Rialtas na hÉireann
Government of Ireland

PRECAMBRIAN – LOWER PALAEOZOIC

Merlin Energy Resources Ltd

PIP
Petroleum Infrastructure Programme

TABLE OF CONTENTS

D. STRATIGRAPHIC INTERVALS D.1-2

D.1 PRECAMBRIAN-LOWER PALAEOZOIC (PRE-DEVONIAN) D.1-3
CRYSTALLINE OR METAMORPHIC BASEMENT PENETRATIONS D.1-3
PRE-DEVONIAN SEDIMENTARY PENETRATIONS D.1-3
"18/25-2 SANDSTONE/CLAYSTONE" D.1-3
"26/28 BASAL CONGLOMERATE" D.1-4

D.2 DEVONIAN D.2-6
DEVONIAN LITHOSTRATIGRAPHIC SUBDIVISIONS D.2-6
DARRIG FORMATION (NEW) D.2-6

LIST OF FIGURES

Figure D.1.1 *Probable Cambrian succession in 33/22-1, Kish Bank Basin.* D.1-3
Figure D.1.2. *18/25-2, showing development of "18/25-2 Sandstone/Claystone" section, of possible Silurian age.* D.1-4
Figure D.1.3. *Probable Lower Palaeozoic sections penetrated in Connemara discovery area, block 26/28 and seismic tie. Correlation proves onlap above unconformity on top of the 26/28 Basal Conglomerate (?Silurian).* D.1-5
Figure D.2.1. *Devonian, Darrig Formation; montage of type and reference wells with location and distribution map.* D.2-8
Figure D.2.2. *Seismic line tying DSDP Hole 548A to Fastnet Basin wells 56/15-1, 55/30-1. Although the Top Devonian horizon cannot be recognised in the centre of the line (across Celtic Platform) it is considered likely that Devonian rocks are present through this region.* D.2-9

D. STRATIGRAPHIC INTERVALS

This section describes the lithostratigraphic and sequence stratigraphic subdivision of each chronostratigraphic interval identified in the Irish offshore region. This includes the following: -

- Sequence stratigraphy, based on an integration of well and seismic data, calibrated by biostratigraphy.
- Palaeofacies maps.
- Lithostratigraphy, describing the newly proposed scheme for the region.
- Source rock characterization for each lithostratigraphic unit that carries identified source potential.
- Comparisons between offshore Ireland and offshore Eastern Canada (Newfoundland and Labrador).

Each section is illustrated with stratigraphic summary diagrams, well displays, seismic lines, maps and geochemistry plots as appropriate.

The lithostratigraphic unit descriptions for offshore Ireland are arranged overall in ascending stratigraphical order (i.e. Devonian, Carboniferous, Triassic etc.) within this section. Within these headings the group descriptions are arranged in descending stratigraphical order (e.g. Penarth, Mercia Mudstone, Sherwood Sandstone for the Triassic) to reflect the drilled succession. Within the groups, the formations (and members within them) are described in alphabetical order in most chapters. This has been necessitated by the fact that there are some groups that occur across the whole of offshore Ireland (e.g. the Triassic groups and the Lias Group), while formations within them are specific to particular basins. This fact makes it difficult to apply a logical order based on either stratigraphic position or geographic occurrence, for all stratigraphical intervals. This approach is similar to that used by the British Geological Survey for the UK offshore area. In one of these publications, for the Jurassic of the Central and Northern North Sea, Richards *et al.* (1993) arranged the groups by descending stratigraphical order, but formations within the groups were arranged alphabetically. An exception is the Carboniferous section, which is arranged in stratigraphic order throughout.

Each lithostratigraphic unit description is illustrated with type and reference wells (a minimum of two wells where possible), showing the unit's typical development, and variations within the unit. Type and reference wells are chosen that are believed to preserve complete (i.e. conformable) upper and lower contacts, though this is not possible in all cases. Type wells are those that display the most representative sections of a particular lithostratigraphic unit, and, ideally are also associated with a good quality biostratigraphic data set. Reference wells have been chosen to illustrate the range of variation seen within the unit or to illustrate development in different depositional areas. Type and reference wells are selected for all new, formally described formations and members, but not for groups that are subdivided into new formations. Type wells are selected, however, for new groups that are not divided into formations, e.g. the Blackthorn Group. Reference Irish wells are selected for previously named formations and members (which are normally those that have been described from contiguous UK offshore areas).

The type and reference well log panels display lithostratigraphic units, wireline logs, casing points (if present over the displayed interval) and lithology. Note that the lithological columns displayed have been primarily based on the well composite log lithologies and are generalized overall. More detailed lithological displays are provided in the well and borehole summary logs, where an additional data set of lithological qualifiers have been plotted that provide further detail. The intention of the lithology columns is to essentially reproduce the lithologies as shown on the well composite logs, according to a standard graphical legend. However, these have been edited in the current project in many instances to more accurately reflect the interpreted lithological succession. These lithologies are stored within the project *IC* database.

In the lithological descriptions of the lithostratigraphic units, reference is occasionally made to the presence of organic matter that is visible in the palynology preparations. In this regard, Amorphous (unstructured) Organic Matter (or "AOM") is "sapropelic" organic material derived from marine algae; this is largely oil prone and preserved in anoxic marine palaeoenvironments. "Flimsy" organic matter is AOM that is wispy, rather than forming clumps as in the typical AOM. Flimsy AOM is seen, for example, in the Purbeck and Wealden group (Lower Cretaceous) and Dursey Formation (Upper Jurassic) sediments in offshore Ireland and elsewhere and is largely derived from terrestrial plant material, originating in anoxic lagoons and lakes.

