BHP Billiton Petroleum in Liverpool Bay, United Kingdom

A major offshore development is established in an area of high environmental sensitivity

Liverpool Bay was the first significant near-shore area of the United Kingdom to show commercially exploitable oil and gas. The subsequent development by BHP Billiton Petroleum of offshore installations and an onshore gas terminal has taken place close to a highly populated area which has suffered in the past from domestic and industrial pollution, but continues to support important conservation and recreation interests. All the elements of a major offshore development, including onshore gas terminal and pipeline, are carried out in the full view of the local community. Success can partly be attributed to

achievements in key environmental management steps: impact assessment; community consultation; and monitoring.

Background

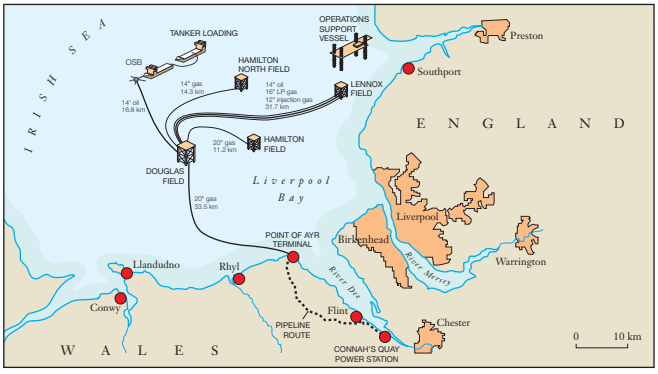
Liverpool Bay lies in the eastern Irish sea against the coasts of North Wales and North-West England, a heavily industrialized coastline. Exploration activities carried out by BHP Billiton Petroleum during 1990 were the first to locate significant supplies of commercial oil and gas; such exploration and production activities were relatively new to the area at this time.

The developments

Four major oil and gas discoveries were made in the Bay by BHP Billiton Petroleum—the Douglas and Lennox oil and gas fields, and the Hamilton and Hamilton North gas fields. The oil and much of the gas have a high concentration of hydrogen sulphide. The fields were developed by means of offshore and onshore production facilities (see map on right). The offshore facilities comprise three unmanned platforms and a central complex including wellhead, processing and accommodation. The oil is stored in a floating offshore installation, then exported by tankers. The gas is exported to a new terminal on the North Wales coast, processed and transported by pipeline to a new power station.

Satisfying environmental concerns required an understanding of the environmental resources of Liverpool Bay, including the offshore waters, intertidal areas and coastal lands. BHP Billiton Petroleum therefore compiled an objective environmental appraisal of the area, which summarized all published data on the physical environment, vegetation and wildlife and their conservation status, commercial fisheries, pollution sources, tourism and recreation, and shipping and other maritime interests. As well as forming the basis of a subsequent Environmental Impact Assessment of the development, it provided a unique overall description of the local environment. The appraisal was published in an easily readable format and was made available to the central and local Government authorities, environmental interest groups, schools and the general public.

BHP Billiton's Liverpool Bay development incorporates drilling and production facilities, a mobile support vessel, oil storage barge, subsea pipelines, gas terminal and export gas pipeline, and onshore base—all in the full view of the local community.



The offshore environment

Liverpool Bay is a shallow-water sedimentary marine ecosystem. The River Mersey discharges a large quantity of fresh water into the Bay, slightly reducing the salinity, and adding organic matter, nutrients and contaminants to the water. The seabed consists of fine sand and mud. The Bay has one of the greatest tidal ranges in the British Isles. There is a complex circulatory water movement. The result of the dynamic nature of these waters is that the marine fauna living on the seabed tends to be restricted to those species which can live and reproduce successfully in continuously changing conditions. Parts of the Bay have been used for many years as a disposal site for sewage sludge and dredge spoil but, because of the dynamic nature of the dumping area, organic enrichment of the sediments has been barely detectable.

