BEST AVAILABLE TECHNIQUE SIGNPOSTING DOCUMENT

SCHEDULED ACTIVITY S1.2 A(1)(a): REFINING GAS WHERE THIS IS LIEKLY TO INVOLVE THE USE OF 1,000 OR MORE TONNES OF GAS IN ANY 12-MONTH PERIOD

REFERENCE DOCUMENTS: GASIFICATION, LIQUEFACTION AND REFINING INSTALLATIONS (EPR 1.02)
BEST AVAILABLE TECHNIQUES (BAT) REFERENCE DOCUMENT FOR THE REFINING OF MINERAL OIL AND GAS

BAT REFERENCE:	APPLICABLE BAT:	RELEVANT PERMIT SUBMISSION DOCUMENT:	COMMENTS:
GASIFICATION, LIQUEFACTION AND REFINING INSTALLATIONS (EPR 1.02)			
Managing your activities - Accident management	Design process control systems to include provisions for a safe shut-down with minimum emissions from the unit involved. During unplanned operational upsets, these provisions should guarantee that feed supply is controlled or terminated followed by pre-programmed automated activating of pumps, relief systems, purging systems, flares and other equipment. Where necessary for key plant an uninterrupted power supply should be guaranteed.	Safety Management System Environmental Management System	Pollution Accident Management Plan and Site Emergency Response Plan in place to minimise any potential environmental impact from spillages should they occur. Site Emergency Response Plan outlines emergency response actions to be undertaken including activation of the emergency shut down process. Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment. Electrical power will be imported from the electricity grid with back-up electrical power supplied from on-site power generation equipment where required.
	Have standing emergency procedures to address emergency situations which could lead to direct spills occurring in parts of the plant which are neither fully contained nor fully automated (such as pipeline or tank bottom rupture). These will minimise and contain the spills, followed by rapid clean-up.	Safety Management System Environmental Management System	Pollution Accident Management Plan and Site Emergency Response Plan in place to minimise any potential environmental impact from spillages should they occur. The Wellsite is underlined by an HDPE Liner providing Secondary and Tertiary containment. Storage tanks are contained within containment bunds to contain any spillages should they occur.
Managing your activities - Efficient use of raw materials and water	Implement water use management programmes, facilities and training to prevent or reduce excessive use, accidental spills and leaks, including arrangements to transfer known spillages or leaks directly to oil recovery processes, not via the drains. E.g. using tankers to draw light hydrocarbons from drain traps and manholes.	Site Condition Report	Surface Water Management Plan in place for the management of surface run-off water collected within the perimeter containment ditch. Surface run-off water is treated via a Class 1 Interceptor prior to discharge from site. Surface Water Management Plan in place for the management of surface run-off water collected within secondary containment bunds. Surface run-off water from secondary containment bunds is processed within the wellsite. Surface run-off water from secondary containment bunds is not permitted to be discharged to surface or ground. Where required, surface run-off water will be transferred offsite by a licenced waste carrier for onward treatment and/or disposal. Sumps are installed within containment bunds and tanker bays for the collection of spillages with fluids transferred via pump to storage tank for recovery process. The Wellsite is underlined by an HDPE Liner providing Secondary and Tertiary containment. Operational controls, competence and supervision should prevent overfilling of storage tanks. Site Maintenance. Inspection and Testing Procedures in place.
Managing your activities - Avoidance, recovery and disposal of waste	Provide dedicated areas for the holding and collection of solid waste, avoiding cross contamination of wastes or the mixing of incompatible materials.	Not Applicable	No solid wastes anticipated from the gas refining process.

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Managing your activities - Avoidance, recovery and disposal of waste (cont.)	Avoid storing wastes of particular environmental sensitivity, such as halogenated organics, unless the materials are fixed or otherwise rendered harmless. High temperature incineration may be a preferred option. All substances produced by the process and disposed of to land on or away from the site should be handled and conveyed to prevent spillage, dust release or the generation of odours.	Waste Management Plan	Non-extractive wastes will not be treated at the wellsite. They will be segregated and stored according to their EWC Code pending collection by a licenced waste carrier for onward treatment and/or disposal. All wastes will be handled, stored or transported in accordance with applicable SDS's, manufacturer's guidance and legislation. Where waste natural gas is produced, for example via maintenance operations, the waste gas will be sent to the onsite enclosed ground flare which will incinerate the waste gas. The onsite enclosed ground flare (UF10) has been determined as BAT and permitted by the Environment Agency.
	Provide hard surfacing in areas where accidental spillage may occur, e.g. beneath prime movers, in storage areas, and in loading areas. The surfacing should be impermeable to process liquors. This also applies to tank bund floors. This facilitates recovery and clean-up operations and prevents penetration into the ground. The organic sludge should be recycled for processing (e.g. by filtration, centrifuging).	Site Condition Report	Pollution Accident Management Plan and Site Emergency Response Plan in place to minimise any potential environmental impact from spillages should they occur. Hard surfacing is provided within secondary containment bunds and road tanker loading bay to prevent escape of fluids. In the event of a spillage occurring within these areas, fluids will be contained to ensure remediation is undertaken effectively. The Wellsite is underlined by an HDPE Liner providing Secondary and Tertiary containment.
	Not allow potentially contaminated surface run-off to drain into the ground. Particular care is needed in areas of inherent sensitivity to groundwater pollution. Surface/above-ground drains are preferred to facilitate leak detection (and to reduce explosion risks).	Site Condition Report	Surface Water Management Plan in place for the management of surface run-off water collected within the perimeter containment ditch. Surface run-off water is treated via a Class 1 Interceptor prior to discharge from site. Surface Water Management Plan in place for the management of surface run-off water collected within secondary containment bunds. Surface run-off water from secondary containment bunds is processed within the wellsite. Surface run-off water from secondary containment bunds is not permitted to be discharged to surface or ground. Where required, surface run-off water will be transferred offsite by a licenced waste carrier for onward treatment and/or disposal. Sumps are installed within containment bunds and tanker bays for the collection of spillages with fluids transferred via pump to storage tank for recovery process. The Wellsite is underlined by an HDPE Liner providing Secondary and Tertiary containment. Operational controls, competence and supervision should prevent overfilling of storage tanks. Site Maintenance. Inspection and Testing Procedures in place.
Managing your activities - Odour	Vent all odorous releases regardless of size (e.g. instrument purge lines) via suitable traps.	Not Applicable	No odours anticipated from the gas refining process.
	Provide a blanketed fixed roof emergency tank for off-specification or unstabilised/unsweetened condensate;	Not Applicable	No condensate anticipated from the gas refining process.
	Have closed effluent systems vented to flare.	Waste Management Plan	Effluent will be transferred to storage tank for offsite disposal. Any odour generated will be scrubbed via a VOC carbon filter system prior venting.