Wireline log patterns (typically displayed by the gamma ray log) are described, following industry convention (e.g. Emery & Myers, 1996, Fig. 4.7; Rider, 2002, Fig. 14.1), as follows: -

- *Cylindrical (or boxcar)*; consistent log values with sharp top and base.
- *Funnel*; upwards decreasing gamma ray log values, often interpreted as reflecting coarsening upwards, prograding facies.
- *Bell*; upwards increasing gamma ray log values above a sharp base, often interpreted as reflecting fining upwards, retrogradational facies.
- *Symmetrical (or bow)*; initial upwards increasing to minimum point, followed by upwards increasing values to maximum, interpreted as prograding and retrograding facies. Also known as a "gamma-sonic bow" or bow trend.
- *Serrated (or irregular, saw tooth, spiky)*; overall even log values, but with fluctuating high and low values reflecting interbedded (e.g. sandstone-shale) successions.
- *Parallel/linear*; even log values where gamma ray and sonic velocity traces show little variation.
- *Waisted*; term used in this atlas for the opposite of the bow shaped profile, for a unit displaying low gamma ray and high sonic velocity values at the base and top, with a middle section of higher gamma and lower sonic velocity values, i.e. an "hour glass" profile.

The lithostratigraphic unit distribution maps are provided for all formally described groups, formations and members (but not for informal members or units). These maps show all proven well and borehole penetrations of the unit in question, together with an outline reflecting the current interpretation of the likely distribution of the unit. This outline is based on extrapolation from the proven data points to a likely depositional (or preservational) limit based on seismic data available to the project. In addition, question marks are shown in areas where the presence of the unit is considered possible, based on geological criteria (e.g. extrapolation to the extent of a basin in which the unit is proven to be present in part). A case in point is the presence of Lower Jurassic and Triassic sediments in the Porcupine Basin; there are two wells in the northern part of this basin, 26/21-1A and 26/22-1 which drilled sediments of this age, and which therefore demonstrate the presence of these rocks in the basin; hence it is reasonable to expect their presence across the basin to the south of these wells, in areas as yet undrilled.

There are several basins within the overall project bounds that are currently undrilled; these include the Cockburn and Little Sole basins, to the south east of the Fastnet Basin, and many small basins on the eastern flank of the Rockall Basin, including the Colm, Fursa, Padraig, South Bróna and Cillian basins. These basins have not been intepreted in any detail as they sit outside the agreed project scope. No detailed mapping has been carried out that incorporates these basins, though some of them are mentioned where relevant in the stratigraphic sections below.

Ties between wells and seismic lines are illustrated in many figures through the Atlas. The positions at which the seismic horizons tie to the wells are marked on the well panels shown on these figures. It should be noted that seismic horizons do not always tie precisely to the expected levels in the wells, due to a number of factors; the positions at which the horizons are drawn on the well panels reflects the actual apparent depth ties at the well locations and have not been adjusted to fit any preconceived expected depths.

Depths shown for core photographs are original drilled depths and units, which are in some cases in feet and in other cases in metres.

D.1 PRECAMBRIAN-LOWER PALAEOZOIC (PRE-DEVONIAN)

Few wells and boreholes have penetrated Lower Palaeozoic sedimentary or low-grade metamorphic rocks offshore Ireland; one well penetrated probable Cambrian rocks, three wells penetrated possible Ordovician sediments and one well penetrated possible Silurian sediments. In addition, sea bed sampling sites, from either dives or sea bed grab sampling, on the Porcupine High and one well have recorded Dalradian (Precambrian) granitic othogneiss.

Dating of these rocks is inherently difficult because biostratigraphic data or radiometric data are lacking. None of these Precambrian to Lower Palaeozoic occurrences will be described formally or named in this report due to the general lack of data and paucity of well penetrations.

CRYSTALLINE OR METAMORPHIC BASEMENT PENETRATIONS

Sea bed cored borehole 25/7-sb (MeBo) 3, located on the Porcupine High, immediately south of the Macdara Basin, drilled a core into basement, described as granitic garnetiferous othogneiss (Daly *et al*., 2008), that was later referred to as the Porcupine High Orthogneiss (PHO) by Tyrrell (2013). This rock was dated as Mesoproterozoic (1314 Ma) on the basis of U-Pb zircon geochronology (Daly *et al*., 2008). These authors considered that the most likely source for the magma from which the orthogneiss crystallised are the Rockall Bank gneisses (1750 Ma), suggesting to them that these rocks may underlie the northern Porcupine area.

Tyrrell (2013) described the presence of metasedimentary rocks (psammites) that had been penetrated around 60km to the south of the former borehole, as a result of sea bed sampling by the Geological Survey of Ireland Celtic Explorer sampling programme carried out in 2011. Tyrrell (2013) considered these rocks to represent a significant east-west ridge of apparent sea bed outcropping metasedimentary succession of low-metamorphic grade, quartzo-feldspathic rocks with abundant accessory minerals suggestive of a granitic/gneissic source (titanite, epidote, zircon and tourmaline). Tyrrell (2013) referred this unit to the Porcupine High Metasedimentary Sequence (PHMS). U-Pb geochronology of detrital zircons from the samples yielded ages indicating a Laurentian provenance, similar to the Moine Supergroup or the Grampian Group of the Dalradian Supergroup. The youngest age derived from the detrital zircons is ~874 Ma, suggests that these rocks represent part of the lowermost Dalradian Supergroup, considered by Tyrrell (2013) to be a likely equivalent to the Erris Group of County Mayo (onshore Ireland) and the Grampian Group of Scotland. Tyrrell (2013) considered, on the basis of geophysical data that the Porcupine High Metasedimentary Sequence (PHMS) was more extensive than the Porcupine High Orthogneiss (PHO) proven in the 25/7-sb (MeBo) 3 borehole.

