

Saltfleetby Wellsites

Environmental Permit Variation EPR/JB3107XB
Waste Management Plan

Angus Energy Weald Basin No 3 Limited

Project number: 60625790
60625790-ACM-XX-00-RP-WMP-R03

15/04/2021

Quality information

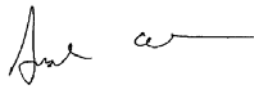
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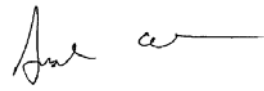
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Revision History

Revision	Revision date	Details	Authorized	Name	Position
00	25/02/2020	Initial Draft	20/04/2020	A Graham	Project Manager
01	15/01/2021	Final Draft	18/01/2021	A Graham	Project Manager
02	02/02/2021	Final Draft	02/02/2021	A Graham	Project Manager
03	14/04/2021	Amended to add 'Refining Activity'	15/04/2021	A Graham	Project Manager

Distribution List

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1. Report Context

1.1 Introduction

AECOM have been commissioned by Angus Energy Weald Basin No3 Limited (“the Operator” or Angus Energy) to prepare an application to vary the existing environmental permit (EPR/JB3107XB/T001) for the mining, extraction and transportation of natural gas and gas condensate from proven underground reservoirs at Saltfleetby Wellsites.

The application is being submitted to cover changes at the existing Gasfield which will facilitate the processing of natural gas to ensure it meets the quality requirements necessary to export the gas into the National Grid. This report details the Waste Management Plan for the site and should be read in conjunction with the other application documents.

1.2 Existing Facility

Saltfleetby ‘A’ and ‘B’ (“SFA”, “SFB”) onshore production sites were established in 1999. Both sites produce natural gas, water and condensate with two 6” pipelines connecting the SFA and SFB sites. A 10” pipeline transported hydrocarbons to the nearby Theddlethorpe Gas Terminal (TGT) for processing. Gas production at the site was suspended by then Operator Wingas Storage UK Ltd in 2017 due to the closure of TGT.

In November 2019, Angus Energy farmed into the licence and became the Operator of the field with the intention to restart production from the field following the installation of a new pipeline connection to National Grid transmission system (NTS). To facilitate the resumption of operations, the intention is to:

- Keep suspended three of the remaining wells (SF 5, 6 and 7) with the potential for sidetracking any one or all of them.
- Evaluate the commercial case for continued production from Saltfleetby 8 either with or without sidetracking.
- Examine the possibility of the utilising any two of the remaining wells for geothermal heat recovery; and
- Return the existing two producing wells to natural gas and associated condensate production.

1.3 Proposed Changes

Since 2017, the processing operations at the nearby Theddlethorpe Gas Terminal (TGT) has ceased. Therefore, to ensure the produced natural gas can be exported into NTS, Angus Energy also intend to:

- a) install natural gas and condensate processing facilities at SFB Site. This will indicatively include the modification to the existing first stage separator, a set of compressors, a passive dehydration system to remove water, a solid state Joule-Thomson valve allowing for a drop in pressure and temperature to remove heavy hydrocarbons, a condensate stabilisation tower, a new condensate storage unit, produced water storage, a metering and analysis skid, a fuel gas skid, an enclosed ground flare, and some associated pipework manifolding, comms and electrical ancillaries; and
- b) install up to 750m of pipeline from the existing TGT entry point to the new NTS connection point which is beyond the scope of this permit variation and
- c) Install power generation equipment to support the above facilities.

2. Scope of Document

The proposed activities fall under the scope of the Mining Waste Directive (2006/21/ EC) and as such the proposed operations will be regulated under the Environmental Permitting (England and Wales) Regulations (EPR) 2016 (as amended). Under these regulations, any extractive wastes generated as part of the site operations need to be managed in accordance with an approved Waste Management Plan (WMP).

The plan has been developed to ensure compliance with the requirements of Article 4 and 5 of the Mining Waste Directive 2006/21/EC, namely:

1. Pursuant to regulations implementing Article 4 of the Mining Waste Directive, to ensure that necessary measures are taken to ensure that extractive waste is managed in a controlled manner without endangering human health or harming the environment; and
2. Pursuant to regulations implementing Article 5 of the Mining Waste Directive to develop a WMP that facilitates minimisation, treatment, recovery and disposal of extractive waste, taking account of the principle of sustainable development.

In accordance with Article 5 (4) of the Mining Waste Directive, the plan is required to be updated at least every five years, or whenever a substantial change to the mining waste operation or the waste deposited occurs.

This WMP will supersede the previously submitted WMP documents (ref: WG-WMP-F.01 and WSUKL/SFB-7X/EA/WC/WMP-OO1 rev 3).

3. Site Description

3.1 Installation Boundary

The permit covers three discrete well sites in close proximity to each other:

- Saltfleetby A site;
- Saltfleetby B site;
- Saltfleetby B site extension.

The SFA and SFB sites are approximately 1km apart, connected by a two 6" 1km pipelines, located on either side of Saddleback Road. The installation boundary can be viewed on Drawing AE-SFB-EPR-002 (Application Section 10).

3.2 General Site Operations

Both wellsites currently comprise gas well infrastructure and are dominated by hardstanding of concrete, tarmac or compacted gravel. Each is surrounded by a security fence and, as regards SFB Site where processing will take place, there is a private access road with control barriers in place.

The following regulated activities take place across the two sites:

Table 1: Site Activities

Activity Reference	Activity	Description	Limits of the Activity
Installations			
A1	S5.1 A (1)(a): Incineration of hazardous waste in a waste incineration plant during a well test activity.	Well Testing using an enclosed flare for short term period to clean up well after drilling. Emergency flaring of waste gas from onshore gas production activities using an enclosed ground flare	From the receipt of waste gas into the enclosed flare to the dispatch of waste combustion gases. The flare operation is limited to emergency operation as a safety measure to facilitate the surface equipment maintenance.
A2	S1.2 A (1)(e)(i): The loading, unloading, handling or storage or, or the physical, chemical or thermal treatment of crude oil.	Production of fluids extracted from the resource formation, phase separation and storage of products (crude oil) and waste prior to onward transport.	From receipt of production fluids at the wellhead to the dispatch of products (condensate) and waste.
A3	S1.2 A (1) (a): "Refining of Gas Where This is Likely to Involve the Use of 1,000 or More Tonnes of Gas in a 12 Month Period"	Processing of natural gas incorporating separation, compression and dehydration prior to export from the site to NTS	From receipt of the natural gas at the wellhead to the export of gas to NTS.
Waste Operations			
A4	Mining Waste Operation	The management of extractive waste from production activities, not involving a waste facility. The management of extractive waste generated from well drilling, workovers and by decommissioning.	Covers the activities and waste types which are detailed in Sections 3 and 4 of this WMP.
Directly Associated Activities			
A5	Use of produced gas in generator to produce electricity.	Combustion of produced gas in engines permitted under the MCPD.	From the receipt of gas into the generators to the dispatch of combustion gases.
A6	Processing of natural gas during the well testing phase only.	Involves the processing of the extracted natural gas during the well testing activity operations.	Well test spread and associated pipework to flare system.

