommencement of storage started in September and continued until the field reached its maximum permitted capacity in late November. From this point, the field reverted to production for the winter, higher demand, season. This storage model is expected to continue like this until the end of the consent in 2032 unless market conditions change.

Currently all storage and production capabilities are processed via the 47/3 Bravo platform as it was also decided to permanently withdraw the Rough 47/8 Alpha platform from service and start the preparations to decommission the platform. In 2018, Well Plug and Abandonment (P&A) work was initiated leaving the Rough 47/8 Alpha wells in a mechanically plugged state. During 2019, a jack-up vessel was acquired to support Non-Permanently Attended Installation (NPAI) enabling works to enable the de-manning of 47/8 Alpha platform.

Full abandonment of the wells by means of capping and filling was due to commence in 2020, however the global Covid-19 pandemic delayed this for a few years. It was expected to recommence in 2022 and permits/licences associated with this work were granted for work to start in September 2022. However, a number of delays with the jack up rig (Valaris Norway) at its previous job and poor weather conditions meant the work is not due to take place until 2023. The full P&A works are expected to be completed in 2023.

For all the above-mentioned activities, environmental aspects and impacts were assessed prior to commencement of the work and monitored throughout, giving consideration to the whole life cycle impacts on resources to prevent pollution, reduce waste and ensure their efficient use.

Throughout 2022, as per the Centrica Health, Safety, Environmental and Security Policy (Appendix 1), CSL have continued to place a huge importance on their environmental responsibilities and continue to be committed to understanding, managing and reducing the environmental and ecological impacts of our activities through innovation, technology and cultural change. As part of this, CSL successfully maintained the ISO 14001:2015 standard in 2022 and continue to maintain develop improvements in line with this.

2 Executive Summary

Centrica Storage Limited owns and operates the Rough Gas Facilities which is located approximately 29 kilometres off the east coast of Yorkshire. The platforms are permitted to undertake regulated activities under a Production/Storage licence, Consent to Vent, OPPC Permit, Chemical Permit, PPC Permit and Consent to Locate. Under these permits and consents, CSL are required to monitor, record and report emissions released to air and water. The amount and classification of waste is also required to be reported. A greenhouse gas emissions permit was also live however, following the removal of the RGT gas turbines offshore in 2021, this permit was formally surrendered in 2022.

Throughout 2022, the Rough Offshore Facilities operated for 205 days. During this time, 456.41 Mscm of gas was produced and a total of 432.83 Mscm was injected back into the reservoir for storage. There was a planned maintenance outage on the 47/3B platform between July 2022 to September 2022, this was largely to allow the plant modifications to be made to revert the platform to a storage facility.

Releases to Air

An application to surrender Greenhouse gas emissions permit on the 47/3B (UK-D-13143) was made in March 2022. Following review by the UK ETS, official confirmation that the GHG emissions permit had been surrendered was received on 2nd September 2022 confirming no returns would be required in 2022. CSL have continued to monitor CO₂ emissions on the platform and will continue to do so. Throughout 2022 the asset produced 5964 tCO₂e, that is a reduction of 50% compared with 2021 which was largely down to the removal of the RGT gas turbines.

Releases to Water

The 47/3 Bravo generated Produced Water on 161 days, with a total of 2,520m³ of Produced Water discharged to sea and 81 kg of associated oil.

The Produced Water was analysed for radioactivity during Q2, Q3 and Q4. With no radiation detected therefore it can be considered that the Produced Water generated in 2022 was not radioactive.

All chemicals used were within permitted limits. Throughout 2022, the Rough Gas Facilities discharged a total of 0kg of chemicals into the sea. All other chemicals used were returned to shore through the sealine and were either recovered or disposed of.

Waste

The Rough Gas Facilities generated a total of 339.9 tonnes of waste throughout 2022, of which all but 0.6 tonnes was recovered (recycled or sent for treatment). From the total amount of waste generated, 119.2 tonnes was categorised as non-hazardous and 220.7 tonnes as hazardous waste.

Non-Conformities

CSL exceeded the maximum concentration for Oil in Water on 4 occasions and exceeded the Monthly Average Oil in Water concentration 2 times during 2022. CSL submitted 3 PON1's

throughout 2022, all of which were under a tonne, with the maximum release being 0.0053 tonnes caused the deluge system washing residual oil into the sea.

With the exception of the non-conformities mentioned above, all releases to the environment have been within the permitted limits set out by the various Permits and Consents under which the Rough Gas Facilities operate.

3 Introduction

3.1 Site Location & Operation

The Rough offshore gas field is located approximately 29 kilometres off the east coast of Yorkshire.

The Rough Offshore Facilities comprises of the Rough 47/8 Alpha (two bridge-linked platforms), which is undergoing decommissioning, and Rough 47/3 Bravo (three bridge-linked platforms) complexes. The complexes are approximately 2 kilometres apart and were designed to produce gas from the reservoirs 30 wells. There are now 14 operational wells available on 47/3B only for production of natural gas and condensate.

During production, the nature of the reservoir results in some contamination with water and indigenous hydrocarbons, necessitating separation offshore. Water and condensed hydrocarbons are removed by the offshore process prior to transmission via the 36-inch sealine to shore. The small quantities of produced water are discharged to sea and the natural gas condensate is re-injected into the pipeline and carried ashore with the gas.

During injection the same 14 wells are used to inject gas back into the reservoir. When the asset was previously a storage asset, gas was injected using offshore compression to boost the maximum pressures to around 90 barg, however following the reinstatement of gas storage onshore NTS gas pressures are used. This means in 2022 the maximum operational capacity of the Rough field was 59 bcf of gas.

Corrosion inhibitor is injected on the 47/3 Bravo platform to prevent corrosion of the sealine. Methanol is also injected into the sealine to prevent the build-up of hydrates. Production fluids are transferred, via the subsea pipeline to the onshore Easington Terminal.

3.2 47/8 Alpha

With the 47/8 Alpha no longer operational, CSL made the decision to isolate the platform from the reservoir through mechanical plugging and to kill the wells with inhibited seawater. In addition to this, CSL also made the decision to de-man the installation in 2019. The activities associated with the wells took place from October 2018 through to March 2019, with the Non-Permanently Attended Installation (NPAI) enabling works taking place in May 2019.

Full abandonment of the wells by means of capping and filling was due to commence in 2020, however the global Covid-19 pandemic delayed this for a few years. It was expected to recommence in 2022 and permits/licences associated with this work were granted for work to start in September 2022. However, several delays with the jack up rig (Valaris Norway) at its previous location and poor weather conditions meant the work is not due to take place until 2023. The full P&A works are expected to be completed in 2023.

3.3 Environmental Permits

The Rough Gas Facilities operate under the following permits.

3.3.1 Production Licence

On 23rd April 2020, CSL applied for and obtained a Long Term Production Consent (PCON/5439/0 (Version 1)) which permits CSL to extract gas from the Rough Gas Field until 31st December 2023. Pervious to this, CSL operated and extracted gas under Production Licence PCON4517/0 (Version 2).

3.3.2 Consent to Vent

The Consent to Vent (VCON/6465/0 (Version 3)) permits CSL to dispose of unignited natural gas into the atmosphere won under the Rough Gas Field Petroleum Production Licence. This licence allows the 47/3B platform to vent gas at a rate of no more than 0.822 tonnes on an average daily rate.

The purpose of venting under this consent is to

- facilitate the planned start-up, shut-down or maintenance of plant and equipment, or to ensure its efficient operation, or
- to protect plant, equipment or persons.

As venting is a loss of primary product, CSL endeavour to limit the amount of gas lost through venting.

3.3.3 OPPC Permits

The Rough Offshore Facilities operated under a Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005 permits. These permits allow the discharge of oil in accordance with the arrangements described within the permit for the Rough BP platform (OLP/72/9 (Version 1)). The Rough AD platform formally operated under oil discharge permit (OLP/74/6 (Version 1)) however, this was surrendered due to production no longer taking place on the asset.

As part of the jack up campaign (Valaris Norway) CSL have applied for a Oil Pollution Prevention and Control permit associated with these works. The permit wis expected to be granted in 2023 along with when the P&A works commence.

