15 GAS FIELD COMPONENT REHABILITATION AND DECOMMISSIONING

This chapter, *Chapter 15*, outlines the anticipated rehabilitation and decommissioning strategies and methods to return the Gas Field Component of the Queensland Curtis LNG (QCLNG) Project to its previous land use and capabilities at the completion of gas production and prior to Petroleum Lease surrender. This chapter also investigates:

- interim rehabilitation activities of disturbances caused by construction and operation of coal seam gas (CSG) infrastructure
- the rehabilitation of various temporary disturbances, such as surface disturbance during the construction of gathering systems.

15.1 REHABILITATION

The Gas Field Component area will be progressively rehabilitated as core exploration, appraisal and production wells and associated infrastructure are no longer required. Partial rehabilitation will also be carried out following construction of infrastructure, such as well lease areas and pipelines (as described in *Sections 15.1.1* and *15.1.2* below), where a portion of the well lease area and Right-Of-Way (RoW) used during construction will be restored.

An Environmental Rehabilitation Team will be available throughout the life of the Project. This crew will prioritise, plan, carry out and monitor rehabilitation works, including the reduction of disturbed areas post-construction. In the event a third-party contractor undertakes restoration works, the Rehabilitation Team will coordinate and advise on the contractor's scope of works, and monitor rehabilitation results post-restoration.

During construction of larger facilities (e.g. greater than 4 ha), the topsoil will be stored adjacent to the site, in a stable and safe location, for rehabilitation purposes. This will reduce the need to import topsoil or fill during rehabilitation.

Prior to decommissioning, information from previous rehabilitation works and annual environmental audits will form the basis of a Gas Field Component decommissioning and rehabilitation plan. This plan will detail the methodology, performance criteria, timeframes and monitoring required for specific disturbance types. For many areas, the performance criteria will be determined in consultation with the landholder, and depend upon the proposed final land use for the area. Performance criteria will also take into consideration the existing site conditions, type of soil and any relevant features of the site that might contribute to the final rehabilitation outcome. Best available methods will be used to guide successful rehabilitation.

Pre-construction photos will be taken of all sites undergoing disturbance. These photos will provide a benchmark for rehabilitation and set minimum standards.

Any rehabilitation of facilities will be conducted in accordance with the following processes:

- Surfaces will be profiled to be stable with minimal erosion potential
- Topsoil will be rehabilitated to an acceptable level
- Photo-monitoring points will be established
- Flora species appropriate to the land use will be established.

The seed mix generally to be applied includes an equal mix of Bambatsii, Katambora Rhodes, Creeping Blue Grass, Floren Blue Grass and Medic Mix, unless otherwise specified by individual landholders and agreed to by QGC.

Plate 2.15.1 and *Plate 2.15.2* illustrate a river crossing over the Condamine River before and after being rehabilitated.

Access tracks will be rehabilitated if they are no longer required for use by the landholder. The surface material will be removed and disposed of, with topsoil spread over the surface and seeded, or stabilised to allow for natural regrowth (if narrow and surrounded by vegetation). Permanent erosion and sediment controls will be designed to provide long-term stability to the disturbed area.

Within two years of initial rehabilitation works at a restoration site, it is expected that the land use will return to the minimum expectation (e.g. low-intensity grazing). Should vegetation not be established within this timeframe, rehabilitation methods will be reviewed. The criteria used to assess the success of the rehabilitation works at the project site will also be site-specific, and might encompass:

- actual land use and constraints
- measures of vegetative success
- soil physical and chemical stability
- a lack of weed species.

Land on which notifiable activities, as defined under the *Environment Protection Act 1994* (Qld) *(EP Act),* have been undertaken and recorded on the Environmental Management Register (Queensland) (EMR), will require a contaminated land assessment. Any areas identified as contaminated will be managed in accordance with contaminated land requirements under Queensland environmental legislation and current best practice.

QGC will strive to complete all environmental commitments prior to surrender of its petroleum tenures. Where an environmental obligation is longer-term, a site management plan or transitional environmental program for a specific property may be prepared.