A detailed description of site operations is provided in the Technical Plan document (see document 60625790-ACM-XX-00-RP-TECH-R02). Operations will be undertaken in accordance with the Environment Agency Technical Guidance “Onshore Oil and Gas Sector Guidance” (23 Jan 2020).

3.3 Waste Generating Activities

3.3.1 Drilling

The wellbores already existing at SFA and SFB may require a short period of operations which will involve work-over of existing wells to reinstate the flow of natural gas or a sidetrack to target a new section of the formation.

If required, a sidetrack or work-over will be completed using either a drilling rig or truck-mounted workover rig respectively or similar equipment. Temporary surface installation equipment will include the use of an enclosed ground flare to combust any minor volumes of gas produced as the well is circulated and tested after a sidetrack drilling operation. Details of the extractive waste associated with drilling will be defined in the WR11 submission once detail design of the orientation, length and technique of the drilling is understood. However, for the purpose of estimation a 1.5km sidetrack has been used to estimate waste arisings.

3.3.2 Well Treatment & Clean up

On completion of the drilling phase, the well will be circulated to remove residual muds or debris from the drilling using fresh water or brine. The waste from the circulation run will be managed at surface using the same techniques as the drilling phase.

As a contingency to improve the flow of petroleum within the target formation, an acid, most commonly hydrochloric Acid (HCl) at 15% concentration with water, is applied to the formation through the wellbore. The operation is very much akin to acidisation of boreholes in the water well industry and results in high permeability channels through which gas can flow.

An acid wash is designed to remove scale or similar deposits from perforations and well-completion components. The acid wash can be used to repair formation blinding and help restore the natural porosity of the formation. An acid wash is applying the acid to the formation under pressure not exceeding the fracture pressure of the formation.

The proposed dilution of hydrochloric acid is 15%, which is circulated across the perforations using 1m³ of HCl solution per meter of perforation plus an initial 1m³ of HCl solution as a pre-wash. The process of washing the perforations is repeated until there is adequate clean-up of the perforation.

Following the washing of the perforations, HCl is then squeezed into the near formation, again at 1m³ of HCl per metre of perforation. The process may be repeated several times as necessary to ensure a reaction within the target formation has restored natural pathways.

The HCl is squeezed into the natural formation below the fracture gradient and will remain within the near wellbore target formation. The HCl primary and only objective is to reinstate natural permeability within the near target formation existing natural pathways. The operation will be repeated multiple times to target each isolated zone within the target formation.

The HCl reacts with the calcite through dissolution to produce Carbon Dioxide (CO₂), water (H₂O) and chloride ions (Cl). The chloride ions exist in the water and pair to form calcium chloride (CaCl₂).

If the well does not naturally flow to the surface a small amount of nitrogen (N₂) will be used to displace any liquids remaining in the tubing thus reducing the hydrostatic pressure to allow the well to flow. This is an inert gas which will be pumped from the surface via an inner coil tubing string in the completion tubing with returns occurring outside the inner coil back to the surface.

The gas will be managed as follows:

- Immediately following the artificial lift the gas will be primarily N₂ with small volumes of natural gas. This material will be cold vented through the flare to facilitate dispersion.
- As the lift operation progresses, the volume of natural gas will increase and N₂ levels will decrease to the point where the level won't blanket ignition. Once a suitable mix of natural gas to oxygen has been achieved the flare pilot light will ignite the waste gas stream. The flare pilot light will be continuously on and will ensure the gas is ignited as soon as it is physically possible to do so thus minimising the period cold venting will occur.

The use of N₂ is generally considered as closed loop as it is originally extracted from the atmosphere and the amount cold vented returns to the atmosphere.

3.3.3 Well Testing

Once the natural gas flows to surface, fluids will be diverted by temporary pipework to a three (3) phase separator, which will separate out condensate, natural gas and produced liquids. Condensate and produced liquids will be diverted via temporary pipework to dedicated storage tanks onsite for subsequent offsite removal for sale and disposal respectively. Condensate, which for clarity is not considered a waste, will be transported by a licenced haulier to a permitted refinery for sale. Produced fluid cannot be reused onsite and is therefore considered a waste.

Any natural gas during this short-term test will be diverted by temporary pipework to an enclosed ground flare located onsite for incineration. At the point of incineration, the natural gas is considered a waste. The duration of the well test is up to a maximum of 3 days per well following a sidetrack.

3.3.4 Workover

If a workover is required then it may be necessary to kill the well using an inhibited kill fluid (brine or freshwater pills) made up with sodium chloride (NaCl) corrosion inhibitor, biocide and oxygen scavenger. Typical material data sheets for these substances are provided in Appendix A.

The existing completion tubing would then be pulled out of the well and once the new completion tubing has been set and tested in the well, the rig will be moved off site and a clean-up / well test package will be rigged up.

The inhibited kill fluid behind the tubing will normally be left in place as a kill weight completion fluid to protect the tubulars, for safety and to maintain well integrity.

Once the well test is complete the well will be shut in and the well test package rigged down and taken off site.

In relation to waste materials generated as part of this process:

- The completion tubing which is removed from the well will be tested for the presence of naturally occurring radioactive materials (NORM) before being removed offsite for inspection. If possible, the tubing will be stored and used as a workstring on any future work-overs that require a small OD workstring. If the tubing is deemed to be of no further use it will be sold for scrap and recycling.
- If the tubing is found to contain NORM contaminants then it will be segregated in a secure sealed skip prior to removal to an appropriately licensed site for decontamination and subsequent recycling or disposal.
- Any recovered fluids such as cleaning fluids or kill fluids will be also tested for NORM contaminants prior to transfer to the stock tank. Material which is NORM-free will be taken offsite by road tanker for recycling or disposal at an appropriately licensed site.
- NORM contaminated materials will be transferred by tanker to an appropriately licensed waste site for treatment and disposal.
- Surplus gas produced as the well is brought back into operation will be burnt off by a temporary installation of an enclosed ground flare

3.3.5 Extractive Wastes from Production activities

During production activities extractive waste which may be generated comprises 'produced water' - traces of produced condensed and formation water which may be present will be extracted by a knock-out pot installed between the wellhead and the principal processing plant. This water will be collected to a suitable container (IBC or similar), tested for the presence of NORM contaminants and then removed as required from site for recycling or treatment at an appropriately licenced facility.

