2011 Environmental Statement
Talisman Energy (UK) Limited
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1 INTRODUCTION

This document is the 2011 Offshore Operations Environmental Statement for Talisman Energy (UK) Limited and Talisman North Sea Limited (together “Talisman”) as required under the Department of Energy and Climate Change guidance on the Oslo-Paris Convention (OSPAR) Recommendation 2003/5 to promote the use and implementation of Environmental Management Systems by the offshore industry. The purpose of this environmental statement is to provide our stakeholders with a high level overview of the environmental performance of the Company’s offshore operations in the UK. It covers emissions from our offshore operations, including those from our drilling programmes. Talisman Energy Inc., the parent company of Talisman, produces a broader report of its environmental, health, safety and social responsibility performance on an annual basis: The company’s current Corporate Responsibility Report is available on the Talisman website (http://www.talisman-energy.com/responsibility/cr_report.html).

The document also provides an overview of the scope of Talisman’s offshore operations on the UK continental shelf, a brief description of its environmental management system including the HSE policy, the setting of objectives and targets and performance tracking, a review of performance for the most significant environmental impacts associated with offshore operations for the company as a whole and for each installation, as well as summary tables with 2011 performance data for each installation and drilling operations.

If you would like any more information on any aspect of Talisman’s environmental management and performance, or you would like to provide feedback on this report, please email environment@talisman-energy.com.
2 UK OPERATIONS

Fields and installations

In 2011, Talisman produced oil and gas from 35 offshore fields and operated 11 offshore production installations (see Table 1); the location of the installations is shown in Figure 1.

Figure 1: Asset Map

Table 1: Fields and installations

<table>
<thead>
<tr>
<th>Field</th>
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<tbody>
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<td>015/17</td>
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</tr>
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* Not operated by Talisman therefore not included in report.

Table 2: Hydrocarbon export routes

<table>
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<th>Gas</th>
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<td>Via Montrose</td>
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<tr>
<td>Auk</td>
<td>Via Fulmar</td>
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<td>Frigg Pipeline</td>
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<td>Buchan</td>
<td>Forties Pipeline</td>
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<td>Clyde</td>
<td>Norpipe Pipeline</td>
<td>St Fergus Line</td>
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<td>Via Piper B</td>
</tr>
<tr>
<td>Tartan</td>
<td>Flotta Pipeline</td>
<td>Frigg Pipeline</td>
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</tbody>
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Oil and gas production

Oil reservoirs contain a mixture of oil, natural gas and water. A primary purpose of an offshore production platform is to separate out the extracted “well fluids” into these three separate components using separation vessels. Once the oil has been separated from the gas and water, it is pumped to shore via subsea pipelines; or, in the case of oil from the Ross and Blake fields, shipped to shore. The gas is dried and then compressed. Some of the gas, where possible, is used to generate power to run the process equipment and the remainder of the gas is exported via pipeline to the UK mainland (see Table 2), used for gas lift, or flared.

The proportion of oil, gas and water produced from reservoirs changes over time. Oil and gas production will decrease, and the volume of water will increase. The separated water, known as produced water, is treated to remove oil droplets prior to discharge to sea.

Drilling

As the fields mature and more information about the reservoirs becomes available, more wells may be drilled or existing wells may be revisited. This can be done either from the platform, or with mobile drilling rigs. Geological information and production tests determine how many wells are needed to produce the oil and gas effectively.
3 ENVIRONMENTAL MANAGEMENT

Talisman has an integrated Health, Safety and Environmental Management System (HSE MS). The environmental elements of the system have been independently verified as meeting the requirements of the Oslo-Paris Convention (OSPAR) Recommendation 2003/5 to promote the use and implementation of Environmental Management Systems by the offshore industry.

Minimise impact and continuous improvement

Talisman’s environmental commitment is outlined in its Global HSE policy (see Figure 2). All environmental aspects including climate change, air quality, water quality and waste are issues that receive constant attention to minimise Talisman’s environmental impacts. The environmental impacts from oil and gas exploration and production activities have been minimised as far as practicable through the design of the installations and modifications made to plant and process since.

Figure 2: Talisman Global HSE Policy

Talisman follows a 2-phase environmental management strategy. The first phase consists of the identification and characterisation of our environmental impacts to determine their significance and how to manage them. This considers local environmental sensitivities, company and legislative performance standards, and stakeholder concerns.