3.3.4 Chemical Permits

During 2020, the Rough Offshore Facilities operated under two Offshore Chemicals Regulations 2002 permits, the 47/8 Alpha (CP/300/17) and the 47/3 Bravo (CP/197/20). The permits require that all chemicals used or discharged during the course of the operations are listed on the permit. Where chemicals are discharged to sea, the discharge is undertaken in accordance with the conditions detailed within the permit and appropriate measures are taken to minimise discharge.

3.3.5 Greenhouse Gas Permit

An application to surrender Greenhouse gas emissions permit on the 47/3B (UK-D-13143) was made in March 2022. Following review by the UK ETS, official confirmation that the GHG emissions permit had been surrendered was received on 2nd September 2022 confirming no returns would be required in 2022. CSL have continued to monitor CO₂ emissions on the platform and will continue to do so.

3.3.6 PPC Permit

The Rough BD Platform operates under the Offshore Combustion Installations (Pollution Prevention and Control) Regulations 2013 Permit (PPC/70/5). The permit authorises the use of listed combustion equipment, ensuring that appropriate measures are taken to minimise discharges, emissions and waste. The permit sets limits on the total annual emissions of air polluting substances (Nitrogen Oxides, Sulphur Oxides, Carbon Monoxide, Methane and Non-Methane Volatile Organic Compounds) from the listed combustion equipment.

Following the removal of the RGT gas turbines offshore in 2021, CSL will formally apply to surrender the PPC permit for the BD platform as the currently equipment no longer falls under the medium combustion plant requirements.

3.3.7 Consent to Locate

The Consent to Locate designates the geographic location of the platforms (47/8 Alpha – CP/151/5 (Version 2) and 47/3 Bravo – CL/150/6) and the outlines the navigation aids required to ensure safe navigation of vessels at sea.

3.4 Environmental Management System

CSL have a certified ISO 14001:2015 Environmental Management System which demonstrates our commitment and responsibility to understand, manage and reduce the environmental impact of our operations in a manner which protects the environment and its resources. The environmental management system is integrated within health and safety, as well as the business management activities. Central to the environmental management system is strong leadership, continuous improvements, and good performance baselines. Annual environmental improvement plans are developed to measure and report improvements. The environmental management system is audited internally and externally.

4 Emissions Monitoring

A condition of all the permits described in Section 3.3 is the monitoring and recording of emissions from the activities undertaken by the Rough Offshore Facilities. Throughout 2022, CSL have undertaken the required monitoring of all emission sources and ensured that all reporting requirements have been fulfilled. The following sections discuss the monitoring of each of these activities.

4.1 Releases to Air

Releases to air are emissions of Carbon Dioxide (CO₂), Carbon Monoxide (CO), Oxides of Nitrogen (NO_x), and Methane (CH₄). The quantities of the above gases are calculated from the total volume of fuel gas used, diesel usage, gas vented, and an estimated release of fugitive emissions. The monitoring of emissions includes those from routine, non-routine and abnormal operations, and includes start-up, shut-down and emergency situations.

4.1.1 Fuel Gas Consumption

4.1.1.1 47/8 Alpha

There is no qualifying combustion equipment on the 47/8 Alpha platform therefore the platform is exempt from the EU Emissions Trading Scheme and does not hold a PPC Permit.

4.1.1.2 47/3 Bravo

Following on from the removal of the RGT gas turbines in 2021 and the subsequent surrendering of the greenhouse gas emissions permit, the 47/3B asset does not consume any fuel gas. All power/heating needs are met by the three Agrekko diesel power units and heating medium with back up diesel generators available if required.

4.1.2 Diesel Consumption

From 2022, Diesel is now the primary source of Power Generation and heating in the form of; the three Agrekko diesel generators, Heating Medium heater, firewater pumps and crane activities. Consumption of diesel can be assumed to be equal to the amount of diesel bunkered on the platforms, therefore equal to the quantities recorded on the bunker delivery notes. The density factor (0.8425 t/m³) used to convert litres to tonnes is obtained from the most recent Digest of UK Energy Statistics (DUKES), Annex A, Average conversion factors for petroleum found at:

<https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes>

The NCV factor (42.5688 GJ/t) and Emissions Factor (74.9375 tCO₂/TJ) for diesel are taken from the UK GHG Latest UK inventory factors. These factors are sourced from the GOV.UK website at

<https://www.gov.uk/guidance/participating-in-the-eu-ets#complying-with-the-eu-ets>

The total CO₂ emission is calculated using the ISO6976 methodology and is a product of diesel combusted, a net calorific value (NCV), an emissions factor (EF) per unit of fuel used, and a standard oxidation factor (OF).

4.1.3 Venting

Venting of natural gas represents a loss of primary energy and the largest source of unburnt hydrocarbon emissions from the platforms. Venting of natural gas is required as a result of planned maintenance or blowdown situations. The amount of gas vented is recorded on the IMAC system.

4.1.4 Fugitive Emissions

Fugitive emissions are emissions of gas from pressurized equipment due to leaks, weeps and seeps, and other unintended or irregular releases from operating activities. These emissions cannot be measured; therefore it is considered that 48 tonnes of fugitive emissions are released every six months from the platforms.

4.2 Releases to Water

The releases to the surrounding sea are subject to the OPPC and Chemical permits. The discharge of these substances is controlled and emitted through dedicated emission points that are specified on the above-mentioned permits.

4.2.1 Produced Water

4.2.1.1 47/8 Alpha

The 47/8 Alpha platform does not generate Produced Water, therefore there are no requirements to monitor and sample Produced Water.

4.2.1.2 47/3 Bravo

Produced Water is water which is generated from the reservoir and is extracted along with the extraction of the gas. The water can be contaminated with hydrocarbons and Naturally Occurring Radioactive Material (NORM). The OPPC permit requires the sampling and reporting of oil content at least monthly, an analysis for NORM quarterly, and the in-depth bi-annual analysis of the water.

The equipment used on 47/3 Bravo to process Produced Water before sampling and discharging to sea are described below.

- An Inlet Separator – this is a vertical 2-phase separator which acts as a sand trap to minimise sand erosion and blockage of the downstream equipment.
- An Injection Separator – this provides hold-up and separation for bulk liquids.
- Test Separator – allows liquid separation. Condensate will separate from the water phase and is then routed off.
- Off-Spec Condensate Vessel - a horizontal three phase separator with recently-installed baffles and inclined plate pack to assist oil-water separation.
- Oily Water Separator - is an inclined plate separator that separates hydrocarbons from the produced water.
- Oil Absorption Media Filter Package - removes any residual hydrocarbon from the water phase prior to discharge. The water samples for the required permitted analysis are taken from a sample point after the Oil Absorption Media Filter Package prior to discharge.

Additional polishing filters were installed towards the end of 2022 to which can be run in either series or parallel meaning when wells are brought online its possible to send the liquid through both sets of filters. However, during periods of low OiW readings they can be run in series enable filters can be changed out whilst some remain online.

4.2.1.3 Oil in Water

Analysis of Oil in Water should use the OSPAR reference methodology for oil in produced water. However, this methodology requires the use of gas chromatography using a flame ionisation detector and n-pentane as an extraction solvent, which is unavailable on the platform. CSL use a simpler BEIS approved analytical methodology which is correlated against the OSPAR Reference Method.

4.2.1.4 Radioactivity

There is a requirement under the Radioactive Substances Act 1993 to determine whether produced water is radioactive as defined in Schedule 1 of Radioactive Substances Act 1993. For each Quarter, while generating Produced Water, a sample is taken and sent to Public Health England to undertake the analysis and detection of Polonium-210 (Pb-210), Actinium 228 (Ac-228) and Radium 226 (Ra-226). The analysis follows the fully documented procedures contained in CRCE Glasgow Radiochemistry Group Technical Manual.

4.2.1.5 Bi-annual Water Analysis

The bi-annual water analysis includes testing for the presence of Polycyclic Aromatic Hydrocarbons (PAH), BTEX chemicals (benzene, toluene, ethylbenzene and xylene heavy metals), Heavy Metals, Phenols and Alkyl Phenols, Organic Acids, Oil in Water, NPD's (Naphtalenes, Phenanthrenes, Dibenzothiophenes) and Inorganic compounds.