In addition to produced water, the gas will be subject to processing which comprises compression and dehydration stages to ensure the produced gas meets the qualitative specification to be able to be exported to the NTS. As an output of this process, condensate will be produced and temporarily stored in a tank at the southwest area of SFB. Condensate is a by-product of the process (i.e. not a waste) and will be exported for sale around 4 times per week. Note gas associated with the condensate will be used as fuel gas.

An emergency flare will be used on site and will operate as a safety measure or to facilitate the maintenance of the surface equipment on site. The emergency flare will be kept at a constant state of readiness with pilot light for ignition.

3.3.6 Plug & Decommissioning

Following cessation of production, the wells will be plugged and decommissioned on both site 'SFA' and 'SFB' and all plant and infrastructure will be decommissioned and removed. The general approach to well abandonment will follow the requirements in the "UKOOG Guidelines for the Suspension and Abandonment of Wells" and will generally include:

- Removal of downhole equipment using an appropriate drilling or work-over rig. Material removed will depend on the condition of the well at the time of abandonment but may include production tubing, downhole pumps and packers.
- The wellbore will be cleaned from fill, scale and other debris by flushing with a circulation fluid with sufficient density and physical properties to remove the debris.
- Setting of the necessary plugs and barriers at identified depths to act as permanent barriers. At this point the material used for the barrier is anticipated to be cement although other material such as grouts, non-porous polymers, non-porous formation materials (e.g. shale) or non-porous gel (e.g. bentonite, clay or polymer) may also be considered for use. Such materials will be selected from those approved in the "UKOOG Guidelines on Qualification of Materials for the Suspension and Abandonment of Wells".
- All surface equipment will be removed, and the pads filled in with earth from onsite stockpiles and replanted in accordance with an approved restoration scheme.

The final well abandonment approach will be developed at the time taking into consideration specific site conditions and the industry and regulatory standards in place at that time.

3.3.6.1 Extractive Wastes Generated

- The extracted tubing which is removed from the well will be tested for the presence of NORM before being removed offsite for inspection. If the tubing is found to contain unacceptable concentrations of NORM, then it will be segregated in a secure sealed skip prior to removal to an appropriately permitted site for decontamination and subsequent recycling or disposal. If possible, the tubing will be stored and used as a workstring on any future workovers that require a small OD workstring. If the tubing is deemed to be of no further use it will be sold for scrap and recycling.
- Circulation fluid which will be used to remove the fill, scale or debris from the well bore – this will be tested for the presence of unacceptable concentrations of NORM and stored in a designated storage tank prior to removal from site by tanker to an appropriately permitted waste treatment and disposal activity.
- Cement returning to the surface will temporarily be stored in skips before being sent off site to a permitted waste facility for reprocessing as aggregate. Cement returns will be kept to a minimum by minimising the amount used. Estimated quantities of cement waste are less than 20 m³ per well.
- Other well sealing/plugging materials as deemed necessary at the time of abandonment to ensure integrity of the barrier. This will be kept to a minimum and is expected to be less than 10 m³ per well.

3.3.6.2 Non-Extractive Wastes Generated

- The well head and surface valve arrangement will be removed and checked for the presence of NORM. Where necessary, the equipment will be sent for decontamination prior to either reuse where possible or where that is not feasible will be sent for recycling.
- All pipes, cables, ducting and services above the geotextile membrane will be disconnected, excavated and removed from the site. Where possible material will be recycled.
- Concrete installations will be broken up and removed for recycling.
- In appropriate weather conditions all hardcore will be removed for re-use or disposal.
- The geotextile membrane and impermeable linings will then be removed and sent for disposal.

All waste removed at this time will be removed to an appropriately permitted recycling, treatment or disposal facility.

3.3.7 Other Non-Extractive Waste Activities

Other wastes and activities likely to arise (the management explained in Section 4.3) include:

- waste generated during site preparatory works;
- any oils, fuels and lubricants greases that are used or may leak;
- fire waters generated as a result of a fire onsite; and
- general non-hazardous office wastes such as paper and cardboard.

3.4 Waste Management Areas

3.4.1 Mining Waste Operations

The regulations define a mining waste operation as the management of any extractive waste that falls within the scope of the Mining Waste Directive, including wastes generated as a result of prospecting activities.

The areas associated with storage and handling of extractive wastes including kill fluids, removed tubing or other well equipment at the time of abandonment will be treated as mining waste operations.

3.4.2 Mining Waste Facility

The Regulations define a mining waste facility as any area designated for the accumulation or deposit of extractive waste for the following retention time periods:

- >6 months for any area used for the storage of hazardous waste which is generated unexpectedly;
- >1 year for areas used for the storage of non-hazardous, non-inert waste;
- >3 years for areas used for the storage of unpolluted soil, non-hazardous prospecting waste, waste resulting from the extraction, treatment and storage of peat and inert waste; and
- No time period for areas used for the storage of expected hazardous waste (Category A Waste Facility).

Based on the proposed operations, it has been concluded that there will not be a mining waste facility at the SFA or SFB, on the basis that:

- non-hazardous extractive wastes will be generated from site work-over and abandonment operations and that storage of such materials on the site will not exceed the 1 year threshold;
- hazardous extractive wastes that are generated will be removed from site within 1 working week of production.

