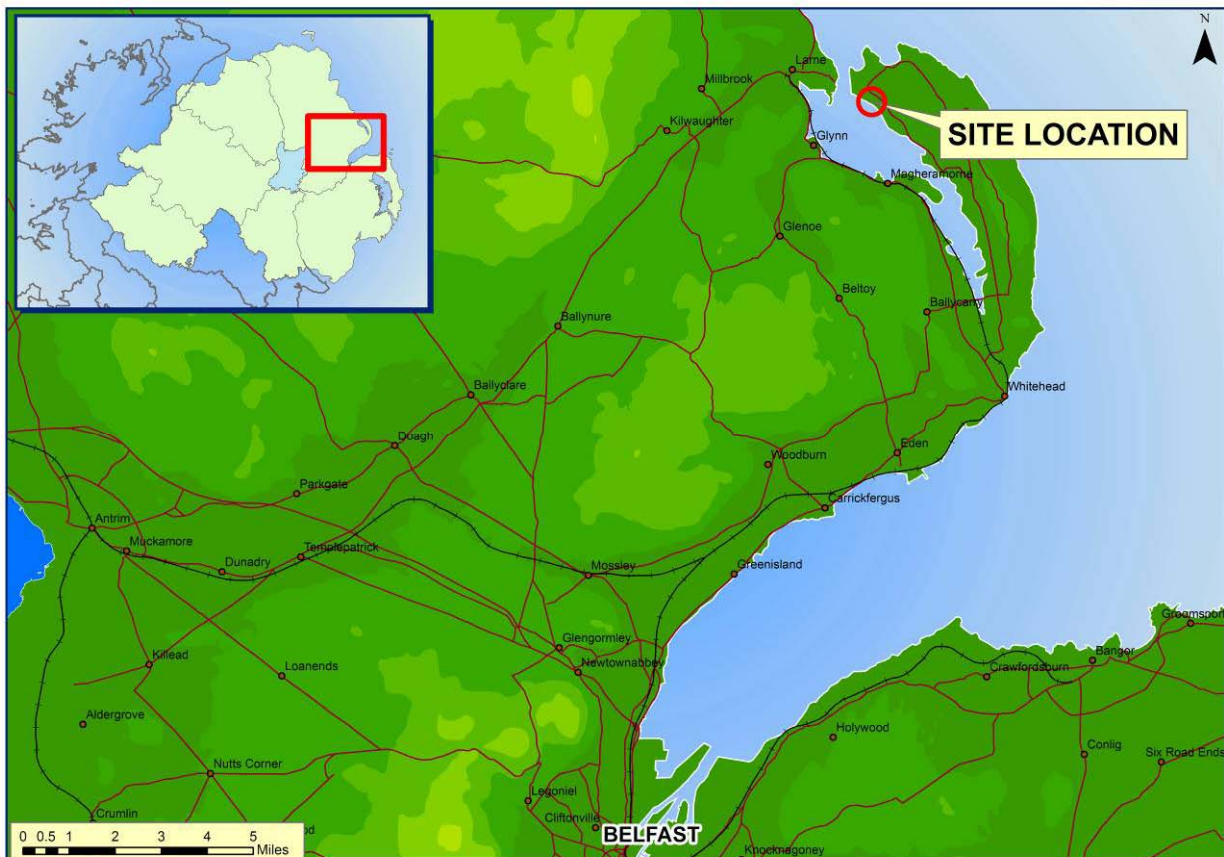


## 3.0 SITE DESCRIPTION

### 3.1 Site Location

The proposed site for the gas storage caverns is approximately 1,500 metres beneath the seabed of Larne Lough, offshore of the townland of Ballydown, County Antrim. The above-ground facilities for the scheme will be mainly located adjacent to and south of the existing power station at Ballylumford, at the northern end of the peninsula of Islandmagee.



**Figure 3.1 Site Location (Regional Context)**

Larne Lough is located on Northern Ireland's east coast, approximately 25 miles north east of Belfast. Its entrance is flanked on the west by the town of Larne and to the east by the village of Ballylumford. As discussed in the “*Site Selection*” section of Chapter 1, the sub-surface in the Larne area is the only area of the island of Ireland in which Permian age salt has been discovered to date, thus making it currently the only suitable location for underground gas storage within salt. The proposed site also takes advantage of the convenient location of Ballylumford Power Station and the Scotland to Northern Ireland natural gas transmission Pipeline (SNIP), both of which are discussed in more detail in Sections 3.4.1 and 3.5.2 respectively of this Chapter.

