3.3.4 Onshore gas-processing facility

Hydrocarbon gas and liquids brought onshore via the subsea pipeline will be treated at an onshore gas-processing facility at Blaydin Point. Liquids (condensate and LPGs) will be separated, processed and stored, and gas will then be treated and liquefied. All the products will then be stored for later export via an offloading jetty.

The onshore gas-processing facility will be designed for a nominal design life of 40 years, with an approximate processing capacity of 8 Mt/a LNG, obtained through the installation of two LNG trains. This may be increased to approximately 10 Mt/a through future debottlenecking. A conceptual site plan for the proposed onshore facilities is presented in Figure 3-5.

Design of the onshore facilities will address risks associated with credible climate-change scenarios, in order to capture the possibility of severe weather events and a rise in sea level.

The primary components of the onshore gas-processing facility are:

- a gas reception area (with a pig receiver and slug catcher)
- two LNG liquefaction trains
- an LPG fractionation plant
- a condensate stabilisation plant
- gas turbines for power generation
- LNG, LPG and condensate storage facilities.

Other infrastructure associated with the operating gas-processing facility will include the following:

- a product offloading jetty
- emergency gas flare systems (ground flares)
- a control room
- on-site utilities and infrastructure (e.g. office, workshops, and storage areas).

3.4 PRODUCT EXPORT

Products from the onshore gas-processing facility will be exported by ship, using the product offloading jetty. The final layout and orientation of the jetty will be determined through stakeholder consultation.

Shipping movements during operations are expected to consist of approximately two to three LNG shipments per week, one to two LPG shipments per week and one condensate shipment per month.