Liverpool Bay is an important fish spawning and nursery ground and also supports a locally important pelagic fishery for herring, a mixed demersal fishery for cod, whiting and plaice, a beam trawl fishery for sole, a dredge fishery for scallops and, in shallower waters, an important shrimp fishery.

Intertidal areas

The shorelines of the Bay comprise extensive muddy and sandy beaches, most of which are relatively sheltered and stable, supporting rich populations of invertebrate animal life. The Bay supports large populations of bird life and juvenile fish which feed upon invertebrates. Large lengths of the coastline consist of artificial habitats such as sea walls and docks.

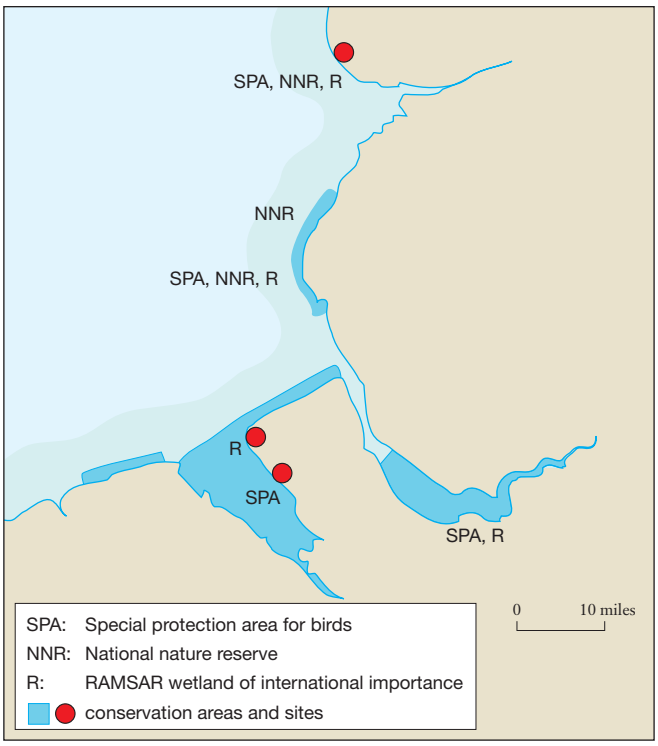
As a large human population lives within easy travelling distance of the Bay, the beaches of the area are used extensively for recreation. However, the discharge of sewage into coastal waters, littering and occasional oiling continue to impair the quality of the water.

Coastal lands

The coastal lands in Liverpool Bay are heavily urbanized but, where undeveloped, the coastal strip adjacent to the sea sustains some important biological habitats. Of particular interest are the sand dunes of the North Wales coast. These vary from sparsely vegetated mobile dunes immediately behind the foreshore, through damp slacks which support a rich flora, to fully vegetated stable dunes. The dunes, under pressure from recreational use, provide a habitat for small migrant birds including finches, warblers and buntings. Another previous inhabitant behind the dunes, the Natterjack toad, was thought to have been extinct from North Wales for many years.

Conservation interests

The areas adjacent to the oil and gas developments include areas which have international, national and local designations as conservation areas. Some are designated under the International Convention on Wetlands of International Importance (RAMSAR) and the European Community Directive on the Conservation of Wild Birds. The map below shows the locations of the designated conservation areas within the Bay.



The map above is reproduced from *The Coast of North Wales and North West England—an Environmental Appraisal* (OPRU, Pembroke, UK).

Environmental controls

Environmental controls were applied throughout the main phases of field development, namely, exploration, project engineering, and operation. The development has taken place on- and offshore, under significantly different planning and environmental legislation regimes, and with different authorities and interest groups.

From the outset, BHP Billiton Petroleum planned to apply high standards of environmental care, both for its own operation and those of its contractors. The development of an Environmental Management System (EMS) provided the framework for the required controls.

Offshore exploration operations

Marine seismic surveys were conducted and exploration and appraisal wells were drilled. Environmental standards for the seismic and drilling operations were covered both by licence conditions imposed at the block acquisition phase, and by standards developed by BHP Billiton Petroleum for near-shore

operations. Liverpool Bay was not as sensitive to seismic operations as other marine areas have since proven to be; however, in addition to specified groups which had to be consulted, local authorities and appropriate conservation bodies were informed of the proposed seismic operations.

