NON TECHNICAL SUMMARY

NB. This summary includes information on the onshore pipeline route (landfall to Terminal). The RPS Onshore Pipeline EIS (2008) supersedes the information on the onshore section of the pipeline provided herein.

INTRODUCTION

Enterprise Energy Ireland Limited (hereafter Enterprise) propose to develop the Corrib natural gas field (the Corrib Field) off the coast of County Mayo with its co-venturers Statoil Exploration (Ireland) Limited and Marathon International Petroleum Hibernia Ltd. The first significant new gas development in Ireland for over 20 years, this project will bring gas infrastructure to the northwest region, which currently has no access to the national natural gas network. While very important for Ireland, the Corrib discovery is relatively small by international standards. However, the proposed development entails significant inward investment for County Mayo, and offers important security of energy supply in Ireland in the coming years.

This document is a non-technical summary of the Offshore Environmental Impact Statement (EIS) prepared for Enterprise and its co-venturers as part of their application for permission to develop the Corrib Field. The EIS (and thus this summary) covers the development of the offshore facilities and a pipeline from the facilities to a terminal on the coast.

The Corrib Field is an accumulation of natural gas located below the seabed in the northeast Atlantic Ocean, roughly 65 kilometres from the nearest significant landmass, the islands of the Mullet peninsula and Achill Head, on Achill Island (**Plate 1**). The natural gas is contained in a porous rock formation (reservoir) that lies at a depth of about 3,000 metres (11,500 feet) below the seabed.

Plate 1: Location Plan of Corrib Field

The gas in the Corrib Field is a dry gas, composed mainly of methane, and it will be an environmentally friendly fuel. It is quite similar to the natural gas that has been produced from the Kinsale Head gas field off the coast of County Cork since 1978. When developed, the Field will produce gas over a period of 15 to 20 years.

The natural gas will be produced from a number of wells drilled from the seabed into the gas reservoir. Equipment located on the seabed will control the flow of the gas from the wells into a pipeline. The pipeline will in turn take the gas to a reception facility (terminal) at Bellanaboy Bridge, County Mayo. There, the gas will be prepared for onward distribution and sale to domestic and commercial users through Bord Gáis Éireann's network of gas distribution pipelines (see **Plate 3**).

When the gas enters the terminal, it will be dried by removing small volumes of condensate (a hydrocarbon liquid that condenses from the gas) and water. It will then be exported from the terminal via a pipeline. The pipeline is to be funded jointly by the Corrib co-venturers and Bord Gáis Éireann (BGE), and will be built and operated by BGE, to tie into the national grid at Craughwell near Galway.

The Promoters

Enterprise Energy Ireland Limited is a limited company incorporated in Ireland. It has offices in Dublin and Bangor Erris. It is a subsidiary of Enterprise Oil plc, a publicly traded independent oil and gas company based in the United Kingdom. Approximately 650 staff in eight offices world-wide manage an average 280,500 boepd (barrels of oil equivalent per day) oil and gas production. The company has operations in Ireland, Brazil, Greece, Italy, Morocco, Norway, USA and the U.K.

Enterprise has a sound environmental track record. The company is committed to conducting all its activities in a manner that safeguards the health and safety of the workforce, the environment and the community interests.

The company's co-venturers in the Corrib development have considerable experience in the development and production of hydrocarbon facilities. Marathon, a subsidiary of Marathon Oil (US based) developed the Kinsale Head gas field offshore Cork in the mid seventies, and has operated in Ireland since then. Statoil with its head office in Norway is the largest oil producer in the North Sea. Statoil operates gas and oil terminals, refineries and pipeline transport systems, and has had a presence in Ireland, both in exploration and in petroleum products marketing and distribution, since the early nineties.

The Corrib joint venture has extensive experience in subsea oil and gas developments, offshore and onshore pipelines and in the construction and operation of oil and gas terminals.

Enterprise Health Safety and Environment Policy

Enterprise's Health Safety and Environment policy states that the Company will conduct all its activities in such a way as to:

- avoid harm to all personnel who may be affected by its operations;
- minimise adverse effects of its operations on the environment;
- seek progressive improvements in its health, safety and environmental performance; and
- comply with all applicable legislative and regulatory requirements.

The overall health, safety and environmental goal for the Corrib development project states:

> The development and its associated activities shall not give rise to accidents, personnel injuries or ill health, or to material losses or damage to the environment.

To achieve the above, the offshore development will be designed in accordance with all relevant standards and codes. Environmental and safety hazard identification activities and Hazard and Operability Studies form integral parts of the project's engineering effort, and will be conducted to cover design, installation, construction, commissioning, start-up, normal operations, maintenance and decommissioning activities. Health, safety, environmental and quality management systems will be implemented in all stages and all elements of the project.

All activities will be carried out in accordance with the requirements of the Safety, Health and Welfare at Work Act (1989) as amended.

The Consents Process

Before the Corrib Field can be developed, a number of consents and licences must be in place.

The Minister for the Marine and Natural Resources regulates all exploration activities in Irish waters. To date Enterprise and its co-venturers have carried out exploration in the Field in accordance with the terms set out in an exploration licence. As the joint venture proposes to develop the Field, they apply for a Petroleum Lease, which when granted, sets out conditions for production operations.

When a Petroleum Lease has been granted, the Licence Operator, Enterprise, must apply by submitting a Plan of Development, for the Minister's approval to develop the Field.

The development of the Corrib Field will consist of a number of different elements. Each will require their own, specific, permissions or licences.

The building of the terminal requires planning permission from the local authority. Because of the energy requirements at the terminal, arising from the need to pressurise the export gas, it will also need an integrated pollution control (IPC) licence from the Environmental Protection Agency before operations can commence. This licence sets out the detailed limits for all emissions from the terminal, and specifies the monitoring regime to be put in place to ensure that these limits are adhered to.

Enterprise must also apply to the Minister for consent under the Gas Act 1976 (as amended) to construct and operate the pipeline from the subsea installation to the terminal. A separate application must also be submitted to the Minister for a Foreshore Licence to lay pipelines across the foreshore. The Minister may attach conditions to his approvals.

Each of these permissions and licences involves a high degree of consultation, particularly through the environmental impact assessment process. This process provides opportunities for authorities and agencies with specific environmental responsibilities as well as the public and other interested parties to have input into the development process.

Environmental Impact Assessment

Environmental Impact Assessment (EIA) is a process for anticipating the effects on the environment caused by a development. The aim, through careful scoping, is to identify and predict any impacts of consequence, to describe the means and extent by which the impacts can be reduced or lessened and to interpret and communicate information about the impacts through a formal document known as an Environmental Impact Statement (EIS).

An EIS for the terminal has been prepared and submitted to Mayo County Council as a part of the application for Planning Permission for the terminal.

The Offshore EIS has been prepared and submitted to the Department of the Marine and Natural Resources (DOMNR). It takes into account all the remaining elements of the development seaward from the terminal. It includes: the onshore pipeline and umbilical cable from the terminal to the coast, including two sub-tidal crossings of the Sruwaddacon; the offshore pipeline and umbilical cable between the coast and the subsea facilities; a waste water discharge pipeline from the terminal to Broadhaven Bay; the subsea facilities and the wells. The Offshore EIS and this non-technical summary have been produced on behalf of Enterprise by RSK Environment Ltd. They are prepared in accordance with the requirements of the European Communities (Environmental Impact Assessment) Regulations, 1989 to 1999, which specify the types of project requiring an EIS and the information to be provided.

A combination of field surveys, desktop studies and modelling techniques were used to evaluate the potential impacts of the development. Consultations, a very important element of the environmental impact assessment process, have been undertaken with the DOMNR, as well as other government departments and agencies with specific environmental

responsibilities. The main organisations contacted are listed below with a summary of key concerns arising:

Consultee	Key Concerns
An Taisce	Potential impact on the biological environment
Central Fisheries Board	Potential impact on fish nursery areas
Dúchas	Potential impact on archaeology
	Designated conservation sites
	Deposition of spoil in SAC and SPA.
	Potential impact on little tern when constructing landfall
Erris Inshore Fishermen's Association	Potential impact on Broadhaven Bay water quality and bioaccumulation Restriction of access to Broadhaven Bay
Irish Whale and Dolphin Group	Potential impact on cetaceans
Mayo County Council and Local Community	Fishermen – potential impact on Broadhaven Bay water quality and shellfish
	Proposed abalone farm – impact on Broadhaven Bay water quality
	Potential siltation arising from crossing the Sruwaddacon
	Economic implications of construction of the onshore pipeline on farmers with respect to REPS, Headage schemes, Area Aid and Afforestation schemes.
	Justification of landfall location and onshore pipeline route
Department of the Marine and Natural Resources	Consideration of alternatives Potential impact on offshore fisheries
Marine Institute	Offshore discharges and potential impacts on water quality and flora and fauna

Consultations with local communities, landowners and interest groups such as fisheries organisations have also been undertaken. A series of public exhibitions were held in Mayo in June 2000 and November 2000 where comments were invited. Feedback from the consultations was incorporated into the EIS. Enterprise established a Corrib Gas Information Office in Bangor Erris in August 2001, which serves to invite people who have queries or an interest in the project to contact the company. Newsletters have also been distributed as insert in local newspapers.

A glossary of technical terms and abbreviations for the Offshore EIS is provided at the end of this document.

THE CORRIB PROJECT

Project Overview

The Corrib gas field was discovered in 1996 when an exploration well was drilled. Since then Enterprise has drilled five appraisal wells to gather more information about the size and properties of the hydrocarbon reservoir, and carried out studies to determine the feasibility of developing the field. About 100 people are now employed in Ireland on the Corrib development and related issues. This will rise to about 500 during construction. A further 50 to 70 people will be recruited to operate the Gas Reception terminal.

It is proposed that the Corrib Field is developed using a number of subsea gas wells flowing into an underwater pipeline. The wells will be connected to the pipeline via a collecting system known as a manifold placed on the seabed. The pipeline carrying the gas will come ashore at Dooncarton in Broadhaven Bay, County Mayo, from where it will run underground to the terminal. The 20 inch diameter pipeline will be made of steel and will be buried to a minimum depth of 1.3 m below ground level throughout the route between the landfall and the terminal.

The terminal facilities will include equipment to control the subsea production facilities and to remove liquids from the Corrib gas so that it meets the specification required by Bord Gáis Éireann (BGE). BGE will operate the pipeline that transports the gas from the terminal to the users. The terminal facilities will include compressors to control the flowrate and pressure of the gas in this pipeline. The subsea facilities in the Corrib Field will be controlled and monitored from the terminal by means of an electric and hydraulic remote control system. Control signals and power, along with required chemical injection fluids, will be carried between the terminal and the Corrib Field in an underwater 'cable' (umbilical), buried in the seabed.