The purposes for undertaking the bi-annual water analysis is to build-up a regulatory database of information on the amounts of various constituents of produced water discharged to sea.

4.2.2 Chemical Permits

Under the Chemical Permits, all chemicals used are to be monitored and their usage recorded. The chemicals used are essential to the operation and are used sparingly and responsibly to ensure limited impact on the environment.

Under the 47/3 Bravo Chemical Permits, apart from ZOK MX GS and Offshore Degreaser EF, which are discharged to sea, all other chemicals permitted and used on the Rough Offshore Facilities are returned through the 36-inch sealine pipe to Easington Gas Terminal, to be treated ashore.

Only deck cleaning chemicals have remained on the 47/8 Alpha Chemical Permit.

4.3 Waste

CSL have a Duty of Care and takes measures to ensure that all controlled waste generated on the Rough Offshore Facilities are treated, segregated, stored, and disposed in an appropriate manner to prevent the likelihood of pollution or harm to health. The Offshore 47/8 Alpha Garbage

Management Plan (DOC-CSL-HSE-ENV-006a) and the Offshore 47/3 Bravo Garbage Management Plan (DOC-CSL-HSE-ENV-006b) provides a detailed description of how waste is managed on the platforms.

The waste generated on the platforms are separated into various waste streams but can be categorised into General/Industrial waste and Hazardous waste. The waste is transferred to the support vessel before been sent to shore to a treatment or disposal facilities. The transfer of waste is accompanied with appropriate transfer documentation.

5 Emissions Reporting

A condition of the Permits is the reporting of emissions from the regulated activities undertaken at the Rough Offshore Facilities. CSL have fulfilled its responsibility to report the 2022 emissions and below is a discussion of the Rough Offshore Facilities performance against the permit conditions. Trends, using historical data, have also been discussed.

5.1 Performance

Throughout 2022, the Rough Offshore Facilities operated for 205 days. During this time 456.41 Mscm of gas was produced and a total of 432.83 Mscm was injected back into the reservoir for storage. There was a planned maintenance outage on the 47/3B platform between July 2022 to September 2022, this was largely to allow the plant modifications to be made to revert the platform to a storage facility.

5.1.1 Environmental Observations

CSL run an HSE Observation system which allows all employees and contractors to report activities which they may consider to be unsafe or may cause an incident which is harmful to personnel, the environment or plant. The observations are reviewed in a daily meeting by the OIMs, Supervisors, and HSE advisors. These meetings allow opportunity for discussions on safety and environmental themes and include any significant learning from monitoring activities, accidents and near misses.

During 2022, there were 9,552 observations raised on the platforms, of which 768 were directly related to environmental concerns. CSL consider that the number of observations raised in 2022 has had a direct contribution to the prevention of potential incidents.

5.2 Releases to Air

5.2.1 CO₂ Emissions

Through the combustion of diesel and LPG, Rough Gas Facilities released 5964.06 tCO₂e during 2022.

Figure 1: Annual CO₂ emissions from Rough Offshore Facilities.

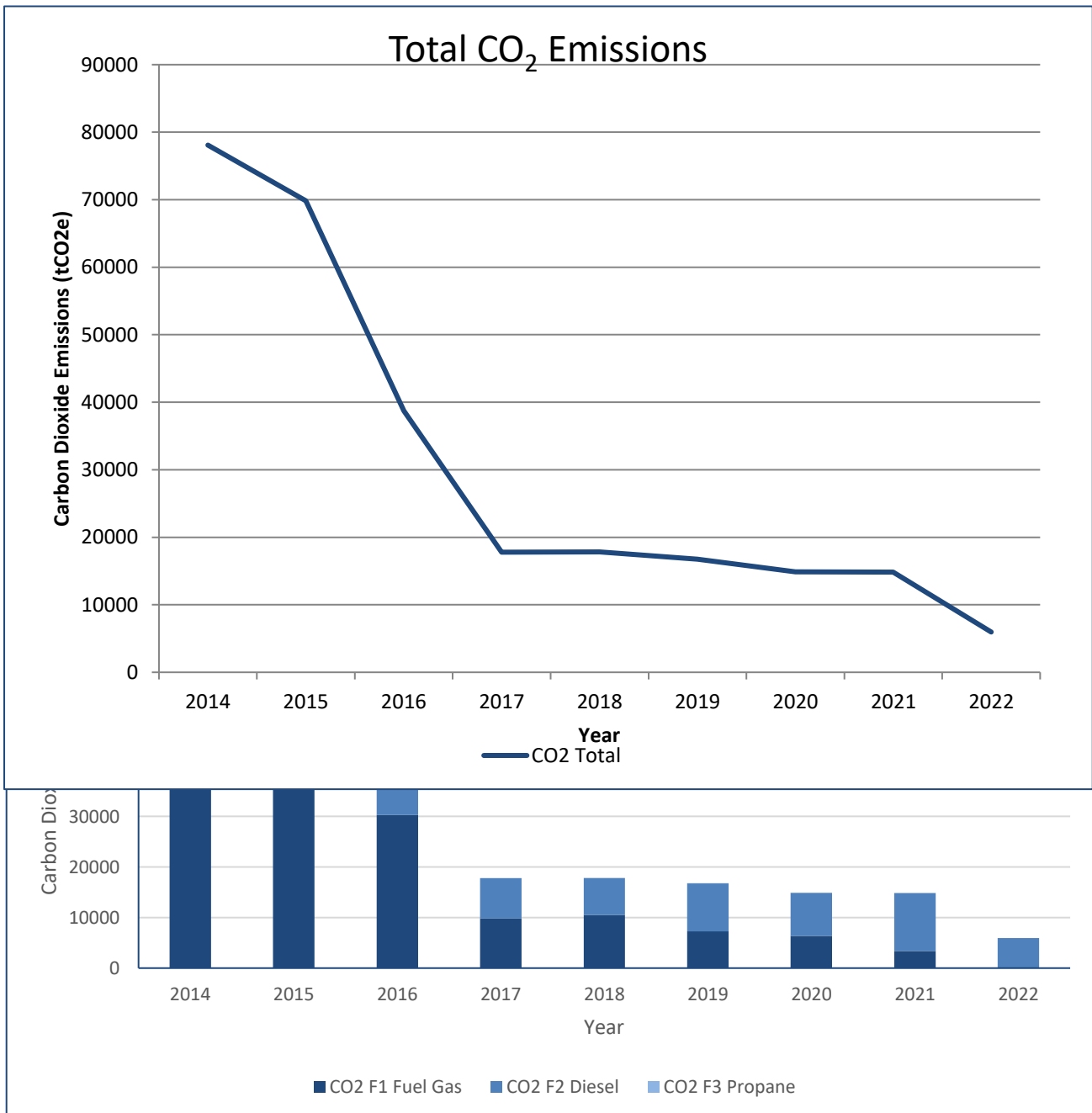


Figure 2: CO₂ emissions from the different fuel types.

). From 2016 to present, there has been an increase in the number of days each year that the RGT’s have operated on diesel, instead of fuel gas, accounting for the increase in Carbon dioxide emissions from diesel.