Plate 2.15.1 Condamine River Crossing – before Rehabilitation

Plate 2.15.2 Condamine River Crossing – after Rehabilitation

15.1.1 Partial Well Lease Area Rehabilitation

The partial rehabilitation of a well lease area includes the rehabilitation of drilling sumps and septic pits, and the restoration of the well lease area, except for the well hardstand area. A well lease area is generally 1 ha in size, with the required hardstand approximately 0.5 ha.

If water contained within the drilling sumps is less than 2,000 parts per million (ppm) total dissolved solids (TDS), the water might be beneficially used (e.g. for dust suppression on QGC access tracks). If the TDS is above 2,000 ppm TDS, the water will be pumped out and taken to a licensed storage facility.

Once drained, the soil from the fill pile (generated from sump construction) will be mixed with the mud in the base of the sump to form a thick paste. If the original sump water TDS was below 2,000 ppm, the mud may be removed from the sump to mix and dry on the drill pad to accelerate the restoration process, but all material will be replaced in the sump at the end of rehabilitation.

Once the mud has been dried and mixed sufficiently, the sumps will be backfilled with the remainder of the fill pile. Stored topsoil will then be placed over the top of the sump. The filled area will be formed with a slight mound to account for subsidence, overlapping the edges of the pit and compacted.

The area between the edge of the drill pad and the edge of lease will be deep-ripped and seeded (Refer to *Plate 2.15.3*). If the lease is on a slope, a diversionary drain will be formed on the uphill side of the drill pad.

Well infrastructure will then be fenced, with any flagging or remaining pegs removed from the site.

Periodic inspections will be conducted on the lease area and access tracks to assess vegetation establishment, erosion or any landholder issues.

Plate 2.15.3 Deep-ripped, Scarified and Seeded Well Lease Edge

15.1.2 *Trunkline and Gathering Line RoW Reinstatement*

The RoW width of pipelines (trunkline and gathering lines) will be influenced by pipe size and environmental constraints, but will be nominally 40m, with all disturbed areas regardless of width requiring reinstatement and maintenance. During construction, subsoil will be stored separately from topsoil so the area can be reinstated successfully for future groundcover establishment.

Partial restoration of the Pipeline RoW includes:

- reprofiling to original profile with topsoil spread across the entire RoW, roughly to minimise erosion
- mulch or vegetation waste respread across the RoW for stability of fauna habitat (refer to *Plate 2.15.4*)
- installation of permanent erosion and sediment controls
- restoration of watercourses by installing jute matting on the banks, contour berms on the high bank, rock-lining the creek base to minimise scour, and limiting the use of fertilisers
- direct seeding with a standard QGC mix approved by the landholder.

Plate 2.15.4 Cleared timber spread across pipeline RoW

Monitoring of a restored pipeline RoW (refer to *Plate 2.15.5*) will occur every month for the first year. Weed controls may be required. A report on the RoW reinstatement will be produced after a six-month period and after one year, detailing groundcover establishment rates, erosion and sediment control effectiveness and photos from monitoring points.

Plate 2.15.5 Restored RoW using mulching technique

15.1.3 Associated Water Facilities

In the early stages of the Project, QGC will operate a number of evaporation ponds as a disposal mechanism for Associated Water (i.e. water that is a by-product of the CSG extraction process). These ponds may be drained and converted to treated water storage ponds should they be deemed fit for this purpose by an appropriately qualified engineer. This may result in a number of evaporation ponds being decommissioned, with others to remain as treated water storage ponds. This will be managed in accordance with QGC's water strategy.

A preliminary mass-balance model indicates that dissolved ion concentrations within an evaporation pond will increase by a factor between six and 10 over a 20-year operating life (Golder, 2008). This increase is not significant and is unlikely to result in a build-up of precipitated salts prior to decommissioning at the end of a 20-year operating life, or conversion to a storage pond. A decommissioning plan will include alternatives to minimise the footprint of former evaporation ponds by pumping hypersaline residue (>30,000 mg/L) into a purpose-built storage facility. The contained material would require an engineered capping option followed by vegetation cover with minimal root penetration.

