Barrow Island Joint Venture Environment Plan Bridging Document - Tank Remediation and Sludge Storage

Environment Plan Summary

Document ID:	ABU170300634	**Revision ID:**	2.0
Revision Date:	17 May 2017	**Next Revision Due:**	N/A
Information Sensitivity:	Public		

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1.0 Introduction

This public disclosure summary document of the *Barrow Island Joint Venture (BWIJV) Environment Plan (EP) Bridging Document – Tank Remediation and Sludge Storage* has been submitted to comply with Regulation 11(8) of the Petroleum and Geothermal Energy Resources (Environment) Regulations 2012.

The Barrow Island (BWI) oilfield is operated by Chevron Australia Pty Ltd (Chevron) on behalf of the BWIJV. The non-operating Joint Venture Partners are Santos Offshore Pty Ltd and Mobile Australia Resources Company Pty Ltd. Petroleum exploration and production operations are conducted on BWI and surrounding areas within petroleum titles L1H (R2), TL/3, L10, EP/61, EP/62, and WA-7-L.

This document summarises the *Barrow Island Joint Venture (BWIJV) Environment Plan (EP) Bridging Document – Tank Remediation and Sludge Storag*e (ABU170100122 Revision 1) (the Plan) which was submitted to the Western Australian Department of Mines and Petroleum.

The purpose of the Plan is to:

- Define the additional activity of tank remediation and Sludge storage, which will be completed in addition to the ongoing BWIJV EP activities;
- Identify the potential environmental impacts and risks associated with tank remediation and Sludge storage in addition to those impacts and risks already identified in the BWIJV EP
- Identify the management strategies that will be implemented to reduce the potential impacts of the tank remediation and Sludge storage activities to as low as reasonably practicable (ALARP) and to an acceptable level.

The tank remediation and Sludge storage activities include removal of Sludge from five tanks, including:

- Terminal Tank T-305: a crude oil storage tank located in the Terminal Tank Bund Area with a capacity of approximately 200,000 barrels (bbl)
- Central Processing Facility (CPF) Tank T-01: an oil and water settling tank located at the CPF with a capacity of 2,000 bbl
- CPF Tank T-02: a water and oil settling tank located at the CPF with a capacity of 7,100 bbl
- CPF Tank T-03: a water and oil standby tank located at the CPF with a capacity of 7,100 bbl
- Terminal Transfer Tank T-401: a water tank located at the Terminal Tank Bund Area with a capacity of 200 bbl

Sludge is defined as remnants from the above tanks made up of varying proportions (between 0 to 100%) of the following:

- solids (sands, metal particles etc)
- crude oil
- water.

The accumulation of Sludge inside the tanks has reached a level where removal is required to maintain the required operational tank inventory. A combined total of approximately 12,600 bbls (approximately 2,000 m^3) of Sludge is proposed to be removed from the tanks. Sludge will be transferred from the tanks to ISO Tanks for storage. Filled ISO Tanks will be stored in the Terminal Tank Bund Area and will be progressively removed from BWI for disposals on the mainland. The five tanks will be cleaned, inspected and repaired (if required) and placed back into service.

1.1 Scope

The scope of the Plan addresses the removal of Sludge from the tanks, inspection and repair of tanks and the storage and management of Sludge in ISO Tanks.

1.2 Location

BWI is located approximately 1,300 km north of Perth and 56 km from the nearest point on the mainland. The island is approximately 25 km in length and 10 km wide, covering an area of 23,483 ha.

The Terminal Tank Bund Area is located on the east coast of BWI (Figure 1-1). Terminal Tank T-305 and Terminal Transfer Tank T-401 are located within the Terminal Tank Bund Area.

The CPF is located in the centre of BWI (Figure 1-1) where Tanks T-01, T-02 and T-03 are situated.