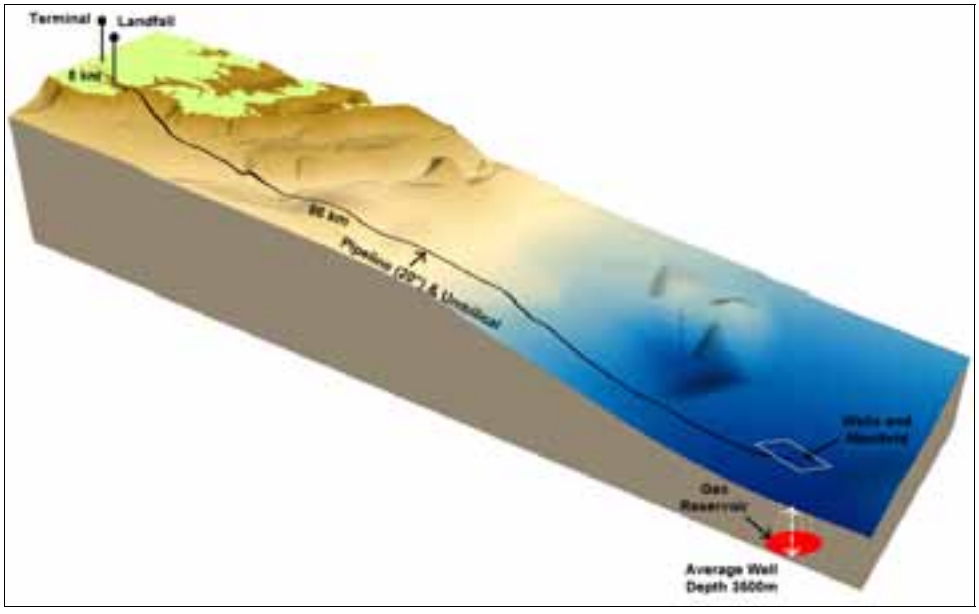

Plate 2: Corrib Development

Production of gas is expected to start in 2003 and is predicted to continue for 15 to 20 years. It is anticipated that during the early years of production, Corrib will produce between 310 and 350 million standard cubic feet of gas per day (mmscfd). In the first year of production it will contribute approximately 60 per cent of predicted demand in Ireland.

The natural gas supply from Corrib would form an integrated part of the existing and planned national network as shown in **Plate 3**

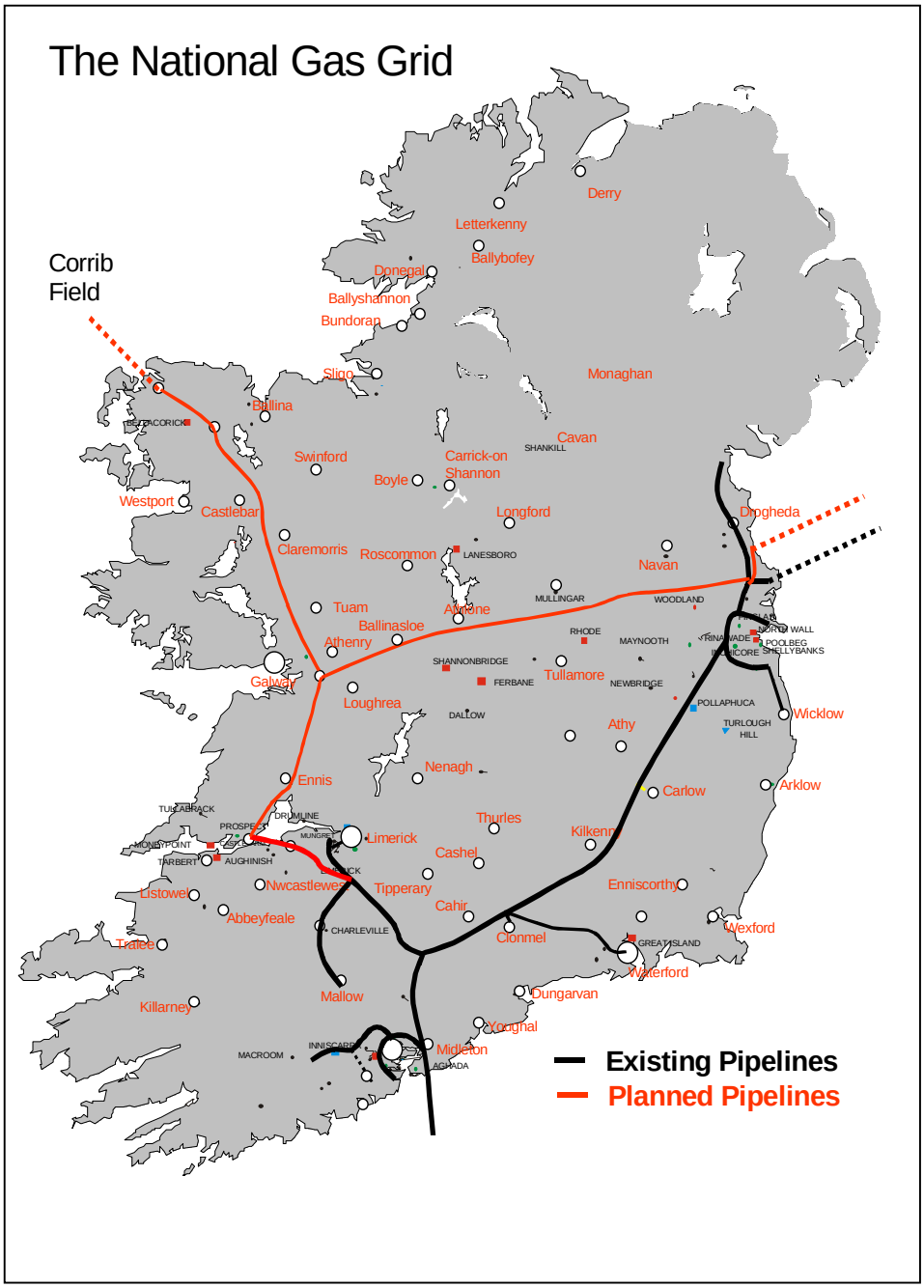

Plate 3: The current and proposed extent of the Bord Gáis Éireann gas network.

Significance of the Corrib Development

The Corrib Field is of importance to Ireland as a whole. In this respect, the following points should be noted.

- Currently, the only source of Irish natural gas is the Kinsale Head/Ballycotton gas field area off the coast of Cork. The Kinsale Head gas field has been in production since 1978 and has contributed greatly to the Irish gas supply. The balance (currently 70%) is provided by imports from abroad. Production from this area has been declining for several years and within the next few years is expected to cease entirely.
- The demand for gas in Ireland is growing rapidly, due principally to its increasing use for power generation to meet rising demand for electricity. Demand for gas powered electricity generation is expected to continue to grow as other less environmentally acceptable fuels are phased out in order to achieve Ireland's emissions reduction targets for greenhouse gas emissions under the Kyoto Protocol.
- There is no gas distribution system in the west or northwest of Ireland.
- The present electricity supply to northwest Ireland is unreliable.
- The UK is expected to be a net gas importer by 2004. Ireland, through its reliance on imports, will shortly become dependent on imports via a country, which is itself a net importer of gas. This could give rise to price increases, as the U.K. will depend on imports from Norway, the former Soviet Union and North Africa. The European commission has expressed concern about security of supply for Europe, given the political instability of some of these areas.

The timely development of the Corrib Field will resolve or partly resolve many of the issues and problems highlighted above. In particular it will:

- Provide a significant and reliable additional indigenous gas supply, increasing Ireland's overall security of supply.
- Reduce or eliminate the risk of gas and electricity shortages in late 2003 and beyond.
- Improve Ireland's balance of trade position by reducing the need for gas imports.
- Support the construction of an Irish gas ring main system and the provision of a major gas pipeline in the west of Ireland and encourage the development of regional power generation projects.
- Reduce the cost of and therefore facilitate the provision of fibre optics infrastructure (a fibre optics cable can be laid with the gas pipeline).
- Aid the development of an improved electricity supply system in the west of Ireland.
- Create a large number of jobs during the construction phase of the development; temporary local employment, as well as increased demand for accommodation, transport and catering services.
- Create a significant number of skilled jobs at the terminal throughout the life of the Field.

- Through the development of gas and fibre optics infrastructure, stimulate the development of existing and new local businesses and generally benefit the Mayo/Galway area, helping to redress regional economic imbalance (an objective of the current National Development Plan).

ALTERNATIVES

Consideration of alternative development strategies

During the early studies of the Corrib Project, a number of technical alternatives were evaluated to identify the best way of extracting the gas and bringing it to shore. The evaluation considered the use of proven and developing technology to develop the Field in a harsh marine environment, with the knowledge that no existing natural gas production infrastructure exists in, or offshore this part of Ireland.

The area where the Corrib Field is located is known as the Slyne Basin. This is a sedimentary basin that lies below the seabed, and was formed hundreds of millions of years ago. The basin runs roughly north south, parallel to the Irish coast. It lies in the northeast Atlantic between the Rockall Trough and the western coast of Ireland. The water depths in the immediate area generally vary between 300 and 350 metres, becoming deeper to the north and west. Water depths become shallower moving east towards the Irish coast.

This area is considered to be one of the harshest environments in the world for marine developments of this kind. The area is exposed to harsh weather, with wave heights normally being greatest during winter. The west to northwest winds, associated with Atlantic weather systems, cause heavy seas and there is also significant exposure to the full impact of Atlantic swell from the northwest to the southwest.

Concepts Considered

A number of possible ways forward were identified. The concepts studied represented realistic and technically feasible solutions to all the relevant technological, environmental and safety issues. The principal options considered were:

1. Construction and installation of a deepwater fixed platform standing on the seabed, with drilling, processing and accommodation facilities. The gas would be carried in a pipeline to an onshore reception terminal.
2. Construction and installation of subsea production facilities in the Corrib Field, and a “shallow water” (less than100m depth) fixed platform located between the Corrib Field and the shore with gas/liquid separation facilities and production control. This option also required an onshore gas reception terminal.
3. Construction and installation of subsea production facilities in the Corrib Field supported by floating facilities (a ship or floating platform) for gas/liquid separation and production control. Subsequent gas transport through a pipeline to an onshore reception terminal.
4. Construction and installation of subsea production facilities in the Corrib Field. The gas would be carried in a pipeline to an onshore reception terminal.

The first three options each required offshore processing and accommodation facilities. All required a gas pipeline to transport the gas to shore and an

onshore reception terminal. Option 4 required more extensive facilities at the terminal than the other three since all production support would be located there.

