The Standard Stratigraphic Nomenclature of Offshore Ireland:

An Integrated Lithostratigraphic, Biostratigraphic and Sequence Stratigraphic Framework

Summary Report

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Introduction & Scope

This report presents a summary of the results of project IS16/04 funded by the Irish Shelf Petroleum Studies Group (ISPSG) of the Petroleum Infrastructure Programme (PIP). The project results are reported in detail in the project Atlas which accompanies this summary report.

The project has been carried out by a consortium of companies, led by Merlin Energy Resources Ltd, also incorporating Palaeodate Ltd, Network Stratigraphic Consulting Ltd, Riley Geoscience Ltd, and Integrated Geochemical Interpretation Ltd. The study area includes the Rockall, Slyne, Erris, Donegal, Macdara/Brona, Porcupine, Clare, Goban Spur, Fastnet, North Celtic Sea, South Celtic Sea, Kish Bank and Central Irish Sea basins of the offshore Ireland region.

The project presents new lithostratigraphic, chronostratigraphic, biostratigraphic and sequence stratigraphic frameworks for the Ireland offshore region. These are based on an extensive legacy data set, and published research, supplemented by a significant amount of new data generation and interpretation. The new lithostratigraphic scheme has been developed in association with a newly established Stratigraphic Committee. The atlas and the new lithostratigraphic scheme will be published as a Petroleum Affairs Division Special Publication.

The new lithostratigraphic nomenclature combines the adoption of existing names where appropriate, including some currently in use in the UK offshore and onshore areas, together with newly created names where existing names are not considered to be suitable. Maps have been produced showing the interpreted distributions of all defined lithostratigraphic units, based on a considered interpretation of the likely extent of each unit, utilising all well and borehole penetrations, integrated with seismic interpretation.

The reservoir intervals for all producing gas fields and discoveries in offshore Ireland have been placed into the new lithostratigraphic nomenclature (see **Atlas Introduction, Section A**). All test intervals have been incorporated into the project and are plotted against the new stratigraphy on the supplied project well and borehole summary logs provided as a digital Appendix (**Atlas Appendix C**).

New biozonation schemes are defined for the Jurassic, Cretaceous and Cenozoic of the offshore area, based on a thorough review of all legacy data integrated with a significant body of new data generated in this study from new sample analysis (involving over 3000 new sample analyses from 106 wells). For the Carboniferous and Triassic, existing published palynology biozonation schemes have been applied. See **Atlas Appendix B** for details of the biozonation schemes.

The new Ireland stratigraphy has been compared to adjacent regions of offshore East Canada, the UK Continental Shelf and the North Sea. This is illustrated in a series of stratigraphic charts included in the Atlas (see **Atlas Section C**).

Digital outputs derived from the project include *Stratabugs* and *IC* databases containing all stratigraphic data, including tops, raw and interpreted biostratigraphic data (all legacy data combined with newly generated data), biozones, biostratigraphic comments (key biostratigraphic markers), chronostratigraphy, groups, formations, members, wireline logs, test data, geochemistry data (TOC, HI values) and stratigraphic sequences. The original data sets, well displays and correlations that have been used in the Atlas are provided in the *IC* database. A set of well and borehole stratigraphic summary logs is provided in pdf form, as a digital appendix to this atlas, which have been generated from the original files in the *IC* database.

An *ArcGIS* database has been developed that contains all maps generated in the project. A full listing of all biostratigraphic reports available from the area is provided as an *Excel* spreadsheet.