Waste may be in a solid state, liquid state, in a solution or suspension. At Saltfleetby, areas of the wellsites will be designated as follows:

Table 2: Waste Area Classification

Extractive Waste	Assessment	Activity Classification
Waste gas	Hazardous	Waste facility (M2)
Descaler	Non-hazardous	Waste facility (M4)
Dewaxer	Non-hazardous	Waste facility (M4)
Completion tubing	Non-hazardous	Waste facility (M4)
Recovered kill fluids	Non-hazardous	Waste facility (M4)
Produced water for disposal	Non-hazardous	Waste facility (M4)
Circulation fluids	Non-hazardous	Waste facility (M4)

* Activity type and code from EA Form guidance EPB: - Part B5 new bespoke mining waste operation permit

3.4.3 Assessment of the Facility in Respect of Category A Classification

The Mining Waste Directive (MWD) requires a justification to be provided as to why the Mining Waste Operations do not require designation as a Category A Mining Waste Facility. Annex III of MWD states that a mining waste facility shall be classified under Category A if:

1. A failure or incorrect operation (e.g. the collapse of a heap or the bursting of a dam) could give rise to a major accident, on the basis of a risk assessment considering factors such as present or future size, the location and the environmental impact of the waste facility; or

2. It contains waste classified as hazardous under the Directive 91/689/EEC above a certain threshold; or
3. It contains substances or preparations classified as dangerous under Directives 67/548/EEC or 1999/45/EC above a certain threshold.

In accordance with the MWD requirements, an assessment against each of these criteria is detailed below.

A. Failure or Incorrect Operation

Commission Decision 2009/337/EC provides that a Category A classification will apply if the predicted consequences in the short or long term of a failure due to loss of structural integrity or incorrect operation of the waste facility could lead to:

- a) non-negligible potential for loss of life;
- b) serious danger to human health; or
- c) serious danger to the environment.

In evaluating the waste facility at Saltfleetby, it has been concluded that:

- The risk in respect of point (a) and point (b) is insufficiently high as no people other than site workers operating the facility that might be affected are expected to be present permanently or for prolonged periods in the potentially affected area.
- In respect of point (c) the Mining Waste Facility is part of a fully engineered Gas Production Facility which is constructed on impermeable surfaces underlain by membrane. The tanks used for storage of condensate or treatment fluids (e.g. glycol) are constructed to appropriate tank standards with over pressurization and overflow protection and is situated within a concrete bunded area which can hold 110% of the tank capacity. The facility infrastructure is also subject to a robust inspection and preventative maintenance regime. As such, no potential source-pathway-receptor relationship between the facility and environmental receptors exists.

For the purpose of the assessment we have considered, with regard to structural integrity, the ability of the facility to contain the waste within the boundaries of the facility in the manner for which it was designed and all possible failure mechanisms. The evaluation of the consequences of the loss of structural integrity included both the immediate impact of any material transported from the facility and the resulting short- and long-term effects, over the lifecycle of the facility.

In respect of considering the impacts from incorrect operation of the mining waste facility, consideration was given to any type of operation which could potentially give rise to a major accident, including the malfunction of environmental protection measures and faulty or insufficient design. The impact of from the release of contaminants both in respect of short- and long-term releases included consideration of the operational period as well as the period following closure along with the potential reactivity of the waste.

B. Hazardous Waste Above the Threshold

MWD Article 7 states:

1. *"The threshold referred to in the second indent of Annex III of Directive 2006/21/EC shall be determined, as the ratio of the weight on a dry matter basis of:

 - a. all waste classified as hazardous in accordance with Directive 91/689/EEC and expected to be present in the facility at the end of the planned period of operations, and
 - b. waste expected to be present in the facility at the end of the planned period of operation.*
2. *Where the ratio referred to in paragraph 1 exceeds 50% the facility shall be classed as Category A.*
3. *Where the ratio referred to in paragraph 1 is between 5 and 50%, the facility shall be classed as Category A."*

Taking this into consideration at Saltfleetby, if for any reason the condensate or produced water is considered hazardous waste then is as such at the end of the planned period of operation, the potential hazardous waste contents of the tanks will be removed from site by road tanker for disposal at a suitably licensed third party waste treatment facility. The storage tank and associated pipework would also be cleaned and also removed from site as part of the site clearance process. Therefore, on this basis the Mining Waste Facility cannot be classed as a Category A facility.

C. Dangerous Substances Above the Threshold

Produced water and/or condensate are not envisaged to include any substances or preparations classified as dangerous under Directive 67/448/EEC or 1999/45/EC above the applicable thresholds.

Based on the above assessment against the three MWD criteria, it is therefore concluded that none of the mining waste operations on the site constitute a Category A Mining Waste Facility.

4. Waste Classification and Quantities

4.1 Introduction

Extractive and non-extractive waste streams produced as a result of site operations must be classified in accordance with the relevant regulatory requirements. Wastes will be classified according to their properties as follows:

- Inert Waste – waste which does not undergo any significant physical, chemical or biological transformations.
- Hazardous Waste - as defined by making reference to Article 1(4) of the Hazardous Waste Directive which lists the properties of wastes which render them hazardous.
- Non-hazardous waste – this is waste which is neither classed as inert or hazardous waste.

A description of the anticipated waste streams and estimates of waste arisings are presented in the sections below.

4.2 Extractive Wastes

Extractive wastes will consist of:

- recovered circulation fluids;
- recovered cleaning or kill fluids;
- drilling muds or fluids;
- used tubing;
- nitrogen; and
- waste gas.

The potential waste streams are detailed in Table 3 below and each waste will be subject to classification using WM3 Guide to the Classification of Hazardous Waste.

Table 3: Extractive Waste Summary

Item	Source	Description	EWC Code
Circulation Fluid	Well work-over and/or abandonment	Classification as hazardous or non-hazardous dependent on material used and will be confirmed with testing.	16 10 01 16 10 02*
Kill Fluids	Well work-over	sodium chloride (NaCl) corrosion inhibitor, biocide and oxygen scavenger.	16 10 02*
Milling	Well work-over	2.3/8" EUE N-80 completion tubing – steel composition.	16 01 17
Produced Water	Formation	Produced water removed by the knock-out pot this water will be tested for presence of NORM contaminants.	16 10 01* 16 10 02
Waste natural gas	Site Workover Emergency flare	Natural gas generated during site workover while gas flow is re-established. Natural gas which is combusted for safety purposes or to facilitate maintenance of surface equipment	16 05 04*
Cement Slurry	Drilling, Well abandonment	Cement slurry used during well plugging / sealing operations.	10 13 14
Other well sealing materials	Well abandonment	These may include <ul style="list-style-type: none"> • Grouts (e.g. sands and clays) • non-porous polymers, 	01 04 09 01 04 06 01 05 07