## 3.2 Site Context and Land Use

The individual elements of the proposed gas storage facility have been split across three main locations which are shown in Figure 3.2. As has been discussed in the “*Consideration of Alternatives*” Section 1.4 in Chapter 1, various facility configurations were investigated, however the final layout maximises the use of the available brownfield land adjacent to the power station whilst minimising the geotechnical and visual issues from creating level areas on steeply sloping ground. For this reason the wellpad and brine pumping facilities are located remote from the main gas plant facility and will be connected by sub-surface pipelines.

### 3.2.1 Main Gas Plant

The main gas compression, metering and dehydration facilities will be located on a brownfield site adjacent to Ballylumford Power Station’s 110kv sub station and Premier Transmission’s Pressure Reduction Station, at the south eastern edge of the power station’s compound. Approximately 1.5ha of the site is currently within the power station’s fenced off sterile zone and comprises scrub. A further 0.7 ha of the site in addition to the access road is located within fields which are currently used for grazing. As will be discussed in more detail below and in Chapter 12 “*Geology and Hydrogeology*” this entire section of land area was built up artificially in the late 1990s and early 2000s using material excavated during the construction of the Combined Cycle Gas Turbine (CCGT) known as the Ballylumford “C” Station for Premier Power. The location of the main facilities allows for convenient connection to the main gas network via the adjacent Pressure Reduction Station as well as the National Grid via the 110kv sub station. Access to the site will be via the Ballylumford Road.