Development Concept Selected

The preferred development option for the Corrib Field is Option 4, a subsea system connected directly into an onshore gas reception terminal.

The reasons for selecting this concept are as follows:

- The relatively dry nature of the Corrib gas and the high reservoir productivity permits the practical adoption of well-proven and reliable subsea production technology.
- The proposed development scenario (Option 4) readily allows the use of the existing appraisal wells as production wells, thereby minimising the drilling activities required with associated environmental implications.
- All the options involving an offshore manned facility (Options 1, 2 and 3) have increased risk implications, both in safety and environmental terms, particularly with respect to movements of goods at sea and transfer of personnel to and from the platform. In addition, vessels and aircraft, with high associated resource and energy requirements, must support such facilities.
- Options 1 and 2 require platforms fixed to the seabed. The deep water and harsh sea conditions in the Corrib area represent conditions at the limit of current technology with respect to such structures.
- Floating production facilities (proposed in Option 3) are sometimes used to develop fields in deep waters. These are particularly suitable when the product, normally crude oil, is sold in particular volumes or batches, to the customer. Gas from the Corrib Field will have to be sold in a long-term gas sales contract, which guarantees constant delivery of a set quantity of gas, with very few opportunities for interruption without serious commercial penalties. Floating production facilities are more vulnerable to weather, and may have to be disconnected from the export facilities for safety reasons in extreme weather conditions. The harsh weather conditions in the area therefore weigh against the use of such facilities.
- The floating and fixed platform options considered (with the requirement for gas transportation and onshore gas reception infrastructure) have high capital costs which, in combination with the volume and predicted gas price for the Corrib gas, rendered their adoption uneconomic.

Landfall Site Selection

A thorough evaluation of a suitable landfall for the Corrib development was carried out, considering the technical feasibility of bringing a pipeline ashore, as well as identifying a suitable location for the onshore gas reception terminal.

Feasibility

The coast to the east of the Corrib Field is very rugged and exposed. It is characterised by numerous islands, inlets and small bays making it necessary

to cover a very wide area in the search for a suitable place to bring the pipeline ashore. Surveys carried out along the coastline from the mouth of the Shannon to Sligo provided basic information on seabed features and sediments.

Plate 4: Alternative landfall locations

The surveys identified many areas of extensive rock outcrop. Because of environmental and technical difficulties encountered when attempting to lay pipeline in areas of rock, the number of locations suitable for bringing the pipeline ashore are severely limited. Four suitable areas were identified:

1. Killala Bay, in Counties Mayo and Sligo;
2. the eastern side of Broadhaven Bay and Blacksod Bay in Co. Mayo;
3. Emlagh Point, to the west of Westport in Co. Mayo; and
4. Liscannor Bay and Doughmore Bay in central Co. Clare.

Evaluation

It was then necessary to evaluate each of these areas further. In particular it was necessary to establish how the various landfall options would affect the viability of routes for the offshore and the onshore pipelines and the location of a terminal. An ideal location for a landfall might not be viable if, for example, the bay further out to sea was too rocky for a pipeline, or if the pipeline on land had to cross an environmentally sensitive site, or if there was no suitable location for a terminal. Choice of landfall would greatly affect the ease and cost of production.

This screening process identified the following potential landfall locations in Counties Mayo and Sligo:

1. Between Lenadoon Point and Rathlee Head, on the east side of Killala Bay in Co. Sligo, with the reception terminal located at the landfall.
2. The west side of Killala Bay in Co. Mayo, with two possible reception terminal sites, one at the landfall and the other some distance inland.
3. Bunatrahir Bay, in Co. Mayo, with the reception terminal within 0.5 kilometre of the landfall.
4. Broadhaven Bay, either to the north or south of the Sruwaddacon inlet, with the reception terminal nearby.

Review and Selection

The subsequent selection process reviewed the preferred terminal location(s) for each landfall. The main criteria applied were as follows:

- keep visual impact to a minimum;
- avoid environmentally sensitive areas, included those designated as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) including candidate areas; and
- minimise the distance from landfall to the terminal.

The findings were as follows:

1. Rathlee. The primary constraint identified was the potential visual impact of the terminal because all locations were highly visible and difficult to screen.
2. Killala Bay. Several landfall locations were considered around the bay. One landfall location was a designated SAC and National Heritage Area (NHA), another was a recreational beach. The areas to the west of the bay were designated as being of Special Scenic Importance. No suitable terminal location could be identified within a suitable distance from the landfall.
3. Bunatrahir Bay. The beach area was designated an Area of Special Recreational Importance. Potentially exposed bedrock could be problematic for landfall construction. The nearby beach of Portnahally was considered but potential terminal sites were highly visible, particularly from the R314 around Ballycastle. .
4. Broadhaven Bay/Bellanaboy Bridge. This was the favoured location for the terminal because it could be located within farmed forestry (the Coillte plantation). Screening could be maintained using the existing plantation.

In addition to Broadhaven providing the best location for a terminal, the ground conditions at the foreshore and the approach to the bay are predominantly sand and thus suitable for landfall construction. A further benefit was that the bay is the closest to the offshore facilities thus minimising offshore pipeline length.

Four potential routes were identified between the landfall and terminal. With the bay recognised as a candidate for designation as an SAC and Sruwaddacon Bay SPA and Glenamoy Bog Complex SAC adjacent, great care was needed when choosing the route. The favoured scenario was to come

ashore at Dooncarton, near the mouth of the Sruwaddacon inlet, and build the terminal within the Coillte plantation area near Bellanaboy Bridge.

Alternative terminal locations were considered around Broadhaven Bay, but none were as suitable as that near Bellanaboy Bridge. In particular the visual impact of alternative sites nearer the bay would have been much greater. The Bellanaboy Bridge site in ecological terms is also less sensitive than the general area around it, having already been ecologically altered from its original state by its use as a forestry and peatland research station since the 1950s.

In summary, the combination of a landfall at Broadhaven Bay and a terminal near Bellanaboy Bridge, in spite of the need to pass through designated areas, offers the following advantages:

- the approach to the landfall is feasible, and in parts rock free, allowing the pipeline to be installed without significant environmental impact on the candidate SAC;
- the pipeline can be installed at the landfall by conventional means with minimal environmental impact;
- installation of the onshore portion of the pipeline is relatively straightforward and can be achieved with minimal to moderate environmental impact and no impact on an SAC or SPA;
- there is no residual environmental impact predicted from the construction of the pipeline;
- the terminal site is partly wooded, greatly reducing the visual environmental impact ; and
- the terminal site has already been disturbed during its previous use as a Coillte experimental site.

Onshore Pipeline Route

Four options were considered for the pipeline route between the landfall and the terminal. These were as follows:

- from a landfall at Brandy Point to the terminal site;
- from a landfall at Dooncarton through Sruwaddacon Bay to the terminal site;
- from a landfall at Dooncarton via the south side of Sruwaddacon Bay through the back of Pollathomas village to the terminal site; and
- from a landfall at Dooncarton via Rossport and the north side of Srawaddacon to terminal site.

Very early in the selection process, the two first alternatives were ruled out; the route through Sruwaddacon was ruled out on environmental grounds, due to the SPA status of the bay, and the predicted amount of disturbance

associated with routing through it. Brandy Point was ruled out as a landfall, due to extensive technical difficulties identified with respect to construction through the cliff. This alternative was also found unsuitable with respect to archaeology onshore, as the pipeline route between Brandy Point and Bellanaboy Bridge passes between numerous known monuments and field systems in the vicinity of Graghil and Gortbrack North. These remains indicate Neolithic activity and a high level of archaeological potential, and this route option was therefore considered less attractive than the routes from Dooncarton (see below).

Detailed ecological and archaeological routing surveys had been carried out for the Brandy point route, as well as for the Pollathomas and Rossport route options. The northern route through Rossport was chosen for the following reasons:

- The route was straighter, and more level, thereby reducing the overall environmental impact associated with construction of the pipeline; and
- The technical feasibility of the southern route was doubtful. Due to the steep hilly terrain, particularly behind Pollathomas village, significant safety risks were identified with respect to slope stability and the possibility of landslides impacting on the pipeline. These aspects made this route less feasible.

Rainwater and Produced Water Disposal Options

Studies were carried out to determine how best to dispose of waste water from the terminal. The water to be disposed of includes treated rainwater and produced water (water of condensation and formation water) removed from the gas brought to the terminal.

Various options for the disposal of the water were evaluated, as follows:

1. onshore injection;
2. discharge to local drainage systems;
3. re-injection into the Corrib reservoir via a pipeline;
4. estuarine discharge;
5. coastal discharge, no water treatment in the terminal;
6. coastal discharge, limited water treatment in the terminal; and
7. coastal discharge, full water treatment in the terminal.

The onshore injection and local drainage options were ruled out due to the possible salty nature of the water.

The laying of a second pipeline back to the field to re-inject the produced water into the reservoir (Option 3) would have required a larger trench in the seabed with associated environmental impact. In addition, the water would need to reach the reservoir at reservoir pressure, which would require very

extensive pumping power. This in turn would entail larger onshore facilities and associated emissions.

Estuarine discharge in Sruwaddacon Bay (Option 4) was ruled out due to the enclosed nature of the south-eastern end of the bay, which would reduce the potential for dispersion and potentially upset the existing salt/freshwater balance

The disposal option selected is comprehensive water treatment at the terminal in combination with coastal discharge option (Option 7). Any liquids produced from the wells with the gas stream will be extracted within the proposed reception terminal at Bellanaboy Bridge. Produced water will be separated out, and passed through a comprehensive treatment process. The role of the proposed treatment process is to reduce concentrations of elements in the effluent to or below Environmental Quality Standard (EQS) levels before the water is allowed to leave the terminal.

In addition, before discharge, the treated produced water is combined with the rainwater and in emergency cases treated firewater run-off (water used to put out fires) from the terminal site. Rainwater and firewater, if any, will also have been treated to EQS level in a separate treatment process.

Option 6, which proposed limited water treatment, may not result in the discharge meeting this standard and thus was not considered viable.

Hydrodynamic and dispersion modelling of the discharge has been carried out to determine the fate of the discharged effluent, and its potential impact on the water quality of Broadhaven Bay.

Four alternative discharge locations were considered. These were located at 10, 20, 30 and 40 metres water depth, at the points where the incoming pipeline route crosses the respective depth contours. The results of modelling indicated that by moving the point of discharge into progressively deeper water the maximum concentration of each constituent of the effluent is reduced.

The incremental benefit achieved reduced with increasing total water depth to the point where there is no significant improvement in terms of water quality as a result of moving from a water depth of 30m to 40 m.