1.3 Timeframes

The tank remediation and Sludge removal activities are proposed to commence during Q2 of 2017. Tank remediation is proposed to be completed by Q1 2018 with the storage of ISO Tanks until Q1 2019.

1.4 Nominated Operator Contact Details

Chevron is the operator of the Barrow Island oil field and associated decommissioning activities, on behalf of the BWI JV. The Joint Venture consists of Chevron, Santos Offshore Pty Ltd and Exxon Mobil Australia Resources Company Pty Ltd.

In accordance with Regulation 38 (a) of the Petroleum Regulations, details of the operator's nominated liaison person are listed in Table 1-1.

Table 1-1: Nominated Operator Contact Details

Company Name	Chevron Australia Pty Ltd
Contact Person	Graeme Harman
Business Address	GPO Box S1580, Perth WA 6845
Telephone Number	08 9216 4000
Email Address	ask@chevron.com

Figure 1-1: Location of CPF and Terminal Tank Bund Area on Barrow Island

2.0 Description of the Petroleum Activity

Chevron proposes to undertake inspection of and, if investigation confirms that it is required, remediation activities on hydrocarbon storage tanks and water settling tanks on BWI for the BWIJV. The following tanks are proposed for inspection and possible remediation:

- Terminal Tank T-305 (200,000 bbl crude oil storage tank)
- CPF Tank T-01 (2,000 bbl oil and water settling tank)
- CPF Tank T-02 (7,100 bbl oil and water settling tank)
- CPF Tank T-03 (7,100 bbl oil and water standby tank)
- Terminal Transfer Tank T-401 (200 bbl water tank).

Waste Sludge removed during the clean out process will be transferred to ISO Tanks and stored in the Terminal Tank Bund Area. The ISO Tank are designed to be lifted while filled. The containment tank of the ISO Tanks sits inside a frame which provides some impact protection for the tank and valves. They will have a minimum wall thickness associated with a pressure rating and will have valves for pressure management (such as pressure vacuum valves) and valves that can be closed while transporting filled tanks. ISO Tanks are used globally for storing and transporting hazardous materials.

A summary of the storage of ISO Tanks containing Sludge and inspection and remediation activities are discussed below:

- The Terminal Tank Bund Area, which is already cleared of vegetation, will be the designated laydown area for filled ISO Tanks. Filled ISO Tanks will be progressively stored and removed from this area. Vegetation clearing may be required if ISO Tanks are unable to be progressively removed from BWI due to unexpected circumstances.
- Removal of Sludge from tanks will be conducted using a pumping system or vacuum truck and the Sludge will be pumped into ISO Tanks.
- Once Sludge is removed, the tanks will be cleaned with water using a high pressure hose.
- Filled ISO Tanks will be transported to the Terminal Tank Bund Area and will be arranged in a format to allow safe vehicle access. Storage will commence in existing areas that are cleared of vegetation. Decanting may be required and will be undertaken using a vacuum truck and decanted liquids will be re-introduced to the process stream for processing. Some ISO Tanks may require re-filling with Sludge after decanting prior to shipping.
- Transport of full ISO Tanks off BWI and disposal on the mainland will be undertaken progressively using existing vessels used for the transfer of goods as part of the normal supply chain. Sludge will be disposed on the mainland by a waste contractor at an appropriately licensed waste facility
- Inspection of the tanks will include the use of non-destructive testing equipment to determine the thickness of the base of the tank. Repairs (if required) may include sand blasting of the floor base, application of sealants, welding to repair patches and painting the floor base. Once inspection and repair are complete the tanks will be placed back into service.

2.1 Timing

The activity is expected to commence during Q2 of 2017. Tank remediation is proposed to be completed by Q1 2018.

Filled ISO Tanks will be stored no longer than 12 months and will be progressively removed from BWI. All tanks will be removed by Q1 2019.

All activities will be undertaken during daylight hours and 12-hour operation unless there is an emergency situation which may require night works and lighting.