Item	Source	Description	EWC Code
		<ul style="list-style-type: none"> non-porous formation materials (e.g. shale) non-porous gel (e.g. bentonite, clay or polymer). Classification will depend on material used and composition	01 05 08 16 10 01
Condensate spillage	Storage and handling of condensate.	Small quantities associated with spillages.	13 08 99*
Residues from interceptors or bunds	Material removed from containment bunds or interceptors	Potentially include: <ul style="list-style-type: none"> solids oils oily water 	13 05 01* 13 05 06* 13 05 07*
Drill Cuttings	Generated during sidetrack drilling	Dependent on materials chosen (e.g. water based, oil based, containing barite or chloride)	01 04 07* 01 04 08 01 04 09
Drilling muds/fluids	Generated during sidetrack drilling	Dependent on materials chosen (e.g. water based, oil based, containing barite or chloride) but could include: <ul style="list-style-type: none"> acid wash returns spacer and suspension fluid pipe scale 	01 05 04 01 05 05* 01 05 06* 01 05 07 01 05 08

*European Waste Catalogue (EWC) Codes are provisional and will be confirmed prior to disposal/treatment.

All wastes will be transferred to a permitted recycling/treatment/disposal site using a registered waste carrier as required by the Environmental Permitting (England and Wales) Regulations 2016 (as amended).

The principles of the waste hierarchy will be applied in that all waste will either be reused or recycled following treatment.

4.3 Non-Extractive Wastes

Other wastes that may be generated due to site preparatory works and operations on site but not directly associated with drilling activities are summarised in Table 4.

Table 4: Non-Extractive Waste Summary

Item	Source	Description	EWC Code
Wellhead & surface valve arrangement	Site abandonment	Equipment which can potentially be reused following decontamination and inspection.	16 02 14
Pipes	Site abandonment	Used for transfer of natural gas, crude oil, produced water or treatment additives (e.g. corrosion inhibitor).	16 01 17 16 01 19
Cables and ducting	Site abandonment	Used for provision of services – likely to comprise steel ducting and electrical cables.	17 04 11 17 04 07
Construction wastes	Site work-over Site abandonment	This includes material that may be generated during site work-over and at time of the site abandonment. The material is likely to include: <ul style="list-style-type: none"> concrete Soils and stones 	17 01 01 17 01 07 17 05 04

Item	Source	Description	EWC Code
		<ul style="list-style-type: none"> Hardcore materials. <p>Material will be reused on site where possible.</p>	
Geotextile membrane / impermeable lining	Site abandonment	HDPE/LDPE/Geotextile materials which underlaid the site.	17 02 03
Surface water	Site Operations	<p>This category comprises a variety of different wastes including:</p> <p>a) Any rainfall (precipitation) will be collected in a perimeter drain surrounding the wellpad.</p> <p>b) Fire waters which will be collected in the perimeter ditch.</p> <p>Potential spills and possible pipework leaks. This will be contained in either an overall perimeter containment system or as an individual drip trays/secondary bunding arrangement.</p>	16 10 02
Dirty Water	Site Operations	<p>This may include:</p> <p>a) washdown water which will be collected and treated.</p> <p>b) foul water from site welfare facilities which will be collected separately and sent to the nearest EA registered off-site treatment facility.</p>	16 10 02
Lubricating oils and greases	Site Maintenance	Associated with the maintenance of the work over rig, site plant and associated equipment. The lubricants and hydraulic oils are anticipated to be mineral based and non-chlorinated. Separate storage areas with drip trays or secondary containment will be provided for all items and spill kits will be available to deal with any spillage.	13 02 05* 13 01 10*
Office/Canteen Waste	Site Operations	Separate bins (or enclosed skips) will be provided onsite for these wastes. The bins/skips will be collected by a private waste contractor, most probably on a weekly basis. It may be possible to recover paper or cardboard materials, and separate containers will be provided to collect these materials.	20 01 01 20 01 08

*European Waste Catalogue (EWC) Codes are provisional and will be confirmed prior to disposal/treatment.

4.4 Arisings Estimates

The following estimates of waste arisings have been made.

Table 5: Waste Arisings Summary

Activity	Waste Type	EWC Code*	Waste Classification	Waste Estimate	Management Route
Waste From Operations and Maintenance					
Produced Water	Aqueous Liquid	16 10 01* 16 10 02	Hazardous Non-hazardous	900 T per annum	Collected by contractor for offsite recovery / disposal
Excess Natural Gas	Gas	16 05 04*	Hazardous	2.2 MMscf/day	Combusted in flare
Condensate spillage	Aqueous liquid	13 08 99*	Hazardous	<1T per incident	Collected by contractor for offsite recovery / disposal
Residues from interceptors or bunds	Aqueous liquid Solids	13 05 01* 13 05 06* 13 05 07*	Hazardous	<10T per annum	Collected by contractor for offsite recovery / disposal
Wellhead & surface valve arrangement	Solid waste	16 02 14	Non Hazardous	<10T per annum	Collected by contractor for offsite recovery / disposal
Lubricating oils and greases	Aqueous liquid	13 02 05* 13 01 10*	Hazardous	<1T per annum	Collected by contractor for offsite recovery / disposal
Contaminated Surface water	Aqueous liquid waste	16 10 01*	Hazardous	800 T per annum	Tankered offsite by waste contractor for treatment and disposal
Dirty/Washdown Water	Aqueous liquid waste	16 10 02	Non-hazardous	1000 T per annum	
Sewage	Aqueous liquid waste	16 10 02	Non-hazardous	1000 T per annum	
Canteen Waste	Solids	20 01 08	Non-Hazardous	3T per annum	Collected by contractor for offsite recovery / disposal
Paper/Card from office	Solids	20 01 01	Non-Hazardous	5T per annum	Collected by contractor for offsite recovery / disposal
Packaging	Solids	15 01 06	Non-Hazardous	5T per annum	Collected by contractor for offsite recovery / disposal
Wastes From Potential Work Over, Sidetrack Work or Well Abandonment Activities					
Kill Fluids/Acid Wash	Aqueous Liquid	16 10 01*	Hazardous	50 T	Tankered offsite by waste contractor for treatment and disposal
Milling	Steel swarf	16 01 17	Non-Hazardous	1-2 tonnes per well	Collected and transported offsite for reclamation / treatment
Circulation Fluid	Aqueous Liquid	16 10 01 16 10 02*	Non-Hazardous Hazardous	50 T	Tankered offsite by waste contractor for treatment and disposal

