Gallow’s Deep RIGS site

NRW RIGS no. 150 [SH 59872 74947]

Gallows Point 564 [SH 59437 74973]

GeoMôn Global Geopark original webpage

RIGS Statement of Interest:

Gallow’s Deep RIGS site provides one of the most extensive and detailed records of Holocene land- and sea-level changes in Britain. It provides by far the best evidence yet known for understanding the post-glacial evolution of the Menai Strait. The sequence comprises near-horizontal layers of alternating terrestrial and marine deposits. These have been cliffed by strong currents in a deep scour hole, located in the Menai Strait near Gallow’s Point. The cliffed section exposes [n metres of/ n clay & n peat units – more details]. It is very rare to have such deposits with heights well below OD exposed in such a manner. The sediments have been sampled from a borehole sunk on the northern side of the sub-marine cliff. Micropalaeontological, sedimentological and geophysical evidence has been collected from the site and organic-rich sediments, including peat beds, have been radiocarbon dated, providing one of the most detailed records of Holocene sea-level changes in the region. The evidence shows that relative mean sea level within the north-eastern Menai Strait increased from –26m OD to –6m OD between 11,500 and 8,000 calendar years before present (BP). Continual relative mean sea-level rise, albeit at reduced rates, resulted in the eventual breaching of a watershed within the central region of the Menai Strait. This rise formed the contemporary tidal strait and finally separated Anglesey from the mainland about 7,200 years ago. Relative mean sea level subsequently rose by approximately 1.5m between 6,800 and 4,000 calendar years BP. Since this time, erosional and depositional processes have continued to shape the Menai Strait. The sedimentary evidence at Gallow’s Deep RIGS spans the early to middle Holocene and reflects alternating development of low-lying coastal marsh and intertidal sedimentation. It is suggested that the clyclic sedimentation pattern reflects a close interplay between rates of eustatic sea-level rise and isostatic uplift.

Geological setting/context: About 2.4 million years ago there was a general cooling of the Earth’s climate, heralding the onset of the Quaternary “Ice Age”, a period of geological time extending to the present day. In reality, the period has seen a number of cold ‘glacial’ periods interspersed with warmer ‘interglacial’ periods such as the one in which we now live. Since about 450,000 years ago there have been at least four intensely cold periods during which large parts of upland Britain were covered by ice sheets for long periods. Although Anglesey was probably overrun by ice on these occasions, only evidence from the last major glacial phase – the Late Devensian – is known. Possible evidence from the warm interglacial period before the Late Devensian may locally have escaped the destructive erosional and depositional effects of the last ice sheet. Following gradual climatic warming, the Late Devensian ice sheet had probably disappeared from Anglesey by about 14,500 years ago. From this time, vegetation began to spread back over the land surface and soils started to form. The speed of plant colonisation and soil development was affected by fluctuations in climate. An intensely cold period about 11,000–10,000 years ago, known as the Younger Dryas, saw the reappearance of small cirque glaciers in the uplands of Snowdonia and elsewhere in Britain. Stratigraphic evidence for this cold period is known from several basinal peat sequences on the island and it is likely that there was discontinuous permafrost, local frost-cracking of the ground surface and the redistribution downslope of unconsolidated sediment such as boulder clay. The Younger Dryas was followed at about 10,000 years BP by what is known as the Holocene – the current interglacial. In Anglesey, as in the rest of Wales, the Holocene saw the development of temperate deciduous mixed oak forest and its progressive modification by humans. Early plant colonisers, such as crowberry, juniper, birch and willow were succeeded by ash and hazel and later by oak, elm and pine. Wetter periods, aided by the early tree-felling activities of humans, saw the extensive development of lowland bogs and extensive heaths. In inland areas of the island, soil development and plant colonisation reduced geomorphological activity. Locally, however, the solution of limestone continued and limestone pavements were exhumed. Significant changes, however, occurred around the coast. Throughout Devensian late-glacial time and into the Holocene, the Earth’s crust recovered and rebounded from its depression beneath an extensive ice cover. Around the coastline of Wales, the rate of Holocene sea-level rise stabilised about 6,000 years ago. Rates of

relative land/sea-level change due to the interplay between ice retreat (during deglaciation), rising global sea level and crustal recovery or ‘rebound’, were subject to wide variation. Deglaciation of Welsh coastlands occurred earlier than in Scotland, for example, and crustal rebound occurred before rising global sea levels were able to modify the coastline. An exception is the slightly raised Holocene beaches of Anglesey which occur only a few metres higher than present sea level. The intermittent occurrence of ‘submerged forest’ beds seen in foreshore exposures around the coast of Anglesey (and widely elsewhere around the Welsh coast) attests to the inundation of a densely wooded coastal fringe by the rising Holocene sea.

Four sub-networks of RIGS have been selected to demonstrate the most important aspects of the Holocene evolution of Anglesey. These are: 1. Holocene peat beds and pollen biostratigraphy; 2. Holocene sea-level changes; 3. limestone pavements; and 4. Man and the Holocene.

Network context of the site: Gallow’s Deep RIGS belongs to Network 2 (‘Holocene sea-level changes’). It is one of a series of sites that provides evidence for the Holocene sea-level history of the island. Whereas Gallow’s Deep RIGS provides the most detailed Holocene sea-level record yet known from the region, Llanddwyn Island RIGS provides the best examples of the slightly raised Holocene beaches which occur on the island and a good example of the periodically exposed submerged forest bed. Malltraeth Marsh and Llanleiana RIGS provide important complementary records of sea-level change and terrestrial sedimentation, while Cemlyn Bay RIGS provides a fine example of a Late Devensian drumlin landscape drowned and modified by the Holocene sea. Llanddona RIGS provides a controversial and unique example of a proposed Holocene raised beach conglomerate that provides a rare insight into the evolution of Anglesey’s coastline during the Holocene.

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