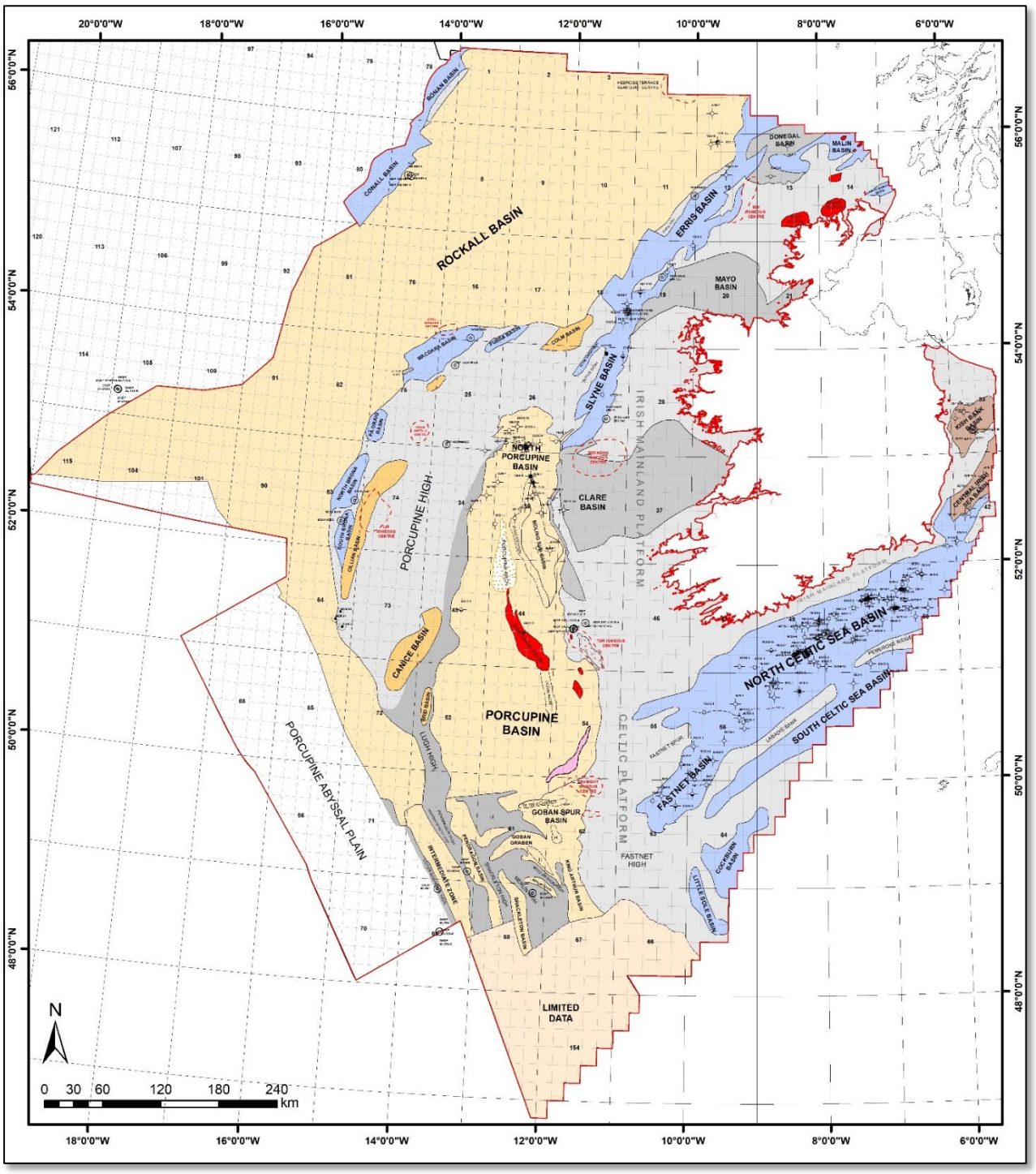

Figure 1. ***Map showing study area and location of all wells and boreholes in the project.***