In dispersing environments, routine drilling operations using water based mud do not have a significant effect upon the ecology of the marine environment. An independent study concluded that discharged drill cuttings would be dispersed and incorporated into the seabed sediment. BHP Billiton Petroleum used only approved non-toxic drilling chemicals. In addition, the drilling rig was extensively modified to ensure that the contents of all surface drains were collected and cleaned before discharge.

Project development

For each of the offshore and onshore production facilities and associated pipelines, a formal Environmental Impact Assessment (EIA) was prepared, in consultation with the regulatory authorities and others specified in licence conditions. BHP Billiton Petroleum chose to widen the scope of consultations to include other interested parties in the area. National organizations such the Royal Society for the Protection of Birds (RSPB), as well as local conservation organizations such as the Dee Estuary Conservation Group, were involved in some of the many consultation meetings that were held. Non-technical summaries of information were also made available to the public.

The EIAs identified the main concerns and suggested potential mitigation measures. As an example, early in the consultation process, concerns were expressed about the potential impact on local wader and sea bird populations of helicopter traffic between the onshore terminal and the offshore platforms. As a result, plans to site a helipad at the terminal were cancelled and helicopter operations were transferred to a commercial airport some miles away.

For the onshore terminal, planning approval was granted following a public inquiry. In the EIA for the terminal, the main issues identified were noise, atmospheric emissions and the loss of roosting area for winter bird populations. The design therefore incorporated noise reduction measures and, as a condition of its Integrated Pollution Control (IPC) Authorization, BHP Billiton Petroleum was required to demonstrate that minimum atmospheric emissions were achieved using best available techniques not entailing excessive cost (BATNEEC); the land was also designed to be integrated as far as possible into the local surroundings by means of landscaping. In consultation with conservation agencies and non-governmental organizations, BHP Billiton Petroleum proposed a programme to undertake a considerable amount of conservation work to compensate for the loss of wetland areas and to improve the capacity of the area for bird life. One outcome was that BHP Billiton Petroleum purchased and modified adjacent land in order to maintain an area of wetland close to the lost roosting area. This area has a management plan coordinated by local conservation groups. The BHP

Statement from the RAMSAR report on the Dee Estuary, endorsing the BHP approach

Pasture land within and around the proposed development site had been identified by conservation organizations, including the RSPB, as being of significant importance at high tide for roosting and feeding waders. Furthermore, the pipeline bringing gas onshore was to be routed through Gronant Dunes and Talacre Warren SSSI. These factors led to a number of environmental conditions being attached to the granting of the planning application for the gas terminal itself. BHP's subsequent actions and implementation of environmental safeguards have been exemplary and have drawn praise from non-government conservation bodies.

Among the positive steps taken have been open and constructive dialogue with conservation organizations and local people, and provision of comprehensive yet comprehensible public information materials; appointment of a resident ecologist to advise the Company and liaise with the statutory and non-conservation agencies; purchase and management for conservation, in conjunction with CCW and RSPB of 40 hectares of pasture land; significant habitat enhancement within part of the 40-hectare site; funding of a major restoration and conservation programme for Gronant Dunes and Talacre SSSI, going far beyond simply repairing the damage done through laying of the gas pipeline; conclusion of an eight-year management agreement with the RSPB for the nature reserve located within the Dee Estuary SSSI, immediately adjacent to the gas terminal site; initiation of a ten-year ecological monitoring programme to assess the impact of the development; establishment of a rigorous environmental emergency response plan.

The RAMSAR Convention is an international body which monitors fragile wetland habitats worldwide. The convention encourages the maintenance of the ecological character of wetlands and the establishment of wetland reserves.

Source: RAMSAR Convention Bureau 1995

Billiton Petroleum action programme for the terminal received strong endorsement from the RAMSAR Commission (see box).