**Plate 3.1 Gas Plant Facilities Site viewed from fields due east (June ‘07)**

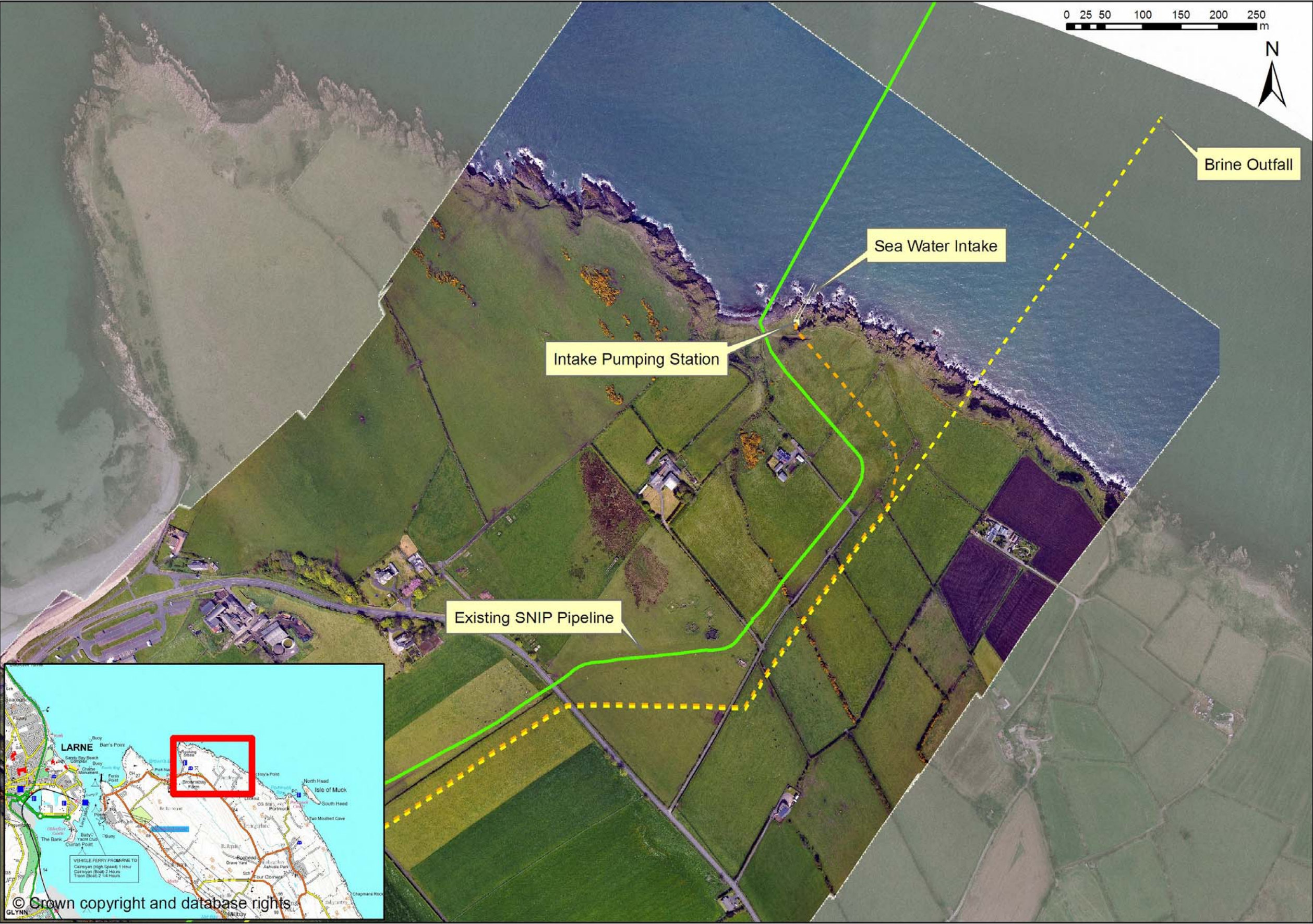




Figure 3.2 General Layout of Above-Ground Elements of Gas Storage Facility

Aerial Photography reproduced with the permission of Premier Transmission Ltd





**Figure 3.3 Location of Sea water Intake and Brine Outfall Pipelines**

*Aerial Photography reproduced with the permission of Premier Transmission Ltd. OS Orthophotography reproduced from Land and Property Services' Digital Data with the permission of the Controller of Her Majesty's Stationary Office, © Crown copyright and database rights*



The ground drops relatively steeply south west from the level of the Ballylumford Road (elevation approx. 65m AOD) to sea level, over a horizontal distance of approximately 400m, producing an average slope of 9° to the horizontal or 1v:16h. The access road to the gas facilities must therefore sweep out around the site in order to reduce the gradient sufficiently to make it suitable for HGV traffic.

It is known that large volumes of fill material (comprising mainly demolition rubble and natural soils/rock) were placed on the site of the proposed gas plant and in surrounding fields during the development of the CCGT (Combined Cycle Gas Turbine) power station (Ballylumford C) between 2000 and 2003. Placement of this fill has resulted in the formation of a number of man-made plateaux and embankment slopes. The man-made embankment slopes were typically formed at angles of 1v:2h (27° to the horizontal).

The gas plant facilities will be largely situated on one of these plateaux (refer to Plate 3.1 on page 3.2), although a small portion will extend onto the sloping ground adjacent and approximately 31,600m<sup>3</sup> of fill will be required to make the site completely level.

### 3.2.2 Brine Leaching Facility

The sea water and brine leaching facilities will be located north east of the main gas plant facilities, on the northern side of the Ballylumford Road. This site was formerly used as a basalt quarry and currently holds two agricultural sheds. An additional area will require to be cleared and levelled in order to create sufficient area for the plant, which will necessitate the removal of some 17,100m<sup>3</sup> of outcropping basalt. It was determined that it would be more appropriate in terms of landscape and visual impact to excavate basalt to form the level platform necessary for the brine facilities rather than filling the site. The rock excavated from this area will be reused as fill material in the other elements of the proposed scheme.

The brine leaching facilities will be connected to the wellpad via two pipelines (for incoming sea water and outgoing brine) which will be buried using conventional trenching methods to a junction point east of the main gas plant facilities. From the junction point, the sea water and brine pipelines will be tunnelled to the wellpad site, alongside the gas pipeline, using the horizontal directional drilling technique. This will avoid any disturbance to the potentially environmentally sensitive area of scrub between the wellpad and the main gas facility.

### 3.2.3 Wellpad

The proposed wellpad site is situated approximately 725 metres south east of the main gas plant facility (Figure 3.2). As discussed in the “*Consideration of Alternatives*” section of Chapter 1, various alternatives were investigated for the wellpad site, but when factors such as topography and safety with respect to the overhead power lines were considered, this location was determined to be most appropriate. The wellpad will be connected to the main gas plant facilities via three directionally-drilled sub surface pipelines for gas, brine and sea water.

The site is currently used for grazing and silage (Plate 3.2). An existing access exists from the Ballylumford Road, however, the upper portion of this access is too steep to safely accommodate HGV traffic. In addition, the lane runs adjacent to a residential property. Therefore, a new access lane will be constructed from an alternative entrance, which will follow the route of an existing lane which leads to a group of agricultural sheds for approximately half its length.

The ground falls approximately 3 metres from approx 8.25m to 5.25m AOD in elevation across the proposed wellpad site in a northeast-southwest direction, parallel with the alignment of the wellpad and the shore. The wellpad area will be cut/filled to create a level platform at approximately 6.4m AOD with a gabion wall supporting the 2.25m cut face on the upslope side.