The rehabilitation and decommissioning of each evaporation pond or water storage pond will be subject to a detailed engineering plan and use of best engineering methods. Prior to evaporation pond decommissioning, water will be pumped to either an operational evaporation pond with the capacity to hold additional Associated Water, beneficially used or reinjected into a suitable aquifer in the process of being decommissioned. Embankment material will form a cover over the pond base, and stored topsoil will be utilised to support the growth of a grass species mix.

Following decommissioning, groundwater flow modelling of the clay-lined ponds will be used to estimate the area affected by salty pore water below the pond footprint. The wetting front should cease after pond dewatering, allowing the soil to desaturate.

Should an alternative Associated Water disposal facility not be available, in situ encapsulation of the saline material may form the basis of the closure and rehabilitation concept. Encapsulation material will comprise material with a low permeability and will insulate against infiltration, percolation and salt migration.

In general, rehabilitation activities associated with the disposal of saline residues and evaporation ponds will involve a physical and chemical investigation to determine the area extent of saline contamination, undisturbed landform characteristics and landholder requirements (e.g. preferred vegetation type).

Individual rehabilitation plans will depend on many factors that are site-specific: landform features, slope, water-flow restrictions in the landscape and soil type and quality. General rehabilitation principles can only be specified to a certain extent in the planning phase, but can be used as a basis for the preparation of the site-specific decommissioning and rehabilitation plan.

Associated Water facilities, as a minimum, will be decommissioned such that they:

- prevent environmental harm
- become stable landforms
- no longer contain flowable substances (diversion drains may be left in operation to transport water away from the pond floor area)
- comply with the rehabilitation requirements of the environmental authority (EA) issued in terms of the *EP Act* (Qld), best management practice for saline areas and any rehabilitation and decommissioning plan approved by the administering authority with the concurrence of the landholder.

15.2 *DECOMMISSIONING*

Prior to the decommissioning phase of the Gas Field Component, a decommissioning and rehabilitation plan will be prepared. Details within this plan will be based on landholder requirements, experience of any previously decommissioned structures, recent environmental audits, infrastructure registers, current EA conditions, legislative requirements and best practice at the time. The potential for recycling or reuse options by the landholder or a third party, and the nature of the environment in which the equipment or facility is located, will also be taken into account.

The plan will include a schedule and a standard method for each type of structure to be decommissioned. QGC may draw upon experience gained during decommissioning, which may occur prior to the ramp-down phase of the Gas Field. Infrastructure and their general decommissioning principles are as follows:

1. Well site equipment will be removed from the site. Wells will be decommissioned by plugging and sealing.
2. Inactive, buried gas and water-gathering pipelines will be decommissioned in situ consistent with the requirements of the Australian Standard 2885.
3. Access tracks will be decommissioned should they not be required for use by the landholder.
4. Field Compression Station (FCS) and the Central Processing Plant (CPP) and associated infrastructure, such as interceptor pits, triethylene glycol (TEG) units, and evaporation pond high-density polyethylene (HDPE) liners, will be removed from the site. Items such as compressors and driver engines will be recycled or salvaged for potential reuse by a third party where possible.
5. Hardstand areas will be removed where not required by the landholder, with footings buried in a suitable location, preferably within a decommissioned pond footprint. Compacted material will be deep ripped or removed from the site depending on the final land use requirements.
6. Flares will be removed from the site.
7. Evaporation ponds and water storage facilities may remain at the request of a landholder only if they do not contain hazardous substances; have been subject to a contaminated land assessment and possess structural integrity suitable for the future purpose.
8. Water treatment facilities will be wholly removed from the site. Treatment units, or components thereof, will be recycled or salvaged for potential reuse by a third party where possible.
9. Accommodation camps, administration buildings and warehouses will be removed from the site, unless a landholder requests to retain aspects of this infrastructure.
10. Energy infrastructure may remain if a further appropriate use can be foreseen. Otherwise it will be dismantled for recycling, scrap metals or transported to a waste disposal facility.
11. Waste transfer facilities will be decommissioned by the removal of all waste materials off site to an appropriate disposal location. To support the decommissioning and rehabilitation plan, waste facilities will be scheduled for decommissioning subsequent to the aforementioned items.