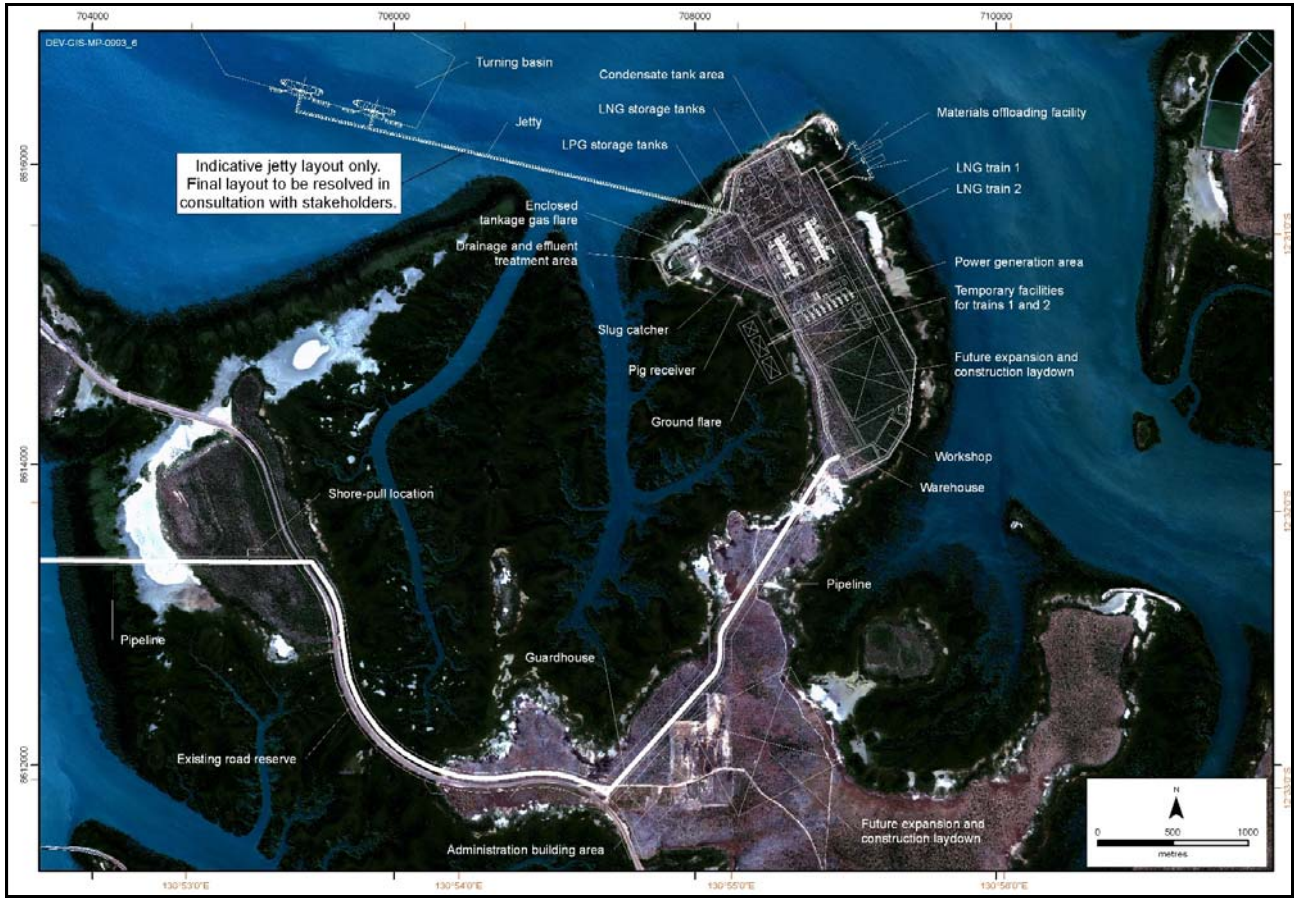

Figure 3-5: Conceptual site plan for onshore gas-processing facility, onshore pipeline and MOF, at Blaydin Point

3.5 CONSTRUCTION ACTIVITIES

A number of activities will be unique to the construction phase of the Project. These include the following components that have the potential to impact on the environment or on the heritage values of the area.

3.5.1 Offshore activities

Drilling and subsea structure installation

Subsea systems comprise subsea wells, a wellhead and a subsea tree connected to a manifold. Development of the Ichthys Field will require the drilling of a number of wells over the Project's lifetime. The final number of wells required will be determined in the detailed design phase of the Project but will be in the order of 50 wells with around 20 wells being drilled in the initial construction period.

Drilling is likely to be undertaken using a semi-submersible rig which is anchored into position. In the process of drilling the development wells, rocks crushed and ground by the drill bit are generated. These are referred to as "drill cuttings". Drill cuttings must be continuously removed from the hole using drilling fluids. The majority of these cuttings are discharged to sea.

The subsea system constructed on top of the wells forms the interface between the well and the CPF. The subsea trees and manifolds will be installed by the drilling rig as part of the drilling process. Installation on the seabed will involve either piled foundations or spread-concrete foundations. Further geotechnical investigation will determine which option will be used. Infield flowlines, jumpers and umbilicals will be installed from pipelay vessels or diving support vessels and connection to the subsea equipment and the CPF will be completed by remotely operated vehicles (ROVs) or by divers.

Installation and commissioning of the floating and fixed facilities

Offshore facilities and their process components are typically constructed at off-site fabrication shipyards.

Integration of the process modules and hulls typically takes place at the fabrication yards with the completed facilities being sailed into place at the gas field. Once the facilities are in place, they will be detached from the towing or transport vessel and either de-ballasted in the case of floating facilities or lifted and fixed to the seabed in the case of the fixed platform.

The export pipeline and flowline risers will be installed between the seabed and the CPF and the facility will be pressure-leak tested with seawater containing corrosion inhibitors.

INPEX intends to maximise off-site trialling and pressure-testing of facility components. Completion of the offshore facilities will coincide with the completion of

the onshore gas-processing plant and when all facilities are certified as ready the first hydrocarbons can be introduced into the system.

Pipeline installation

The offshore subsea pipelines will be laid using a pipelay barge kept in position using either dynamic position systems or an anchor system, depending on the depth of water, seabed conditions and vessel availability. Pipeline sections are welded together on the pipelay barge and laid over the stern of the barge. Prior to laying the pipeline, pre-lay preparation may involve sand-wave pre-sweeping.

In order to protect the pipeline from damage and movement, the entire length of the pipeline will require concrete-weight coating.

Following the installation of the pipeline and stabilising rock armour, further disturbance to the seabed is not foreseen.

3.5.2 Darwin Harbour activities

Construction of the pipeline and shore crossing

It is likely that the subsea pipeline will require burial in a pre-dredged trench in some or all parts of the alignment in Darwin Harbour, and may also require rock dumping to ensure bottom stability and protection from groundings or anchor dragging from other vessels. A source of subtidal marine sands somewhere in the Darwin region may be required to provide pipeline trench backfill material of the appropriate grain size.

The pipeline shore crossing is likely to be constructed using an open-cut trench design similar to that used at the ConocoPhillips LNG facility at Wickham Point. This involves dredging and excavating a trench, installing onshore winches and pulling the pipeline to shore from the anchored pipelay barge with a winch cable. Following the shore-pull operation, the trench may be rock-dumped offshore and reinstated onshore.

Construction of the jetty

The product offloading jetty is likely to be constructed using conventional piling techniques working out from an abutment. These techniques involve piling from jack-up barges. The jetty deck is likely to be constructed from precast deck sections installed on beams spanning the piled substructures.