Thus it was concluded that extending the outfall into still deeper water would not yield any significant benefit provided the effluent is treated to at least the EQS standard before discharge, and an outfall extending to the 40 m contour in Broadhaven Bay was chosen. This is approximately 7 km from the landfall at Dooncarton.

THE UPSTREAM DEVELOPMENT

Description of the Development

The Corrib Field will be developed around a subsea 'drilling centre'. The drilling centre will comprise a cluster of wellheads which mark the seabed location of the gas producing wells. In addition, single wells, termed satellite wells, located up to 3 km away from the drilling centre, will be connected by pipes and by control/support cables. It is currently proposed that there will be up to eight wells in the field, five of which will be located at the drilling centre, with the remaining three being satellite wells.

Gas produced from the drilling centre and the satellite wells will come together in a gathering pipe, termed the production manifold, from where the gas will be transported through a pipeline to shore. From the landfall at Dooncarton, the pipeline is routed in a north-easterly direction across the Sruwaddacon to Rossport, from where it will pass through agricultural land close to the Sruwaddacon to a point opposite the proposed location of the terminal. The pipeline then crosses the Sruwaddacon in a southeasterly direction, and continues through peat bog and forestry land before reaching the terminal site.

The development is outlined below in the following sequence:

- description of the facilities necessary to develop the field;
- description of the construction and installation operations (including drilling); and
- production operations.

Facilities necessary to develop the field

Equipment in the field

The equipment placed on the seabed will include:

- Wellhead valve assemblies or 'Christmas trees'. These are a collection of valves, mounted on a common structure, used to control the flow of gas from each well.
- A production manifold. This pipework is used to gather gas from all the producing wells.
- A pipeline end manifold or PLEM. This item allows the gas flow from the manifold to be shut off from the pipeline to shore when necessary.
- An umbilical. This is a bundle of electrical cables and hydraulic pipes encased in a cable which runs from the terminal along the pipeline route to the equipment in the Field. Its purpose is to allow a) the operation of the Corrib Field to be controlled from the terminal and b) the injection into the gas stream of small volumes of chemicals (see below).

- A subsea distribution unit (SDU), incorporated into the production manifold. This is used to distribute hydraulic fluid and chemicals from the umbilical to the wells.

The satellite wells will be connected to the production manifold by separate flowlines (pipes) and umbilicals.

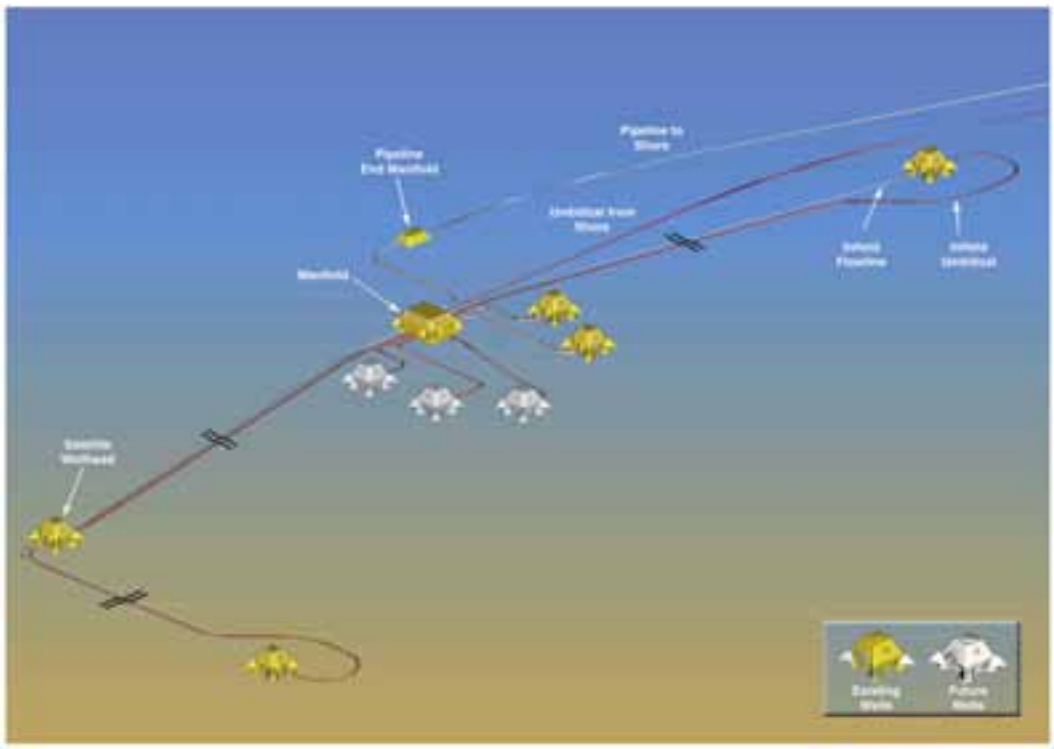

Plate 5: Offshore Field Facilities layout

The subsea facilities will be protected from physical impact and from corrosion. Physical damage can occur if objects are dropped on the facilities, or if fishing gear comes into contact with them. Engineering assessments, which are based on over 30 years experience in the North Sea, have been made on how best to protect the pipeline and other facilities from physical damage, as well as protecting fishing gear from being damaged. Overtrawlable protection frames are installed over the wellheads and manifold.

The inner surfaces of the wellhead equipment and manifold require protection, since the fluids coming from the reservoir can be corrosive in nature. They will therefore be coated internally by a corrosion resistant material.

In order to prevent the formation of gas hydrates (ice crystals which form in certain temperature and pressure conditions), which can build up and cause blockages in pipework and valves, a hydrate inhibitor is also injected into the fluids in the production manifold. The hydrate inhibitor, methanol, acts as an 'antifreeze' in the gas stream.

Pipeline/Umbilical/Outfall Pipe

The gas pipeline and umbilical cable will be routed from the offshore facilities to shore, through Broadhaven Bay to a landfall at Dooncarton at the western end of Sruwaddacon Bay and from there to the terminal.

A water discharge pipeline will be laid in the same trench as the gas pipeline from the terminal to a location approximately 7 kilometres from the landfall in Broadhaven Bay.

Physical protection measures for the offshore section of the gas pipeline include concrete coating, rock placement, and trenching where deemed necessary. Onshore the pipeline is buried to a minimum of 1.3 metres depth. The umbilical is buried throughout its entire length, offshore and onshore. The outfall pipeline is also buried.

The outer surface of the gas pipeline needs protection from corrosion. This will be achieved by a combination of pipeline coating, and the use of a cathodic protection system. The latter uses a series of sacrificial anodes to maintain an electrical potential across the pipeline. The inner surface of the pipeline also requires protection. This is achieved by pumping a small amount of a corrosion inhibitor into the fluids in the production manifold.

Construction/Installation

Drilling Operations

The five appraisal wells that have already been drilled in the Corrib Field have been blocked off (plugged) and left in a safe state, in such a way that it is possible to reuse these as future production wells.

In addition, Enterprise is proposing to drill up to three new wells in the field, between 2002 and 2007. Each well takes approximately 2 months to drill.

All the wells in the Corrib Field are drilled from a mobile, semi-submersible drilling rig. The rig, which is towed to and from location by tugs, is held in position by anchor chains, and is supported in the field by a safety stand-by vessel and a supply vessel.

During drilling operations a fluid known as drilling mud is pumped from the rig and circulated around the well through sections of pipe known as the drill string. As the drill bores through the rock, it produces small chips or cuttings of rock, ranging from fine sand to gravel, like sawdust from a domestic drill. The mud carries the drill cuttings out of the well, and back to surface. Initially, cuttings are discharged directly on to the seabed from the wellbore. Further into the drilling operations, the cuttings are transported up to the drilling rig for treatment before discharge or recycling. Mud returning to the

rig, is processed and recycled to the well. The mud has an important safety functions, providing hydrostatic pressure in the well to control the formation pressures found in the various rock layers. In addition, it lubricates and cools the drill bit on the bottom of the drill string.

Different mud types are used in different rock formation. In the Corrib Field, the upper parts of the wells are drilled with water-based mud, and the lower unstable formations drilled with an organic-phase system, i.e. a synthetic-based mud system or an oil-based mud system. Rock cuttings and mud from the parts of the well drilled with water-based mud are discharged to the seabed. The lower sections of the wells drilled between 1996 and 2000 (5 wells) were drilled with synthetic-based mud. Rock cuttings from these sections were returned to the drilling rig from the well for cleaning before they were discharged to sea.

For wells drilled after 1 January 2001 an oil-based mud has replaced the synthetic-based mud, and all cuttings from the sections drilled with this fluid are returned to the drilling rig and subsequently transported to shore for recycling. No discharge of oil-based mud or cuttings containing oil-based mud takes place.

Field equipment installation

Installation of the equipment on the seabed in the Corrib Field will be carried out from specialised offshore construction vessels, including a drilling rig and a number of support vessels. Because the water is too deep for divers to operate safely, installation activities will be supported by Remotely Operated Vehicles (ROVs). The ROVs will be deployed from the surface vessels, and where appropriate, from the drilling rig. It is intended that these operations will be undertaken during the 2003 summer season.

Installation of Offshore Pipeline, Umbilical and Outfall Pipe

The gas pipeline, which will be installed during the summer season of 2002 will be laid from a pipe lay vessel which uses its own propulsion system to hold position (dynamically positioned) rather than anchors. The barge will lay pipe between Broadhaven Bay and the Corrib Field. The pipeline sections are welded together on the barge and lowered to the seabed from the stern of the vessel, as it moves along the pipeline route. In the shallower areas of Broadhaven, a smaller lay vessel, which will be held in position by anchors, will lay the remaining offshore pipeline.

Where the pipeline is to come ashore, a trench will be prepared from the high water mark to approximately 10 metres water depth (below lowest tide). Lengths of pipe will be welded together on the smaller pipelay barge, which will positioned some distance out in the bay, and the pipe will be pulled ashore through the trench by winches which will be set up on the shore above high water mark.

It is anticipated that the laying of the pipeline will be completed in approximately one month.

The offshore section of the outfall pipe from the Terminal will be laid and trenched together with the main pipeline, by the same vessels.

Plate 6: Dynamically Positioned Pipe Lay Vessel

Where the pipeline needs to be buried, including the whole of Broadhaven Bay, a trench is prepared in the seabed sediment. This is normally done by a dredger or trenching vehicle. In some areas very close to shore, where the sediment layer is too thin to bury the pipe completely, it will be necessary to remove some of the rock that lies under the sediment. This may require underwater blasting.

Where necessary to keep the pipeline stable on the seabed, the pipeline will be concrete coated. This coating is placed on the pipeline prior to the lay operation and will not cause additional seabed disturbance. In deep water the pipeline does not require a concrete coating for stability. It is still protected by a dense polypropylene coating. These methods of protection represent best industry practice for oil and gas pipelines above 16-inch diameter, and are widely used, both in the North Sea, and in other offshore oil and gas regions.