The second phase involves the development and implementation of environmental management strategies that are integrated with business and operational systems, and are in concert with all company performance improvement objectives: such as safety and installation integrity, and security of supply.
Targets and objectives

The Senior Leadership Team of Talisman sets annual regional and site-specific environmental targets. Each is set with a view to achieving the overarching objective of continuous improvement. To ensure all of Talisman’s installations work towards achieving the targets, a performance contract is agreed with the site leadership team and Talisman personnel.

Environmental performance is tracked using a set of performance indicators. Each site’s performance relative to its targets in areas such as Carbon Dioxide (CO\(_2\)) emissions, oil in produced water, hazardous chemical use, spills and waste management is monitored.

Permits and consents

Talisman’s conduct in the North Sea is governed by a range of legislation and the Company is required to hold a number of permits and consents that authorise it to operate. These permits and consents come with detailed operating conditions to which Talisman must adhere.

Talisman tracks the number of non-conformances (permit breaches) to measure the effectiveness of its systems, processes and procedures. Figure 3: Number of non-conformances illustrates the number of Oil Pollution Prevention and Control (OPPC) non-conformances when the oil concentration in produced water exceeded the permit limit of 100 mg/l. This shows an increasing trend which can largely be attributed to particularly challenging produced water chemistry issues on the Bleo Holm Floating Production Storage and Offload vessel (see Bleo Holm offshore performance on Page 7).

Figure 3: Number of non-conformances also illustrates the number of Offshore Chemical Regulations (OCR) permit non-conformances reported to the Department of Energy and Climate Change (DECC). OCR non-conformances occur when a chemical is used which is not on the permit or is used in a way that does not conform to permit conditions (e.g. exceeding set limits). Throughout 2011, Talisman continued to improve its systems and work closely with chemical suppliers to minimise the number of OCR permit non-conformances.
4 OFFSHORE PERFORMANCE

Climate change and air quality

Atmospheric emissions from offshore platforms include pollutants, and greenhouse gases. The main sources of atmospheric emissions from the platforms are power generation and flaring. Power generators run mainly on produced gas, with diesel used as a back-up fuel and for some small diesel engines.

The emissions of the greenhouse gas, CO$_2$, from combustion equipment and flaring are included in the European Union Emissions Trading Scheme (EU ETS). Figure 4 shows a reduction in (CO$_2$) emissions for the past four years.

The 2011 absolute emissions of pollutants and greenhouse gases for each offshore installation and drilling operations is provided in Table 3: Platform Data and Table 4: Drilling Data on pages 18 and 19 respectively.

Water quality

Talisman operations can affect water quality in a number of ways: the discharge of produced water, the operational use and discharge of oil and chemicals, and accidental discharge of oil or chemicals.

Produced water

Both the concentration and total quantity of oil in the produced water discharges are subject to governmental discharge consent under the Oil Pollution, Prevention and Control Regulations 2005. Figure 5 shows that Talisman’s oil in produced water discharges have been largely consistent. The site specific sections below provide more detail on individual performance.

In 2011, Talisman had OPPC permit consents in place for the discharge of 727 tonnes of oil in produced water and the maximum average concentration allowed under the permits is 30 mg/l. Figure 5 shows that Talisman successfully limited the total oil discharged to 314 tonnes with an average concentration of 16 mg/l.

Chemicals

The use and discharge of chemicals offshore is regulated by permits. Several chemicals used by Talisman are described as substitution chemicals (in other words candidates for substitution), because of their potential to harm the marine environment. Talisman is committed to reducing the use and discharge of substitution chemicals and Figure 6 illustrates a successful reduction since 2008. This is primarily due to the reduction of a specific inhibitor on the Bleo Holm; see the site section on page 7 for details.

Spills

Spill preparedness and prevention is a constant priority and is an integral part of each sites annual HSE Improvement. All spills are investigated to determine root causes and implement corrective actions to prevent recurrence.

Figure 7 shows that in 2011, Talisman had a total of 36 oil and chemical spills, or unpermitted discharges associated with its offshore platforms. This number represents a total mass discharge of 134 tonnes to the marine environment. This is an increase in both number and mass from 2010. The number of spills is up 16% from 31 however the significant increase is in the mass tonnage from 51 tonnes to 134 tonnes. This 163% increase is due to a sustained subsea hydraulic fluid release on Tartan. The total release from this occurrence equates to 90% of Talisman’s total tonnes released in 2011.