Activity	Waste Type	EWC Code*	Waste Classification	Waste Estimate	Management Route
Cement Slurry	Waste concrete and concrete sludge	10 13 14	Non Hazardous	10 T	Collected and transported offsite for recycling.
Other well sealing materials	Aqueous Liquid or sludge	01 04 09 01 04 06* 01 05 07 01 05 08 16 10 01	Non-Hazardous Hazardous* Non-hazardous Non-hazardous	2 T	Tankered offsite by waste contractor for treatment and disposal
Drill Cutting	Solids	01 05 04 01 05 05* 01 05 06* 01 05 07 01 05 08	Non-hazardous Hazardous Hazardous Non-hazardous	1 T	Collected by contractor for offsite recovery / disposal
Drilling muds/fluids	Solids Sludges Aqueous Wastes	01 05 04 01 05 05* 01 05 06* 01 05 07 01 05 08	Non-hazardous Hazardous Hazardous Non-hazardous	1T	Collected by contractor for offsite recovery / disposal
Pipes	Solid waste	16 01 17 16 01 19	Non Hazardous	1T	Collected by contractor for offsite recovery / disposal
Cables and ducting & other maintenance waste	Solid waste	17 04 11 17 04 07	Non Hazardous	0.25T	Collected by contractor for offsite recovery / disposal
Construction wastes	Solid wastes including concrete, hardcore, soils and stone	17 01 01 17 01 07 17 05 04	Non Hazardous	5T	Reused on site where possible otherwise exported for offsite recovery.
Geotextile membrane / impermeable lining	Solid waste	17 02 03	Non Hazardous	50 T	Transported for recycling or disposal

* - mirror hazardous entry

+ European Waste Catalogue (EWC) Codes are provisional and will be confirmed prior to disposal/treatment.

4.5 Storage Arrangements

The arrangements for showing main waste types is presented in Table 6 below.

Table 6: Waste Storage Arrangements

Waste Type	Quantity	Storage Capacity	Containment Type	Storage Duration
<i>Waste From Normal Operations and Maintenance</i>				
Natural gas	15-30mins blowdown ~1250m ³	None to be flared	None to be flared	Intermittent/emergency
Produced Water	50 m ³	240 m ³	Storage tank	Up to 1 month
<i>Wastes From Potential Work Over, Sidetrack Work or Well Abandonment Activities</i>				

Waste Type	Quantity	Storage Capacity	Containment Type	Storage Duration
Kill Fluid	-	1m ³ IBC	1m ³ IBC	14 days
Circulation Fluid	-	1m ³ IBC	1m ³ IBC	14 days
Clean-up Fluid	10 m ³ per squeeze	1m ³ IBC	1m ³ IBC	14 days
Other materials such as concrete, tubing, metals, etc	-	Up to 40 cu,yd skips or containers	Skips or similar waste containers	Up to 1 month
Drill Cuttings	-	1m ³ IBC/tanks	1m ³ IBC/tanks	14 days
Drilling muds/fluids	-	1m ³ IBC	1m ³ IBC	14 days

5. Waste Management and Hierarchy Compliance

5.1 General

The activities will be conducted so as to prevent waste production wherever possible, reducing the quantities generated wherever possible / appropriate. In all cases the Waste Hierarchy will be applied, in order to reduce the amount of material sent to landfill for final disposal, applying recovery / recycling best practice where applicable / appropriate.

However, the nature of the operations giving rise to the extractive wastes which are the subject of this Plan means that it is in essence impossible to de-couple waste creation from the originating process. The site workover and abandonment processes are also subject to a degree of variation, and whilst every effort will be made to conserve natural resources, and therefore generate as little waste as possible, the precise rock / material characteristics encountered in the target reservoir will mean this is subject to change.

5.2 Drilling Fluids, Kill fluids and Circulation fluids

Drilling fluids, kill fluids and circulation fluids and drill cuttings will only be generated periodically and when in use will be temporarily stored in dedicated IBCs.

Filled IBCs containing the waste liquids will be removed to a permitted waste disposal/treatment facility. The ultimate end waste management route for the waste will be dependent on the material composition and it is anticipated that both materials will be transferred to an appropriately permitted facility for treatment and where possible recycling.

The IBCs will be retained within existing containment bunds and will be subject to weekly visual integrity inspections. All pumps, IBCs and connecting hoses / lines will be inspected daily.

5.3 Tubing

The completion tubing which is removed from the well during workover or will be tested for the presence of naturally occurring radioactive materials (NORM) before being segregated in a secure sealed skip prior to removal to an appropriately licensed site for decontamination and subsequent recycling or disposal.

The skips will be subject to daily visual integrity inspections.

5.4 Well sealing materials

Cement returning to the surface will temporarily be stored in skips before being sent off site to a permitted waste facility for reprocessing as aggregate.

Cement returns will be kept to a minimum by minimising the amount used. Estimated quantities of cement waste are less than 10 m³.

5.5 Collected Produced Water

Collected Produced water will be stored in an IBC or similar container prior to removal from site for recycling or disposal at an appropriately licensed facility.

The storage container will be subject to weekly visual inspections.

5.6 Excess Gas

Natural gas generated during the site well testing activities will be sent to the flare for combustion.

During the production phase natural gas, which due to safety or maintenance reasons, will be directed to the enclosed emergency flare for combustion. This will be short term and minor quantities of natural gas combustion based on the blowdown zoning. However, the primary purpose of the natural gas is to be processed and sent to the pipeline.