Plate 7: Trenching vehicle suspended from mother ship

The control umbilical will be installed using a dynamically positioned cable-laying vessel. It will be laid in two halves with a connection point midway between the landfall and the Corrib Field. Laying will commence at the landfall, and continue to the mid-point. The laying of the second half will commence at the mid-point and proceed to the Corrib Field. The umbilical will be laid on the seabed along the pipeline route. A dynamically positioned vessel towing a trenching and burying machine will then dig a trench in the seabed and place the umbilical in it. Installation and trenching of the umbilical are planned for the summer season of 2003.

The method selected to carry out the two crossings of the Sruwaddacon is "open-cut" where a trench will be dug in the bed of the estuary and the pipeline lowered or pulled into it.

Onshore Pipeline Construction

Prior to construction, the route will be surveyed and pegged out in consultation with the landowner/occupier.

All construction activities will normally be undertaken within a fenced strip of land, known as the working width. This will generally be 40 m wide. The working width will be clearly marked and stock proof fencing will be erected in areas grazed by sheep, cattle etc.

The topsoil will be stripped across the entire working width by appropriate earth moving equipment and stored carefully at one side of it.

The pipe will be delivered to the area by road. A temporary pipe storage area of approximately one hectare will be required to store the sections of pipe

between their delivery from the coating mill and use on the construction site. This will be at the proposed terminal site.

The pipe lengths will be delivered with a factory applied anti-corrosion coating and where appropriate with concrete weight coating. The pipe sections will be laid out along the route and will then be welded together. All the welds will be x-rayed and approved before an approved coating is applied.

The pipe trench will be dug either with mechanical excavators straddling or running alongside the pipeline trench or using a specialised trenching machine, (**Plate 8).**

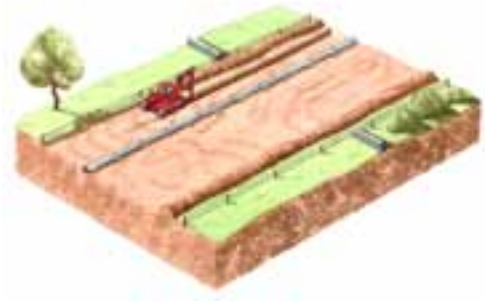

Plate 8.1: Pipeline Trenching

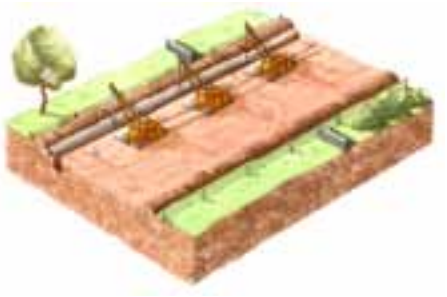

Plate 8.2: Pipe laying

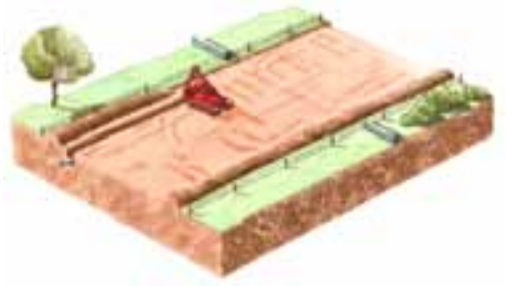

Plate 8.3: Backfilling

Following trench excavation the welded pipe will be carefully lowered into the trench in a continuous operation,

The pipe trench will then be backfilled, where possible with the material taken from the trench in the reverse order in which it was excavated. Sand padding and surround may be used to protect the pipe if the backfill material is particularly stony and in areas of rock.

The inside of the pipeline will be cleaned to ensure removal of all debris. It will then be pressure tested with water to prove its integrity in accordance with the relevant specifications. Water required for testing will be sourced and discharged locally with the agreement of Mayo County Council. The quality of the water to be discharged will be monitored to ensure compliance prior to discharge.

The delicate nature of the ecology and the difficult construction conditions associated with areas of peat, mean that some modifications will be made to the 'normal' methods of pipelaying.

These will include working very short sections at a time, using bogmats and low ground bearing pressure vehicles to minimise damage to the bog surface, restricted stripping of working width and very careful handling and storage of peat turf.

The construction of the onshore pipeline is planned to take place during the summer months of 2002. The duration is estimated at 4 – 6 months.

Operations/Maintenance

Once the construction process has been completed, the system will be inspected, tested and commissioned, leading to full operation. These operations will be closely monitored and managed in accordance with the strictest internationally recognised standards.

Normal production operations will consist of remote control from the terminal of the subsea facilities, the flow of gas from the field to the terminal, and the transfer of power and chemicals to the field via the umbilical. There will also be flow of treated waste water from the terminal to the discharge point in Broadhaven Bay.

The volume of water extracted from the gas in the terminal, and routed through the outfall, is expected to peak at about 80 cubic metres of water per day during the first years of production. After that the volumes will decrease gradually.

During normal operations of the Corrib Field there will be infrequent maintenance work carried out on the subsea facilities or pipeline. Periodic inspection surveys from survey vessels will be carried out in the Field and along the pipeline route.

The pipeline route will be inspected routinely along the onshore route.

There may be an occasional requirement for the pipeline to be cleaned or inspected internally using a PIG (pipeline integrity gauge, a remotely operated tool which is sent through the pipeline), or for intervention work on a well. Pigging and well intervention activities would require a vessel to be stationed in the Corrib Field for a short period. The pig would be 'launched' or sent from offshore, and would come into the terminal for recovery, and downloading of data.

THE ENVIRONMENT

The Marine Environment

Results of surveys carried out in the Corrib Field area and along the proposed pipeline route, as well as published literature, have been used to describe the environmental sensitivities of the area.

Seabed surveys undertaken by Enterprise specifically for the Corrib development provide basic information regarding seabed features and sediments, and their associated animal communities, in the area.

The seabed surface sediments in the Corrib Field area are silty sands, which overlie buried iceberg scours. The seabed in the area shows evidence of having been trawled, and there are sand ripples due to tidal currents. For a distance of about 35 km along the pipeline route towards the coast there are ancient iceberg scours filled with silts and sands. In the outer approaches to Broadhaven, there is a stretch of about 15 km of intermittent sands and gravels. Immediately offshore of Broadhaven the seabed sediments consist of sands, with grains of uniform size. Within Broadhaven there are extensive areas of rock outcrop on the seabed associated with areas of boulders. There are sandy channels through the rock and a route through one of these has been identified as the preferred pipeline route.

The benthic communities in the Corrib Field area are typical of a deep water, sandy/muddy substrate area. The most abundant animal groups living in the sediment are anemones, polychaetes (worms), crustaceans and brittle stars. Animals living on and within the sediments feed by filtering food from the water (filter feeders), from the seabed sediment (deposit feeders), or by scavenging or predation.

The mobility of the sediments inshore in Broadhaven Bay means that there are low numbers of species and individuals present in that area.

Fish populations in the Corrib Field and offshore parts of the pipeline route area are typical of Atlantic waters with similar water depths, and include species such as haddock, monkfish, saithe, blue whiting and megrim. The Corrib Field coincides with nursery grounds for mackerel and blue whiting, which both have widespread distribution. The area is considered to be of moderate value for commercial fishing in an Irish context. Fishing activity occurs all year round, when the weather is suitable. The main commercially important shellfish caught in the area of the Field and offshore parts of the pipeline route include Dublin Bay prawn, squid and crab. The Corrib Field and offshore parts of the pipeline route also lie within the spawning grounds for the Dublin Bay prawn, while closer inshore the pipeline route travels through an area where herring and sprat spawn.

Nearer to shore, the fisheries are concentrated on shellfish, and pelagic species such as mackerel and herring.

Within Broadhaven Bay the most important fisheries are for crab, lobster, crawfish and periwinkle, these species are fished for mainly by small vessels which operate mostly during the summer months because of the weather conditions at other times of the year. Much of the crab caught in Broadhaven is landed at Porturlin, and marketed through the local co-operative. During June and July Broadhaven Bay is also fished by driftnet for salmon, with 16 boats being involved in this occupation.

The seabirds found in the vicinity of the Corrib Field include coastal species which are feeding (such as petrels and gannets), and possibly auks which are in their moulting stage during the late summer months. The same species are found along the pipeline route, as well as species that are more coastal but use the sea for feeding such as gulls, cormorant and terns.

Long-term studies are ongoing to describe seasonal abundance and movement patters of cetaceans in the areas offshore West of Ireland. Evidence indicates that Atlantic white-sided dolphins, common dolphins and bottlenose dolphins regularly frequent the Corrib Field area and the areas along the pipeline route. Of the larger whale species Minke, sei, humpback and sperm whales are known to occur in the eastern Atlantic and have been recorded close to the Field.

The coast of Mayo supports large populations of wildlife including birds, seals and otters which are reliant on the marine environment. There are many sites of international conservation importance along the coastline. Aquaculture forms an important part of the local economy, and angling is important to the local tourism industry.

Salmon and sea trout move through Broadhaven Bay and the Sruwaddacon, with highest numbers migrating during mid to late summer.

In summary, the key sensitive environmental features within the vicinity of the Corrib Field, along the offshore pipeline route and within Broadhaven Bay are fishing grounds, the benthic communities, seabirds and cetaceans.

Broadhaven Bay is designated as a candidate SAC. It contains examples of four habitats listed in Annex I of the Habitats Directive, namely Atlantic saltmarsh, tidal mudflats, reefs and large shallow bay.

Landfall and Onshore Pipeline

The shoreline in Broadhaven Bay is comprised mostly of shingle beaches and sandy beaches, as well as marginal habitats such as cut-away bog, heathland, dune grassland, machair, wet grassland, tidal rivers and dry pasture, which is used for grazing. There are several extensive areas of intact saltmarsh, with thrift, saltmarsh rush, buck's-horn plantain, sea arrowgrass, common scurvygrass and common saltmarsh-grass. Parts of the saltmarsh are heavily grazed.

In addition to the above, Broadhaven supports an internationally important number of brent geese, as well as regionally important populations of ringed plover, golden plover, dunlin, bar-tailed godwit, curlew and redshank.

Plate 9: The landfall area viewed from the east

Plate 10: The landfall area and Sruwaddacon Bay

Corncrake and little tern, both bird species of conservation interest, have been known to breed close to the landfall location. Other species breeding in and around the Sruwaddacon include black-headed gull, cormorant and

ringed plover. The mid sections of Sruwaddacon Bay are also used by overwintering wildfowl and waders such as light-bellied brent geese and dunlin.