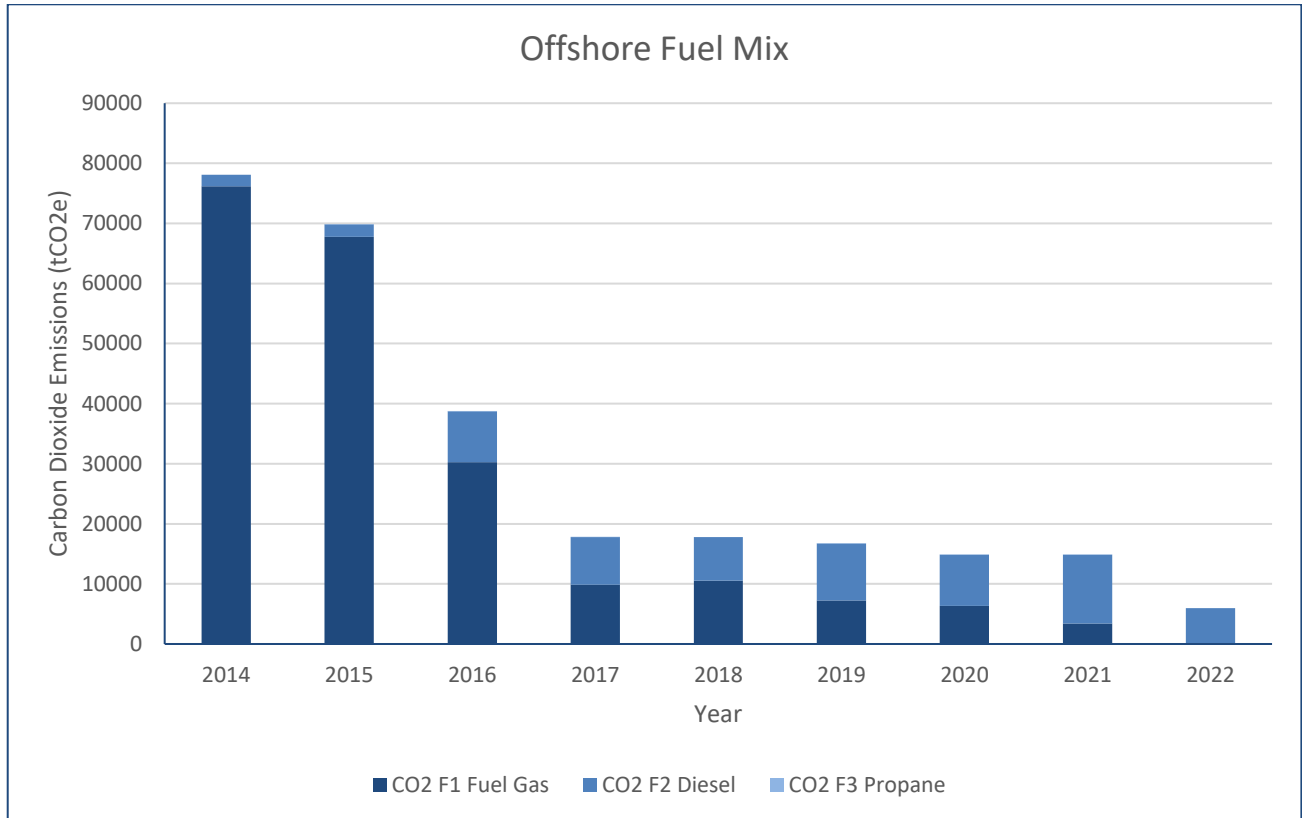


Figure 2: CO2 emissions from the different fuel types.

5.2.2 Non-Greenhouse Gas Emissions

Through the operations on the Rough Gas Facilities the following releases were calculated.

5.2.2.1 Nitrogen Oxides (NOx)

There was a total of 27.0 tonnes of Nitrogen Oxides (NOx) released during 2022. The amount of NOx being released from the Rough Gas Facilities has declined since 2014. This is in line with the reduced use and removal of the RR Avon 1535-161 Gas Turbines, used for gas injection operations, and therefore the reduction in fuel gas consumption.

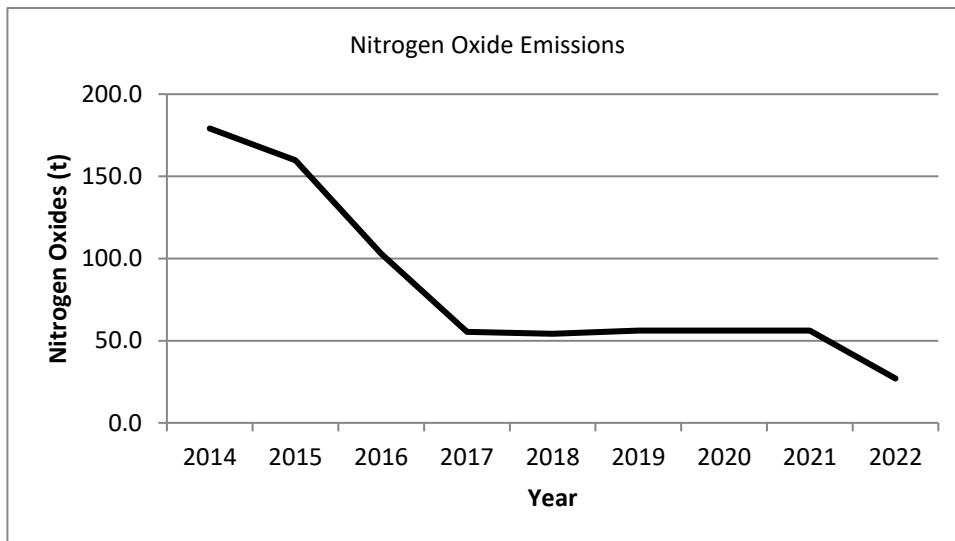


Figure 3: Nitrogen Oxides (NO_x) released to the atmosphere between 2014-2022.

5.2.2.2 Sulphur Dioxide (SO₂)

There was a total of 8.0 tonnes of Sulphur Dioxides (SO₂) released during 2022. The increase in SO₂ emissions in 2016 onwards is due to the increase in diesel usage previously discussed. However, throughout 2022 due to overall lower diesel usage, SO₂ has started to decline again.

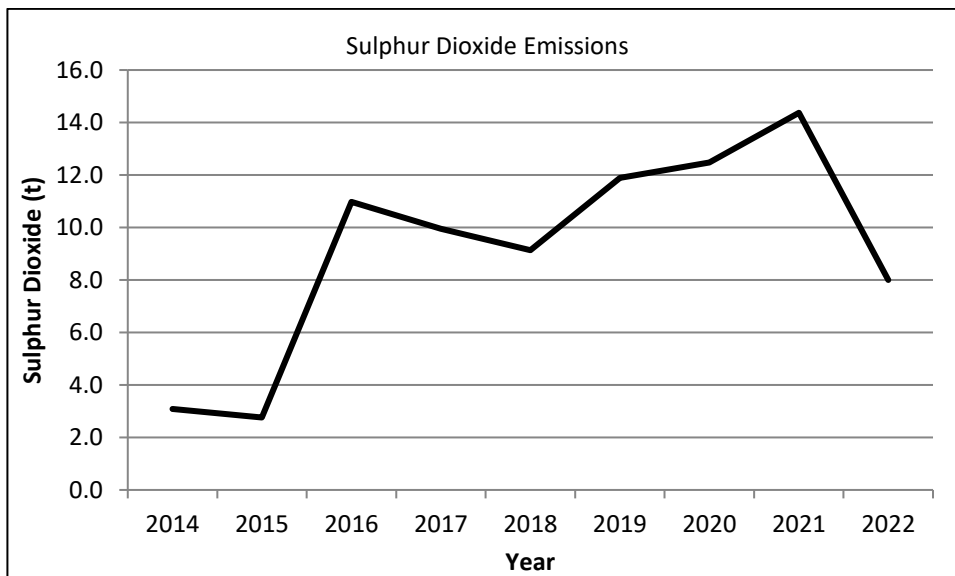


Figure 4: Sulphur Dioxide (SO₂) released to the atmosphere between 2014-2022.

5.2.2.3 Carbon Monoxide (CO)

There was a total of 1.8 tonnes of Carbon Monoxide (CO) released during 2022. The CO emissions continue to follow a downward trend following a spike in CO emissions in 2015. This is in line with the reduction in fuel gas and diesel usage.