5.7

5.8 Other Wastes

Table 7: Other Wastes

Waste	Description
Surface water	<p>As per procedure 13.0 SALOPGEN002 'Surface Water Protection Plan' Surface water is only a waste if, when tested, it fails to meet the requirement to discharge offsite into the Lindsey Marsh Drainage Board water system. Any wastewater will be disposed at an appropriately permitted waste facility.</p>
Sewage	<p>Sewage will be collected separately and not mixed with any of the dirty/washdown water. Sewage will be disposed of via a sewer connection or if this is not possible a waste contractor will regularly collect any sewage (vacuum tanker) and transport it to an EA approved offsite treatment plant.</p>
Construction Wastes	<p>This material will comprise hardcore, crushed concrete, soils and stones which will be stored in designated stockpiles on site. The stockpiles will be subject to daily inspection and measures such as dampening will be used in the event that high levels of dust are observed.</p> <p>It is intended for this material to be reused on site where possible and in the event that material surplus to requirements is identified then this will be removed at site closure and taken a suitably permitted recovery facility.</p>
Removed equipment, cables, ducting and pipework.	<p>This material will be stored for a short period in designated areas of the site – small items such as cabling will be placed in skips while larger items will either be placed on pallets or stored on the ground underlain by impermeable liner before being loaded onto bulk wagons for removal from site.</p> <p>Storage areas will be subject to daily inspection. It is intended that these materials are removed from site and sent for reuse or recovery.</p> <p>Decontamination at an appropriately permitted facility will be undertaken as necessary prior to their onward use.</p>
Lubricating oils and greases	<p>There will be a range of lubricants, greases and hydraulic fluids stored on site. All containers will be clearly labelled to identify contents, toxicity and capacity of the storage containers. Daily inspections are required by the site rig crew to ensure any tanks used are not being overfilled.</p> <p>Waste materials or contaminated absorbents will be collected and stored in sealed containers and transported to a permitted treatment/recovery facility.</p>
Office/Canteen Waste	<p>Paper and cardboard can be recycled and will be put in a separate 'dry recyclables' bin.</p> <p>Canteen and kitchen wastes will involve putrescible materials (food waste) and will need their own separate bin. The waste will be collected by a private waste collection company and will most likely be sent for disposal.</p> <p>No waste is to be buried or burnt onsite.</p>

6. Environmental Risk Assessment

6.1 Method

An Environmental Risk Assessment has been prepared for the activity in support of this Environmental Permit application (document Impact Assessment Part 8). The assessment has been undertaken in accordance with the Environment Agency Guidance "Risk Assessment for Your Permit" (December 2020). Additional guidance for: mining waste operations', Version 2, February 2011.

This qualitative risk assessment has considered odour, noise, fugitive emissions, dust, air emissions, releases to water environment, waste, Global Warming potential, and potential for accidents and incidents as these relate directly to the activities.

The assessment concluded that with the implementation of appropriate risk management measures, potential hazards from the activities are likely to be insignificant.

6.2 Risk Score in the Context of the ERA

The ERA (ref document Impact Assessment, Application Part 8, Appendix A) provides details of activities and situation that may give rise to 'harm' and evaluates each if no mitigation or control measures are in place and then re-evaluates on the basis of implementing planned controls and mitigation measures. Risk ratings are determined based on the following:

Risk Score = probability of harm occurring x severity of the consequence

A mitigation score is then allocated on the basis of how effective the planned control and mitigations will be. The residual risk is then determined and the aim is to reduce this to a reasonably acceptable low level where risk cannot be eliminated,

6.3 Risk Mitigation

The Environmental Risk Assessment has identified all the potential hazards and pollutant linkages at the site relating to the management of the extractive waste, the risks they pose, and the risk control measures that Angus Energy will implement in order to mitigate those risks.

These risk control measures are considered to meet the requirements of the Mining Waste Directive, including the need to prevent water status deterioration and soil pollution.

There will be no deliberate discharges of extractive liquid waste directly to the environment from the site.

Measures to prevent the pollution of soil and accidental releases of waste which could cause pollution of surface water and groundwater have been considered, and mitigation measures within the environmental risk assessment implemented on site.

Mitigation measures are in place to prevent indirect discharges of extractive waste arising from accidents, leaks or percolation into the environment. The mitigation measures are documented with the environmental risk assessment.

The Environmental Risk Assessment details the proposed risk control and mitigation measures that Angus Energy will put in place at the Saltfleetby Wellsites.

7. Monitoring and accident/incident management

7.1 Monitoring and Recording

The Environment Impact Assessment (Application Part 8) coupled with the findings of the Site Condition Report (Application Part 7), demonstrates that, due to the nature of the waste to be generated and the proposed risk control and mitigation measures put in place, there will be no significant risk from mud, odour, noise/vibration, waste, air quality and emissions with global warming potential, or accidents at the site.

Accordingly, the amount of waste produced by the site sidetrack, work-over, production and abandonment operations will be monitored against generation predictions and recorded, such that minimisation actions can be reviewed (where appropriate), and the movement of what waste results may then be moved up the hierarchy, where applicable. Thus, recovery / recycling will be prioritised over final disposal.

In relation to wastes produced and managed at the site the following records will be maintained:

- Details of the processes producing the specific waste streams;
- Sampling and analysis of produced waters, flow back fluids, drill cutting and other waste materials where analysis is required to confirm the composition of the waste. In respect of any flow back fluids, each consignment will be sampled prior to disposal and a reference sample retained by the site;
- Details of the quantity of the individual waste streams including details of any waste gas/vapours which are combusted;
- Details of the properties of each waste type including the specific handling requirements;
- Ensuring the wastes are correctly classified and allocated the appropriate EWC code
- Selection of the appropriately licensed waste carrier and waste treatment facility. This will include periodic checks through compliance audits; and
- Completion of the relevant waste transfer note or hazardous waste consignment note and retention of the producer's copy on site.

This data recorded will be used to inform waste prevention and reduction strategies.

7.2 Flare Monitoring

Flare monitoring will be completed based on a calculation method as the flare is primarily used for emergency and maintenance purposes. During the planned well test after a side-track the flare will be utilised for a short period of time to clean up the well i.e., hours.

Due to the short term and intermittent nature of flaring the following will be monitored:

Table 8: Flare Monitoring

Parameter	Limit	Frequency	Method
Duration of flaring	Not set	Each use	Flare register
Oxides of nitrogen (as NO ₂)	Not set	Monthly	As per the Emissions Calculation Method
Carbon monoxide	Not set	Monthly	As per the Emissions Calculation Method
Total volatile organic compounds	Not set	Monthly	As per the Emissions Calculation Method
Benzene	Not set	Monthly	As per the Emissions Calculation Method
Toluene	Not set	Monthly	As per the Emissions Calculation Method
Ethylbenzene	Not set	Monthly	As per the Emissions Calculation Method
M-xylene	Not set	Monthly	As per the Emissions Calculation Method
P-xylene	Not set	Monthly	As per the Emissions Calculation Method
O-xylene	Not set	Monthly	As per the Emissions Calculation Method
Hydrogen sulphide	Not set	Monthly	As per the Emissions Calculation Method

Parameter	Limit	Frequency	Method
Hydrocarbons (C1 – C5)	Not set	Monthly	As per the Emissions Calculation Method
Flare gas feed rate	2500 Nm ³ /hr	Continuous	At reference conditions of 273K and 101.3 kPa as per method agreed with EA
Flare combustion temperature	> 800°C	Continuous	BS 1041-4: 1992
Visual display of flare	Not set	Continuous when in operation	Video feed as per method agreed with EA

7.3 Engine Monitoring

Engine monitoring will be completed when the generators are first brought into operation and then in accordance with the SR2018 No 7 permit, Table 3.2 as shown in Table 9 below.