2.2 Waste Management

Wastes generated from the activity will be managed in accordance with the BWIJV EP, where applicable, including waste from vessels and facilities (e.g. sewage and putrescible wastes).

A specific Waste Management Plan for Tank Remediation and Sludge Storage (ABU 170100127) has been developed for the hazardous solid and liquid wastes generated by the project and the management of filled ISO Tanks stored in the Terminal Tank Bund Area.

2.3 Air emissions

Air emissions during the activity will be calculated based on fuel consumption from the use of vehicles and generators in accordance with the BWIJV EP.

3.0 Description of the Environment

Barrow Island is gazetted as a Class A Nature Reserve for the protection of native flora and fauna, vested in the Conservation Commission of Western Australia, and managed by Parks and Wildlife. Barrow Island was first declared a Class A reserve in 1910 (Reserve No. 11648). The Australian Heritage Council has placed the BWI Marine Area on the Register of the National Estate. The BWI Marine Park and the BWI Marine Management Area were gazetted on 10 December 2004.

The existing environment related to the Terminal Tank Bund Area and CPF are summarised below.

3.1 Terminal Tank Bund Area Environment

The Terminal Tank site is located on the eastern side of BWI (Figure 1 1). The site is cleared of native vegetation and comprises five crude oil storage tanks (two are not in use) and associated terminal facilities. Terminal Tanks T-301, T-304 and T-305 are currently used to store production fluids. This tank farm is surrounded by an earthen bund (Terminal Tank Bund).

A number of existing access roads are available to service the site.

The cleared area is maintained around each Terminal Tank within the Terminal Tank Bund Area. Vegetation regrowth has occurred in some areas within the bund since the original clearing for construction of the terminal tanks.

Undisturbed areas around the site are predominantly hummock grassland of *Triodia wiseana* with scattered shrubs on limestone ridges and flats (Mattiske, 1993).

As the entire site has been previously cleared and subject to earthworks there are no natural habitats of particular faunal significance. Observations of fauna at the site are generally limited to larger mammals, such as the Barrow Island Euro (*Macropus robustus isabellinus*), which opportunistically use the shade cast by the tanks and facilities during the daytime heat.

3.2 Central Processing Facility Environment

The CPF site is cleared of native vegetation and the site comprises a control room, three bulk separator vessels, storage tanks (for oil and water), transfer pumps and associated pipework and instrumentation.

The storage tanks are located in a concrete bund and surrounded by a cleared hardstand area, which is maintained clear of vegetation.

Vegetation adjacent to the CPF hardstand is hummock grassland of *Triodia wiseana* with *Ficus platypoda* var. *platypoda* on central limestone ridges. This vegetation is widely distributed throughout Barrow Island and not identified as a significant community or as being of conservation significance.

As the site is cleared there are no habitats of particular faunal significance. Some larger faunal species may seek shade at the site during daytime heat, such as the Barrow Island Euro.

3.3 Cultural Heritage

Surveys for Aboriginal sites have been undertaken on BWI and no archaeological sites have been identified within the Terminal Tanks Bund Area or the CPF (Quartermaine, 1994).

3.4 Socio-Economic Environment

There is no resident population on BWI and access is restricted to personnel associated with oilfield operations, DPaW staff and Gorgon Gas Development personnel. Activities in the vicinity of BWI include pearling, nature based tourism, commercial and recreational fishing, European history/maritime heritage, and scientific research.

4.0 Major Environmental Hazards and Controls

The risk assessment for the tank remediation and Sludge storage activities was undertaken in accordance with the Chevron Health, Environment, and Safety (HES) Risk Management Process. This approach is consistent with the processes outlined in ISO 31000:2009 Risk Management – Principles and Guidelines and Handbook 203:2012 Managing Environment-related Risk.

The tank remediation and Sludge storage activities were reviewed against the activities, risk sources and the potential impacts assessed as per Chevron's risk management process detailed in the current BWIJV EP.