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Managing your activities – Odour (cont.)	Have arrangements to collect and treat any spills of unsweetened condensate immediately with sodium hydroxide.	Not Applicable	No condensate anticipated from the gas refining process.
Operations - On-shore oil production	Prevent or minimise the release of VOCs. Associated gas should be put to constructive use wherever possible.	Waste Gas Management Plan	Associated gas will be utilised in accordance with the Waste Gas Management Plan. Where there is potential for waste gas, this will be incinerated via the onsite enclosed ground flare (UF10) which has been determined as BAT and permitted by the Environment Agency.
	Burn surplus sweet gas on sites other than isolated wellheads with only storage facilities, using a well designed enclosed smokeless ground flare or incinerator.	Not Applicable	No surplus of sweet gas anticipated from the gas refining process.
	Minimise the quantities of gas to be flared or incinerated by using best available techniques, including appropriate plant selection and design, operating methods and field management.	Waste Gas Management Plan	Associated gas will be utilised in accordance with the Waste Gas Management Plan. Where there is potential for waste gas, this will be incinerated via the onsite enclosed ground flare (UF10) which has been determined as BAT and permitted by the Environment Agency.
	Provide a high pressure enclosed smokeless ground flare in the event of a major depressurisation on sites with complex gas handling or processing operations.	Waste Management Plan	The onsite enclosed ground flare (UF10) has been determined as BAT and permitted by the Environment Agency.
	During planned depressurisations, minimise the quantity of gas released by depressurising as much as possible through the process before flaring the remaining gas.		The process is incorporated in to site procedures, for example, Site Maintenance. Inspection and Testing Procedures.
	Re-inject produced water into the same oilfield, either to a producing formation as part of the reservoir pressurising system or to a disposal well.	Waste Management Plan	Produced water is transferred offsite by a licenced waste carrier to a nearby oil and gas wellsite operated by a different Operator where it is re-injected into an oil bearing reservoir for production support. Environmental Permits are in place for the receipt and re-injection of the produced water at the receiving wellsite.
Operations – Oil refining - Odorising of natural gas	For Gas Separation Processes, prevent any release of odorant to any environmental medium during storage and handling (e.g. blanket storage).	Waste Gas Management Plan	Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment.
	Use amine scrubbing for hydrogen sulphide capture. A combination of common and individual scrubbers may be required.	Waste Gas Management Plan	Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment. No hydrogen sulphide encountered to date and none anticipated.
Operations - Natural gas refining	Minimise frequency of pig/sphere use by operating sea-lines at high velocity where practicable, i.e. use "mist flow" conditions, minimise recovery of spheres by use of receivers holding several devices and use of vent receivers of high pressure gas to a low pressure part of the process for gas recovery by recompression, before opening for access to pig/spheres.	Not Applicable	Sea-lines – Onshore operation only therefore not relevant. Pigging identified later within this document.

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Operations – Utilities - Flares	Use flaring as a safety system (start-up, shutdowns & emergencies).	Waste Gas Management Plan	Site Emergency Response Plan outlines emergency response actions to be undertaken including activation of the emergency shut down process. The onsite enclosed ground flare (UF10) will be utilised as an emergency flare and has been determined as BAT and permitted by the Environment Agency.
	Use a flare control system with a response sufficiently fast to avoid unnecessarily leaving steam injection running in order to anticipate flaring events.	Waste Gas Management Plan	The onsite enclosed ground flare (UF10) has been determined as BAT and permitted by the Environment Agency. Flare fitted with auto-ignition system.
	Ensure smokeless and reliable operation.	Waste Gas Management Plan	The onsite enclosed ground flare (UF10) has been determined as BAT and permitted by the Environment Agency.
	Minimise flaring by a suitable combination of: • management information systems and instrumentation; • balancing the refinery fuel gas system; • installing a gas recovery system; • using high-integrity relief valves; • applying advanced process control.	Waste Gas Management Plan	Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment. Associated gas will be utilised in accordance with the Waste Gas Management Plan. Where there is potential for waste gas, this will be incinerated via the onsite enclosed ground flare (UF10) which has been determined as BAT and permitted by the Environment Agency.
	Reduce relief gas to flare by management/good housekeeping practices.	Waste Gas Management Plan	Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment. Associated gas will be utilised in accordance with the Waste Gas Management Plan. Where there is potential for waste gas, this will be incinerated via the onsite enclosed ground flare (UF10). The onsite enclosed ground flare (UF10) system is monitored and managed onsite.
Emissions and monitoring - Emissions to water – Natural gas refining	Consider the following techniques in sequence to control releases to water: • minimise the quantity and contamination level of formation water to be treated onshore and control it at source "at source", i.e. off-shore. Measures include off-shore drying, minimising the use of dehydrating agents, using low toxicity corrosion inhibitors and improved field management, e.g. preventing "shock" pollutant loads arriving on-shore; • use a three phase separator on the liquids from the slug catcher to control and minimise hydrocarbon content of the aqueous phase; • treat sour condensate in a sour water stripper first; • separate process effluent from glycol or methanol regeneration plants and any other high BOD/COD effluents from other streams, e.g. surface water, and treated before discharge to the site effluent system	Waste Management Plan	Three-phase separation in use. Produced water is transferred offsite by a licenced waste carrier to a nearby oil and gas wellsite operated by a different Operator where it is re-injected into an oil bearing reservoir for production support. Environmental Permits are in place for the receipt and re-injection of the produced water at the receiving wellsite. Chemicals used within the refining process will be contained within the process. Where required, end of life chemicals will not be treated at the wellsite. They will be segregated and stored according to their EWC Code pending collection by a licenced waste carrier for onward treatment and/or disposal. All wastes will be handled, stored or transported in accordance with applicable SDS's, manufacturer's guidance and legislation.