Well 26/26-1, located on the eastern flank of the Porcupine High, penetrated Dalradian fractured metasediments (biotite schists, muscovite schists, schistose gneisses and feldspathic gneisses) that most likely correlate with the metasedimentary rocks described by Tyrrell (2013) from other parts of this high.

Well 26/30-1, located on the north eastern flank of the Porcupine Basin, penetrated 55ft (16.76m) of granite at TD, situated beneath Upper Jurassic (Beara Group) sediments. The operator attempted to take a TD core in this granite, between 5642ft (1719.7m) -5648ft (1721.5m), but without any recovery. Cuttings samples from 5610ft (1710m) and 5620ft (1713m) comprise between 60%-40% mica. Some, though not all of the mica is probably lost circulation material (vermiculite), and probably reflects the fractured nature of the basement at this location. This may also explain the lack of core recovery. Rock fragments are of 0.1mm - 3mm diameter and include orthoclase and plagioclase feldspars, quartz, biotite and ferromagnesian minerals, indicative of an alkali feldspar rich monzogranite or possibly granodiorite (Stevenson, 2017). Other rock fragments include bluish grey siltstone and dark red-brown friable mudstones, which are probably caved from the overlying Carboniferous section. Radiometric Ar-Ar dating was carried out on picked micas from one sample at 5620ft (1713m), however, no reliable age dating result was obtained from the analysis.

Sea bed dredging on the margin of the Goban Spur (cruises of the R/V Jean Charcot and R/V Le Suroit) yielded abundant samples of granitic rocks (dominantly granodiorites), with radiometric ages of 275 Ma and 290 Ma, suggestive of a Permian intrusive episode (Auffret *et al*., 1979). These rocks appear to compare lithologically with those penetrated in the 26/30-1 well, however, in this well the granite occurs beneath Carboniferous sediments, therefore either the Permian radiometric dates from the Goban Spur samples are in error or the two rock units are not the same.

Five sea bed dive sites recovered a range of crystalline basement samples as part of the CYAPORC (1986) project, from locations at the south western part of the Porcupine High and the Pendragon High (Auffret *et al*., 1987; PAD, 2008).

In the Fastnet Basin, metasediments penetrated at TD in the North Celtic Sea Basin 57/9-1 well were dated as possibly of Carboniferous age by the operator, and described as quartzite, orthoquartzite and schists.

PRE-DEVONIAN SEDIMENTARY PENETRATIONS

Probable Cambrian rocks are present in Kish Bank Basin well 33/22-1, comprising metamorphosed sediments (slates) (**Figure D.1.1**). These rocks are undated biostratigraphically but are referred tentatively to the Cambrian aged Bray Group which is developed onshore Ireland.

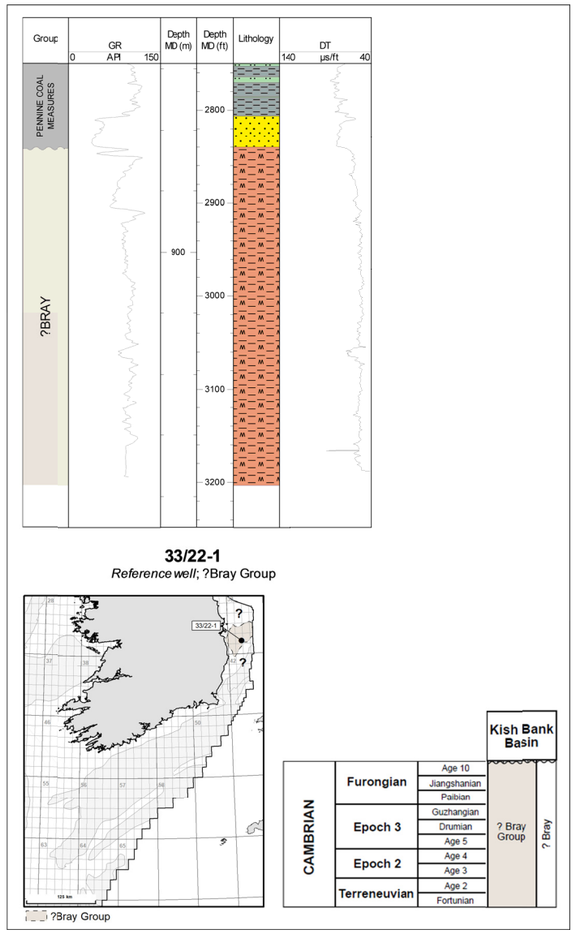


Figure D.1.1 ***Probable Cambrian succession in 33/22-1, Kish Bank Basin.***

"18/25-2 SANDSTONE/CLAYSTONE"

Slyne Basin well 18/25-2 penetrated a succession of interbedded grey, light green, fine to medium grained, locally feldspathic sandstones and grey, locally reddish brown to reddish purple, non-calcareous claystones and siltstones at the base of the well (interval 2397-2965.5m (TD)), which display distinctively high gamma ray log values (see **Figure D.1.2**). This interval is

informally referred to as the "18/25-2 Sandstone/Claystone" in this study. This section was cored in this well (core 1).