Aspects associated with the tank remediation and Sludge storage activities have been subject to an impact and risk assessment to understand the potential environmental risks associated with the activity and identify relevant controls to reduce impacts and risks to as low as reasonably practicable (ALARP) and an acceptable level.

The environmental impact identification and risk assessment process comprised the following components:

- Identification of petroleum activities
- Identification of particular environmental values and sensitivities within the environment that may be affected
- Identification of relevant aspects with the potential to pose a hazard to identified particular environmental values and sensitivities
- Evaluation of the potential consequences to the identified values and sensitivities without controls
- Identification of control measures to reduce the potential likelihood of the consequence occurring
- Evaluation of the likelihood of the consequence occurring with planned and confirmed control measures in place
- Quantification of the risk ranking with controls in place
- Determination of whether the potential environmental impacts and risks are ALARP after considering the effectiveness of the identified controls
- Determination of whether the potential environmental impacts and risks are acceptable.

The following aspects are already identified in the BWIJV EP and also apply to the tank remediation and Sludge storage activities:

- Quarantine – in relation to vessel movement and ISO Tank / equipment transfer
- Fauna – in relation to vehicle movement and interaction
- Vegetation and habitat – in relation to potential vegetation clearing
- Air emissions – in relation to diesel generators, vehicle emissions and venting
- Solid and liquid wastes – in relation to tank cleaning and repair

The new risk sources identified as specific to tank remediation and Sludge storage activities include:

- Solid and liquid wastes – potential long term storage, storage in ISO Tanks and requirement for a specific Waste Management Plan
- Wildfires and cyclones – accidental fire at the Terminal Tank Bund Area
- Spills and releases – accidental spills from ISO Tanks.

Environmental Performance Standards were identified to ensure identified risks were reduced to ALARP and of an acceptable level. Environmental Performance Standards were considered in terms of both preventing the impact occurring, and mitigating the severity of the consequence, drawing on the hierarchy of controls, identified as Elimination, Substitution, Isolation, Engineering, and Administration and Procedures.

A summary of the major environmental hazards and controls in place to manage each environmental aspect is detailed in Table 4-1.

Table 4-1: Major Environmental Hazards and Controls

Source of Environmental Impact or Risk (Hazard)	Potential Environmental Impact or Risk (Consequence)	Environmental Performance Standards
Solid and Liquid Wastes		
Release of waste (Sludge) to the terrestrial environment while being stored	• Decrease in soil quality/ condition • Fauna injury/ casualties • Decrease in marine water quality	• Sludge is stored in ISO Tanks specifically designed for storage (and transport) of hazardous substances • Sludge storage will be managed in accordance with the Waste Management Plan for Tank Remediation and Sludge Storage (ABU 170100127) - ISO Tanks containing Sludge are stored within existing Terminal Tank Bund Area. - Weekly inspection records show ISO Tank storage area inspected for release of Sludge. - ISO Tank valves have been shut off and capped. - Incidents of release of Sludge to the environment during storage are recorded and reported. - Sludge is disposed on the mainland and not on BWI • Onshore spill response equipment is on site. • Spill kits and emergency response trailer (if required) are used in the event of a spill.
Release of waste (Sludge) to the terrestrial or marine environment while being transported	• Decrease in soil quality/ condition • Fauna injury/ casualties • Decrease in marine water quality	• Sludge is transported in ISO Tanks specifically designed for transport (and storage) of hazardous substances. • Caps, valves and hatches are closed and the ISO Tanks are appropriately secured prior to transport • Filled ISO Tanks are stored with a separation distance of 3.5m. • Onshore spill response equipment is on site. • Spill kits and emergency response trailer (if required) were used in the event of a spill. • The vessel has a SOPEP and spill kits available. • BWIJV Oil Spill Operational Response Plan is implemented in the event of an offshore spill.