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Emissions and monitoring - Emissions to water – Effluent treatment	Observe and control effluent treatment plants from production control rooms;	Not Applicable	No effluent treatment plants anticipated. No emissions to water will be undertaken.
	Maintain API and plate separator units to a high standard: • plate packs should be kept clean / undamaged; • level control/oil skimming systems should be frequently checked and adjusted to operate as designed.	Not Applicable	No effluent treatment plants anticipated. No emissions to water will be undertaken.
Emissions and monitoring - Emissions to water – Effluent treatment (cont.)	Improve the performance of separators and reduce water loads on recovery plants by using advanced skimming techniques such as disc-type devices. Low shear pumps should be used to deliver effluent collected in the main inlet sump to the primary separator to avoid oil globule break -up and emulsion formation, with subsequent flow through the plant by gravity.	Not Applicable	No effluent treatment plants anticipated. No emissions to water will be undertaken.
	Include arrangements to adjust the pH by appropriate acid or alkali additions to lie between 7 and about 8.5 to maintain optimum biomass conditions. Facilities to add alkali to correct acid pH should be provided to deal with acidic excursions.	Not Applicable	No effluent treatment plants anticipated. No emissions to water will be undertaken.
	Provide pollutant balancing.	Not Applicable	No effluent treatment plants anticipated. No emissions to water will be undertaken.
	Separate "once-through" cooling water from any effluent streams containing significant amounts of suspended or dissolved pollutants in order that these may be treated as appropriate, unless you can demonstrate that this will give no environmental benefit. Continuing to rely on this cooling method for existing refineries can only be justified if you take due care to prevent oil or other hydrocarbons being in returned cooling water. Appropriate measures include high grade cooling tube/plate materials to avoid corrosion failures, adequate preventative maintenance and effective monitoring for the presence of oil in cooling water returns with immediate action if it is detected.	Not Applicable	No effluent treatment plants anticipated. No emissions to water will be undertaken.
	Minimise releases of VOCs to air from effluent systems by keeping the light hydrocarbon content of waste waters to a minimum and by covering as much of the ETP as possible, especially the primary and secondary units which contain the most free hydrocarbons.	Not Applicable	No effluent treatment plants anticipated. No emissions to water will be undertaken.
	Install fully developed treatment (primary + secondary + tertiary) for complete or partial complex refineries, with tertiary stage BAT being a biological treatment process. Fully developed treatment may also be BAT on simple refineries, but this will depend on circumstances and primary + secondary treatment may be acceptable in some cases.	Not Applicable	No treatment anticipated. No emissions to water will be undertaken.

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Emissions and monitoring - Emissions to water – Bunds	Ensure that areas where spillages are most likely, including any pig receiving facilities on pipelines, process plants, storage tanks, sampling and loading points, are bunded or kerbed and drain to sumps from which oily sludge, spillages etc. can be removed, preferably to recovery plants. The composition of any wastes collected should be checked prior to treatment or disposal.	Site Condition Report	Pollution Accident Management Plan and Site Emergency Response Plan in place to minimise any potential environmental impact from spillages should they occur. Surface Water Management Plan in place for the management of surface run-off water collected within secondary containment bunds. Surface run-off water from secondary containment bunds is processed within the wellsite. Surface run-off water from secondary containment bunds is not permitted to be discharged to surface or ground. Where required, surface run-off water will be transferred offsite by a licenced waste carrier for onward treatment and/or disposal. Hard surfacing is provided within secondary containment bunds and road tanker loading bay to prevent escape of fluids. In the event of a spillage occurring within these areas, fluids will be contained to ensure remediation is undertaken effectively. Storage tanks are contained within containment bunds to contain any spillages should they occur. Sumps are installed within containment bunds and tanker bays for the collection of spillages with fluids transferred via pump to storage tank for recovery process. The Wellsite is underlined by an HDPE Liner providing Secondary and Tertiary containment.
	Bund floors and walls should be impermeable to water and to the materials in tanks and pipelines within the bund.	Site Condition Report	Hard surfacing is provided within secondary containment bunds and road tanker loading bay to prevent escape of fluids. In the event of a spillage occurring within these areas, fluids will be contained to ensure remediation is undertaken effectively. Bund walls constructed in accordance with CIRIA C736 Guidance.
	Fit high level probes and alarms to bunds that are not frequently inspected, based on a risk analysis.	Waste Management Plan	Wellsite is manned 24/7 with periodic checks undertaken of the secondary containment bunds.
	Recycle recovered oil by steam heating it to break down oil/water emulsions. The aqueous phase should be returned to treatment while the hydrocarbons should be recycled or used as fuel for heaters or furnaces.	Waste Management Plan	Where practicable, oil recovery within the process is undertaken using various techniques. Where mixtures of oil / water are recovered, these are processed through the settlement tank to separate oil / water. Where required, hot washing operations are undertaken to maximise production and also maintain process lines and equipment.
	Not use pipelines, vessels or tanks that have leaked into a bund until they have been repaired.	Environmental Risk Assessment	Leak Detection and Repair Plan in place.