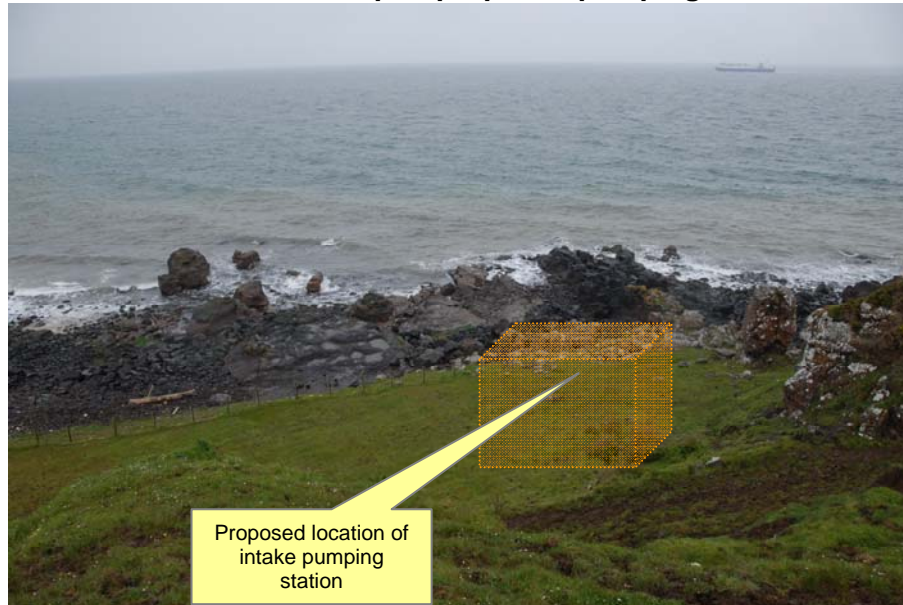


**Plate 3.2 Wellpad site viewed from hillside above Glynn village**

### **3.2.4 Sea Water Intake Pumping Station**

The sea water intake pumping station will be located on the eastern side of Islandmagee, within a small bay set into the cliffs at an area known as Castle Robin Bay, (also known locally as Bell's Port). The bay was used as the landfall site for the SNIP and therefore it has an existing access for heavy plant machinery. Due to the topography, the proposed site of the intake pumping station is only visible from the cliffs immediately above the site, from within the bay itself or from the sea.

**Plate 3.3 View north east from cliff top of proposed pumping station and intake area**



### **3.2.5 Sea Water Intake and Brine Outfall pipeline routes**

The sea water intake and brine outfall pipelines run between the wellpad, the main gas plant facility, the brine leaching facilities and the sea. Their total lengths are approximately 3,570 and 3,880 metres respectively. The route of the pipelines from the sea water and brine leaching facilities to the eastern shore of Islandmagee runs broadly parallel to the SNIP and travels mostly through open farmland. The pipelines are proposed to be buried beneath the surface using conventional trenching techniques, with a 30 metre wide working area. Where possible, the pipelines have been routed to avoid any scrub and hedgerow areas of potentially high conservation value. Where crossing of hedges is unavoidable, the working width will be reduced to mitigate against unnecessary impacts. Following construction, the working width will be fully reinstated with appropriate vegetation and drainage as necessary.

The proposed route of the sea water, brine and gas pipelines between the gas plant facility and the wellpad (approximately 725 metres) travels through a well established scrub area. The pipelines in this section are proposed to be installed using directional drilling techniques, thus avoiding any disturbance of the surface.