The section appears to lie unconformably beneath Permian Zechstein Group. It is possible to broadly correlate to the 19/8-1 well (Blackthorn Group) section on seismic data, however, this requires crossing several faults. It is therefore possible that this section is of Carboniferous age. The 18/25-2 section in question is quite different lithologically from the Blackthorn Group in this area, however, although it is in the correct stratigraphic position, i.e. below the Zechstein Group.

Alternatively, it is possible that the section correlates with the Silurian succession developed on Clare Island, Mayo (see Holland, 2009), which is located around 200km to the south east of the well. This is a fluvial - mudflat succession that spans five formations. The lithological succession is similar to that in the 18/25-2 well. The operator of the well, Enterprise Oil, assigned the lower part of the section to the Silurian (Wenlock), based on very limited biostratigraphical evidence (presence of a single specimen "showing affinity with" *Hispanaediscus verrucatus* at 2934.87m), and the upper part to the "? Lower Carboniferous - Silurian".

The interval is differentiated from the overlying Zechstein Group in having a significantly higher gamma ray log response thought there is no distinction on the sonic logs across the boundary. The base of the unit was not penetrated in the well.

"26/28 BASAL CONGLOMERATE"

Porcupine Basin wells 26/28-1, 26/28-2 and 26/28-3 terminated in sandstones and quartzitic conglomerate of indeterminate age (Error! Reference source not found.). This unit is described as a conglomerate/sandstone, off white to very pale orange, light greenish grey, very fine to very coarse grained, with quartz pebbles of up to 7cm diameter, poorly sorted, angular to subangular, non-calcareous and well indurated. This rock unit occurs unconformably below Carboniferous sediments (though the operator BP considered this unit to be part of the Carboniferous in the 26/28-1 well). It is possible that these metasediments represent "Armorican Quartzite"; a characteristic unit of the Palaeozoic of western Europe, being present in the Lower Ordovician succession of Brittany and Normandy (western France), and also over most of the Hesperian and Iberian massifs of the Iberian Peninsula (Sá *et al*., 2011). The unit is informally referred to in this study as the "26/28 Basal Conglomerate". In the 26/28 (Connemara oil discovery) area, a strong amplitude seismic horizon can be recognised (see **Figure D.1.3**) that can be tied to the "26/28 Basal Conglomerate" in the 26/28-3 well. The unit is cored in the 26/28-1 well, where it is described as clast supported white conglomerate with a coarse sandstone matrix. Clasts comprise quartz, red quartzite, laminated green siltstone, vein quartz and metamorphic quartzite with chlorite.

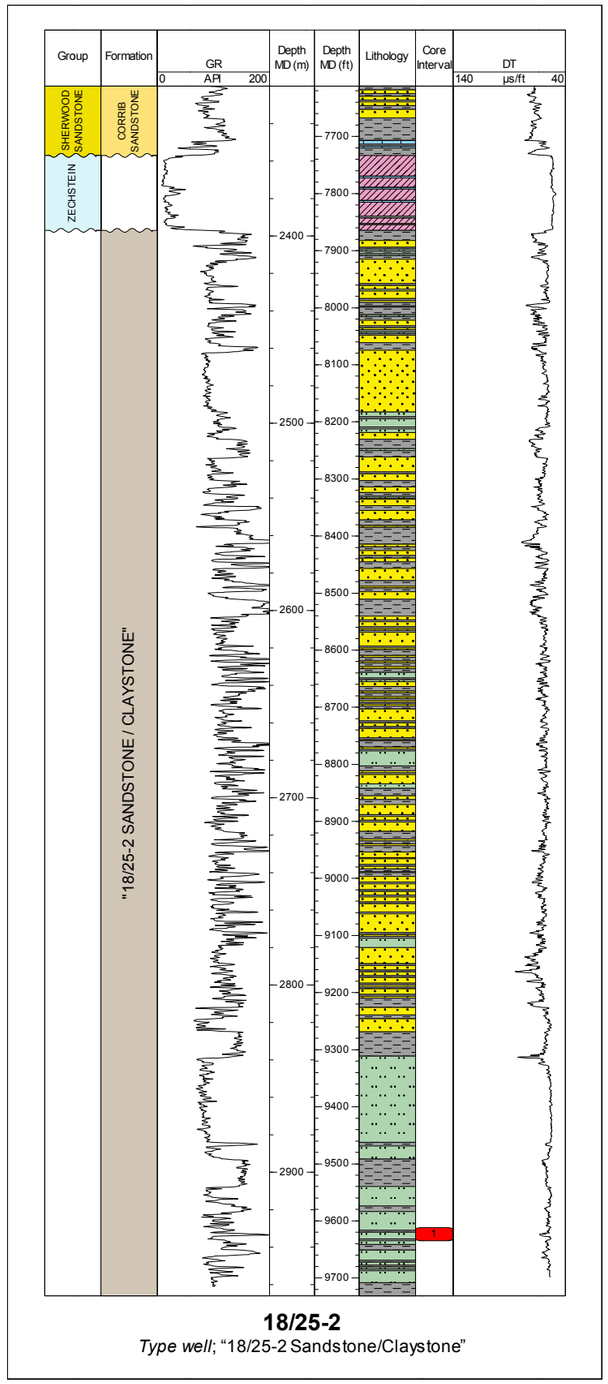


Figure D.1.2. ***18/25-2, showing development of "18/25-2 Sandstone/Claystone" section, of possible Silurian age.***