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Emissions and monitoring - Emissions to water – Bunds (cont.)	Note that mineral oils and hydrocarbons are List 1 substances controlled under the Groundwater Regulations 1998 and must be prevented from entering groundwater. The design, operational management and performance, maintenance, inspection and repair of bunds as a key issue in meeting this requirement.	Site Condition Report Waste Management Plan	Pollution Accident Management Plan and Site Emergency Response Plan in place to minimise any potential environmental impact from spillages should they occur. Surface Water Management Plan in place for the management of surface run-off water collected within the perimeter containment ditch. Surface run-off water is treated via a Class 1 Interceptor prior to discharge from site. Surface Water Management Plan in place for the management of surface run-off water collected within secondary containment bunds. Surface run-off water from secondary containment bunds is processed within the wellsite. Surface run-off water from secondary containment bunds is not permitted to be discharged to surface or ground. Where required, surface run-off water will be transferred offsite by a licenced waste carrier for onward treatment and/or disposal. Hard surfacing is provided within secondary containment bunds and road tanker loading bay to prevent escape of fluids. In the event of a spillage occurring within these areas, fluids will be contained to ensure remediation is undertaken effectively. Storage tanks are contained within containment bunds to contain any spillages should they occur. Sumps are installed within containment bunds and tanker bays for the collection of spillages with fluids transferred via pump to storage tank for recovery process. The Wellsite is underlined by an HDPE Liner providing Secondary and Tertiary containment. Site Maintenance. Inspection and Testing Procedures in place. Where necessary, construction remedial works will be undertaken to an agreed plan.
	Check the composition of any wastes collected prior to treatment or disposal. Wastes containing more than 0.1% oil are hazardous wastes according to the European Waste Catalogue. Rainwater collected from oil tank bunds should be discharged via an oil separator. Water from bunds of tanks containing other chemicals should not be disposed of via surface water drains or soakaways.	Waste Management Plan	Waste Assessment and Classification Procedures in place. Surface Water Management Plan in place for the management of surface run-off water collected within secondary containment bunds. Surface run-off water from secondary containment bunds is processed within the wellsite. Surface run-off water from secondary containment bunds is not permitted to be discharged to surface or ground. Where required, surface run-off water will be transferred offsite by a licenced waste carrier for onward treatment and/or disposal.
	Ensure that existing earth and clay bunds are fit for purpose. A thorough review of earth clay bunds is required. This should include: • bund and storage / process vessel / pipelines capacities; • bund wall design and construction (including thickness of engineered clay layer), strength, resistance to water-logging; • potential for slop-over in event of tank failure; • floor design and construction (e.g. confirmation of clay/impervious layer thickness and that it is compressed and not natural clay - subject to fissures), strength and stability;	Not Applicable	No earth or clay bunds are used. All bunds are constructed using reinforced concrete.

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Emissions and monitoring - Emissions to water – Bunds (cont.)	• hazardous waste removal (e.g. contaminated soils following loss of containment incidents within bunds); • design and operational arrangement for bund isolation and necessary regular drainage management of bunds; • confirmation that bund contents cannot be in hydrological contact with groundwater.	Not Applicable	No earth or clay bunds are used. All bunds are constructed using reinforced concrete.
Emissions and monitoring - Emissions to water – Drainage including rainwater	Contain and treat site drainage waters (including rainwater) from bunded or hard surfaced areas, and emergency fire water before release. They may have been contaminated with hydrocarbons and should be kept separate from clean storm water drainage and treated in an oily water treatment plant. The separated oil should be skimmed off and re-cycled to the process or removed to an oil recovery/treatment facility.	Site Condition Report	Pollution Accident Management Plan and Site Emergency Response Plan in place to minimise any potential environmental impact from spillages should they occur. Surface Water Management Plan in place for the management of surface run-off water collected within the perimeter containment ditch. Surface run-off water is treated via a Class 1 Interceptor prior to discharge from site. Surface Water Management Plan in place for the management of surface run-off water collected within secondary containment bunds. Surface run-off water from secondary containment bunds is processed within the wellsite. Surface run-off water from secondary containment bunds is not permitted to be discharged to surface or ground. Where required, surface run-off water will be transferred offsite by a licenced waste carrier for onward treatment and/or disposal. Hard surfacing is provided within secondary containment bunds and road tanker loading bay to prevent escape of fluids. In the event of a spillage occurring within these areas, fluids will be contained to ensure remediation is undertaken effectively. If required, the Wellsite, including secondary containment systems can contain fire-fighting water / cooling water and if necessary, will be transferred offsite by a licenced waste carrier for onward treatment and/or disposal. The Wellsite is underlined by an HDPE Liner providing Secondary and Tertiary containment.
	Discharge treated drainage waters from small sites to a ditch, soakaway or other suitable watercourse but in some circumstances (e.g. on complex sites with large hard surfaced catchment areas) it may be preferable to re-inject into the oilfield for all but the severest storm event.	Site Condition Report	Surface Water Management Plan in place for the management of surface run-off water collected within the perimeter containment ditch. Surface run-off water is treated via a Class 1 Interceptor prior to discharge from site. Surface Water Management Plan in place for the management of surface run-off water collected within secondary containment bunds. Surface run-off water from secondary containment bunds is processed within the wellsite. Surface run-off water from secondary containment bunds is not permitted to be discharged to surface or ground. Where required, surface run-off water will be transferred offsite by a licenced waste carrier for onward treatment and/or disposal. If required, the Wellsite, including secondary containment systems can contain storm water and if necessary, will be transferred offsite by a licenced waste carrier for onward treatment and/or disposal. The Wellsite is underlined by an HDPE Liner providing Secondary and Tertiary containment.