Waste disposal (excluding drill cuttings)

Waste materials generated offshore are segregated by type and shipped to shore for maximum re-use, recycling, or safe disposal by a licensed company in full compliance with UK waste legislation. Talisman actively pursues ways to manage our waste streams up the waste hierarchy; this involves taking advantage of opportunities to prevent, minimize, reuse, recycle, recover energy, or responsibly dispose of waste streams.

Targets are set to reduce the amount of waste sent to landfill and the amount of waste created is tracked. As shown in Figure 8, Talisman is reducing the proportion of waste material disposed to landfill sites by maximising the proportion of waste that is recycled or reused.
Auk

Field and installation
Talisman acquired Auk in December 2006. The Auk field is located 260 kilometres from the Aberdeenshire coastline in approximately 82 metres of water. The Auk platform consists of an eight-leg steel jacket supporting a superstructure that accommodates the production and drilling modules.

Climate change
Figure 9 shows that CO\textsubscript{2} emissions on Auk are consistent year on year but have increased slightly in 2011. This can be attributed to higher production and lower historic fuel gas system availability. The fuel gas system has been offline since 2008 which has led to an increase in flaring as Auk has no gas export route; in addition lack of fuel gas availability has increased diesel usage for power generation which is more emissions intensive than burning fuel gas. The fuel gas system was re-instated in October of 2011.

Water quality
Produced water
Figure 10 shows that the Auk platform has improved its produced water performance since 2008 with a slight increase from 2010 figures in 2011. Oil and water separation equipment (i.e., hydrocyclone and Induced gas flotation unit) used on board is performing well and a project is underway to install an additional hydrocyclone which will further reduce the concentration of oil in discharged produced water.

Chemicals
The amount of substitution chemicals used on Auk is relatively low and static (see Figure 11). Auk has only 2 permitted continuous discharge chemicals which are a demusifier and a corrosion inhibitor.

Spills
Auk had two small refined hydrocarbon spills in 2010 totalling 3.4 kilograms. This compares to zero uncontained spills in 2011 (see Figure 12).

Waste disposal
There has been a significant reduction in the percentage of waste sent to landfill from the Auk platform down to 11% in 2011 from 23% in 2008 (see Figure 13).
Bleo Holm

Field and installations
Bleo Holm is a Floating Production Storage and Offloading vessel, located approximately 58 kilometres from the Scottish coastline. Well fluids from Ross and Blake fields are processed and the oil is stored onboard before being offloaded by shuttle tanker. The gas is used for fuel, gas-lift, exported or flared.

Climate change
There was a decrease in CO$_2$ emissions from the Bleo Holm in 2011 (see Figure 14) compared to 2010 due to an extended planned turn around, and several unplanned shutdowns resulting from a power generation outage, pipework fabrication maintenance, and a gas lift line replacement.

Water quality
Produced water
The total tonnage of oil to sea has declined since 2008 due to close management of discharge quality and lower production. In contrast, the concentration of oil in water discharged has increased over the same period (see Figure 15). Bleo Holm continues to maintain its discharges below the monthly regulated permit limit, but scale formation has caused significant issues with discharge quality during periods of bad weather.

There have been significant improvements in chemical management of scale formation throughout the production and water treatment systems; however, even with inhibition, residual scale particles still impact the water treatment process. To improve oil in water performance, Talisman has completed tank clean out operations, hydrocyclone refurbishment, and is currently trialling a new demulsifier.

Final resolution of the scale formation issue requires an extended turn around for commissioning of a preheater and steam deaerator which is planned for 2013.

Chemicals
Counter to the improvements in the Bleo Holm’s mass of oil in water discharged; chemical usage has been historically high due to the need to inhibit the formation of calcium naphthenate and barium sulphate scale in produced water storage tanks. This scale form as a result of the commingling of the Ross and Blake production streams.

Ongoing chemical optimisation programmes have led to significant reductions in substitution chemical usage from over 1,000 tonnes in 2008 down to 574 tonnes in 2011 (see Figure 16). This is largely due to replacement of the substitution chemical, SD140, that has been historically used for controlling calcium naphthenate and barium sulphate scale with a less harmful alternative, SD140. The phase out of the inhibitor SD140 has been a priority issue as it accounts for approximately half of all Talismans’ substitution chemical usage.