The short onshore section of the pipeline is routed via a crossing from Dooncarton to Rossport, along the northern banks of the Sruwaddacon Bay, across the tidal section of the Glenamoy River and through a Coillte-owned forestry plantation into the terminal site. The pipeline goes through farmland, bog and forestry.

Sruwaddacon Bay SPA is a shallow tidal inlet off Broadhaven Bay and its estuarine habitats are important feeding grounds for over-wintering wildfowl. In addition to its special importance for its wintering wildfowl populations, the bay forms an integral part of the Glenamoy River salmonid fishery. It forms a part of the Glenamoy Bog Complex SAC and the Blacksod and Broadhaven Bay Ramsar site.

The Glenamoy Bog Complex SAC is a very large site encompassing a variety of habitat types. The main feature of this SAC is the oceanic lowland blanket bog, of international importance and an Annex I habitat (EU Habitats Directive). Much of this bog is still prime habitat and is well documented, having been the subject of blanket bog research for over 30 years.

Large areas of this complex site are intact and of great ecological value. However, parts of this SAC have been subject to damaging land-use practices over a long period of time. These include:

- grazing by sheep and cattle which has resulted in erosion on parts of the bog and in the coastal grassland areas – including the Garter Hill machair site; and

- peat cutting – until recently this was done mainly by hand. In recent years mechanical means have also been used more frequently (e.g. sausage-machines). Peat cutting is widespread and is usually confined to areas beside roads, tracks and habitation.

The onshore pipeline route crosses this SAC on its very edge. This area has modified by grazing and peat cutting, which has resulted in a reduction in its ecological value.

IMPACTS

The likely impacts on the environment from the construction and operation of the Corrib development have been predicted. Control and mitigation measures have been incorporated into the design, from the selection of development strategy through to detailed engineering design, to minimise such impacts.

Areas of environmental concern and the main mitigation measures are summarised below. Issues are dealt with by section of the development; i.e. field equipment, pipeline/umbilical, or onshore pipeline, and by construction and operation where appropriate, within those headings.

Planning

Planning and Policy Issues

Enterprise will comply with the relevant policies contained within the Mayo County Development Plan. The project will provide the basis for future development of the economic infrastructure of the region, and the availability of natural gas may act as a catalyst to economic development, helping to redress the economic imbalance, an objective of the current National Development Plan.

Land Use and Agriculture

Onshore, the proposed pipeline route passes through farmland and forestry. There will be some disruption to farming activity during construction, such as short-term and temporary lack of access during one season. Mitigation measures, such as the provision of temporary access and drainage will be discussed and agreed with landowners. The area disturbed will be fully reinstated once the pipeline has been laid. Restoration will start immediately after the pipeline trench has been backfilled, and it is usual that the land will be available for agricultural use within a growing season.

After construction, there will be the occasional need for Enterprise to inspect, and if required, to access and repair the pipeline. However, this will not affect normal agricultural activities. The only restriction will be over the pipeline itself, where activities such as tree planting and construction cannot take place.

Human Beings

The Corrib development will bring considerable socio-economic benefits to County Mayo, to the west of Ireland and to Ireland in general. In regional terms, the project will provide significant opportunities for employment both during the construction and the operational phases.

Offshore, there will be manpower needed during drilling, installation and testing. However, this highly specialised work is unlikely to be contracted to a company local to County Mayo. Significant benefit, however, will accrue to the Port of Killybegs, which will be the main support base for the offshore drilling and installation work.

The construction of the landfall and onshore pipeline will provide the greatest numbers of jobs. The construction period, which will run for approximately 18 months, will provide positive stimulation to the use of local goods and services, particularly in the areas of plant hire, accommodation, transport and catering. While some of these workers may not be local residents, they will be based in the area during construction. This will have significant impact on the local economy.

Enterprise is working closely with Enterprise Ireland, providing details of the Corrib development and regular updates on its progress and programme in order to give Irish suppliers full opportunity to assess the business potential associated with the project.

Indirectly, and outside the control of Enterprise, the availability of gas through the pipeline to Galway, would allow the connection of a number of towns, mainly in Mayo and Galway. It also creates potential for further pipelines to be built, connecting towns such as Ballina and Sligo. Natural gas supply from Corrib opens up the possibility of locating gas-fired power stations in the North-West, which would generate local employment, and may help in attracting industrial development to the region.

The will be short-term temporary restriction of access for fishing during the laying and trenching of the offshore pipeline and umbilical. In order to minimise disruption to fisheries during the construction period, ship-based fisheries liaison representatives will liaise with the fisheries industry during the activities in accordance with principles agreed between the Irish Offshore Operators Association (IOOA), the Department of Marine and Natural Resources (DOMNR), and the fisheries organisations. Early notification and communication will be prioritised.

Once installation is complete, there will be a small area around the production equipment on the seabed where fishing is not permitted (500 metres radius from each subsea installation). These zones, termed safety or exclusion zones, are required for safety reasons, and will, due to their very limited area, not significantly affect fisheries interest. The installed pipeline and subsea facilities will be designed to minimise risks of snagging by fishing gear.

Each of the Sruwaddacon crossings is scheduled to be completed in less than a week. During those periods, there may be a requirement to restrict the fishing for salmon by netting close to the crossing points. Two licences exist for such fishing in the Sruwaddacon, and in the event that a restriction is necessary, the licence holders will be contacted well in advance of the operations.

Strict mitigation measures regarding water discharge from the terminal have been adopted, centring on the treatment of all waste water to environmental quality standards before discharge. Therefore the discharge is not predicted to have any effect on the water quality in the bay and fisheries will not be affected.

During the shore-based construction activities in 2002 and to a lesser extent 2003, there may be temporary disturbance to local tourism. To minimise the

possible impact and to ensure that disturbance general day-to-day life in the area is minimised, Enterprise is committed to liaison with the local community, and will be implementing a traffic management plan to minimise traffic nuisance.

Enterprise proposes to establish a "Corrib Community Fund" to support community project in the area surrounding Broadhaven Bay and in the general Bangor Erris area. The fund, which will have a budget of £ 1 million, to be distributed over 10 years, will be established as a trust with charitable status, and will be administered by a board of trustees. The board of trustees will be representative of local interest and will include nominees of Enterprise, nominees of Mayo County Council, community representatives and a nominee of the Mayo County Development Board.

Any project supporting the life of the community will be eligible for consideration of financial support form the fund. Such projects may include computer or sporting facilities for schools, public playgrounds, village enhancement schemes, and environmental projects. The fund is designed to support community spirit and provide a mechanism to assist worthwhile community ventures and proposals that come from the community. It is envisaged that applications for funding can be made in two ways, either directly to the board of trustees, or through a Community Consultation Group which will be established.

Flora and Fauna

Offshore

The discharge of rock cuttings from the drilling of wells could have three types of impact on seabed fauna: physical (cuttings actually land on the organisms), smothering (particles of mud and cuttings clog the gills or prevent organisms from filter feeding), or toxic (chemicals in the mud can affect the organisms).

Up to three wells will be drilled in the period 2002 – 2007. Cuttings from water-based mud drilled sections will be discharged onto the seabed directly from the top of the well. The main constituents of this fluid are water and clay minerals. The predicted impact from this is not significant, in that it is short-term and temporary, due to the low toxicity and high biodegradability of water-based mud. Where other muds are used, the cuttings from parts of the well drilled with this mud will be returned to the rig for onshore recycling, with no associated impact on the offshore flora and fauna.

Surveys carried out after previous drilling in the Corrib Field show that the cuttings depositions are small, suggesting effective dispersion.

After the drilling and installation activities have been completed, and the field is in operation, there will be no impacts to the benthic communities.

Drilling operations cause underwater sound, with the potential to disturb fish and cetaceans (whales and dolphins). Fish and cetaceans have different sound and hearing capabilities, which make them more or less sensitive to a range of underwater sounds. It is expected that noise impacts to fish from

drilling operations will be negligible. The Corrib Field and pipeline route form part of a nursery area for saithe and mackerel, and the inshore area forms part of herring and sprat spawning grounds. The spawning and nursery grounds for these species are extensive. Impact to populations of these fish are not expected because they will avoid sources of disturbance, and any disturbance from construction at any particular place along the pipeline route will be short-term and transient.

Low frequencies resulting from drilling activities are in some cases similar to those used by baleen whales. The degree of disturbance to cetaceans from drilling operations is the subject of ongoing research; studies have indicated that some baleen whales may react to noise, for example by avoiding the noise source when the noise intensity reaches a certain level. It is suggested that the intensity needed to initiate such behaviour typically occurs at ranges of tens of metres for semi-submersible drilling rigs. It is considered unlikely that such responses will result in any long-term displacement of animals from the area. Toothed whales poorly detect low frequency sound. They are therefore less likely to be affected by the operations.

Sound generated by the vessels engaged in the installation activities for the subsea equipment and the pipeline and umbilical is similar to that generated by other sea users such as fishing and commercial vessels, and is not considered to have any significant effect on populations of fish or cetaceans.

During operation of the subsea facilities no impact on cetaceans is expected.

There will be discharges, such as sewage, washroom and food waste, to sea from the drilling rig and vessels during construction. When the field is in operation there will be a similar discharges from survey vessels. All discharges will be compliant with MARPOL regulations. While they have the potential to impact on plankton and fish species in the vicinity, in reality, dilution and dispersion will ensure that any impacts are negligible.

Installation of the field equipment and in-field pipelines will cause some temporary disturbance to the seabed sediments, but it is expected that recovery and recolonisation will occur fairly rapidly. In the Field and in some places along the pipeline route where rock armour or concrete mattressing may be laid on the seabed, the existing benthic communities will be disturbed. The area of seabed affected in this way will be very small, and the new hard substrates may attract new species to the area. It is predicted that the soft sediments moved by the installation of the pipeline will be recolonised rapidly. Overall, the predicted impact to sediment due to construction is considered to be negligible.

Normal construction and operation of the Corrib development will not give rise to impacts to feeding or moulting birds offshore. However, in the unlikely event of a significant spill of fuel from one of the drilling, installation or survey vessels, oiling of birds, particularly those moulting, could occur. Given the relatively low volumes of oil which could be spilled by any of the vessels operating on the Corrib development the risk to seabirds from a spill of fuel is considered to be very low. The Corrib Field will produce gas, which eliminates the risk of a large slick of oil resulting from accidents in the Field itself.

Pipeline route

Installation of the pipeline and umbilical in the offshore area will result in some disturbance to sediments on the seabed, and consequently to the invertebrate fauna. The fauna found along the pipeline route changes with depth and sediment type, but is not unusual. Impacts to Dublin Bay Prawn spawning grounds from laying the pipeline are predicted to be negligible because of the wide area over which spawning occurs. During operation, there will be no impacts to the benthic communities along the pipeline route.