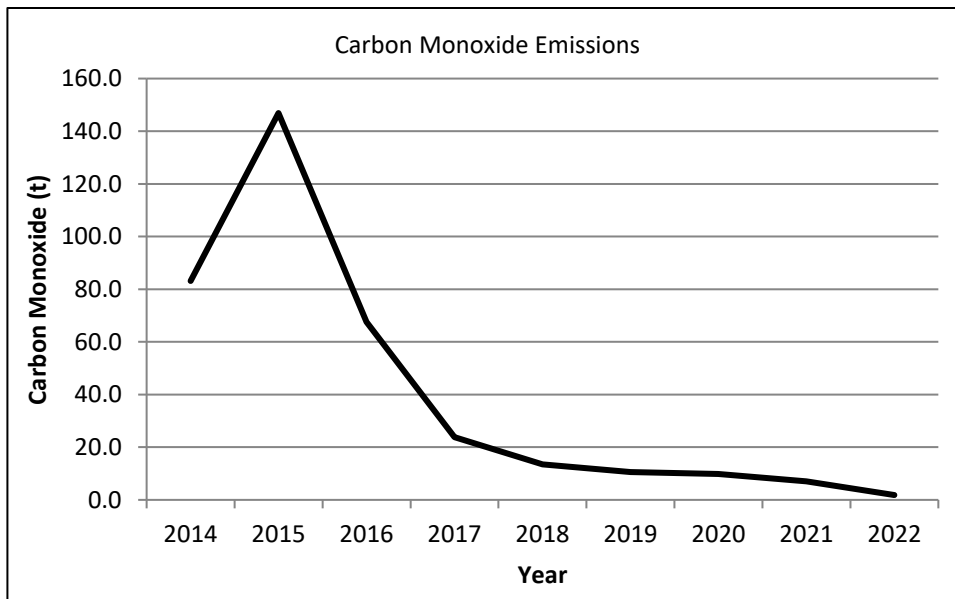


Figure 5: Carbon Monoxide (CO) released to the atmosphere between 2014-2022.

5.2.2.4 Volatile Organic Compounds (VOCs)

There was a total of 6.9 tonnes of Volatile Organic Compounds (VOCs) released during 2022. The amount of VOCs released is in line with the amount of gas vented. Due to the venting of gas been a lose of primary product, CSL endeavour to reduce venting to as low as reasonably practicable (ALARP).

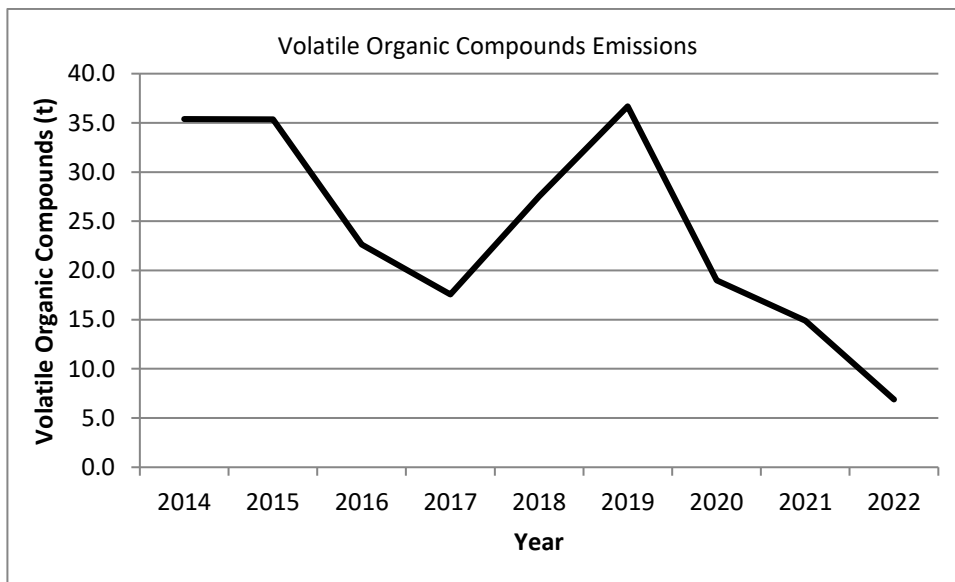


Figure 6: Volatile Organic Compounds (VOCs) released to the atmosphere between 2014-2022.

5.2.3 Methane Releases

Methane released is calculated by the amount of gas vented and the estimated amount of fugitive gas. During 2022 it was calculated that 104.8 t of methane was released into the atmosphere.

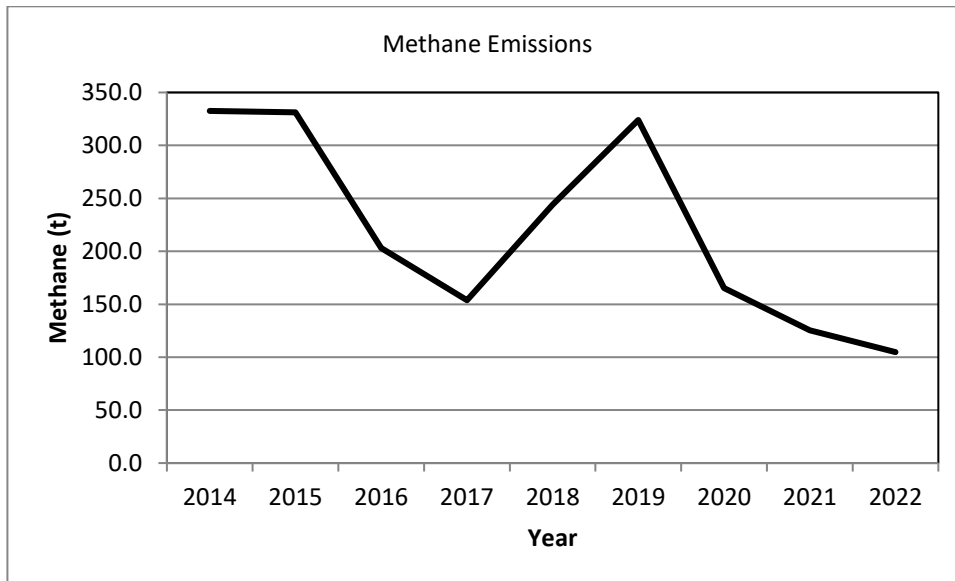


Figure 7: Methane released to the atmosphere between 2014-2022.

5.3 Releases to Water

5.3.1 Oil in Water Content

At the end of 2017, CSL applied for and obtained approval for a transition from storage to production operation licence. A review of the reservoir by a registered third party subsurface specialist, identified that with the production of native gas, produced water would continue to be generated at a rate which is constant to the gas production rate and it is considered very unlikely that there will be any significant influx of formation water. As production rates decrease throughout the life of the reservoir, so will the rates of produced water generated.

Following the conversion of the Rough field back to a storage asset in 2022, it was unknown how much produced water and therefore oil in water would be produced. After the asset had a period of time where dry gas was injected, production recommenced at the end of November. For the remainder of November and December 2022 produced water and therefore oil in water was very low, as the production season continues this level of oil in water is expected to increase slightly.

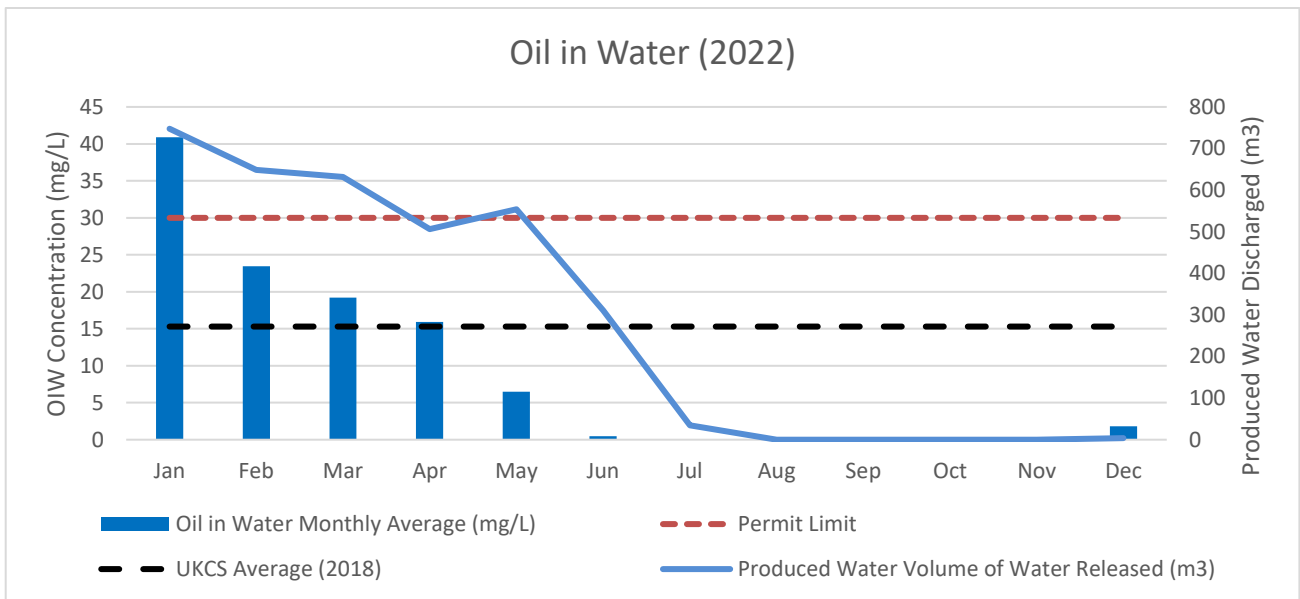


Figure 8: Monthly breakdown of Produced Water discharge and associated oil release.