Name	*Rig release date*	*Discovery well*	*Status*	*Basin*	*Reservoir (new lithostratigraphic nomenclature)*	*Reservoir Age*	*Fluid*
Kinsale Head	1971	48/25-2	Field	North Celtic Sea	Gault Fm (Agone Sandstone Mbr, Bream Sandstone Member)	Early Cretaceous	Gas
Hook Head	1971	50/11-1	Discovery	North Celtic Sea	Wealden Gp (Eel Fm)	Early Cretaceous	Oil & gas
Seven Heads	1974	48/24-1	Field	North Celtic Sea	Wealden Gp	Early Cretaceous	Gas
Seven Heads Oil	1974	48/24-1	Field	North Celtic Sea	Wealden Gp	Early Cretaceous	Oil & gas
Ardmore	1975	49/14-1	Discovery	North Celtic Sea	Wealden Gp	Early Cretaceous	Gas
Nemo	1974	49/14-1	Discovery	North Celtic Sea	Wealden Gp	Early Cretaceous	Oil
Ram Head	1974	49/13-1	Discovery	North Celtic Sea	Purbeck Gp (Pike Fm)	Early Cretaceous	Gas
Burren	1978	35/8-1	Discovery	Porcupine	Bradán Fm (Boladh Sandstone Mbr)	Early Cretaceous (Aptian)	Oil
Connemara	1979	26/28-1	Discovery	Porcupine	Dursey Fm (Streedagh Sandstone Mbr) & Minard Fm (Renard, Dooneragh & Tonakeera Mbrs)	Late Jurassic (Tithonian & Oxfordian)	Oil & gas
63/10-1 Discovery	1981	63/10-1	Discovery	Fastnet	Glenbeg Fm (Gara Sandstone Mbr)	Early Jurassic (Late Sinemurian)	Oil & gas
Spanish Point	1981	35/8-2	Discovery	Porcupine	Dursey Fm (Leck Sandstone Mbr)	Late Jurassic (Tithonian)	Gas & condensate
Helvick	1983	49/9-2	Discovery	North Celtic Sea	Galley Fm, Dunbrattin Fm (Dunworly Sandstone Mbr), Peregrine Fm	Late Jurassic (Kimmeridgian, Oxfordian), Middle Jurassic (Bathonian)	Oil & gas
57/9-1 Discovery	1984	57/9-1	Discovery	North Celtic Sea	Eel Formation	Early Cretaceous	Oil & gas
Galley Head	1985	48/18-1	Discovery	North Celtic Sea	Gault Fm (Agone Sandstone Mbr, Char Sandstone Mbr), Wealden Gp	Early Cretaceous (Albian)	Oil & gas
Dunmore	1986	50/6-1	Discovery	North Celtic Sea	Dunbrattin Fm (Dunworly Sandstone Mbr)	Late Jurassic (Oxfordian)	Oil & gas
Schull	1987	57/2-2	Discovery	North Celtic Sea	Gault Fm (Bream Sandstone Mbr)	Early Cretaceous (Albian)	Gas
Ballycotton	1989	48/20-2	Discovery	North Celtic Sea	Gault Fm (Agone Sandstone Mbr)	Early Cretaceous (Albian)	Gas
Barryroe	1990	48/24-3	Field	North Celtic Sea	Wealden Gp	Early Cretaceous	Oil & gas
Carrigaline	1990	48/24-4	Discovery	North Celtic Sea	Gault Fm (Bream Sandstone Mbr) & Wealden Gp	Early Cretaceous	Gas
Baltimore	1992	48/19-2	Discovery	North Celtic Sea	Gault Fm (Agone Sandstone Mbr, Bream Sandstone Mbr) & Wealden Gp	Early Cretaceous	Oil
Southwest Kinsale	1995	48/25-3	Discovery	North Celtic Sea	Gault Fm (Bream Sandstone Mbr)	Early Cretaceous (Albian)	Gas
Corrib	1996	18/20-1	Field	Slyne	Corrib Sandstone Fm	Early Triassic	Gas
Dooish	2002	12/2-1, -1Z	Discovery	Rockall	Cot Sandstone Fm, Foxglove Fm	?Early Triassic, Pennsylvanian	Gas condensate
Old Head of Kinsale	2006	49/23-1	Discovery	North Celtic Sea	Gault Fm (Bream Sandstone Mbr) & Wealden Gp	Early Cretaceous	Gas
Bandon	2009	27/4-1	Discovery	Slyne	Inagh Fm (Neaskin Mbr)	Early Jurassic (Late Sinemurian)	Oil & gas
Midleton	2015	49/11-3	Discovery	North Celtic Sea	Gault Fm (Agone Sandstone Mbr)	Early Cretaceous (Albian)	Gas

Table 1. ***Ireland fields, discoveries and wells with significant shows, listed by rig release date. New reservoir lithostratigraphic nomenclature shown.***

Database

The well and borehole database for offshore Ireland, at the time of the study, comprised 264 released wells and boreholes; this includes 219 oil and gas wells, 31 DSDP/ODP/IODP boreholes and 14 shallow/mining boreholes (see locations in **Figure 1)**. In addition, a small number of UK wells that are close to the median line with Ireland, have been tied to the evaluations. New stratigraphic interpretations, including tops and stratigraphic summary logs for around 200 wells and boreholes are provided in the study.

The well interpretations have been tied to an extensive seismic database across the region. From the seismic interpretations, a set of around 60 significant seismic horizons were interpreted in the offshore areas of Ireland in this project. These have been named in a consistent manner and will provide a good basis for future work in the area. A set of 10 key regional seismic lines illustrates the regional stratigraphy and horizon development. In addition, ties between the seismic and the wells and boreholes are provided in numerous figures within the atlas. A small number of synthetic seismograms have been produced to illustrate particular well-seismic ties.