Disturbance to cetaceans from the installation and operation of the pipeline and umbilical in the offshore area is expected to be negligible.

The predicted impact of construction and operation of the pipeline to the mackerel and blue whiting populations in the offshore areas of the pipeline route, and herring and sprat populations in the inshore areas, are predicted to be insignificant in population terms, due to the large geographical extent of their spawning and nursery grounds, and the geographically small, and short-term disturbance created.

Landfall area

The components of the ecosystem of this area, which could be disturbed during construction, include benthic species, cetaceans, fish and birds.

The abundance of benthic species in the nearshore area is low due to the mobile, unstable nature of the sediments, hence any disturbance to these sediments is likely to be no more significant than that experienced during a storm.

Cetacean species will be disturbed little by normal pipeline construction techniques. However, it is likely that some underwater blasting will be needed in shallow water areas to create a trench for the pipeline. Careful design of explosives charges and ignition sequencing, as well as mitigation measures in the form of air bubble attenuation will be implemented to minimise impact to fish and marine mammals. This work will be carried out in close liaison with a team of cetacean experts, who on behalf of Enterprise, will discuss and agree in advance all the necessary mitigation measures with Dúchas. Monitoring before, during and after construction will form part of this work. Blasting will not be carried out if marine mammals are present within 1km of the blast source. Fish are unlikely to be affected by normal construction operations. Fish in the vicinity of blasting work could be affected. By applying mitigation measures as outlined above including where possible to blast at low tide, impact to fish will be minimised. Ross Bay, to the north east of the Sruwaddacon is a recognised nursery area for several marine species including topknot and thornback ray. However, this bay is outside the area which could be affected

Species migrating through Sruwaddacon Bay (salmon and sea trout) could be affected by the pipeline crossing operations. Such operations have the potential to release silt that could delay the upstream movement of these species. The timing of the crossings will be selected and the duration of the

operations minimised to ensure that the impact on salmon and sea trout movement is negligible.

During the operation of the terminal, there will be a discharge of water through a pipeline, into Broadhaven Bay. The constituents of this discharge will include rainwater collected from paved areas within the terminal and water from the gas drying process. Trace metals and organic chemicals in small quantities are likely to be present in the water extracted from the gas, but extremely high levels of treatment within the terminal will reduce the concentrations of these contaminants in the discharge to levels which are considered by the EPA to be sufficiently low to cause no change to the functioning of either individual animals or the ecosystem as a whole.

The daily volume of water extracted from the gas is estimated to peak at approximately 80 cubic metres. These quantities are very low in terms of the total water inflow into Broadhaven Bay. In the Glenamoy River alone, the average daily flow between 1978 and 1997 was 2.96 cubic metres per second.

The outlet of the pipeline will be located in an area providing a high degree of dispersion for the discharge. Modelling suggests that the maximum short term increase in concentration of any contaminant in the immediate vicinity of the outlet would be in the range 0.1 – 2.2 % (depending upon the constituent), the effects of such an increase would not be discernible in the fauna. Furthermore, at 500 m radius from the outlet none of these elements will be at a concentration of more than 0.5% above its natural background level.

The landfall installation will not affect any of the overwintering bird species in the Sruwaddacon, however there may be potential for temporary and short-term disturbance to breeding and feeding birds.

Mitigation measures in the form of monitoring effort and method statements, to ensure minimum disturbance to wildlife and plants will be discussed and agreed with all the conservation bodies, including Dúchas, before construction commences.

Onshore

The onshore pipeline crosses farmland and forestry. In some places the removal of field boundaries may be necessary. These will be restored after construction, and the developer will monitor the replanting scheme over time to ensure successful restoration.

Mature trees will be avoided wherever possible, and if trees lie close to or within the route, their roots will be protected to avoid damage.

The route passes through the edge of the Glenamoy Bog Complex SAC. In order to minimise the impacts on this protected habitat detailed construction techniques have been discussed with Duchas, and appropriate mitigation measures will be agreed with Duchas.

Geology

Drilling

The cuttings discharged to the seabed from the top of the well form small accumulations, which are rapidly dispersed by seabed currents. The chemicals used in water-based mud have low bioaccumulation and high degradation characteristics and hence do not persist in the environment.

Field facilities and pipeline installation

There will be a degree of disturbance to the sediments in the Corrib Field and along the pipeline route during construction. This disturbance will be limited to the possible levelling of some areas of the seabed in the Corrib Field, the trenching of the whole of the umbilical cable, and the trenching of some lengths of the pipeline. In some sections there may also be a requirement for rock to be placed either beneath or on top (or both) of the pipeline for stability.

The use of a dynamically positioned vessel, rather than an anchored pipelay vessel to lay most of the pipeline and all of the umbilical will minimise disturbance to the seabed through anchoring.

Trench excavation will increase sediment in the water column, temporarily increasing turbidity and causing accumulation of spoils along the route. The area affected will be small and currents are expected to erode the spoils accumulations gradually returning the seabed to its original state.

Landfall

The pipeline will have to be pulled ashore. It will be pulled through a trench constructed at the landfall. The trench will be approximately 3 m deep, and will most likely require the removal of some bedrock. In the event that this is necessary, blasting will be employed. This will have a minor impact on the bedrock geology at the site. The profile of any soft sediments affected by the near shore and landfall construction operations and the construction of the Sruwaddacon crossings will return to its equilibrium under the influence of waves and currents.

Water

The treated waste water from the terminal will be pumped through an outfall pipe into Broadhaven Bay. The optimum location of the discharge has been determined by detailed modelling. The volumes are expected to be low, on average 80 cubic metres per day of produced water, and on the basis of annual rainfall average at Belmullet, about the same quantity of rainwater run-off. Monitoring of the water quality before discharge will be undertaken on a regular basis to ensure compliance with the IPC licence. The levels of

trace elements and chemicals discharged into Broadhaven Bay will be so low as to have no discernible impact on water quality in the bay.

There will also be water discharges from marine vessels used in the project. These vessels will be required to operate under international maritime conventions, including MARPOL, in respect of aqueous discharges.

During construction of the landfall and onshore pipeline, methods for disposing of accumulated trench water and water used during testing will be agreed with Mayo County Council, and other relevant authorities including the DOMNR and the regional fisheries board in order to minimise any environmental impact.

When the pipeline is being commissioned the hydrotest water will contain a biodegradable dye to help identify any leaks and a biocide in order to stop corrosion. Enterprise will select the least harmful of the chemicals available for effective commissioning of the pipeline. The hydrotest water will be discharged offshore to ensure maximum dispersion and minimum impact. Any release associated with the hydrotesting will be short term, and will disperse very quickly in the deep mobile waters in the area of the field.

It is planned to discharge the hydrotest water offshore at the Corrib Field location. This will ensure maximum dispersion and minimum impact. Any release associated with the hydrotesting will be short term, and will disperse very quickly in the deep mobile waters in the area of the field. The main constituent is seawater, with only very small quantities of biocide, oxygen scavenger, corrosion inhibitor and dye.

During operation of the offshore facilities, very small amounts (less than 4 litres per day on average) of a hydraulic fluid; a glycol/water mix, will be discharged when the subsea valves are operated. This fluid is classified within the most environmentally benign category of the HOCNF) and will disperse immediately and have no measurable effect on the surrounding environment.

Air

During drilling and offshore installation works, there will be some emissions to air from vessel power generation. It is likely that there will be further well testing operations, which include the flowing of gas to the rig, and subsequent flaring of that gas offshore. Such emissions will be localised and disperse very quickly. Equipment used is selected, adjusted and maintained to minimise air emissions.

All equipment used on site for the landfall and pipeline construction activities will be correctly adjusted and maintained to control air emissions. Mud and dust generated by vehicle movements will be dampened down by water spray, and wheel washers, road sweeping and speed restrictions will be applied to minimise dust generation.

Noise

Noise generated during drilling and installation activities offshore will not have an impact on humans except for those on the vessels performing the work. As discussed earlier, in the section on *Flora and Fauna*, underwater sound has the potential to affect fish and cetaceans. Apart from during drilling and installation, there will be little noise generated in the underwater environment.

The proposed landfall site and onshore pipeline route are located in a rural and sparsely populated area characterised by low background noise levels, especially at night. Any noise associated with construction will be controlled as far as reasonably practicable, with levels minimised through the careful siting, silencing and screening of equipment. Background noise levels have already been measured, and Enterprise has committed to monitoring noise regularly over the period of construction to ensure that levels are maintained within acceptable limits. Construction activities will be limited to daytime working, except for some commissioning activities that may be required to run for more than 12 hours. In such cases, the County Council and local community will be notified in advance.

Noise associated with underwater blasting or blasting in the beach zone will be closely controlled and monitored, to ensure there will be no significant effects on the local community. Such operations will only be carried out in strict liaison with the Gardai, the local authority and after liaison with local residents to ensure that the impact is minimised.

During operation of the development there will be very little noise generated. It is expected that the only noise source offshore will be vessels involved in survey work, the levels of subsea noise generated by such vessels will be similar to those from fishing vessels.

Traffic visiting the landfall enclosure or surveying the onshore pipeline will be the only sources of noise associated with the onshore sections of the development. This level of noise is insignificant, as visits to the enclosure are expected to be no more frequent than weekly.

Landscape

Inshore, landfall and onshore pipeline construction activities will have temporary impact on the landscape. As soon as the inshore activities are completed, the construction vessels will demobilise and the 'seascape' will be restored. The landfall and pipeline areas will be reinstated promptly after construction. Some gaps in the vegetation will remain visible for a few years, after which time there should be no residual impact. A fence will remain visible in the area of the landfall valve that will be housed in an underground enclosure.

Cultural Heritage/Archaeology

Archaeological surveys have been carried out offshore and onshore in order to ensure that the areas of high archaeological potential are avoided. The proposed pipeline route avoids all known archaeological monuments. An archaeological method statement for the project, both offshore and onshore, will be developed and agreed with Dúchas prior to construction, and appropriate licences will be sought in order to deal with potential discoveries of previously unknown sites.

Material Assets

Waste

Construction activities will inevitably result in the formation of a variety of solid waste materials, mostly non-hazardous but some hazardous. All waste and litter will be disposed of in accordance with the Waste Management Acts and MARPOL regulations, and to the satisfaction of the relevant authorities. All waste generated onshore, and waste brought ashore from offshore will be collected and disposed of by licensed contractors.

A waste management plan will be prepared to ensure responsible and effective waste management. This will form part of Enterprise's environmental management system for the Corrib project.