Spills
Despite continued focus on spill prevention there were 3 chemical and 4 oil releases from the Bleo Holm in 2011 (see Figure 17). All of the oil releases were of very small quantity – under 18Kg in total and chemical spills totalled 950Kg consisting mainly of subsea hydraulic fluid losses. The total mass of fluid released in 2011 was slightly less than in 2010.

Waste disposal
The percentage of waste sent to landfill has been largely consistent year on year. An increase in work activities, including the storage tank clean out project mentioned above and the nature of the resulting wastes, led to a slight increase in 2011 when compared to 2010 (see Figure 18).
Buchan

Field and installations

Buchan Alpha is the host installation for the Buchan and Hannay fields, and lies in approximately 111 metres of water approximately 132 kilometres north east of Aberdeen.

Climate change

CO₂ emissions have remained broadly consistent since 2008 due to stable power demand requirements (see Figure 19). Within Talisman’s EU ETS regulated sites Buchan remains the lowest CO₂ emitter.

Water quality

Produced water

Buchan saw a sharp increase in oil in water concentration during 2011 due to initial complications with the Hannay wells which came back online towards the end of 2010 (see Figure 20). There was a minor increase in tonnage during 2011 compared with 2010 due to an increase in platform uptime and therefore produced water reinjection reaching maximum capacity as per design.

Chemicals

Buchan used 53 tonnes of Substitution chemicals during 2011 which is consistent with consumption since 2008 (see Figure 21). The slight increase in 2011 is mainly attributable to the use of a particular demulsifier on the Buchan process to aid oil and water separation. This demulsifier has since been changed following a three month trial which started in November 2011 with complete change out in April 2012; this will reduce the use of sub chemicals on Buchan by approximately 28 tonnes per year.

Spills

A focus on spill prevention has kept the number of spills low since 2008 (see Figure 22). There were 2 spills in 2011; 1 spill of 300 kilograms of hydraulic fluid, and another of 25 kilograms of oily water.

Waste disposal

Buchan saw an increase in waste sent to landfill from 32% in 2010 to 38% in 2011 (see Figure 23). This was due to an increase in 2011 activities that generated wastes not suitable for reuse or recycling.
Claymore

Field and installations

The Claymore Alpha installation is situated approximately 130 kilometres from the Scottish coastline in 111 metres of water. There are two structures in the Claymore field: the Claymore Production Platform, and the Claymore Accommodation Platform.

Climate change

$CO_2$ emissions from Claymore dropped from 2010 to 2011 (see Figure 24). This is due to an extended platform turnaround in 2011. Based on 2011 forecasts, without the extended shutdown, Claymore would have emitted a similar amount of $CO_2$ per unit of production as in 2010.

Water quality

Produced water

Claymore’s produced water quality improved markedly in 2011 due to the implementation of a specialist water super clarifier. This chemical is injected into the Claymore product line and has a significant effect on reducing the concentration of oil which is being discharged to sea. A trial of the same chemical will be run in 2012 on the Scapa line that ties into Claymore. If the trial is successful it will be utilised full time on the Scapa line and will thereby improve Claymore produced water quality.

Chemicals

Claymore used 385 tonnes of substitution chemicals in 2011 (see Figure 26); this is comparable with 2010 performance. Talisman is actively working with our chemical vendors to replace our substitution chemical burden with less harmful alternatives, specifically corrosion inhibitors, oxygen scavengers and demulsifiers. The extended turn around mentioned previously did not affect the amount of substitution chemicals used due to the requirement to inject more chemicals during an extended start up process.

Spills

Claymore did not match its 2010 spill performance experiencing 6 spills in 2011 as shown in Figure 27. Spill prevention continues to be a key improvement objective for all Talisman sites including Claymore.

Waste disposal

Using Talisman's current waste performance indicator of the percentage of waste to landfill, Claymore’s performance improved significantly in 2011 (see Figure 28). During 2011, several non landfill options for separate waste streams were identified and utilised.
Clyde

Field and installations
The Clyde field is located approximately 263 kilometres from the Northumberland coastline, in approximately 80 metres of water. The Clyde, Medwin, Leven and Orion fields are all produced over the Clyde installation.

Climate change
There was a slight increase in CO₂ emissions from the Clyde installation from 2010 to 2011 (see Figure 29). This is due to an increase in flaring.

Water quality
Produced water
Oil in produced water concentrations and the tonnes of oil discharged in produced water in 2011 were comparable to 2010 (see Figure 30). This is due to the similarity in terms of 2010 and 2011 plant uptime and production levels.