When produced water was generated, samples were taken and analysed on the platform by qualified trained Operations Technicians. CSL were compliant to the maximum concentration limit (100mg/L) across the full year, however the monthly average concentration limit (30mg/l) was exceeded in January but did reduce each month until the annual shutdown in June.

During the new injection season, no oil in water is produced therefore from September to November OiW was zero, there was a small amount of oiw produced in December but well below the 30 mg/l limit. For the January exceedance, an OPPC non-conformance report was submitted to the regulator (see Section 6.1 for more details of the non-conformance).

5.3.2 Radioactivity

A Sample of Produced Water was taken in Q2, Q3 & Q4 and sent to Public Health England to conduct analysis. No test was conducted in Q1 due to the fact that due to weather conditions, there wasn't a suitable time to get the sample back to shore in a suitable time frame.

Where radioactivity had been detected, the activity concentration was recorded. Where no radioactivity was detected, the laboratory limit of detection (LOD) was provided.

From the analytical results (Table 1), it can be seen that the LOD was recorded for all samples tested; therefore, produced water extracted from the Rough gas field in 2022 would not be considered radioactive.

Table 1: Summary of Radiation Analysis of Produced Water.

Quarter	Sample Date	Test Date	Tested Radioactivity Concentrations				
			Pb-210 (Bq/g)	Ac-228 in soluble (Bq/g)	Ra-226 in soluble (Bq/g)	Ac-228 in particulate (Bq/g)	Ra-226 in particulate (Bq/g)
Q1	No Samples Tested						
Q2	18 Apr 22	28 Apr 22	0.00005	0.00004	0.00040	0.528	2.04
Q3	03 Jul 22	25 Jul 22	0.00005	0.00004	0.00040	0.953	3.36
Q4	23 Dec 22	09 Jan 23	0.00005	0.00004	0.0004	0.144	1.00
*Laboratory Limit of Detection (LOD)							

5.3.3 Bi-Annual Analysis of Produced Water

For the purposes of building up a regulatory database of information on the amounts of various constituents of produced water discharged to sea, for each half of 2022, an accredited laboratory, on behalf of CSL, have undertaken a detailed analysis of Produced Water. The results of these analyses were reported on the UK Energy Portal.

5.3.4 Chemical Permits

5.3.4.1 47/8 Alpha

With the suspension of gas extraction on the 47/8 Alpha platform, only deck maintenance chemicals were permitted for use throughout 2022.

Table 2: Chemicals Used under Chemical Permit CP/300/13 in 2022.

Chemical	Permit Limit (Kg)	Amount Used (Kg)
Offshore Degreaser EF.	300	0
Rigger XL-N	432	0
Cleanup DG-N	600	0

5.3.4.2 47/3 Bravo

Figure 9 shows the usage of Corrosion and Hydrate Inhibitors on the 47/3 Bravo platform. All chemicals were within the permit limit and were sent back to shore in the 36-inch sealine pipe. These chemicals are used to prevent the build-up of hydrates and corrosion in the pipeline.

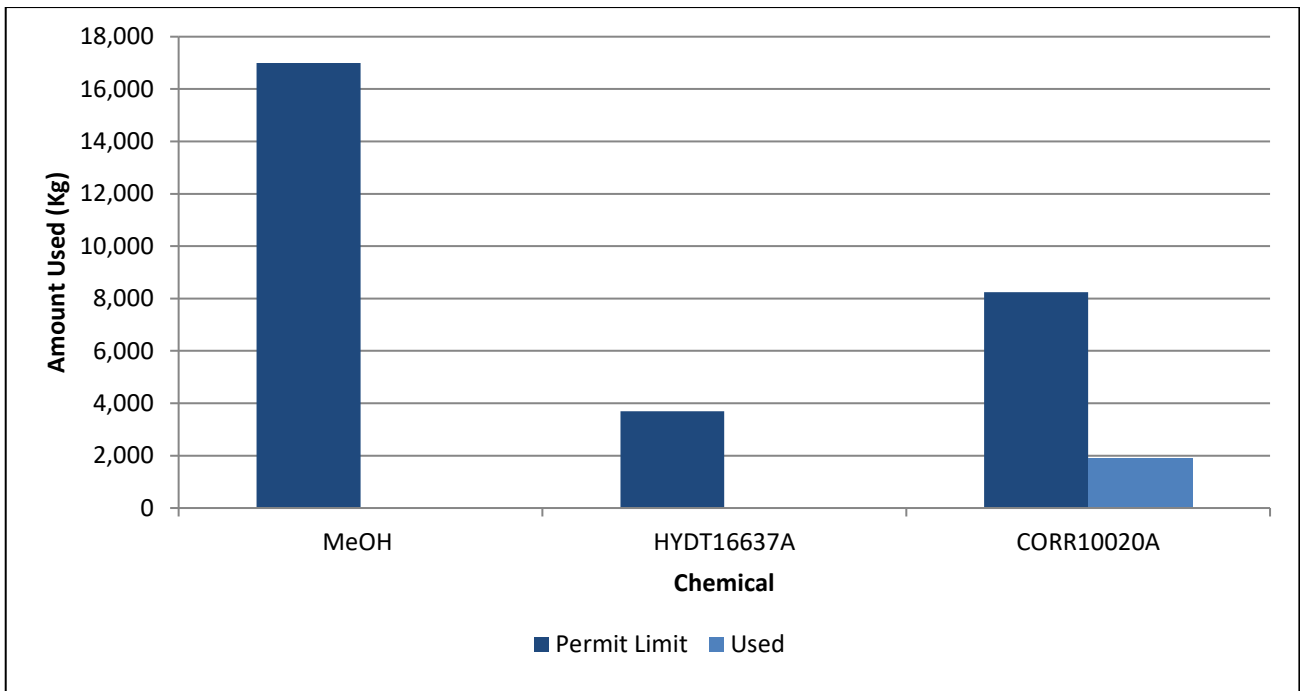


Figure 9: Corrosion and Hydrate Usage on 47/3 Bravo in 2022.

Figure 10 shows the usage of wells chemicals and deck cleaning fluids. All chemicals were within the permit limits. A total of 50 Kg of chemicals (ZOK MX GS, Offshore Degreaser EF) were discharged to sea throughout 2022. Under the permit, a maximum of 1,250 Kg of chemicals were permitted to be discharged to sea.