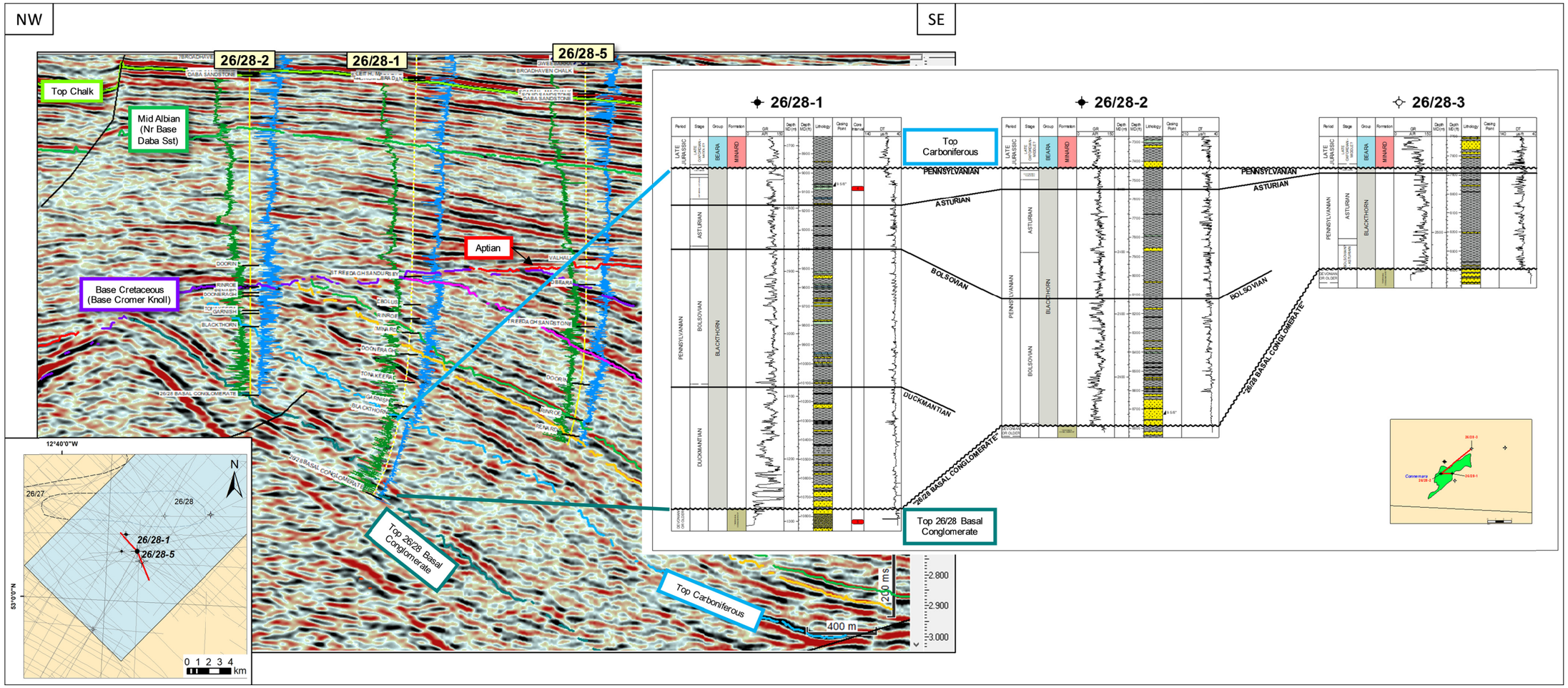


Figure D.1.3. ***Probable Lower Palaeozoic sections penetrated in Connemara discovery area, block 26/28 and seismic tie. Correlation proves onlap above unconformity on top of the 26/28 Basal Conglomerate (?Silurian). Arbitrary line 3D seismic survey 1996-11 Connemara.***

D.2 DEVONIAN

Devonian sediments are known only from a few discrete areas of offshore Ireland, namely the Fastnet Basin (wells 55/30-1, 56/15-1), the Goban Spur area (two DSDP sites) and one possible penetration in North Celtic Sea Basin well 50/10-1.

Seismic interpretations suggest that a Devonian section is present through the Celtic Platform area between the Goban Spur and Fastnet Basin. Another area of potential Devonian presence is the Pembroke Ridge. However, this structure lies largely in UK offshore waters outside the current project area. This area, together with the Goban Spur-Celtic Platform and Fastnet Basin areas represent buried Lower Palaeozoic massifs that can be seen at outcrop in southern Ireland and south west Wales, respectively.

Due to the very patchy and incomplete penetration of Devonian sediments offshore Ireland, and the consequent major uncertainty regarding the presence of Devonian beneath large areas of undrilled acreage, it was not considered feasible to construct a chronostratigraphic summary diagram or a palaeofacies map for this interval.

DEVONIAN LITHOSTRATIGRAPHIC SUBDIVISIONS

No lithostratigraphic nomenclature exists for Devonian sediments in the offshore Ireland region. Due to the small number of well penetrations, all known Devonian sediments are included in one formation, the Darrig Formation, with no member subdivisions. No lithostratigraphic group has been defined for the Devonian.

DARRIG FORMATION (NEW)

The Darrig Formation is defined here to include all Devonian sediments in offshore Ireland.

Definitive, biostratigraphically-dated Devonian sediments of Middle Devonian age, are known from Goban Spur DSDP Leg 80 Site 548A and probable correlative sediments (though not dated biostratigraphically) are known from nearby DSDP Leg 80 Site 549 (Lefort *et al*. 1985). Lefort *et al*. (1985) reported steep dips in the region of DSDP Leg 80 Site 549. The Devonian sediments in Leg 80 Sites 548 and 549 were regarded as "Hercynian Basement" in the initial DSDP reports (Lefort *et al*. 1985).