Reinstatement of areas of the dunes and land disturbed by the installation of the offshore and onshore pipeline has taken place. In addition, BHP Billiton Petroleum has supported community efforts to improve the amenity value of the dune areas in the vicinity of the terminal by such initiatives as improving boardwalks and assisting in community cleanup programmes. The Company sponsored the re-introduction of the Natterjack toad to the sand dune area it now manages. For the export pipeline that transports gas overland to the power station, rehabilitation work included re-establishing native hedgerows and moorland grasses. In some of the more mountainous sections of the crossing, rehabilitation even extended to replacing specific rocks in the positions they were before the pipeline was installed.

The EIAs for the Liverpool Bay facilities were the first submitted in the UK for near-shore developments. The most important environmental issues identified were produced water and drilling discharges, atmospheric emissions and oil spills. The development options took into account the proximity of the installations to the shore, a distance of 8 kilometres for the Lennox installation. Facility design incorporated spill prevention and waste stream minimization measures. The offshore storage barge, which holds the produced oil before it is loaded onto tankers, is of double-sided construction with all cargo tanks flanked by segregated seawater ballast tanks, reducing the risk of oil spillage in the event of a collision.

Operations phase

The onshore and offshore facilities were fully operational in 1996. The local community and conservation bodies remain involved in gas terminal environmental issues (e.g. through the visitors centre and local advisory groups). Though all efforts are undertaken to prevent oil spills, a comprehensive marine oil spill contingency plan is now in place for operations. The resources which have been deployed to respond to oil spills were based upon the assessment of risk as well as on the views of the regulatory authorities and the other bodies consulted. In developing the detail within these plans, BHP Billiton Petroleum has made use of its experiences in other parts of the world; in particular, BHP Billiton Petroleum's experience in managing spill prevention and organizing local spill cooperatives in the Hawaiian Islands have proved invaluable in establishing similar systems at Liverpool Bay.

BHP Billiton Petroleum developed the concept of the 'Environment Case', which parallels the UK Safety Case concept, in order to manage the operational issues identified in the EIA and supporting studies. Both the offshore Environment Case, and the onshore IPC approval provide the basis for a comprehensive monitoring programme for the operations phase. Both these documents list the limits for the various atmospheric, marine and land discharges that will result from the development. These were used to develop a suite of Key Performance Indicators for the development (e.g. stack sulphur dioxide emissions, wastewater discharge limits). Local audit programmes review individual elements of the system. In addition, BHP Billiton Petroleum conducts regular region-wide and worldwide safety, health and environmental audits.

The supply of gas for power generation is of benefit to local and global air quality. Gas is more environmentally-friendly than other fossil fuels. Compared with coal, burning natural gas supplied by this project produces, per unit of electricity, half as much carbon dioxide, one-quarter of the nitrogen oxides, no sulphur dioxide and no dust or ash. The 1500 Megawatt combined-cycle gas turbine power station at Connah's Quay achieves nearly 55 per cent efficiency and will save several million tonnes of carbon dioxide emissions each year when compared with coal-fired power stations being replaced.

Evaluation

The success of BHP Billiton Petroleum in developing hydrocarbon reserves in Liverpool Bay derives from an intimate understanding of the environment and an Environmental Management System supported by BHP Billiton Petroleum management and applied to all phases of field development and operation.

The key elements of the EMS which provided visible evidence of BHP Billiton Petroleum commitment to environmental protection were: open communication with the authorities and with environmental agencies and pressure groups, even those who were not initially well-disposed towards the development; control of contractor operations; design of facilities to meet the rigorous environmental standards demanded of near-shore operations; restoration and enhancement of local habitats; and agreed contingency plans which took into account the views of local and national experts.

The Company learnt the need to be responsive to all concerns which were expressed and sought to find solutions all could agree to, such as relocating the helicopter landing site away from the sensitive wildlife areas and acquiring and developing additional land, with the support of experts, to provide alternative feeding and resting sites for winter bird populations.

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