DECOMMISSIONING AND ABANDONMENT

8.1 INTRODUCTION
At the end of the production life, the project will be decommissioned and abandoned to restore the site to a safe condition that minimises potential residual environmental impact and permits reinstatement of activities such as fishing and unimpeded navigation at the site.

8.2 REGULATIONS AND AUTHORITY
Decommissioning and abandonment will be carried out in accordance with the prevailing national regulations, good practice standards and licence requirements at the time. These are likely to include:

- Government of Ghana including GNPC requirements;
- Ghana environmental and marine regulations;
- other applicable Ghana laws;
- international laws and conventions to which Ghana is a signatory;
- Jubilee Field Phase 1 Plan of Development requirements; and
- industry good practice standards.

8.3 APPROVAL PROCESS
At the completion of oil production, the project will seek approval from GNPC to decommission the facilities and abandon the field. The approval request will include all relevant data required to demonstrate that all practical and economic extraction of oil from the field has been achieved.

Under the Jubilee Unit Agreement, Tullow, on behalf of the Joint Venture Partners, is required to develop detailed and costed decommissioning plans from the early stages in the project life and provide an update to this at least every few years. These plans will be refined as changes occur in the field development, as new decommissioning techniques are developed by the industry and as regulatory requirements for decommissioning develop or change. The decommissioning plan will also be used as part of the assessment required for decommissioning funding as required by the Unit Agreement.

Once approval for decommissioning is granted, the project will finalise and implement the detailed plan for facility decommissioning and abandonment. The plan will include details on all aspects of facility and well decommissioning and abandonment. The plan will also address issues identified by a health and safety risk assessment of the decommissioning itself and the abandonment phase including for the longer term. Potential environmental and social risks will be addressed. The plan will include
environmental monitoring, including a post abandonment environmental survey, to ensure that procedures were properly followed and that they were effective. The plan will be submitted to GNPC and EPA for review and approval prior to commencing decommissioning activities.

8.4 ABANDONMENT METHODS

8.4.1 General Approach

At the time that of abandonment, the Jubilee Field, as defined in Phase 1, is likely to consist of the following infrastructure:

- FPSO vessel;
- nine mooring legs from the FPSO (these consist of chain, rope and suction piles);
- 17 subsea wells;
- about 30 km of 12” (30 cm) diameter flowlines;
- 10 flexible risers (total length circa 30 km);
- 35 km of control umbilicals;
- eight manifolds (5 with suction piles); and
- two riser bases (with suction piles).

The above Phase 1 infrastructure may have been added to by subsequent development phases by the time of decommissioning and any scope increase would be included in the regularly updated detailed decommissioning plan.

The project will dismantle and remove as much of the infrastructure as practicable given the deepwater location. As is typical in deepwater environments, it is likely that the seabed flowlines, manifolds, wellheads (if they cannot be cut off below the seabed) and the suction piles (protruding 1 m maximum above the seabed) will be flushed clean where relevant and then abandoned in place.

The approach and techniques for abandonment shall consider industry best practice, which is continuously being developed, as well as prevailing regulations at the time.

8.4.2 Production and Injection Wells

The downhole equipment such as tubing in the wells will be removed and the perforated parts of the wellbore across the reservoir cleaned of sediment, scale and other debris. Residual hydrocarbons in production wells will be displaced with a high density fluid and wells will be mechanically and/or cement plugged to prevent fluid migration within the wellbore to the seabed or overlying formations. The subsea trees will be removed and the top of the wellheads will be approximately 3.5 m above the seabed in water depths of over 1,000 m. They will not pose a hindrance to fishing or navigation.
The wells will be individually abandoned using a drilling rig or well service vessel. Well abandonment will take approximately 16 days for each well including two days to flush any residual hydrocarbons back to the FPSO.

### 8.4.3 Floating Production, Storage and Offloading Facility

At abandonment, the FPSO will be disconnected from the risers and the production system isolated from the subsea wells. The topsides equipment will be decommissioned offshore. The production system will be flushed from the FPSO end using seawater to displace any residual oil and production fluids. The flushing water will be returned to the FPSO for treatment. Any residual hazardous waste will be taken to shore and treated at appropriate approved waste treatment facilities as required by the Waste Management Plan. Once the production system has been flushed and confirmed clean, the FPSO will be released from the mooring system for removal.

The ultimate disposition of the FPSO will depend upon its condition at the end of the production life and upon the options available for further use. If the decision is made to decommission the FPSO, it will be towed from the site to where it will be dismantled/scrapped. Depending on the condition of the FPSO it could be refurbished and re-used at another location worldwide.

From the mooring system, lines and chains will be recovered. The nine steel suction piles will be abandoned in place. The piles will protrude approximately 1 m above the seabed in waters approximately 1,000 m deep.

### 8.4.4 Subsea Facilities

Subsea facilities above the seafloor will be purged. The flexible risers up to the FPSO will be detached from the riser bases and recovered by reeling onto a lay vessel. The umbilicals will be recovered to the surface as well as the termination boxes and other subsea control equipment. The subsea manifolds, production and wellhead jumpers may be recovered to surface after flushing whilst any steel piles installed to hold the this subsea equipment in place would remain in-situ and protrude a maximum of approximately 1 to 3 m above the seabed in waters of over 1,000 m deep.

The internal field pipelines are likely to have been partially buried in the seabed sediment over time. These will be flushed until hydrocarbon levels are undetectable and left in place. In some cases the pipe may be recovered as scrap though this is considered unlikely.

Following abandonment of all wells and subsea facilities a seabed environmental survey will be undertaken to check that the abandonment process has been carried out correctly. If required, additional surveys will be undertaken to monitor recovery of the site.