Chemicals
The use of substitution chemicals on Clyde was reduced significantly from 88 tonnes in 2009 to 52 tonnes in 2010 (see Figure 31). The figure for 2011 decreased by 1 tonne to 51 tonnes for the year, continuing the downward trend. This significant decrease in 2010 was primarily due to the phasing out of a substitution chemical, WAXTREAT 5003. Work continues to be done in conjunction with the chemical vendor to review all substitution chemical reduction opportunities on Clyde.

Spills
There were a total of 7 spills in 2011 compared to 8 in 2010. Out of the 7 spills in 2011, 6 were oil. The oil was mainly a mineral oil hydraulic fluid used for subsea controls. The amount of oil released reduced from 0.22 tonnes in 2010 to 0.13 tonnes in 2011.

Waste disposal
During 2011, Clyde reduced the percentage of its waste disposed to landfill by 6% from 2010 (see Figure 33).
**Fulmar**

**Field and installations**

The Fulmar field is located 255 kilometres east south east of the Aberdeenshire coastline in approximately 82 metres of water. Fulmar Alpha is a fixed offshore drilling, production and accommodation platform, with a bridge linked wellhead jacket.

**Climate change**

Figure 34 shows that CO$_2$ emissions from Fulmar rose in 2011 compared to the 2010. This increase was due to increased flaring resulting from the addition of the Auk North well gas in 2011. Process improvements are underway to use Auk North gas for power generation which will reduce Auk’s CO$_2$ emissions intensity by reducing the platform’s reliance on import gas and reducing total gas consumption.

**Water quality**

**Produced water**

There was an increase in the average concentration of oil in produced water from 6 mg/l in 2010 to 9.9 mg/l in 2011 (see Figure 35). This increase is also attributable to the aforementioned addition of the Auk North well through Fulmar. Improvements during previous turnarounds assisted with plant optimisation and reduced oil in water overboard concentrations for 2010 but with Auk North, flow rates have increased through the system leading to increased concentrations and oil mass. The amount of oil discharged in tonnes subsequently rose from 12 tonnes in 2010 to 24.5 in 2011. The concentration of mass of oil produced still remains low for Fulmar.

**Chemicals**

The use of substitution chemicals on Fulmar is relatively static year on year. The main substitution chemical used on Fulmar is a combined chemical that prevents scale and corrosion; there are many challenges associated with changing this chemical as the Fulmar and Auk reservoir has a unique scale type. Talisman continues to work with chemical vendors to replace or reduce this and other substitution chemicals.

**Spills**

Fulmar has sustained a significant reduction in the number spills since 2008 (see Figure 37). Fulmar had 2 spills in 2011 one of which being a 0.7 tonne diesel spill from a tank overflow; this incident was investigated and the lessons shared throughout Talisman.

**Waste disposal**

The percentage of total waste to landfill has been trending down since 2008; however, in 2011 there was a significant increase due to increased activities generating wastes not suitable for reuse or recycling (see Figure 38).
Montrose and Arbroath

Field and installations
Montrose Alpha is located 189 kilometres east of Aberdeen, in approximately 91 metres of water. The Arbroath platform is located 11 kilometres to the south and the Arkwright subsea development a further 11 kilometres south. The Brechin, Arkwright, and Wood subsea fields are tied back to the Montrose installation. The fluids produced on Arbroath are processed on Montrose therefore there is no flare or produced water discharge from Arbroath.

Climate change
Arbroath power is supplied from the Montrose platform; therefore, atmospheric emissions from Arbroath are negligible so its CO₂ emissions are not reported here.

CO₂ emissions from Montrose have reduced year-on-year since 2008 (see Figure 39), due to improved process management. Talisman has also made a significant investment to install a gas export line from Montrose, which now allows a proportion of the gas to be exported rather than being flared.

Water quality
Produced water
The concentration and mass of oil discharged in the produced water in 2011 was higher than 2010 but remains inline with 2008 and 2009 performance (see Figure 40) Improving the quality of the produced water discharged from Montrose continues to be a priority for Talisman. A key focus on the installation has been improving plant/process uptime which in turn encourages better oil in water separation. In addition to plant stability, Talisman is implementing enhancements to the produced water treatment plant, including repair, refurbishment and reinstatement of the settlement tank.