Dredging and dredge spoil disposal

Dredging will be required for the development of a navigation channel and ship-turning basin, as well as for the preparation of the pipeline approach. Figure 3-4 (above) illustrates the navigation channels and turning basin for the LNG and LPG carriers. Requirements for dredging the MOF are anticipated to be relatively small. The current estimate of total spoil volume is approximately 5 Mm^3. A breakdown of the estimated dredge volumes are detailed in Table 3-2 below.

Table 3-2: Estimated dredge volumes for Project activities

Activity	Estimated volume of dredging required
Shipping channel and turning basin	Approximately 4 Mm^3
Pipeline approach	Less than 1 Mm^3 within Darwin Harbour
Materials offloading facility	Under investigation, but volumes are expected to be relatively small

A dredge spoil disposal location will be required. Options are currently being investigated and include the option of using settlement ponds at East Arm Wharf and offshore areas adjoining Darwin Harbour. INPEX will consult with key stakeholders (including the Darwin Port Corporation, the Darwin Harbour Advisory Committee, NRETA, the Commonwealth's Department of the Environment, Water, Heritage and the Arts (DEWHA) and the local community) to identify appropriate disposal locations. A dredge management plan will be developed prior to the commencement of dredging.

Maintenance dredging will also be required during operations to preserve appropriate water depths within the shipping channel and turning basin. Dredge spoil volumes to be generated have not yet been calculated but will be significantly less than the initial volumes during construction.

Marine exclusion zones

Throughout construction and into operations there will be a need for an exclusion zone in the nearshore marine waters around Blaydin Point. This is to ensure the safety of personnel and the public. The size of the exclusion zone is yet to be determined but will include the MOF area, the jetty and a perimeter exclusion zone around Blaydin Point. These exclusion zones will be prescribed by safety analysis and established in consultation with relevant stakeholders. They are anticipated to be consistent with those implemented for the ConocoPhillips-operated LNG plant at Wickham Point.

3.5.3 Onshore activities

Shipping movements

An increase in shipping movements within Darwin Harbour can be anticipated from the construction phase onwards. During construction, ship movements would include, but not be limited to, heavy-lift vessels and barges, pipe-laying vessels and pipe transport barges, miscellaneous cargo ships and dredging vessels. With the exception of heavy-lift barges, which will use the MOF to be constructed at Blaydin Point, construction phase cargo is expected to be offloaded at East Arm Wharf. The materials and equipment offloaded from the wharf will be transported by road.

Land clearing

It is anticipated that clearing and earthworks will be conducted over the area identified in Figure 4-1. The total area to be cleared within this proposal is

approximately 300 ha. INPEX has aimed to minimise clearing to the greatest possible extent and will rehabilitate any mangrove areas which will be temporarily disturbed.

Site earthworks

It is anticipated that most of the earthworks will be local cut-to-fill operations. The onshore sites for the gas-processing plant and administration area have been designed to minimise borrow material requirements. Flare construction will maximise use of borrow material from an existing borrow pit located south of the Project's administration area. Additional borrow pits may need to be developed to meet full Project needs.

Borrow material along with aggregate, sand and other earthwork material will be placed on the site, as will related plants such as crushing and screening and concrete batching.

Volumes of the cut, fill, rock protection and borrow requirements for the onshore gas-processing plant and administration area are summarised in Table 3-3.

Table 3-3: Provisional earthwork volumes anticipated for construction of the onshore facilities

Facility	Cut (Mm^3)	Fill (Mm^3)	Balance (Mm^3)	Rock protection (Mm^3)
Onshore gas plant	0.7	0.8	0.1	0.058
Flare	none	0.6	0.6	0.012

Assembly of plant

At this stage the construction method for major components of the onshore gas-processing facility has not been finalised. It is likely that a combination of on-site purpose-built modules and imported pre-assembled modules will be used to construct the plant.

Suppliers for pre-assembled modules have not yet been identified but may be sourced from within Australia or from Asia.

Services and utilities

It is assumed that public utility services such as water supply may be required from the commencement of construction and may also be required into the operations phase. Construction of a wastewater treatment plant will also likely be necessary.

Transport

Materials and equipment required during construction are to be transported by road. This will include heavy, long and wide loads.

Construction workforce

The workforce required at the peak of construction activity is provisionally assumed to be in the order of 2000 to 3000 people working on site. While local workers will be utilised to the maximum extent possible, some of the construction work force could be on a fly-in, fly-out roster.

Housing will be provided locally (in Darwin and Palmerston) or potentially at a third-party construction camp, also external to the Blaydin Point site.