In addition, submersible dives and dredging on the Pendragon Escarpment, 50 km to the north (Masson *et al*. 1989) recorded low dips in the Upper Palaeozoic sequence and provided one sample of sandstone, possibly of Devonian age, near the base of the escarpment, overlain by Barremian limestones. This stratigraphic succession is very similar to that in DSDP Leg 80 Site 549.

Late Devonian sediments, dated biostratigraphically, occur in Fastnet Basin wells 56/15-1 (Late Famennian) and 55/30-1 (?Frasnian). The stratigraphy in these wells is comparable with the Old Head Sandstone Formation onshore southern Ireland, however, this name has not been applied to the Fastnet Basin wells due to the significant distance of the wells from the Old Head Sandstone Formation outcrops.

The North Celtic Sea Basin 50/10-1 well penetrated light reddish brown to reddish brown, purple brown, moderately well indurated, slightly calcareous to dolomitic, claystones and siltstones, locally exhibiting schistose textures or a crenulation cleavage, beneath the Triassic Sherwood Sandstone, in which the well terminated. Included in the Triassic by the operator, this section is considered here to be most likely of Palaeozoic, probably Devonian or Carboniferous age. It is possible to tie from this section up onto the Pembroke Ridge in south westerly direction on seismic data. Several UK wells penetrated Palaeozoic sediments that can also be tied to the Pembroke Ridge on seismic data. The UK 102/28-1 well penetrated what the operator described as pale pinkish grey to purple shales, siltstones and sandstones, assigning them a Devonian/Carboniferous age. The UK 103/21-1 well penetrated purple or red sandstones, slates and slatey claystones ascribed by the operator to the Devonian.

Name. Darrig is derived from the Irish word "dearg", which means "red", reflecting the predominantly red colour of the sediments in this formation.

Type section. 55/30-1: 2602.5-2800m below KB (**Figure D.2.1)**.

Reference sections. 56/15-1: 2502.5-2558.19m below KB, DSDP Leg 80, Site 548A: 1796.5-1812.5m below sea bed.

Lithology. The lithologies in the 55/30-1 well comprise an alternating succession of grey, green, greyish red to red-brown conglomerates, fine to medium grained, angular to subangular, poor to well sorted sandstones, non to slightly calcareous claystones and siltstones, with light to dark grey, speckled, locally welded textured tuffs.

The 56/15-1 well penetrated a grey, greenish grey, waxy, non-calcareous claystone-dominated succession, interbedded with white to light grey, greyish orange pink, very fine to fine grained, angular to subangular, well sorted sandstones, with locally carbonaceous debris. Middle Devonian sediments from Goban Spur DSDP Site 548A are undeformed, quartzitic, feldspathic sandstones and black indurated claystones. Probable correlative sediments from nearby DSDP Leg 80, Site 549 are light olive brown to dark yellowish brown, dark grey, very fine to medium grained, well sorted, laminated and cross-laminated, quartzose, fractured sandstones. The fractures are lined with micaceous or talc like minerals.

Wireline log character. The section in 55/30-1 displays a serrated gamma ray signature reflecting the alternating siltstone, sandstone and tuffaceous succession in the well. Gamma ray values are consistently higher and sonic velocities are generally higher than those of the overlying Mississippian carbonate-dominated section (Bairneach Group).

Upper Boundary. The upper boundary of the formation is marked by an unconformity, and is seen in only two wells, 55/30-1 and 56/15-1. In the former well the formation is overlain by the Carboniferous Bairneach Group limestones and in the latter well by the Triassic Dolmen Sandstone Formation (Sherwood Sandstone Group) sandstones. In both cases, the gamma ray values in the Darrig Formation are significantly higher than in the overlying units.

Lower Boundary. The lower boundary of the formation has not been penetrated.

Subdivision. The formation is not subdivided. Given the heterogeneity of the sediments that are grouped here in the Darrig Formation, there is the potential to recognise further subdivisions of the unit in future studies.

Thickness. Complete Devonian successions have not been proven in any well or borehole penetration in offshore Ireland to date. The 55/30-1 well proved 198m of Devonian section, though the base of the formation was not penetrated. The 50/10-1 well penetrated approximately 200m of Devonian section, where the base of the formation was also not seen.

Biostratigraphic characterization. The formation yields typical Devonian miospores and acritarchs. Well 56/15-1 yielded miospore assemblages characterised by the presence of *Retispora lepidophyta*, *Verrucosisporites nitidus* and *Hymenozonotriletes explanatus*.

Age. Late – Middle Devonian ages are proven biostratigraphically, although as the lower limit of the formation has not been seen, it is possible that the unit ranges older than Middle Devonian. An undivided Devonian age was interpreted, on the basis of palynology, in the 55/30-1 well. Late Devonian sediments, dated biostratigraphically, occur in Fastnet Basin wells 56/15-1 (Late Famennian) and 55/30-1 (?Frasnian).

Depositional environment. For the sediments grouped in this formation, depositional environments range from non-marine, fluvial (grey green claystones and red brown clastics; as in 55/30-1) to marine (black claystones containing acritarchs in the Goban Spur area).

Distribution. Proven to be present in Goban Spur, Fastnet Basin and Pembroke Ridge areas, but likely to be more widespread in currently undrilled areas. Seismic interpretation suggests that the formation is present through the core of the Celtic Platform (see **Figure D.2.2**), and it is therefore possible that the formation continues to be present in the northern part of this platform area, to the north west of the Fastnet Basin. However, at some point on this platform area a junction is likely to exist with Devonian rocks that most probably extend offshore from the onshore outcrops of south west Ireland (County Cork) of the Munster Basin, for example the Devonian slates at Mizen Head, which are in a different facies to the Devonian sediments that occur in the Fastnet Basin and Goban Spur.