Figure 3.4 Pipeline Routes

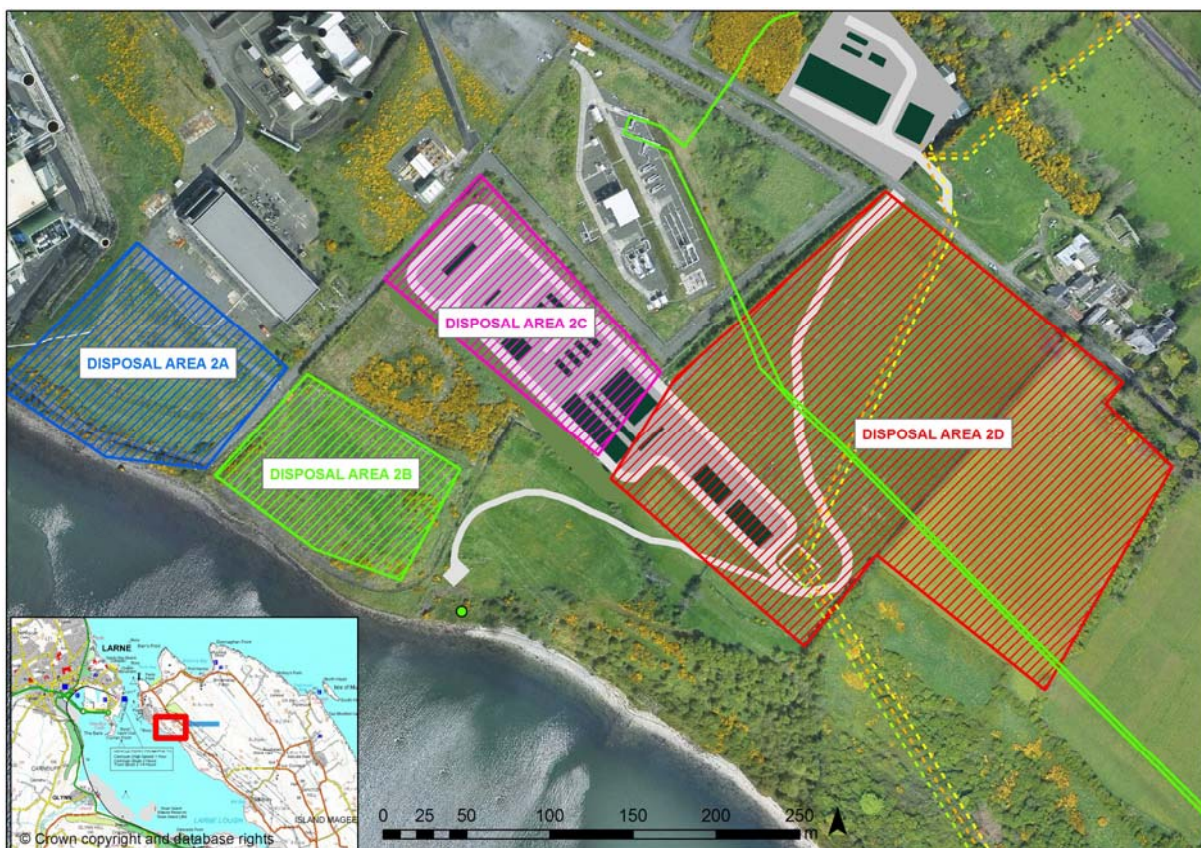
Aerial Photography reproduced with the permission of Premier Transmission Ltd. OS Orthophotography reproduced from Land and Property Services' Digital Data with the permission of the Controller of Her Majesty's Stationary Office, © Crown copyright and database rights



### 3.2.6 Review of Former Site Land Use and Ground Stability

Some parts of the proposed site have previously been used for the disposal of inert waste materials from the construction of the power station. A desktop review and outline ground investigation studies were undertaken of the areas surrounding the main gas plant facilities and brine leaching plant in 2008 and 2009.

Four areas close to the proposed main gas facilities were used by the power station to dispose of surplus fill generated during the construction of Ballylumford Power Station's CCGT "C" Station between 2000 and 2003. These areas are marked as Areas 2A, 2B, 2C and 2D in Figure 3.5 below. The studies undertaken have focused on Areas 2B, 2C and 2D as Area 2A has not been considered for use at any time in the proposed gas storage facility.



**Figure 3.5** Areas formerly used for disposal

*Aerial Photography reproduced with the permission of Premier Transmission Ltd.*

The location proposed for the main gas plant facility coincides with parts of two of the earthworks disposal areas (Areas 2C and 2D) from the construction of the Ballylumford C power station. As shown in Figure 3.5 above, the north western end of the site is underlain by disposal Area 2C and the south eastern end of the site is underlain by disposal Area 2D. The area between disposal Areas 2C and 2D is currently occupied by part of the sterile zone surrounding the existing AGI and a farm access track. Based on descriptions of the proposed embankment designs contained in the earthworks design reports and the current topography, the maximum depth of fill in Area 2C is estimated at around 9m to 10m above original ground



level. The depth of fill placed in Area 2D at the location of the gas plant site is reported to be 1.5m. Fill levels thicken up slope to 3m before thinning out again towards the road.

It is understood that the fill placed in disposal Area 2C consisted of a mixture of demolition rubble and natural soils. Trial pits and trenches excavated in this part of the site in August 2008 have confirmed the variable nature of the fill material. It is understood from consultation with Premier Power Limited that the fill material placed in disposal Area 2D was predominantly crushed basalt and natural soils. Although no records of the placement of this fill have been received and there has been no investigation of this area to date, it is likely that this material will be of better quality than that in disposal Area 2C.

Area 2B, further down the slope from the main gas plant facility and approximately 40 metres west of the proposed vent stack area, was used to dispose of ash generated during the operation of the Ballylumford A coal-fired power station between the late 1940s and 1974. Subsequent to this, fill material arising from the construction of the Ballylumford “C” Station was also placed on Area 2B, leading to localised instability within the area where filling operations were taking place and subsequent land slips. A site within Area 2B was initially considered by Islandmagee Storage Limited for locating the wellpad for the gas facilities. However, this site was ultimately rejected because of the ground conditions and the presence of basalt bedrock beneath the site.