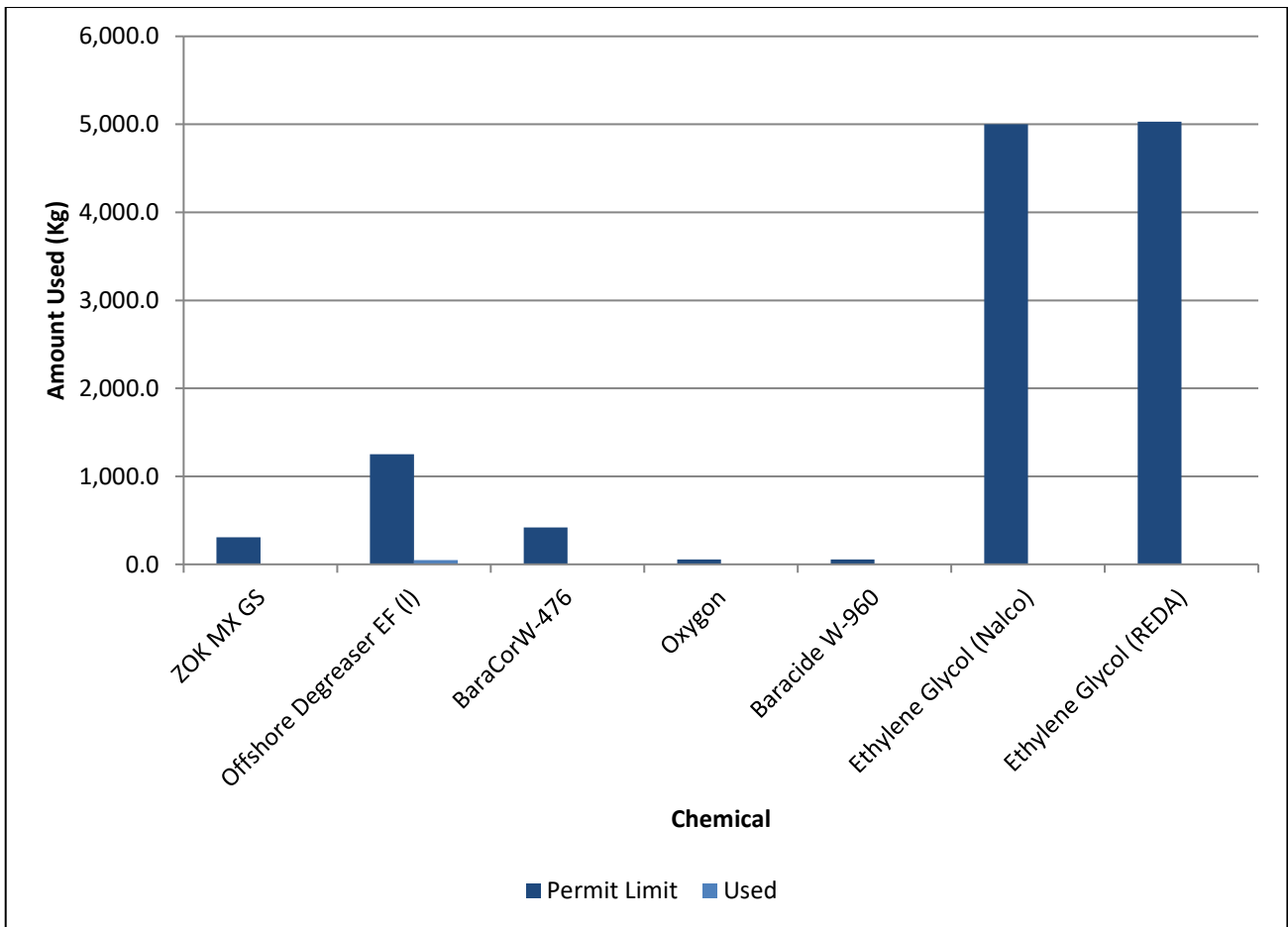


Figure 10: Wells and Deck Cleaning Fluids chemical usage on 47/3 Bravo.

5.4 Waste

5.4.1 Total Waste Generated

The Rough Gas Facilities generated a total of 339.9 tonnes of waste throughout 2022, of which all but 0.6 tonnes was recovered (recycled or sent for treatment). From the total amount of waste generated, 119.2 tonnes was categorised as non-hazardous and 220.7 tonnes as hazardous waste. There was a slight increase in waste produced in 2022 compared with previous years, this was largely down to ‘project phoenix’ reverting the asset back to a storage asset and the associated works.

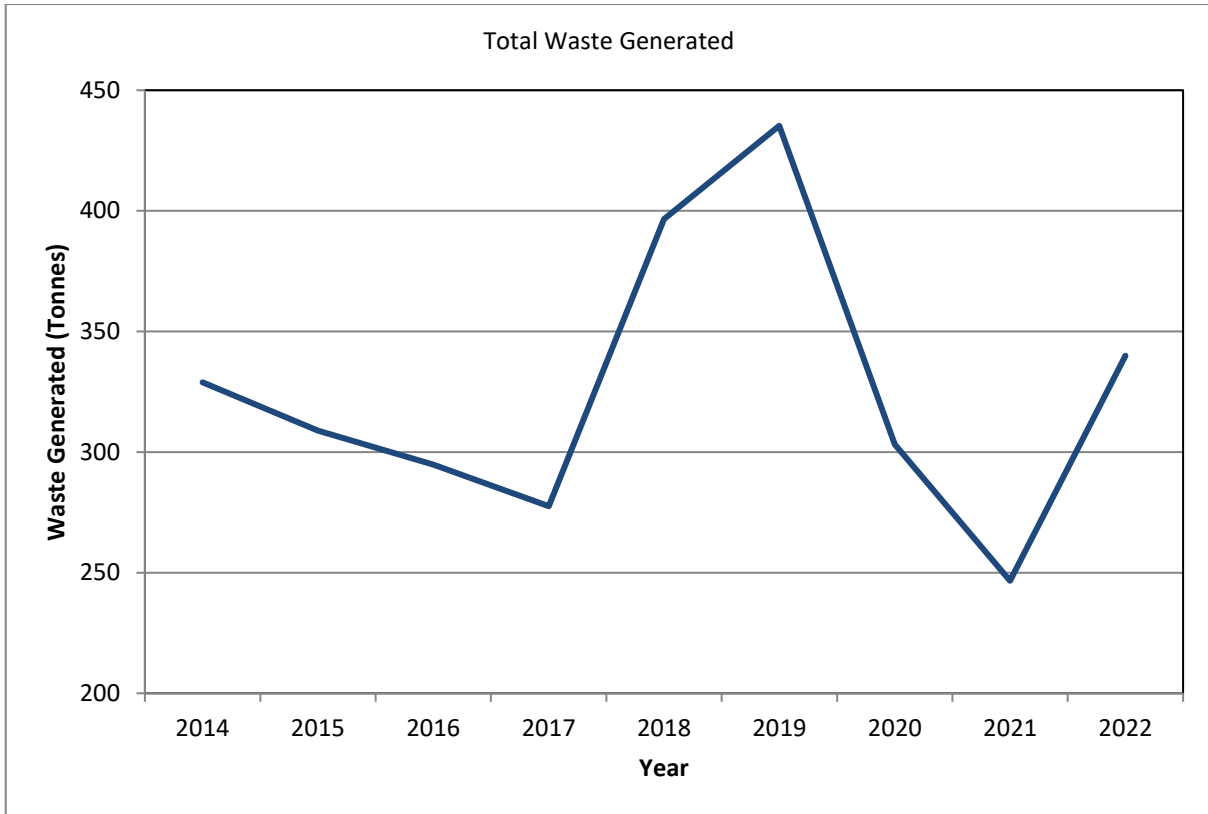


Figure 11: Total waste generated from the Rough Offshore Facilities (2014-2022).

5.4.2 Final Disposal/Recycling

Waste generated on the platforms are transferred to the support vessel to be offloaded ashore where it then goes to appropriate waste facilities. This waste is separated into either final disposal or recovered. Of the total amount of waste generated, 339.80 tonnes was recovered (99%) in 2022.