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Emissions and monitoring - Emissions to water – Drainage including rainwater (cont.)	Provide storm/fire surge containment including arrangements to overflow or pump to surge facilities, from which contaminated water can be returned for subsequent treatment. Drains containing potential pollutants should be located in suitable pipe trenches so that any leaks may be contained, observed and repaired quickly.	Environmental Risk Assessment Site Condition Report	Leak Detection and Repair Plan in place. Pollution Accident Management Plan and Site Emergency Response Plan in place to minimise any potential environmental impact from spillages should they occur. Surface Water Management Plan in place for the management of surface run-off water collected within the perimeter containment ditch. Surface run-off water is treated via a Class 1 Interceptor prior to discharge from site. Surface Water Management Plan in place for the management of surface run-off water collected within secondary containment bunds. Surface run-off water from secondary containment bunds is processed within the wellsite. Surface run-off water from secondary containment bunds is not permitted to be discharged to surface or ground. Where required, surface run-off water will be transferred offsite by a licenced waste carrier for onward treatment and/or disposal. Hard surfacing is provided within secondary containment bunds and road tanker loading bay to prevent escape of fluids. In the event of a spillage occurring within these areas, fluids will be contained to ensure remediation is undertaken effectively. If required, the Wellsite, including secondary containment systems can contain storm water / fire-fighting water / cooling water and if necessary, will be transferred offsite by a licenced waste carrier for onward treatment and/or disposal. The Wellsite is underlined by an HDPE Liner providing Secondary and Tertiary containment. Operational controls, competence and supervision should prevent overfilling of storage tanks. Site Maintenance. Inspection and Testing Procedures in place.
Emissions and monitoring - Emissions to water – Tankage	Bund oil storage tanks and fit them with high level alarms and pump cut-outs to avoid spillage. Remote well sites that are normally unmanned should preferably transmit tank level data, including alarm conditions, to a manned site. Tanks should have level gauges visible from the filling point. Pipework should preferably be over ground. Where it must be underground it should be protected in a sleeve or a duct.	Waste Management Plan	Storage tanks are fitted with high level alarms / pump cut-outs. Automatic shutdown systems are installed to prevent tank over top. Wellsite is manned 24/7 with periodic checks undertaken of the secondary containment bunds, storage tanks, pipelines and process equipment.

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Emissions and monitoring - Emissions to water – Radionuclides	Inform us immediately whenever naturally occurring radionuclides are encountered Reconsider operations so as to minimise the amounts and activity of contaminated materials. Application for authorisation under the Radioactive Substances Act 1993 may be necessary if radioactive waste is being accumulated and/or disposed.	Waste Management Plan	The Wellsite has a current RSR Permit in place for the accumulation, storage and handling of produced water containing NORM. NORM is present within produced water extracted from the formation. Produced water is stored within storage tank(s) installed within a secondary containment bund. Produced water is accumulated within the Wellsite until a sufficient quantity is commercially viable to be transferred offsite. Produced water is transferred offsite by a licenced waste carrier to a nearby oil and gas wellsite operated by a different Operator where it is re-injected into an oil bearing reservoir for production support. Environmental Permits are in place for the receipt and re-injection of the produced water at the receiving wellsite.
	Investigate the source(s) and destination(s) of radionuclides and consider any appropriate changes to operations, particularly to the well fluid and produced water systems. Techniques have been developed that can inhibit scale deposition on equipment, trap the contamination on inserted surfaces that have a preferential affinity for the radionuclides concerned (including ion-exchange resins) and flush contaminated waxy solids through prior to plant shut-downs.	Radioactive Substances Regulations Permit	NORM monitoring plan in place.
Emissions and monitoring - Emissions to groundwater	Re-inject produced water into the same oilfield, either to a producing formation as part of the reservoir pressurising system or to a disposal well. Re-injection should be made below the oil-bearing strata via dedicated wells, and any conditions required to protect ground waters should be included in the authorisation for the process.	Waste Management Plan	Produced water is accumulated within the Wellsite until a sufficient quantity is commercially viable to be transferred offsite. Produced water is transferred offsite by a licenced waste carrier to a nearby oil and gas wellsite operated by a different Operator where it is re-injected into an oil bearing reservoir for production support. Environmental Permits are in place for the receipt and re-injection of the produced water at the receiving wellsite.
	Treat the produced water prior to re-injection by degassing and separating from entrained oil prior to passing to bunded holding tanks and adding biocide. The biocide(s) used should not contain any substance prescribed for release to controlled waters in Schedule 5 of the Regulations. The cumulative discharge of produced water should at no time exceed the cumulative fluid withdrawal from the reservoir.	Not Applicable	Not applicable – produced water is transferred offsite by a licenced waste carrier to a nearby oil and gas wellsite operated by a different Operator where it is re-injected into an oil bearing reservoir for production support.
Emissions and monitoring - Abatement of nitrogen oxide emissions	Use firing of gas with ultra-low NOx burners associated with conventional forced and natural draft furnaces and boilers on oil refineries, gas refining and on-shore oil fields.	Waste Gas Management Plan	Associated gas will be utilised in accordance with the Waste Gas Management Plan. Where there is potential for waste gas, this will be incinerated via the onsite enclosed ground flare (UF10) which has been determined as BAT and permitted by the Environment Agency.
	Test the burners to explore the limits of combustion prior to site installation to ensure reliable operation.	Waste Gas Management Plan	The onsite enclosed ground flare (UF10) has been determined as BAT and permitted by the Environment Agency.