Source of Environmental Impact or Risk (Hazard)	Potential Environmental Impact or Risk (Consequence)	Environmental Performance Standards
Uncontrolled release of waste into the environment	• Decrease in soil quality/ condition • Fauna injury/ casualties • Decrease in marine water quality	• Waste Management Manual WA Oil BWI (BWI-COP-00073) will be used for routine waste management (excluding Sludge) - Waste records indicate correct waste disposal at allocated facilities - Volumes of waste are recorded and reported in the annual report.
Wildfires		
Fire as a result of the works undertaken during tank remediation and Sludge storage	• Fauna disturbance/ behavioural change • Fauna injury/ casualties • Increase in air emissions (decline in air quality) (smoke) • Habitat and vegetation loss/ fragmentation/ alteration	• Communication of fire prevention and emergency response covered in inductions. • Incident records confirm no fire related incidents. • All filled ISO Tanks are stored in the Terminal Tank Bund Area and are not placed on any vegetation. • Emergency response exercises and drills are conducted in accordance with the BWIJV EP to evaluate preparedness in relation to Bush Fire and Terminal Tank fire procedures. • Vehicles are fitted with fire extinguishers. • Permit to Work for Hot Works are obtained which are signed and approved for works being undertaken. • Contractor Traffic Management is in place, to control vehicle movements in the vicinity of T-305 and ISO tanks and will include: - signage and marker tape to segregate ISO Tank storage area - outline vehicle movements based on hazardous area classification • Filled ISO Tanks will be stored with specified separation distances in regards to storage and layout within the Terminal Tank Bund Area and availability of fire extinguishers.

Source of Environmental Impact or Risk (Hazard)	Potential Environmental Impact or Risk (Consequence)	Environmental Performance Standards
Spills and Releases		
Accidental release of Sludge while filling ISO Tanks or release of decanted water	• Soil quality/ condition • Fauna injury/ casualties	• Pre-start meetings are held and environmental risks related to spills and releases are discussed. • Contractor Spill Prevention Plan for Sludge transfer / oily water decanting includes - Use of spill trays/ temporary bunds during Sludge transfer / decanting. - Use of tarpaulins used at manways during Sludge transfer. • Monitoring will be undertaken by two personnel during Sludge transfer / re-filling to prevent overfill: - both ends of the hose will be manned and visually monitored for spills - a dip stick will be used in the ISO Tank and monitored to determine when the Sludge reaches 93% volume - two-way radio will be used to notify when to cease pumping Sludge at 93% volume to prevent overfill. • A temporary bund will be placed under the ISO Tank adjacent to the Terminal Tank T-305 during initial Sludge transfer. • ISO Tanks containing Sludge are stored within existing Terminal Tank Bund Area and decanting and re-filling will only occur in the Terminal Tank Bund Area. • Spill containment (such as drip trays under all connections, fittings and break points) are used while using vacuum trucks. • Onshore spill response equipment is on site. • Spill kits and emergency response trailer were used in the event of a spill.

5.0 Implementation Strategy

The implementation strategy for the Plan is consistent with the BWIJV EP, which identifies the systems, practices, and procedures used to ensure the environmental impacts and risks of the activities are continuously reduced to ALARP and the environmental performance outcomes and standards are met.

Chevron is committed to conducting operations in an environmentally responsible manner and aims to implement best practice environmental management as part of a program of continual improvement. To meet this commitment, objectives have been defined that relate to the management of the identified environmental risks for operations.

The Chevron management strategies are implemented in accordance with Chevron's Operational Excellence Management System (OEMS). Table 5-1 outlines key components of the management system.