Chemicals
The amount of substitution chemicals used on the installation is relatively low (see Figure 41) with a total of 48 tonnes used on both Montrose and Arbroath in 2011. 2011 performance is in line with historic performance.

Spills
The total amount spilled has been consistently low between 2008 and 2011. Despite a focus on spill prevention, 4 spills occurred in 2011 which was consistent with the sites’ decreasing spill trend (see Figure 42).

Waste disposal
The total amount of waste to landfill generated in 2011 was 25% lower than in 2010 and inline with the sites’ decreasing trend. The reduction is down to increased training and awareness amongst the crew and improved practices to recycle and reuse as much waste as possible (see Figure 43).
Piper B

Field and installations

The Piper Field is located 155 kilometres north east of the Scottish coastline in 145 metres of water. Crude oil from the Piper, Chanter and Tweedsmuir fields are produced over the platform.

Climate change

Figure 44 illustrates that CO₂ emissions decreased between 2010 and 2011 due to careful energy management and plant optimisation resulting in reduced flaring.

Water quality

Produced water

Piper is Talisman’s largest contributor in terms of tonnes of oil discharged in its produced water and is therefore an area of considerable focus. 2011 saw an improvement in both oil in water concentration figures and the annual oil discharged when compared to 2010 performance (see Figure 45). This can be attributed to the optimisation of demulsifier, deoiler usage, and the hydrocyclone.

Chemicals

2011 saw an increase in substitution chemical usage onboard Piper from 169 tonnes in 2010 to 354 tonnes in 2011 (see Figure 46). This was due to two chemicals, which were already in use, being reclassified as substitution chemicals. These chemicals will now fall into Talisman’s substitution chemical reduction commitment.

Spills

Piper reported 3 spills in 2011 compared to 1 in 2010, however the associated quantity released decreased from 4.7 tonnes in 2010 to less than 0.4 tonnes in 2011 (see Figure 47). The spills consisted of an oil seep from a drain plug, a subsea loss of hydraulic fluid, and a residual diesel spill from a coupling.

Waste disposal

Piper’s 2011 waste performance has improved since 2008 reducing its percentage of waste sent to landfill to 20% in 2011 (see Figure 48).
Saltire

Field and installations

The Saltire Field is located about 200 kilometres northeast of Aberdeen in 145 metres of water. Crude oil from the Saltire and Iona fields are produced over the platform.

Climate change

Saltire power is supplied from Talisman’s Piper B platform; therefore, atmospheric emissions from Saltire are negligible and its CO₂ emissions are not reported here.

Water quality

Produced water

Oil in produced water concentrations and tonnages were slightly reduced in 2011 when compared to 2010 (see Figure 49).

Chemicals

As shown in Figure 50, substitution chemical usage is low on Saltire and has decreased since 2008. This decrease is largely due to the change out of a subsea hydraulic control fluid to a non substitution alternative.

Spills

Saltire spill performance has been consistently good (see Figure 51). There were zero spills to sea in 2011.

Waste disposal

Despite decreasing the amount of waste generated during 2011 when compared to 2010, Saltire sent a larger proportion of its waste to landfill (see Figure 52). This was due to an increase in the activities generating wastes not suitable for reuse or recycling.
Tartan Field and installations

The Tartan Alpha installation is situated approximately 140 kilometres from the Scottish coastline in water depths of 142 metres. The fluids from the Tartan, Duart, Galley, Petronella and Highlander fields are processed in two parallel production streams.

During 2007/2008, the Floating Production System on Galley was decommissioned and the field tied-back to Tartan with production from Galley re-started on the 1st of January 2009.

Climate change

CO₂ emissions in 2011 were lower than 2010 due to the extended turn around (see Figure 53). Based on 2011 forecasts, without the extended turn around, Tartan would have emitted a similar amount of CO₂ per unit of production as in 2010.

Water quality

Produced water

Figure 54 shows that despite an increasing overall trend there has been a significant decrease in both oil in water concentration and tonnage discharged in 2011. This was due to significant progress made in optimising the production separation facilities; this work will be ongoing during 2012.

Chemicals

Tartan substitution chemical usage in 2011 has been in line with and slightly lower than previous years at 158 tonnes (see Figure 55). The main reason for the decrease was the, replacement of a hydraulic fluid during 2011 with a less hazardous alternative.