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Emissions and monitoring - Abatement of nitrogen oxide emissions (cont.)	Minimise the firing of fuel oil. Where this occurs, low NOx burners should be used. In addition, where practicable, SCR should be considered on large oil-fired plant. Sticky sooty particles from the combustion of heavy fuel oil may necessitate arrestment equipment upstream of the SCR.	Not Applicable	Fuel oil is not fired within the Wellsite.
Emissions and monitoring - Sulphur dioxide abatement	For reliable operation, amine systems need filtration to remove dirt and activated carbon treatment for hydrocarbon removal, otherwise foaming and other operating problems result with associated loss of performance.	Not Applicable	Fuel oil is not fired within the Wellsite.
	Use fuels which contain 1% by weight of sulphur, or better, in fuel oil and 100ppm vol/vol or better of H_2S in the fuel gas.	Not Applicable Waste Gas Management Plan	Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment. H_2S is not present within the gas produced from the well.
	Be able to demonstrate that all appropriate methods for reducing sulphur in fuel have been thoroughly evaluated.	Not Applicable	Fuel oil is not fired within the Wellsite.
	Select clean gas for combustion throughout the plant.	Waste Gas Management Plan	Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment.
	Use amine treatment of all significant sour gas streams to a level of 100ppm vol/vol of H_2S or better.	Not Applicable Waste Gas Management Plan	Sour gas is not produced.
	Be able to demonstrate that fuel selection has been thoroughly evaluated.	Waste Gas Management Plan	Associated gas will be utilised in accordance with the Waste Gas Management Plan. Where there is potential for waste gas, this will be incinerated via the onsite enclosed ground flare (UF10) which has been determined as BAT and permitted by the Environment Agency.
Emissions and monitoring - Abatement of particulate matter emissions	Use wet scrubbing technology where sulphur dioxide and particulates releases are high and both require abatement. For example, large furnaces and boilers combusting high sulphur heavy fuel oils and to FCCUs with high sulphur feedstock.	Not Applicable	
	Use cyclones followed by an electrostatic precipitator for furnaces, boilers and FCCUs where particulates only are required to be abated. An EP may be sufficient without associated cyclones for furnaces and boilers, but you must be able to justify your choice;	Not Applicable	
	Recover metals, e.g. vanadium and nickel from ash and soot, from particulate waste streams.	Not Applicable	
Emissions and monitoring – General Controls	Use wet scrubbing technology where sulphur dioxide and particulates releases are high and both require abatement. For example, large furnaces and boilers combusting high sulphur heavy fuel oils and to FCCUs with high sulphur feedstock.	Not Applicable	

BAT REFERENCE:	APPLICABLE BAT:	RELEVANT PERMIT SUBMISSION DOCUMENT:	COMMENTS:
Emissions and monitoring – General Controls (cont.)	Use cyclones followed by an electrostatic precipitator for furnaces, boilers and FCCUs where particulates only are required to be abated. An EP may be sufficient without associated cyclones for furnaces and boilers, but you must be able to justify your choice.	Not Applicable	
	Recover metals, e.g. vanadium and nickel from ash and soot, from particulate waste streams.	Not Applicable	
Emissions and monitoring – General Controls – Relief valve releases	Test relief valves on a regular basis, to check for correct operation. Where practicable, relief valves that can give rise to VOC releases should be connected to a vent gas system to allow the VOCs to be collected and either recovered or flared.	Environmental Risk Assessment	Relief valves will be part of a planned maintenance, inspection and testing procedures. Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment.
Emissions and monitoring – General Controls – Storage/loading/unloading	Follow the requirements in "Getting the basics right" for the design of storage tanks and associated tank seals.	Site Condition Report Waste Management Plan	Tank storage was designed during the HAZID/HAZOP undertaken prior to installation and commissioning of the current process plant and equipment.
	Install vapour recovery at loading and unloading points from road, rail and ships. In particular where the hydrocarbons being handled have a high vapour pressure. These include gasoline and lighter hydrocarbons.	Waste Management Plan	Vapour Capture and Recovery Procedures. Crude oil will be transferred to storage tank for offsite disposal. Any VOCs generated will be scrubbed via a VOC carbon filter system prior venting.
Emissions and monitoring – General Controls – Pigging activities and depressurisation – vapour recovery	Recover the vapours and liquids by piping to a vapour recovery and recompression system rather than routing to flare.	Waste Management Plan Waste Gas Management Plan	Vapour Capture and Recovery Procedures. Crude oil will be transferred to storage tank for offsite disposal. Any VOCs generated will be scrubbed via a VOC carbon filter system prior venting.
	Ensure operating procedures are in place to prevent venting of vapours to atmosphere.	Waste Management Plan Waste Gas Management Plan	Vapour Capture and Recovery Procedures. Crude oil will be transferred to storage tank for offsite disposal. Any VOCs generated will be scrubbed via a VOC carbon filter system prior venting.
Emissions and monitoring – General Controls – VOCs from miscellaneous sources	Use vapour recovery to abate VOC releases where it is practicable to capture them and where possible they should be returned to fuel gas systems.	To be incorporated into the design of the gas processing system	Vapour Capture and Recovery Procedures. Crude oil will be transferred to storage tank for offsite disposal. Any VOCs generated will be scrubbed via a VOC carbon filter system prior venting. VOCs from gas will be incinerated during the combustion process.
	Use catalytic incinerators or flameless thermal oxidisers. They can typically achieve the same or better destruction efficiency at a lower temperature. With incineration, the use of flame/detonation traps or other safeguards is essential.	Waste Management Plan Waste Gas Management Plan	Where there is potential for waste gas, this will be incinerated via the onsite enclosed ground flare (UF10) which has been determined as BAT and permitted by the Environment Agency.
Emissions and monitoring – General Controls – Refrigeration systems	Avoid the use of refrigerants that are of significant environmental concern which will escape during operation. Best available techniques for gas dew-point control are to avoid the use of refrigerants.	To be incorporated into the design of the gas processing system	Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment. Compression and chilling are being considered.
Emissions and monitoring – General Controls – Carbon dioxide	Use acid gas streams, containing carbon dioxide and a significant hydrocarbon content, in a suitable combustion process.	Not Applicable	