Table 9: Engine Monitoring

Parameter	Limit	Frequency	Method
Oxides of nitrogen (as NO ₂)	95 mg/Nm ³	Every 3 years	At reference conditions 273.15 K and 101.3 kPa, after correction for water vapour at standardized O ₂ of 15%. In accordance with EA TGN M5.

7.4 Odour

Based on prior experience, the extractive waste that will be generated is not malodorous and nor are any of the associated processes that will be performed.

7.5 Noise and Vibration

A noise survey of background noise was completed in February 2020 in accordance with the methodology in BS 7445: 1991 "Description and Measurement of Environmental Noise". The survey demonstrated that the most typical background levels were around 37 dB during the day and 30 dB during the night.

The assessment of noise was completed for the operational equipment associated with the Saltfleetby 'B' site using the method BS 4142: 2014 + A1: 2019 Methods for Rating and Assessing Industrial and Commercial Sound.

Mitigation, in the form of acoustic enclosures, could reduce absolute sound levels by 15 dB. Given this reduction, the rating level would be no more than 35 dB at any location at any time. At this level, the specific sound may not be distinctive against the background sound and the +3 dB character penalty may not be applicable, resulting in a low rating level of 32 dB and no adverse or significant adverse impacts.

Given that background sound levels do typically drop to as low as 24 dB at night, and even lower in some cases there may appear to be a risk that adverse or significant adverse impacts occur at these times. However, BS 4142 states, "Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night." In the context of the assessment and based on professional judgement, rating levels of around 30-35 dB or lower are considered to be low, and absolute levels ought to be considered.

Given that the source of the sound is unlikely to be clearly identifiable (due to the distances from source to receivers and the visual masking of the site with trees and earth bunds), as well as the fact that typical background sound levels reach up to 40 dB at night, absolute external sound levels of 30-35 dB would therefore be considered to have a low impact on this basis.

On this basis no specific routine noise monitoring is proposed at this time.

7.6 Ambient Air Quality Monitoring

Ambient monitoring will be completed at 4 monitoring locations as shown on commissioning monitoring site plan in Appendix 3 of the Flare Appraisal and Design Report (WSUKL/SFB-7X/EA/WC/FAD-001 Rev

2. The monitoring will be completed in accordance with the permit, Table S3.3 as shown in Table 10 below.

Table 10: Ambient Monitoring

Parameter	Limit	Frequency	Method
Oxides of nitrogen	Not Set	Monthly	Diffusion tubes as per BS EN 13528 (Parts 1- 3 2002.3)
Sulphur dioxide	Not Set	Monthly	Diffusion tubes as per BS EN 13528 (Parts 1- 3 2002.3)
Carbon monoxide	Not Set	Monthly	Spot sampling
Methane	Not Set	Monthly	Spot sampling
Non-methane VOCs	Not Set	Monthly	Spot sampling

7.6.1 Fugitive Emissions Monitoring

Monitoring for the volatile organic carbons will be undertaken in accordance with the submitted Leak Detection and Repair (LDAR) plan using EN 15446 or equivalent monitoring method.

7.7 Water

7.7.1 Groundwater

Reinjection of produced water is not proposed and as such the site does not include any groundwater activities. No groundwater monitoring is proposed at this time.

7.7.2 Surface Water

Surface water will be managed and monitored in accordance with the Site Surface Water Management Plan (*Document SALOPGEN002*).

7.8 Complaints

Complaints will be recorded, investigated and responded to without delay as detailed in Section 6.2 Management Plan summary (ref: 60625790-ACM-XX-OO-RP-ENV-MMP-R002, Application Part 3).

7.9 Accident/Incident Recording

The environmental risk of an accident is predominantly associated with the potential for spillage of extractive wastes. Given that the site is constructed with an impermeable membrane (providing spillage containment), that pipework and storage areas will be inspected daily for leaks and damage and that the site is not situated in a Source Protection Zone, the environmental risk assessment has concluded that the risk of damage to the environment as a result of waste spillage is low.

By way of incidents relating to the management of waste, two response levels will be recognised:

- Firstly, should more waste than predicted be created, the reasons for this will be assessed, if necessary, and a lessons-learned exercise undertaken for future operations; and
- Secondly, should loss of control of waste occur, immediate containment plans will be put into action, based around transfer to interim containment in dedicated on-site containers, or containers brought to site under the (then) existing management contract(s).

7.10 Reporting of Monitoring Results

The results of this monitoring will be recorded and will inform the future monitoring. Details of all accidents, and our response, will be shared with the Environment Agency and other regulators as appropriate. The relevant sections of the Site Condition Report will be updated accordingly.

8. References

- Environment Agency: Onshore oil and gas sector guidance. January 2020.
- Oil & Gas Authority UK: Guidance for applications for suspension of inactive wells (2018)
- Onshore Oil and Gas UK: Guidelines for the Suspension and Abandonment of Wells (2015)
- Onshore Oil and Gas UK: Guidelines on Qualification of Materials For the Suspension and Abandonment of Wells (2015).

Appendix A Typical Material Safety Data Sheets

Appendix B Monitoring and Inspection

- 1) The quantity of waste arising each day will be monitored and recorded, along with the quantities despatched off-site for disposal.
- 2) Liquid and solid wastes from site workover and abandonment will be sampled at the first available opportunity when operations commences for chemical analysis and any other additional waste acceptance criteria requested by the offsite permitted waste facility.
- 3) Samples will be taken as required alternating between solids and liquids for the remainder of the work period. Changes in the chemical profile of the waste will inform decisions concerning future waste management arrangements and environmental risk control measures, as well as sampling and testing frequency.
- 4) The quantity of cement waste arising will be monitored and recorded, along with the quantities despatched off site to a permitted waste facility.
- 5) Waste production rates of non-drilling wastes will be monitored, and compared against generation predictions, as will off-site management routes, including the proportion of material sent for treatment (prior to recovery / re-use and/or hazard reduction) and landfill diversion
- 6) Pipework and associated storage tanks will be inspected daily
- 7) The results of monitoring will be recorded.