There has also been some localised land slippage in the vicinity of the proposed vent stack area. This area has not been used for tipping of ash, but has had clay placed within it during the construction of the power station (it is unknown at present during which phase of the power station’s construction that this occurred)

The locations of the various facilities associated with the proposed gas storage scheme have been selected to avoid areas in which ash is known to have been tipped. However, ground investigations will be undertaken prior to/during the front end engineering or detailed design of the plant in order to confirm that no ash is present below any of the site elements and to provide more information on the condition and mechanism of the landslip in the vicinity of the cold vent. These investigations will also be used in the design of any stabilisation measures that may be required.



### 3.3 Larne Lough

As will be discussed in more detail in Chapter 12, “*Geology and Hydrogeology*” of this EIS, Larne Lough has been formed as a result of the erosion of the tertiary basalts of the Antrim plateau and underlying softer sedimentary rocks, following uplift of the area in the Miocene geological epoch.

Larne Lough is long (c. 9 km in length) and narrow (c. 2.5 km wide at its maximum) in shape, running approximately north north east to south south west. Approximately mid-way down its length, the lough has become constricted by a man-made one mile long peninsula, created by a spoil heap of basalt which was removed from a former quarry at Magheramorne to allow access to the limestone beneath.

The spoil heap at Magheramorne greatly restricts tidal flows into the lower lough and as a consequence the lower lough comprises mostly tidal mudflats and saltmarsh, providing a rich habitat for wading birds.

Larne Lough is a wetland of outstanding importance for numbers of wildfowl and waders. Much of the estuary is shallow, having become extensively infilled with sediments of fine muddy sand, and at low water the largest areas of intertidal flats are exposed at the south of the lough. The northern parts of the lough are wider and relatively deep, especially at the mouth where dredging is regularly carried out to maintain the shipping channel to the Port of Larne.

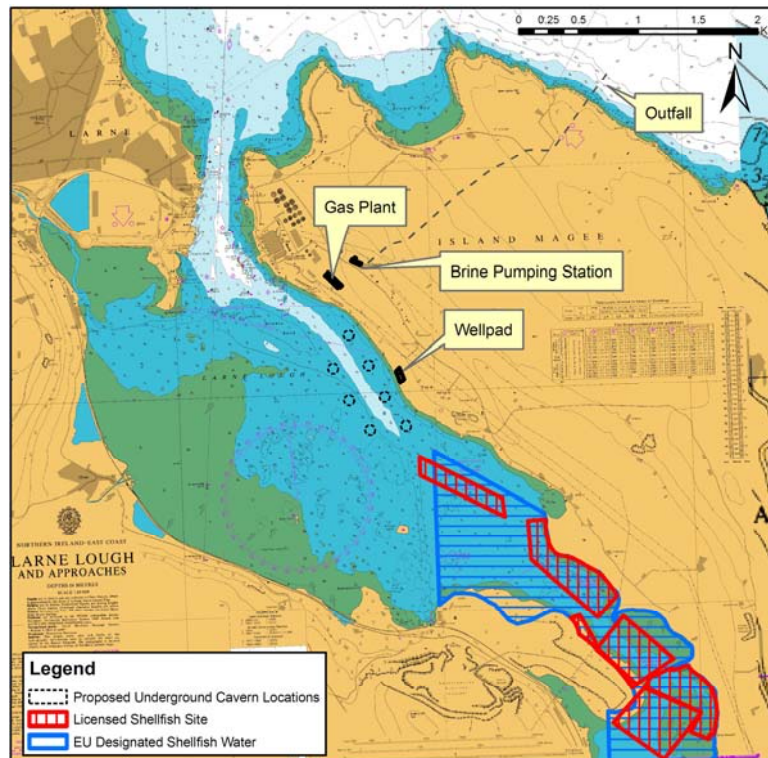
Part of the narrower stretch of Larne Lough between Magheramorne and Millbay, shown in Figure 3.6 below, was given EU Designated Shellfish Water status in 1999 (NIEA, 2009).

There are six licensed sites for shellfish cultivation, however not all of these sites are currently in use. The main operator, Island Shellfish, is based at Millbay and operates a hatchery for native oysters as well as cultivation of native oysters, pacific oysters, clams and mussels. The aquaculture activities in and around the lough will be discussed in more detail in the *Fisheries* section of Chapter 6, “*Intertidal and Underwater Flora and Fauna*”.

The proposed site of the gas storage facilities is adjacent to the Larne Lough Special Protection Area (SPA), Area of Special Scientific Interest (ASSI) and RAMSAR site (Figure 3.7). In addition, the Portmuck ASSI and The Gobbins ASSI are on the eastern shores of Islandmagee and the Waterloo ASSI is on the shore just north of Larne town.