BAT REFERENCE:	APPLICABLE BAT:	RELEVANT PERMIT SUBMISSION DOCUMENT:	COMMENTS:
Emissions and monitoring – Fugitive emissions	Use a Leak Detection and Repair (LDAR) programme for the control of fugitive releases.	Environmental Risk Assessment Waste Management Plan	Leak Detection and Repair Plan in place. Operational controls, competence and supervision should prevent overfilling of storage tanks. Site Maintenance. Inspection and Testing Procedures in place.
	Use low emission valve stem packing (500ppm) on critical valves, e.g. rising stem gate type control valves in continuous operation, particularly on gas/light liquid high pressure/temperature duties.	To be incorporated into the design of the gas processing system	Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment.
	Use alternative proven types of low-release valves where gate valves are not essential, e.g. quarter turn and sleeved plug valves, both of which have two independent seals.	To be incorporated into the design of the gas processing system	Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment.
	Use balanced bellows type relief valves to minimise valve leakage outside the design lift range and piping of reliefs to RFG or flare gas, normally via phase separation, without header back pressure.	To be incorporated into the design of the gas processing system	Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment.
	Minimise the number of flanged connections on pipelines and use high specification jointing materials; use canned pumps or double seals on conventional pumps; piping of compressor seals, vent and purge lines to RFG or flare systems.	To be incorporated into the design of the gas processing system	Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment.
	Use end caps or plugs on open ended lines and closed loop flush on liquid sampling points.	To be incorporated into the design of the gas processing system	Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment.
	Minimise the releases to air from process hydrocarbon analysers, by optimising sampling volume/frequency and venting to RFG or flare systems.	To be incorporated into the design of the gas processing system	Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment.
	Identify and, where possible quantify, significant fugitive emissions to air from all the specific relevant sources listed above, estimating the proportion of total emissions that are attributable to fugitive releases for each substance. Where there are opportunities for reductions, the Permit may require the updated inventory of fugitive emissions to be submitted.	Environmental Risk Assessment	Leak Detection and Repair Plan in place.
BEST AVAILABLE TECHNIQUES (BAT) REFERENCE DOCUMENT FOR THE REFINING OF MINERAL OIL AND GAS			
General BAT conclusion for the refining of mineral oil and gas			
BAT 1	In order to improve the overall environmental performance of plants for the refining of mineral oil and gas, BAT is to implement and adhere to an environmental management system (EMS).	Environmental Management System	Environmental Management System in place and adhered to by all personnel.
BAT 2	Energy efficiency	Waste Gas Management Plan	Associated gas will be utilised in accordance with the Waste Gas Management Plan. Where there is potential for waste gas, this will be incinerated via the onsite enclosed ground flare (UF10) which has been determined as BAT and permitted by the Environment Agency.

BAT REFERENCE:	APPLICABLE BAT:	RELEVANT PERMIT SUBMISSION DOCUMENT:	COMMENTS:
BAT 3	Solid material storage and handling	Not Applicable	No solid materials anticipated from the gas refining process.
BAT 4	Monitoring of emissions to air and key process parameters	Waste Management Plan	Monitoring required specified in the Environmental Permit.
BAT 5	BAT is to monitor the relevant process parameters linked to pollutant emissions, at catalytic cracking and combustion units by using appropriate techniques and with at least the frequency given in this section.	Waste Gas Management Plan	Where there is potential for waste gas, this will be incinerated via the onsite enclosed ground flare (UF10) which has been determined as BAT and permitted by the Environment Agency. The UF10 has built in monitoring systems for the determination of relevant pollutants.
BAT 6	Monitor diffuse VOC emissions to air from the entire site	Environmental Risk Assessment	Site walkover survey for fugitive emissions has recently been undertaken, forming part of the Leak Detection and Repair process.
BAT 7	In order to prevent or reduce emissions to air, BAT is to operate the acid gas removal units, sulphur recovery units and all other waste gas treatment systems with a high availability and at optimal capacity.	Waste Gas Management Plan	Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment.
BAT 10	BAT is to monitor emissions to water by using the monitoring techniques with at least the frequency given in Table 5.3 and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	Site Condition Report	Groundwater and Surface Water Monitoring undertaken in accordance with current environmental permit requirements.
BAT 11	In order to reduce water consumption and the volume of contaminated water, BAT is to use all of the techniques given in this section.	Waste Management Plan	Pollution Accident Management Plan and Site Emergency Response Plan in place to minimise any potential environmental impact from spillages should they occur. Site Emergency Response Plan outlines emergency response actions to be undertaken including activation of the emergency shut down process. Surface Water Management Plan in place for the management of surface run-off water collected within the perimeter containment ditch. Surface run-off water is treated via a Class 1 Interceptor prior to discharge from site. Surface Water Management Plan in place for the management of surface run-off water collected within secondary containment bunds. Surface run-off water from secondary containment bunds is processed within the wellsite. Surface run-off water from secondary containment bunds is not permitted to be discharged to surface or ground. Where required, surface run-off water will be transferred offsite by a licenced waste carrier for onward treatment and/or disposal. Hard surfacing is provided within secondary containment bunds and road tanker loading bay to prevent escape of fluids. In the event of a spillage occurring within these areas, fluids will be contained to ensure remediation is undertaken effectively. Storage tanks are contained within containment bunds to contain any spillages should they occur. Sumps are installed within containment bunds and tanker bays for the collection of spillages with fluids transferred via pump to storage tank for recovery process. The Wellsite is underlined by an HDPE Liner providing Secondary and Tertiary containment.