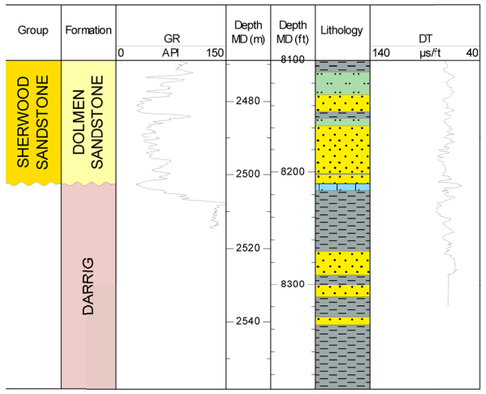
Seismic expression. This formation is not well imaged on the available seismic data. A Top Devonian horizon has been interpreted in the Fastnet Basin and in the Goban Spur area (see **Figure D.2.2),** which correlates with the top of the formation (see above and below for further discussion). The tie to the DSDP Leg 80 Site 549A is not straightforward as the hole is located 1.5km to the north of the seismic line and no direct seismic tie to the borehole is available. However, the strong seismic event as picked is considered likely to correspond to the top of the Devonian.

Regional correlation. The Devonian sediments in the 56/15-1 well compares with the Old Head Sandstone Formation at outcrop in southern Ireland, however, this name has not been applied due to the significant distance of the well from the Old Head Sandstone occurrences onshore.

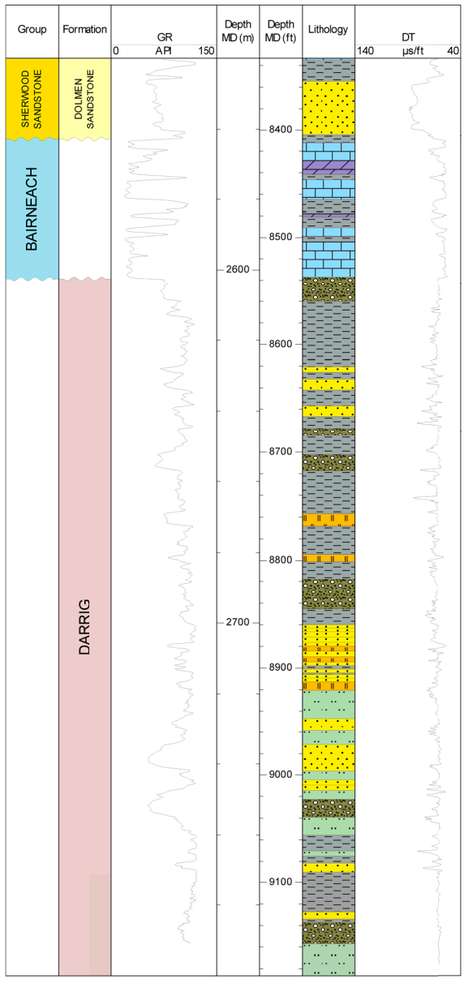
Based on regional seismic interpretations it seems highly likely that the Devonian sediments penetrated in the DSDP holes Leg 80, 548A and 549 in the Goban Spur area are genetically related, and possibly contiguous with the Devonian sections penetrated in Fastnet Basin wells in quadrants 55 and 56 (see **Figure D.2.2**). A succession of Devonian rocks most likely underpins the Celtic Platform area that separates the Fastnet Basin from the Goban Spur area, however, it is not possible to confidently pick a top Devonian horizon through this platform area. This platform area most likely represents an extension into the offshore area of the Palaeozoic rocks that outcrop in southern onshore Ireland and therefore Devonian rocks would be expected to be present in the area between the Fastnet Basin and the Goban Spur.

The offshore Ireland sections are comparable with Old Red Sandstone developments seen in onshore southern Britain, for example in South Wales. The section present in well 56/15-1 may be equivalent to the transition from the Skrinkle Sandstone Group to the Avon Group (formerly Lower Limestone Shales) of Pembrokeshire, South Wales.

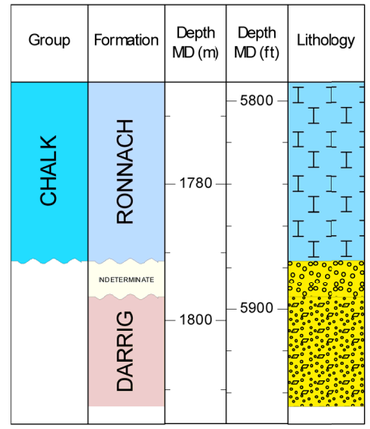
Comparison with Eastern Canada. A number of offshore wells in the Grand Banks penetrated Devonian sediments (Gannet O-54, Phalarope P-62 and Roberval K-92) (Williams *et al.,* 1990).