The boundaries of the Larne Lough Ramsar site, Area of Special Scientific Interest (ASSI), and Special Protection Area (SPA) are all entirely coincident. In addition to the Larne Lough designations, Swan Island, which is located near the western Lough shore, approximately 750m northwest of Dalaradia Point was assigned its own SPA status in 1992, and is also home to the tiny area (0.04Ha) designated as Swan Island National Nature Reserve.





**Figure 3.6** Admiralty Chart of northern section of Larne Lough, showing Designated Shellfish Waters and licensed aquaculture sites.

*Admiralty Chart reproduced from Chart 1237 © UKHO Not For Navigational Use*



**Figure 3.7** Environmental Designations

*Reproduced from Land and Property Services' Digital Data with the permission of the Controller of Her Majesty's Stationary Office, © Crown copyright and database rights*

### 3.4 Islandmagee

Islandmagee, despite its name, is not an island but a peninsula, measuring approximately 11km in length and varying between 1.5 and 3km in width. It is, however, frequently referred to by locals as “the Island”. At the 2001 Census (NISRA, 2002) the population of Islandmagee stood at 2,385 inhabitants, of which approximately 781 live in the main centre of population at Ballystrudder at its southern end. There are also small population centres at Millbay, Mullaghboy, Portmuck and Ballylumford, but otherwise it is relatively sparsely populated, with individual dwellings and farm houses dispersed along the main roads. The land use is largely agricultural, mostly for grazing cattle and sheep.

The topography of the island comprises a number of ridges and hollows which are aligned roughly parallel with overall shape of the peninsula in a generally north west to south east direction. The ridges rise to heights of 120-130 metres in places, affording spectacular views west towards the Antrim plateau and east as far as the Scottish coast.

The eastern coast of Islandmagee ends in sheer basalt cliffs, which have resulted in ASSI designations for Portmuck and the Gobbins Cliffs due to the spectacular geology and the wealth of sea birds present at the cliffs. In the early 1900s the Gobbins Cliffs were one of Northern Ireland’s most popular tourist attractions, with up to 2 million visitors per year walking along a purpose built 2 mile cliff path which incorporated tunnels and suspension bridges linking parts of the cliffs above the sea. The cliff path fell into disrepair during the Second World War, when most of the ironwork was removed for reuse in the war effort, and was never reinstated after the war. It officially closed in 1962, however plans are currently under way to rebuild part of the walkway and reopen it as a tourist attraction.

Due to its relative proximity to Belfast and the main A2 scenic coast road which leads to the Glens of Antrim and the North Coast, Islandmagee is quite popular as a day trip tourist destination, with the beach at Browns Bay at its northern end being especially popular in the summer months. Portmuck harbour, on the east coast, is also a popular destination.

#### 3.4.1 Ballylumford Power Station

Ballylumford Power Station is located at the northern end of Islandmagee, directly opposite the Port of Larne. It was originally built in 1943 when the coal-fired “A” Station was commissioned by the government (Premier Power, 2009). At that time, during World War II, it was initially intended to extend Belfast Harbour Power Station; however, due to the risk of bombing in Belfast, it was decided that the power station should be built away from Belfast and Ballylumford was chosen instead, where it was felt that it would be safer. The power station survived the war unscathed, and helped to supply much needed electricity to a recovering Northern Ireland after the war.

In order to meet the increasing demand, a heavy oil-fired “B” Station with a total generating capacity of 1057MW (inclusive of emergency turbines) was completed in 1974. The “B” station has three tall chimneys, each 400 feet in height and is a prominent feature in the local landscape. In 1989 the original “A” station was demolished and in 1992 Ballylumford along



with the other three power stations in Northern Ireland, was sold. The power station was purchased by Premier Power, a subsidiary of British Gas and as a condition of the sale the power station was to be converted from heavy oil to gas. Following the completion of the SNIP gas pipeline in 1996, the “B” station switched to gas in 1997. A new state of the art Combined Cycle Gas Turbine (CCGT) (known as Ballylumford “C” Station) and capable of producing 600MW (half of Northern Ireland’s demand) was opened in 2003. The CCGT is capable of producing 40% more power from the same amount of gas as a conventional thermal turbine (Premier Power, 2009).

### **3.5 Infrastructure**

Principally due to the presence of Northern Ireland’s largest power station, Islandmagee has become a hub for regional infrastructure networks. The main features are shown in Figure 3.8 and are discussed below.

#### **3.5.1 Electricity**

There are four sets of above-ground high voltage electricity cables (two 110kv and two 275kv) that issue from two electricity sub-stations within the power station compound and travel south along Islandmagee before diverging to various locations across County Antrim. The 110kv sub-station is located immediately west of the proposed site for the gas plant facilities and will serve as the connection point for the facilities’ electricity demands.