BAT REFERENCE:	APPLICABLE BAT:	RELEVANT PERMIT SUBMISSION DOCUMENT:	COMMENTS:
BAT 12	In order to reduce the emission load of pollutants in the waste water discharge to the receiving water body, BAT is to remove insoluble and soluble polluting substances by using all of the techniques given in this section.	Waste Management Plan	Pollution Accident Management Plan and Site Emergency Response Plan in place to minimise any potential environmental impact from spillages should they occur. Site Emergency Response Plan outlines emergency response actions to be undertaken including activation of the emergency shut down process. Surface Water Management Plan in place for the management of surface run-off water collected within the perimeter containment ditch. Surface run-off water is treated via a Class 1 Interceptor prior to discharge from site. Surface Water Management Plan in place for the management of surface run-off water collected within secondary containment bunds. Surface run-off water from secondary containment bunds is processed within the wellsite. Surface run-off water from secondary containment bunds is not permitted to be discharged to surface or ground. Where required, surface run-off water will be transferred offsite by a licenced waste carrier for onward treatment and/or disposal. Hard surfacing is provided within secondary containment bunds and road tanker loading bay to prevent escape of fluids. In the event of a spillage occurring within these areas, fluids will be contained to ensure remediation is undertaken effectively. Storage tanks are contained within containment bunds to contain any spillages should they occur. Sumps are installed within containment bunds and tanker bays for the collection of spillages with fluids transferred via pump to storage tank for recovery process. The Wellsite is underlined by an HDPE Liner providing Secondary and Tertiary containment.
BAT 14	In order to prevent or, where that is not practicable, to reduce waste generation, BAT is to adopt and implement a waste management plan that, in order of priority, ensures that waste is prepared for reuse, recycling, recovery or disposal.	Waste Management Plan	Non-extractive wastes will not be treated at the wellsite. They will be segregated and stored according to their EWC Code pending collection by a licenced waste carrier for onward treatment and/or disposal. All wastes will be handled, stored or transported in accordance with applicable SDS's, manufacturer's guidance and legislation. Where waste natural gas is produced, for example via maintenance operations, the waste gas will be sent to the onsite enclosed ground flare which will incinerate the waste gas. The onsite enclosed ground flare (UF10) has been determined as BAT and permitted by the Environment Agency.
BAT 15	In order to reduce the amount of sludge to be treated or disposed of, BAT is to use one or a combination of the techniques given in this section.	Waste Management Plan	Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment.
BAT 18	In order to prevent or reduce diffuse VOC emissions, BAT is to apply the techniques given in this section.	Environmental Risk Assessment Waste Gas Management Plan	Leak Detection and Repair Plan in place. Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment. Refining plant and equipment will be installed to an agreed installation management plan, commissioned and tested prior to use.

BAT REFERENCE:	APPLICABLE BAT:	RELEVANT PERMIT SUBMISSION DOCUMENT:	COMMENTS:
BAT conclusion for the combustion units			
BAT 34	In order to prevent or reduce NOX emissions to air from the combustion units, BAT is to use one or a combination of the techniques given below.	Waste Management Plan Waste Gas Management Plan	Gas is utilised for power generation within the Wellsite. Fuel oil is not fired within the Wellsite. The onsite enclosed ground flare (UF10) has been determined as BAT and permitted by the Environment Agency.
BAT conclusion for the natural gas refinery			
BAT 41	In order to reduce sulphur dioxide emissions to air from the natural gas plant, BAT is to apply BAT 54.	Not Applicable.	No hydrogen sulphide encountered to date and none anticipated.
BAT 42	In order to reduce nitrogen oxides (NOX) emissions to air from the natural gas plant, BAT is to apply BAT 34.	Waste Management Plan Waste Gas Management Plan	Gas is utilised for power generation within the Wellsite. Fuel oil is not fired within the Wellsite. The onsite enclosed ground flare (UF10) has been determined as BAT and permitted by the Environment Agency.
BAT 43	In order to prevent emissions of mercury when present in raw natural gas, BAT is to remove the mercury and recover the mercury-containing sludge for waste disposal.	Not Applicable	No mercury emissions anticipated.
BAT conclusion for storage and handling process			
BAT 49	In order to reduce VOC emissions to air from the storage of volatile liquid hydrocarbon compounds, BAT is to use floating roof storage tanks equipped with high efficiency seals or a fixed roof tank connected to a vapour recovery system.	Waste Management Plan	Gas Refining process control systems will be designed during the HAZID undertaken prior to installation and commissioning of the gas refining plant and equipment. Refining plant and equipment will be installed to an agreed installation management plan, commissioned and tested prior to use. Vapour Capture and Recovery Procedures. Crude oil will be transferred to storage tank for offsite disposal. Any VOCs generated will be scrubbed via a VOC carbon filter system prior venting.
BAT 50	In order to reduce VOC emissions to air from the storage of volatile liquid hydrocarbon compounds, BAT is to use one or a combination of the techniques given in this section.	Waste Management Plan	Oil tank cleaning will be performed by workers entering the tank and removing sludge manually.
BAT 51	In order to prevent or reduce emissions to soil and groundwater from the storage of liquid hydrocarbon compounds, BAT is to use one or a combination of the techniques given in this section.	Site Condition Report	Pollution Accident Management Plan and Site Emergency Response Plan in place to minimise any potential environmental impact from spillages should they occur. The Wellsite is underlined by an HDPE Liner providing Secondary and Tertiary containment. Storage tanks are contained within containment bunds to contain any spillages should they occur.
BAT 52	In order to prevent or reduce VOC emissions to air from loading and unloading operations of volatile liquid hydrocarbon compounds, BAT is to use one or a combination of the techniques given below to achieve a recovery rate of at least 95 %.	Waste Gas Management Plan	Vapour Capture and Recovery Procedures. Crude oil will be transferred to storage tank for offsite disposal. Any VOCs generated will be scrubbed via a VOC carbon filter system prior venting.

BAT REFERENCE:	APPLICABLE BAT:	RELEVANT PERMIT SUBMISSION DOCUMENT:	COMMENTS:
BAT conclusion for waste gas sulphur treatment			
BAT 54	In order to reduce sulphur emissions to air from off-gases containing hydrogen sulphides (H_2S), BAT is to use all of the techniques given in this section.	Not Applicable	No hydrogen sulphide encountered to date and none anticipated.
Bat conclusion for flares			
BAT 55	In order to prevent emissions to air from flares, BAT is to use flaring only for safety reasons or for non-routine operational conditions (e.g. start-ups, shutdown).	Waste Gas Management Plan	The onsite enclosed ground flare (UF10) will be utilised as an emergency flare and has been determined as BAT and permitted by the Environment Agency.
BAT 56	In order to reduce emissions to air from flares when flaring is unavoidable, BAT is to use the techniques given in this section.	Waste Gas Management Plan	The onsite enclosed ground flare (UF10) will be utilised as an emergency flare and has been determined as BAT and permitted by the Environment Agency.