Table 5-1: Summary of Key Implementation Measures for BWIJV EP

Key Implementation Measures	Brief description
Roles & Responsibilities	Accountabilities and responsibilities are defined for personnel involved in the execution of WA Oil operations at BWI. Under the systematic approach to environmental management, WA Oil is required to establish a clear chain of command that sets out the roles and responsibilities of personnel in relation to the implementation, management and review of the EP.
Training and Communication	Detailed inductions are provided to educate personnel about environmental risks and requirements and specific management strategies required to be implemented. Together with further training as required for individual roles, and the communication of Chevron's environmental policy and procedures, this enables all employees and contractors involved with the operation to have awareness of their responsibilities in relation to the environment and gain the appropriate competencies and skills.
Emergency Response	Chevron's Emergency Response Procedures have been developed to manage potential emergencies. WA Oil maintains an up-to-date emergency management process manual for emergencies with environmental implications that includes detailed response and investigative arrangements.
Auditing and Inspections	A multi-tiered environmental compliance assurance program is implemented to verify compliance with the EP and applicable legislation, and to facilitate continuous improvement. This program addresses environmental legislation and internal processes applying to the operation by implementing a schedule of audits and inspections that is effective in verifying EP compliance. At the highest level, the operation is subject to external audits conducted either by regulatory authorities through operating license conditions and legislation or by Joint Venture Partners (JVPs).
Routine Reporting	Chevron has a number of internal and external environmental reporting requirements. Routing reporting provides information regarding Chevron's environmental performance to line management, Chevron or JVPs, or external stakeholders such as the DER, DMP and APPEA. DMP reporting captures regular recordable incidents and emissions and discharges, and annual environmental reporting on all measurement criteria and controls in the EP.

Key Implementation Measures	Brief description
Monitoring	WA Oil conducts monitoring programs to verify the effectiveness of its management strategies and to form a baseline to provide historical information and reference points against potential environmental impacts. Monitoring is fit for purpose and regularly reviewed for improvement opportunities. High-risk elements of operation such as quarantine risks and contamination to the environment are scheduled for monitoring at appropriate intervals to meet the objectives of our management strategies.
Incident Reporting and Investigation	Chevron has a system in place for Incident Investigation and Reporting (II&R) which details expectations relating to incident notification, investigation reporting and competency of investigators, and complies with regulatory reporting requirements.
Continuous Improvements	Further implementation measures provide for the execution of improvement plans, implement corrective actions and schedule reviews of the EP to address continuous improvement. Tank remediation and Sludge storage is anticipated to be completed by 2019, therefore the requirement for a five-year review under Regulation 20 of the Petroleum (Environment) Regulations is not relevant to this specific scope of work.

6.0 Stakeholder Consultation

In addition to consultation during formal assessment of the original and subsequent BWI oil field development proposals, Chevron has continually and actively consulted with Government, industry groups and the community. The project team has identified that the relevant stakeholders associated with this tank remediation and Sludge storage project are the Department of Mines and Petroleum (DMP) and the Department of Parks and Wildlife (Parks and Wildlife).

Table 6-1: Summary of Stakeholder Consultation

Stakeholder	Issues Discussed and Outcomes
Department of Mines and Petroleum (DMP)	Chevron liaised with DMP in March 2017 and provided preliminary information on the proposed tank remediation and Sludge storage activities. DMP confirmed via email that a bridging document to the BWIJV EP was required for the activities. DMP requested the bridging document to include adequate spill response controls/strategies, adequate segregation controls are in place for stored ISO Tanks and a firm commitment and timeframe for the removal of the ISO Tanks. Chevron advised spill response, segregation and removal of ISO Tanks would be addressed in the bridging document.
Department of Parks and Wildlife (Parks and Wildlife)	Chevron liaised with the Parks and Wildlife Senior Reserves Officers based on Barrow Island in March 2017 and provided preliminary information on the tank remediation and Sludge storage activities. Chevron confirmed a bridging document would be prepared and provided to Parks and Wildlife for their review. Chevron met with Parks and Wildlife in April 2017 and provided a copy of the bridging document. Parks and Wildlife advised via email they had no concerns regarding the program and acknowledged that the measures taken to minimise the chance of spillage and contamination within the Terminal Tanks Bund Area were adequate.