Construction schedule

Construction for the Project is scheduled to commence in the second half of 2009 and is expected to be completed in the second half of 2013 to the first half of 2014.

This conceptual schedule will be influenced by many factors, particularly the plant construction methods. It is not yet known whether the plant components will be purpose-built modules or installed using pre-assembled modules.

3.6 WASTE MANAGEMENT AND POLLUTION CONTROL

3.6.1 Waste

Non-process waste streams during construction and into operations are likely to include:

- offcuts of fabrication materials, such as steel and electrical wiring
- packaging materials, such as wood, cardboard and plastic
- general domestic wastes and sewage from crib rooms and toilets
- machinery wastes, including lubricating oil, filters, etc.

Waste streams will be characterised in more detail, and disposal methods investigated, during development of the waste management plan for the Project (see Section 7 *Environmental Management Program*). The philosophy for waste management will be to reduce at source and reuse and recycled where possible.

3.6.2 Liquid discharges

Liquid process discharges from the offshore facilities are likely to consist of produced water, cooling water, sewage and deck drainage.

For the onshore processing facilities, a wastewater discharge outfall at an appropriate location may be required for nearshore disposal of treated wastewater which may contain trace levels of hydrocarbons and production chemicals. As the onshore gas-processing plant will be air-cooled, there will be no requirement for warm-water discharge. Other water discharges will include stormwater from non-process areas and treated sewage.

Modelling will be undertaken to demonstrate the environmental acceptability of any discharge streams.

A liquid discharge and drainage management plan will be developed prior to the commencement of construction (Section 7 *Environmental Management Program)*.

3.6.3 Air emissions

Emissions from the onshore gas-processing facility will include the following:

- nitrogen oxides (NO_x)
- sulfur oxides (SO_x)
- carbon dioxide (CO_2)
- carbon monoxide (CO)
- particulate matter
- methane (CH_4)
- volatile organic compounds (VOCs).

Air emissions from the onshore facility will be modelled to ensure that ground-level concentrations will comply with the relevant ambient air quality standards, notably the national environment protection standards set by the National Environmental Protection Measure (NEPM).

In addition, ozone (O_3) will be produced from the reaction of nitrogen oxides with VOCs in sunlight; this will also be modelled and compared against the NEPM. Cumulative air emissions from other existing industries will be taken into account within the air quality assessments to be conducted as part of the environmental assessment process.

3.6.4 Greenhouse gas emissions

INPEX recognises the capacity of greenhouse gases (GHGs) to impact on the environment on a global scale through their contribution to the phenomenon of global warming. As part of INPEX's commitment to the reduction of GHGs across its operations, a GHG emissions assessment is being conducted for all onshore and offshore activities associated with the Ichthys Project.

The Project will have two significant sources of GHG emissions: reservoir carbon dioxide (CO_2) and combustion GHG emissions. Reservoir CO_2 is the term used to describe CO_2 that is naturally present in the natural gas reservoir and which has traditionally been vented to the atmosphere when the reservoir gas is processed to produce LNG. The CO_2 content within the reservoirs averages 8.6% in the Brewster Member and 16.8% in the Plover Formation. Combustion GHGs are produced in large volumes from the gas production process, from gas turbines for compression and power generation, and to a lesser extent from acid gas removal units, hot-oil furnaces and flares.

INPEX is committed to reducing GHGs from its operations. In order to realise this commitment, an assessment is being undertaken within the design process to identify technical abatement and offset opportunities to reduce net GHG emissions. INPEX's environmental policy requires the company to actively promote the reduction of GHG emissions in a safe and technically and commercially viable manner.

3.7 REHABILITATION AND DECOMMISSIONING

Decommissioning of the both the onshore and offshore facilities will commence at the end of the Project's life in accordance with relevant national and state legislation and any conditions laid down during the approvals process.

Decommissioning of the offshore facilities will involve the removal of the CPF, FPSO, wellheads and manifolds. Decisions on the decommissioning of the infield flowlines, risers, suction pile anchors and the export pipeline will be subject to a comprehensive risk assessment conducted in consultation with the regulatory authorities.

Onshore decommissioning and rehabilitation will be agreed with the Northern Territory Government prior to the commencement of decommissioning. Options for the rehabilitation of the site will be appraised and a final decommissioning plan determined. Options may range from site levelling for further industrial use to rehabilitation to a state equivalent to that which existed prior to the Project being constructed. There will also be a need for rehabilitation plans for temporarily disturbed areas such as the shore crossing, pipeline routes and temporary construction laydown areas.

The initial design of facilities to be installed at Blaydin Point will include reasonable practicable measures to ensure that decommissioning can be safely performed.