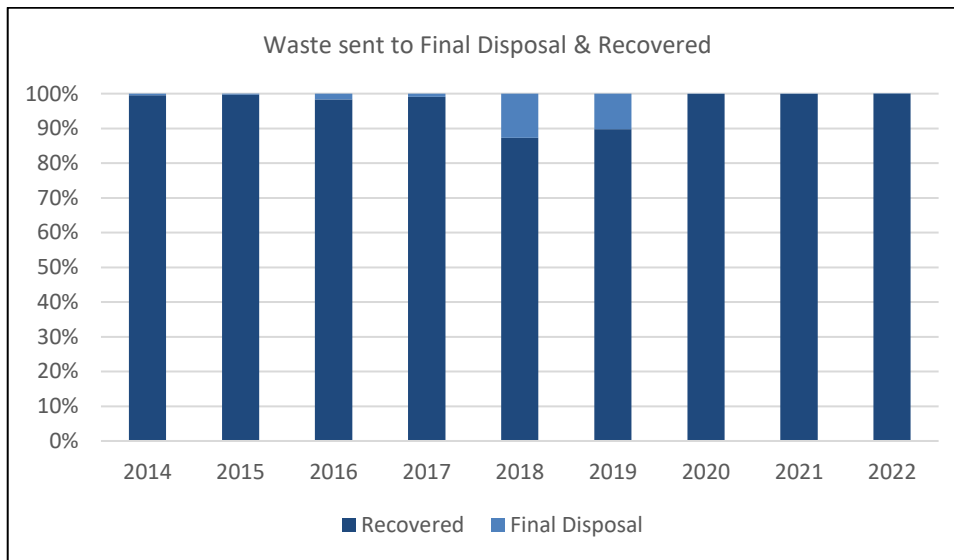


Figure 12: Breakdown of the final destination of generated waste from the Rough Offshore Facilities.

5.4.3 Non-Hazardous/Hazardous Waste

The waste which leaves the platforms can also be categorised as non-hazardous or hazardous waste. Out of the total waste generated, 119.16 tonnes was categorised as non-hazardous and 220.70 tonnes as hazardous waste in 2022.



Figure 13: Historical Non-Hazardous and Hazardous Waste generated from the Rough Offshore Facilities.

6 Non-Conformities

Throughout 2022, CSL have reported a number of non-conformities to the environmental regulator and are discussed below.

6.1 Oil in Water

During 2022 the 47/3B platform produced gas on 205 days, of which, produced water was generated on 165 days. CSL exceeded the maximum concentration for Oil in Water on 4 occasions and exceeded the Monthly Average Oil in Water concentration 2 times during 2022. CSL submitted 3 PON1's throughout 2022, all of which were under a tonne, with the maximum release being 0.0053 tonnes caused the deluge system washing residual oil into the sea.

Table 3 shows the monthly breakdown of the number of days produced water was generated, the number of maximum concentration non-conformities and the monthly oil in water average.

Table 3: Summary of Oil in Water non-conformities.

	No. of Days Online	No. of Days Produced Water Generated	No. of Days of Maximum Concentration Non-Conformities	Oil in Water	
				Monthly Average (mg/L)	Mass of Oil Released (Kg)
January	28	28	4	40.88	30.56
February	24	24	0	23.45	15.21
March	16	16	0	19.20	12.12
April	30	30	0	15.94	8.07
May	8	8	0	6.48	3.59
June	7	7	0	0.53	0.15
July	1	1	0	0.00	0.00
August	3	2	0	0.00	0.00
September	0	0	0	0.00	0.00
October	0	0	0	0.00	0.00
November	0	0	0	0.00	0.00
December	31	31	0	2.40	10.00
Annual Total	191	191	4		237.47

Unfortunately, CSL experienced a number of non-conformities during the January 2022 period. Throughout this time, CSL continued to investigate causes for the exceedances and action corrective measures, including the increase change out rate of the polishing filters. This has resulted in CSL been compliant with the OPPC permit, every month following January. In November

2022 CSL added additional polishing filters to further reduce the risk of exceeding OiW limits. Since this change combined with conversion back to storage, CSL hasn't had any further non-comformances.

6.2 IR Standards and Calibration graphs

Due to the extended shutdown period a condensate sample for the development of the Infra-Red Standards and Calibration graphs for the validation of the Oil in Water concentration against the GC-FID correlation results could not be taken before the expiration date in September 2022.

A representative condensate sample was taken immediately upon returning to operation and was sent to be developed to generate new IR Standards and Calibration graphs.

Until the new IR Standards and Calibration graphs were developed, CSL used the expired IR Standards and Calibration graphs to calculate the Oil in Water concentration and then re-calculated the Oil and Water concentration when the new IR Standards and Calibration graphs were developed.

6.3 PON1's

In 2022, CSL submitted 4 PON1's to the regulator with regards to non-regulated oil releases to sea, one of which was from an unknown third-party. A review of these submissions is below:

Table 4: Summary of submitted PON1's during 2022.

Date	PON1 Ref	Category	Description	Min Quantity Released (t)	Max Quantity Released (t)	BEIS Status
29-May-22	PON1/1262	Hydraulic Oil	Spurious activation of deluge system caused residual oil on plant to be washed to sea	0.000396	0.005332	No Further Action Required
19-May-22	PON1/1218	Diesel	Diesel transfer stopped to the generator day tank. Line opened up to the fire pump day tank to reduce the head in the line and stop the leak.	0.000173	0.002703	No Further Action Required
26-Mar-22	PON1/957	Hydraulic Oil	Very small weep in upper master valve area. Dripped through open grating to sea.	0.000086	0.000349	No Further Action Required

7 2022 Audits

CSL's management systems are highly developed with an operations management system (OMS) in place. The OMS identifies the potential direct and indirect effects associated with the platform and its operations and identifies those that are considered significant. The significance is determined in the context of the legislative and regulatory requirements, platform processes and potential emissions generated. The OMS defines a systematic approach to HSE Management and provides a documented system of procedures which are in place to ensure effective management of environmental and identification of safety related issues. Group-wide procedures and permitting requirements are integrated into local procedures on the platform. All elements of the OMS are regularly reviewed and independently audited by an accredited verification company on a periodic basis to ensure compliance to the accrediting Standard.

CSL conducted an internal compliance audit on the Rough 47/3B in September 2022. Mitigating corrective and preventative actions were identified for non-compliances found throughout the audit and all have been closed out.

8 Summary

During 2022, CSL produced 456.41.40 Mscm of gas from the Rough Gas Facilities and exported it into the NTS via Easington Terminal and a further 432.83 Mscm was injected back into the reservoir for storage. The production of gas was in accordance with the regulated activities described within the Permits and Consents under which CSL operate.

CSL have reported 6 OPPC permit non-conformances to the regulator during 2022 considerably fewer than in previous years. CSL have implemented corrective and preventative actions to rectify and prevent recurrence of these events.

In 2022, CSL will continue to endeavour to operate within permitted limits and look for opportunities to improve their environmental performance and reduce their environmental impacts.

Appendix 1: Centrica Health, Safety, Environment and Security Policy

Centrica Health, Safety and Environment Policy

At Centrica our priority is to create an environment where an incident free workplace is possible, ensuring the wellbeing of our employees, the safety of our customers and the protection of the environment. All employees and business partners are required to comply with this policy and our commitments outlined below.

We are committed to:

- **Helping our customers** to move towards a low carbon future through our products and services
- **Assessing**, understanding and managing our HSE risks and impacts
- **Enabling** the creation of a positive culture holding each other accountable, helping us to: achieve our HSE goals; support business growth; and realise our vision of an incident free workplace and a low carbon future
- **Proactively** supporting employee health and safety, seeking ways to protect the environment, including the prevention of pollution, efficient use of resources and the reduction of waste and carbon emissions
- **Empowering and encouraging** personnel to work in a safe way, through effective consultation, to prevent injuries and ill-health
- **Intervening** if we believe that the work environment or task is unsafe or may cause environmental damage, or we see an unsafe act
- **Learning** from our successes and incidents, and freely sharing lessons with business partners
- **Working with stakeholders**, suppliers and business partners in the pursuit of good practice in HSE
- **Continually improving** and setting measurable objectives and targets in business plans to enhance HSE performance
- **Developing** and testing prioritised incident response and recovery plans to protect our people, the environment and minimize business impact
- **Ethically conducting our business** and complying with regulatory and other applicable requirements

Our HSE management system enables the delivery of these policy commitments, is structured in line with recognised good practice, and is routinely assured. Our performance is reviewed regularly and relevant results published.



Chris O'Shea
Group Chief Executive Officer
April 2020

centrica