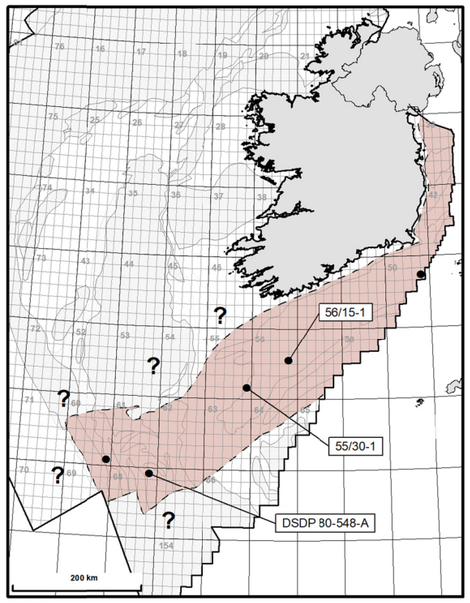
56/15-1
Reference well; Darrig Formation



55/30-1
Type well; Darrig Formation



DSDP 80-548-A
Reference well; Darrig Formation



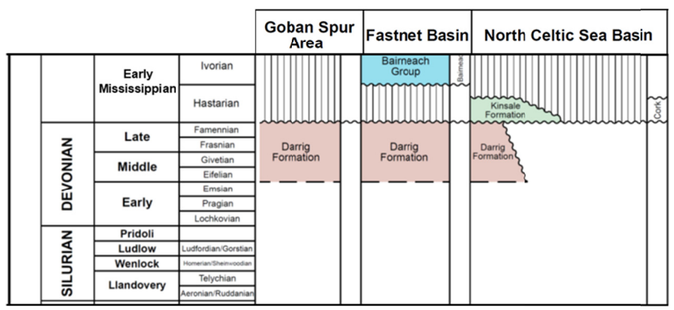


Figure D.2.1. ***Devonian, Darrig Formation; montage of type and reference wells with location and distribution map***.

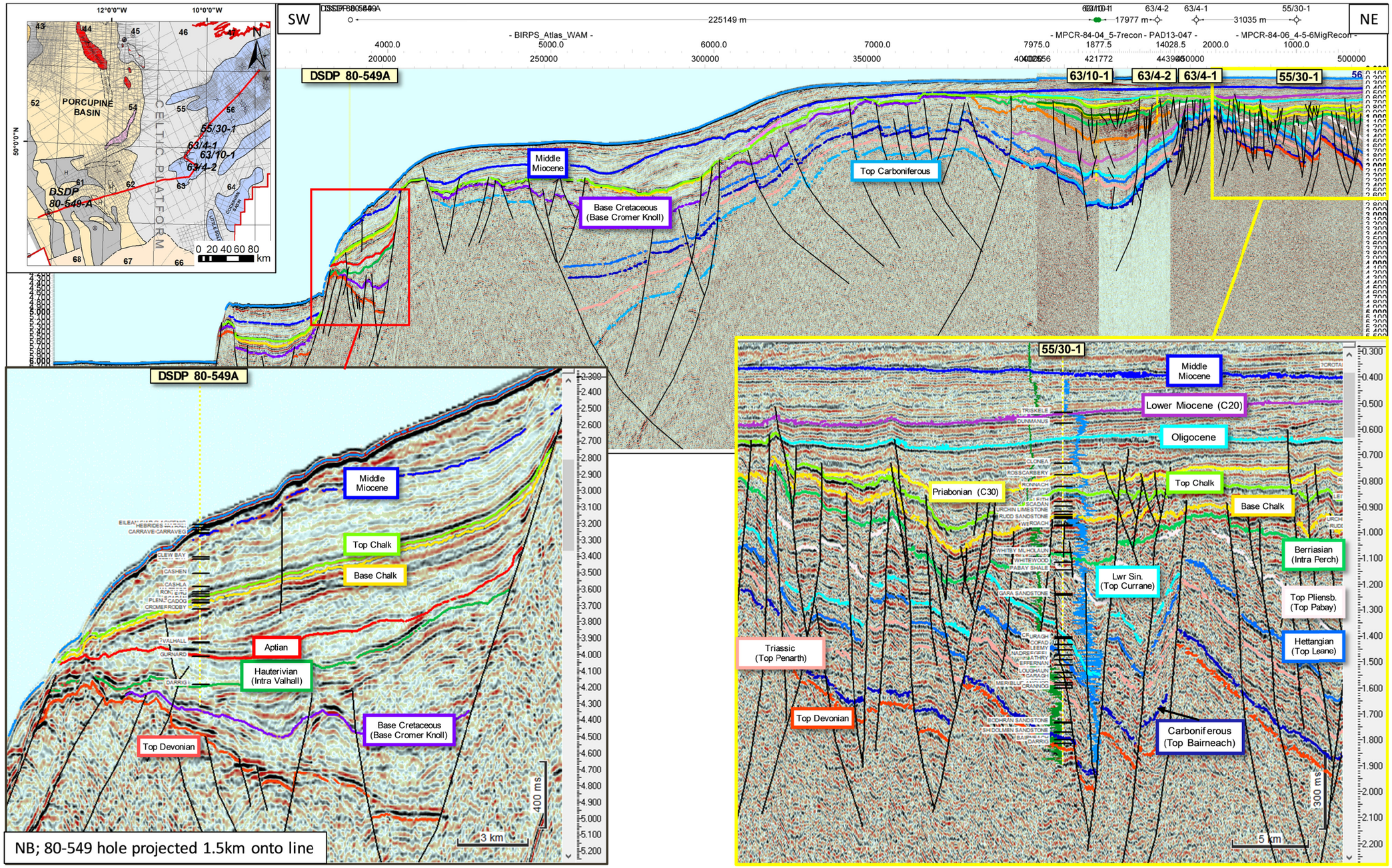


Figure D.2.2. ***Seismic line tying DSDP Leg 80 Site 548A to Fastnet Basin wells 56/15-1, 55/30-1. Although the Top Devonian horizon cannot be recognised in the centre of the line (across Celtic Platform) it is considered likely that Devonian rocks are present through this region****.Seismic lines from left to right BIRPS Atlas_WAM, MPCR-84-04_5-7recon, PAD13-047, MPCR-84-06_4-5-6 MigRecon.*