Spills

Tartan Alpha had five spills to sea in 2011, the quantities spilled were low with the exception of one spill which resulted in a release of 120 tonnes of water based hydraulic control fluid during an ongoing subsea leak at Talisman’s Highlander well HS13 (see Figure 56).

Waste disposal

There was a higher percentage of waste sent to landfill in 2011 relative to historic performance due to the type and quantities of wastes generated during an extended turn around (see Figure 57).
Drilling operations
Ocean Princess

Mobile Offshore Drilling Unit
Talisman had one mobile drilling unit, the Ocean Princess, on contract until July 2011. A total of 3 wells were drilled from the rig in 2011.

The data reported in this section relates to drilling from the mobile drilling unit only. The data presented in figures 58-62 are for all mobile rigs on contract to Talisman since 2008. The environmental aspects of platform drilling (e.g. CO\textsubscript{2} emissions, spills and waste) are included in the site specific sections. However chemical usage by platform drilling is reported separately and included in the drilling operations data table (see Table 4 on page 20).

Climate change
Emissions from drilling operations are from consumption of diesel for power generation, and flaring during well testing. Two well tests were carried out in 2011 and emissions are small when compared to power generation. CO\textsubscript{2} emissions from diesel usage are illustrated in Figure 58 and show a consistent level since 2008 reflecting a relatively constant level of drilling effort.

Water and sediment quality
Water and sediment quality is potentially impacted from drilling operations from discharges of oil in produced water, cuttings, chemicals and accidental spills.

Produced water
Oil in water discharges from drilling operations only occurs during well testing. These discharges are very small when compared to platform production operations; however, Talisman continues to ensure these discharges are minimised. A total of 34.61 tonnes of oil was flared under permit in 2011.

Chemicals
The reduction in the number of substitution chemicals used during drilling operations, including platform drilling, continued to be a key focal area during 2011. Talisman is continuing to work closely with chemical vendors and the drilling contractors to replace a number of substitution chemical products with less hazardous alternatives. A total of 47 tonnes of substitution chemicals were used in 2011, but only 0.2 tonnes were discharged to sea.

Spills
During 2011, there were 2 spills from mobile rig operations which is an increase on 2010 but still a significant improvement on previous years (see Figure 59). Both of the spills in 2011 were due to liquid carry over during flaring operations; a total of 0.33 tonnes of oil was released. During 2011 a Site Spill Survey was conducted on the Ocean Princess to identify and action key spill risks which was part of a continued effort by Talisman and Diamond Offshore Drilling to reduce the number of spills to sea (see Figure 59).
Onshore waste disposal

Talisman works closely with its drilling contractors to minimise the amount of waste generated and sent to landfill during drilling activities. Total waste generated has decreased significantly since 2008 in line with a reduction in the number of wells drilled (see Figure 60). The proportion of waste disposed to landfill in 2011 increased slightly but is consistent with previous years (see Figure 61).

Oil Based Mud (OBM) cuttings

OBM cuttings are brought onshore for treatment and disposal. The cuttings are treated to recover and recycle the oil based mud. The cleaned solids are then disposed of to landfill. Figure 62 shows the amount of OBM cuttings from mobile rig operations disposed to landfill since 2008 has been variable. This is because the amount of OBM cuttings to landfill is dependent on the number and complexity of the wells drilled during any given year.

Talisman continues to trial the latest developments in drilling fluid technology to reduce the number of well sections that have to be drilled using OBM.
5 DATA TABLES

Table 3: Platform Data

(All figures have been rounded)

<table>
<thead>
<tr>
<th>Platform</th>
<th>Fuel gas (Te)</th>
<th>Diesel (Te)</th>
<th>Flaring (Te)</th>
<th>CO₂ (Te)</th>
<th>NOₓ (Te)</th>
<th>N₂O (Te)</th>
<th>SO₂ (Te)</th>
<th>CO (Te)</th>
<th>CH₄ (Te)</th>
<th>Non-methane VOC (Te)</th>
<th>Total volume (m³)</th>
<th>Total oil (Te)</th>
<th>Conc. (mg/l)</th>
<th>Total waste disposal (Te)</th>
<th>Scrap metal (% landfilled)</th>
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</thead>
<tbody>
<tr>
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Note: The table includes data such as fuel gas consumption, atmospheric emissions, discharges, spills, and waste disposal for various platforms. Each category is quantified with specific units and values, providing a comprehensive overview of operational data. The data is rounded for clarity and ease of reading.
### Table 4: Drilling Data

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