Approximately 200 metres north east of the brine leaching facilities lies the Moyle Interconnector. It began operations in 2002 and links the electricity systems of Northern Ireland and Scotland via two undersea 275kv cables. The cables make landfall in the vicinity of Portmuck, before travelling sub-surface across Islandmagee to the Interconnector.

#### **3.5.2 Gas Pipelines**

The Scotland to Northern Ireland natural gas transmission pipeline (SNIP) extends 135 kilometres to Ballylumford from Twynholm in Scotland and was completed in 1996. The 24 inch sub sea pipeline makes landfall at Castle Robin Bay on the eastern shore of Islandmagee and crosses the peninsula, terminating at the Ballylumford Pressure Reduction Station (PRS), adjacent to the Power Station (Figure 3.6)

The Belfast Gas Transmission Pipeline (BGTP), completed in 1998, also originates from the Ballylumford PRS and runs for 26 km to a pressure reduction station at Tory Town on the northern shore of Belfast Lough where it then travels 9 km across Belfast Lough to Knocknagoney pressure reduction station. A 3km spur, known as the Larne Crossing Pipeline, also travels from the PRS at Ballylumford to a Pressure Reduction Station at Curran Point in Larne.

The Ballylumford PRS neighbours the proposed gas plant facilities on their northern side. It is proposed that the connection to the mains gas network will take place through the PRS.



**Figure 3.8 Infrastructure surrounding proposed site of gas storage facilities**



Whilst the presence of gas and electricity infrastructure is helpful in terms of supplying and powering the proposed gas storage facilities, they have also proven to be significant constraints in determining the most appropriate location for the facility.

### **3.5.3 Oil pipeline**

A 12" pipeline which was commissioned to transfer heavy fuel oil between Ballylumford Power Station and Kilroot Power Station in the 1980s runs through the vicinity of the proposed site. The oil pipeline is now redundant and was decommissioned following the power station's conversion to gas in 1997. The pipeline was pigged in 1999 and is understood to have remained empty since that date. The pipeline features a Skin Effect Current Trace heating system and therefore may have electrical cables within the vicinity of the pipeline. For safety reasons we will be considering these cables as live. As with the other sub-surface infrastructure, prior to construction the precise location of the oil pipeline will be identified using sub surface imaging and its location will be clearly marked on the site.

### **3.5.4 Larne Crossing Pipeline Cathodic Protection**

The cathodic protection for the Larne Lough Crossing Pipeline, a 28m groundbed, is known to be located close to the shore below the main gas plant facilities and is connected to a transformer rectifier and subsequently to the pipeline within the Ballylumford PRS compound. The precise location of the groundbed and the connecting cables will need to be identified using sub surface imaging and its location will be clearly marked on the site.

## **3.6 Larne and the Eastern Shore of Larne Lough**

### **3.6.1 Larne**

Larne is an important seaport and small industrial town located at the mouth of Larne Lough, on its western side. At the 2001 Census (NISRA, 2002) it had a recorded population of 18,228.

The Port of Larne lies immediately opposite Ballylumford Power Station and the two are linked by a short (1 minute) foot passenger ferry service. The Port of Larne is the second largest freight and passenger seaport in Northern Ireland, and operates up to 28 Roll-On Roll-Off sailings per day to Scotland (Cairnryan and Troon), and England (Fleetwood). The port has 5 main berths, capable of accommodating vessels up to 175 metres in length.

### **3.6.2 Glynn**

Approximately 2.5km south of Larne lies the village of Glynn, which had a population of 641 declared at the 2001 census. (NISRA, 2002) The village has views across the Lough and of the Swan Island Nature Reserve.

### **3.6.3 Magheramorne**

The village of Magheramorne (2001 population 75) and its associated quarry are located approximately 6km south of Larne, on the western shore of Larne Lough.

Magheramorne quarry was originally opened in 1794 (Lafarge, 2009) and mainly focused on lime production until production switched to cement in 1914. Quarrying ceased in 1980, however cement production continued until 1990 using imported materials. The site remained open as a storage site for imported cement until finally closing in 2001. In the 1990s a planning application was submitted to convert the former quarry into a landfill waste site; however the planning application received considerable local opposition and was subsequently turned down in 1997. In 2009 a planning application for a development including an eco-village, national cycling centre, diving centre and industrial heritage museum on the 153 hectare site was granted outline permission, paving the way for a much needed regeneration of the site.

The proposed gas storage facilities will be more visible from Larne, Glynn and Magheramorne than from within Islandmagee. The impacts on receptors in these areas will therefore also be taken into consideration in this EIS.



**This page has been left intentionally blank.**