Traffic

Effects on marine traffic will be of a temporary and short-term nature. During drilling, support vessels will be making regular trips from the Field to the shore. These will not cause a significant impact to normal shipping traffic movements. However there will be a very limited area around the rig unavailable to marine traffic during drilling. During installation, there will also be some restrictions to marine traffic in the immediate area of the working vessels. During the operational phase of the development there will be regular but infrequent visits to the Corrib Field, and along the pipeline route by survey vessels checking on the status of the facilities, using video and sonar techniques. Vessel movements associated with such surveys will not cause significant disruption to the normal operations of other vessels in the area.

During operation there will be an exclusion zone of 500 m radius around the production equipment on the seabed. This is not likely to have any measurable effect on the marine traffic in the area.

There will be an increase in traffic levels in the local area during the construction of the landfall and onshore pipeline. This will be short-term in nature and result mainly from the delivery of materials and construction plant, and the daily movement of the workforce to and from the sites. It is possible that heavy construction vehicles may cause damage to the road surface. Enterprise is committed to reinstating the route used by such vehicles to its original condition following construction.

A traffic study has already been carried out. The results from the study will be used to develop a Traffic Management Plan which will control the number, types and time of vehicles arriving and departing from the site, and the deposition of mud on roads. The plan will be prepared in close consultation with Mayo County Council and local representatives.

Once the development is operational, there will be a need for regular, possibly weekly, visits to the enclosure which houses the umbilical onshore termination unit, and for general pipeline surveillance, but these visits will involve the use of a small vehicles and will not cause any disruption to normal vehicle movements in the area.

ENVIRONMENTAL MANAGEMENT

A series of control and mitigation measures have been identified in the EIS. Enterprise is committed to the full implementation of these.

In addition, an Environmental Management Plan, which details how such measures will be implemented and controlled, will be prepared. The plan will include all the detailed procedures contractors are required to comply with, and it will be verified by Enterprise in consultation with all the relevant authorities. The implementation of the plan will be managed by Enterprise and will ensure that environmental impact of construction and operation of the Corrib development is minimised.

GLOSSARY OF TECHNICAL TERMS

TERM	DESCRIPTION
Ameliorate	Take measures to diminish a negative impact.
Appraisal Well	A well drilled as part of an appraisal drilling programme which is carried out to determine the physical extent, reserves and likely production rate of a field.
Baseline survey	A description of the existing environment against which future changes can be measured
BAT	Best Available Technique
Benthos	Organisms that live on or in the seabed.
boepd	Barrels of Oil Equivalent Per Day
Christmas Tree	The assembly of fittings or valves on the top of the casing which controls the production rate from the well.
Commissioning	The rendering fully operational of a project or process.
Competent Authority	Any agency charged with examining an Environmental Impact statement with a view to issuing a consent to develop
Completion	The installation of permanent wellhead equipment for the production of oil or gas.
Condensate	Hydrocarbons which are in the gaseous state under reservoir conditions and which become liquid when the pressure and/or temperature is reduced. A mixture of pentanes and higher hydrocarbons.
Corrosion inhibitor	Liquid that will be added to the offshore system in small quantities to prevent corrosion of the steel pipes and equipment.
Cuttings	Rock chippings cut out from the formation by the drill bit, and brought to the surface with the mud. Used by geologists, while drilling a well, to obtain formation data.
Decommissioning	The final closing down, and putting into a state of safety of a development, project or process when it has come to the end of its useful life.
Daily cover	Material used as a cover on top of a pile of spoil at the end of a working period.
Demersal	Organisms that occur near the seabed.
Drilling Rig	A drilling unit that is not permanently fixed to the seabed, e.g. a drillship, a semi submersible or a jack-up unit.
Dry Gas	Natural gas composed mainly of methane with only minor amounts of ethane, propane and butane and little or no heavier hydrocarbons in the gasoline range.
Emission	The amount of pollutant discharged per unit time, or the amount of pollutant per unit volume of gas or liquid.
Environmental Quality Standards	The EQS values reflect the maximum level in the water body that may be present without affecting biological communities in their functional processes or otherwise give rise to unacceptable adverse effects on the ecosystem or accumulation of substances that are harmful to the biota (EPA, 1997). The Environmental Quality Standards referred to throughout this EIS are those for marine waters (EPA, 1997).
EPA	The Environmental Protection Agency
Epifauna	The animal life which lives on the surface of the seabed, a river bed, etc., or attached to submerged objects or to aquatic animals or plants
Exploration well	A well drilled in an unproven area. Also known as a 'wildcat well'.
Field	A geographical area under which an oil or gas reservoir lies.
Flowline	Steel pipeline between wellheads and the manifold, usually between 6 and 10 inches diameter.

TERM	DESCRIPTION
Formation water	Salt water underlying gas (and oil if any) in the formation.
Fracturing	A method of breaking down a formation by pumping fluid at very high pressures. The objective is to increase production rates from a reservoir.
Gas field	A field containing natural gas but no oil.
High Water Mark	The line of high water of ordinary or medium tides
HOCNF	Harmonised Offshore Chemical Notification Format
Hydrate	A solid ice-like material formed from gas and water at specific temperatures and pressures.
Hydrocarbon	A compound containing only the elements hydrogen and carbon. May exist as a solid, a liquid or a gas.
Hydrotest	Water used in testing the integrity of the pipeline
IMO	International Maritime Organisation
Iceberg scours	A seabed feature caused by the tracking of icebergs.
Impact	The degree of change in an environment resulting from a development.
Infauna	The animal life found within the sediments of the ocean floor, river beds, etc
Integrated Pollution Control - IPC	Aims to prevent or solve pollution problems rather than transferring them from one medium to another. All major emissions to land, air and water are considered simultaneously and not in isolation in order to minimise pollution of the environment as a whole.
Jacket	The lower section, or 'legs', of an offshore platform.
Landfall	The point on the coastline where the pipeline transporting natural gas from the Corrib Field to the terminal comes ashore.
Lay barge	A vessel that is specially equipped to lay submarine pipelines.
Manifold	An item of subsea equipment that gathers gas from each of the wells in the field.
MARPOL	International Convention for the Prevention of Pollution from Ships. International agreement to prevent marine pollution.
mmscfd	Million standard cubic feet of gas per day
Moored tower "guyed tower"	Tower standing upright in the water column, which is attached to the seabed by mooring lines.
Monitoring	The repetitive and continued observation, measurement and evaluation of environmental data to follow changes over a period of time, also used to assess the effectiveness of control measures.
Mud	A mixture of base substance and additives used to lubricate the drill bit and to counteract the natural pressure of the formation.
Natural gas	Gas, occurring naturally, sometimes occurring in association with crude oil.
Nephrops	Dublin Bay prawn also known as. Norwegian Lobster
Oil	A mixture of liquid hydrocarbons of different molecular weights.
Oil-based mud (OBM)	Drilling mud used to drill through rock which can react with water based materials
Onshore Injection	Disposal of water by injecting it into the ground at depth.
Operator	The company that has legal authority to drill wells and undertake production of hydrocarbons found. The Operator is often part of a consortium and acts on behalf of this consortium.
Pelagic	Organisms that occur in the water column, especially near the surface.
OSPAR	Oslo Paris Commission,
Petroleum	A generic name for hydrocarbons, including crude oil, natural gas liquids, natural gas and their products.

TERM	DESCRIPTION
PIG	Pipeline Integrity Gauge- remotely operated tool which is sent through the pipeline to gather information.
Platform	An offshore structure that is permanently fixed to the seabed.
Plankton	Small animals and plants which drift with the currents and are incapable of swimming against them.
PLEM	Pipeline End Manifold- allows the gas flow from the manifold to be shut off from the pipeline to shore
PLONOR	Chemicals that "Present Little Or No Risk" to the marine environment
Produced Water	This is a combination of the water of condensation and the formation water.
Reservoir	The underground formation where oil and/or gas have accumulated. It consists of a porous rock that holds the hydrocarbons, and a cap rock that prevents its escape.
Risk assessment	An analytical study of the probabilities and magnitude of harm to human health or the environment associated with a physical or chemical agent, activity or occurrence.
ROVs	Remotely Operated Vehicles- diverless underwater vehicles.
SAC	Special Area of Conservation
Scale inhibitor	Liquid that may be added to the offshore system in small quantities to prevent the precipitation of natural mineral salts in the field facilities.
Scoping	The process of identifying the significant issues which should be addressed by a particular Environmental Impact Assessment
SDU	Subsea Distribution Unit- distributes the hydraulic fluid and chemicals from the umbilical to the wells
Semi submersible drilling rig	Floating drilling platform which is towed to site in an unballasted condition, and ballasted (lowered) for stability upon mooring on location.
Separator	A steel tank (vessel) with internal baffles. Used to separate liquid from gas.
SPA	Special Protection Area
Sonar	Sound Navigation and Ranging- a system for underwater detection of objects.
Suspended well	A well that has been capped off temporarily.
Synthetic-based mud (SBM)	Drilling mud used to drill through rock which can react with water based materials
Terminal	The plant where the Corrib gas will be separated from any associated liquids to meet BGE export specifications. A detailed description is given in this document.
Transmission Specification	Before a gas can be exported on to the transmission system it has to meet certain criteria.
Umbilical	A 'bundle' of electrical and hydraulic control lines and chemical transportation lines used to a) control and monitor the subsea facilities from the terminal and b) supply methanol and other chemicals to the manifold and wellheads. The bundle is encased in a protective cable.
Water-based mud	Basic composition of drilling mud, used for drilling uncomplicated section of wells.

TERM	DESCRIPTION
Water of condensation	The hydrocarbon gas in the reservoir contains a certain amount of water in vapour phase. This water in vapour phase condenses out as liquid during the production process as the temperature and pressure of the hydrocarbon gas decreases. This water is known as water of condensation. It is produced throughout field life in rough proportion to the gas production rate.
Well	A borehole, lined with steel, that is drilled from the sea bed into the reservoir and through which gas is brought to the seabed surface.
Workover	Remedial work to the equipment within a well.

IMPERIAL/METRIC CONVERSIONS

Imperial to Metric		Metric to Imperial	
Imperial Unit	Metric Unit	Metric Unit	Imperial Unit
Lengths		Lengths	
1 inch	25.4 mm	1 mm	0.0397 in
1 ft	0.3048 m	1 m	3.281 ft
1 mile	1.609 km	1 km	0.6214 miles
1 nautical mile (nm)	1.853 km	1 km	0.5396 nautical miles
Volumes		*Volumes*	
1 standard cubic ft (scf)	0.0283 m^3	1 m^3	35.33 cf
1 million standard cubic feet (mmscf)	28,300 m^3	1 m^3	6.29 barrels
1 barrel	0.159 m^3		