Source Rocks

A regional evaluation of the source rock potential for offshore Ireland has identified 21 formations with hydrocarbon generation potential based on the newly developed stratigraphy of this project. Identified source rock formations are mainly of Early Cretaceous to Early Jurassic age, although the Paleogene Gweedore Formation and Carboniferous Blackthorn Group also show significant source potential. None of the Upper Cretaceous or Triassic formations showed hydrocarbon generative potential.

Igneous Rocks & Radiometric Dating

Volcanic rocks occur throughout the offshore Ireland area, at many stratigraphic levels and are of both intrusive (plutonic rocks, sills and dykes) and extrusive (lava flows, including pillow lavas and tuffs) origin. Several extrusive igneous rock units are named and described in the new lithostratigraphic scheme. Several of these lavas have been tied to seismic and available biostratigraphy, resulting in a new understanding of their age and extent. The Péist Member is newly identified in the Eocene of the Porcupine Basin, and the Changeling Member is defined within the uppermost part of the Chalk Group. The well known Cenozoic lavas of the Slyne Basin are named as the Druid Formation. The basalt lava within the 62/7-1 well is considered to be most likely of Late Jurassic age, and is named the Púca Member (Galley Formation). The lava that occurs within the Cot Sandstone Formation reservoir in the Dooish Discovery well in the Rockall Basin is named as the Merrow Member.

To assist the evaluation of the age of these igneous rock units, 10 new radiometric dating (Ar-Ar) analyses were carried out in cases where no previous dating had been performed, or to obtain a check on a previous radiometric dating analysis (whether K-Ar or Ar-Ar). The radiometric dating work and its integration into the project results, is described in **Atlas Appendix D**. Most of the results of the new analysis were inconclusive due to the high degree of alteration of the samples analysed.

Stratigraphic Summary by Interval

Detailed descriptions of lithostratigraphy, chronostratigraphy and sequence stratigraphy, including source rock intervals, are provided in the **Atlas Sections D1-D10**, covering the Precambrian to Cenozoic intervals. This section includes definitions for all the recognised stratigraphic units for offshore Ireland. Summaries of the key conclusions pertaining to each stratigraphic interval are provided below.

Lower Palaeozoic

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 (Pre Cambrian) granitic orthogneiss. These rock units are not formally named in this project due to insufficient data.

Devonian

Devonian sediments are known only from a few discrete areas of offshore Ireland, namely the Fastnet Basin, the Goban Spur area (two DSDP sites) and one possible penetration in the North Celtic Sea Basin. The Darrig Formation is defined here to include all Devonian sediments in offshore Ireland.

Carboniferous

Carboniferous sediments are the most frequently occurring Palaeozoic rocks in offshore Ireland and are known from 38 wells and boreholes. The Carboniferous of offshore Ireland is represented by a succession of Mississippian to Pennsylvanian sediments ranging from marine (Mississippian) to non-marine (Pennsylvanian) in origin. Three new groups are defined for the Mississippian interval and two new groups for the Pennsylvanian, however, existing groups and formations, as used in the East Irish Sea Basin can be applied in the Kish Bank, Central Irish Sea and Celtic Sea basins. Three major seismic horizons are identified in the Carboniferous interval.

The overall Carboniferous succession proven in offshore Ireland is incomplete, in particular a large part of the Namurian stage is absent from the wells that have been drilled to date in the region. Also notable is the presence of late Stephanian and early Autunian sediments in offshore Ireland, an interval that is absent from most of the Carboniferous successions of the nearby surface (Ireland, onshore UK) and offshore (UK offshore, for instance East Irish Sea Basin) areas.

The Carboniferous (Pennsylvanian) newly defined Blackthorn Group displays source rock potential in the Porcupine and Slyne basins. Samples show a Type II/III kerogen composition and mixed oil and gas potential in the Porcupine Basin, but samples are mainly gas prone in the Slyne Basin.

Permian

Permian rocks are proven to be present in two regions of offshore Ireland, in the Slyne and Erris basins in the western offshore region and in the Central Irish Sea and Kish Bank basins in the eastern offshore area. Permian rocks that are present offshore Ireland are all referred to existing lithostratigraphic units that are known from UK offshore areas, namely the Cumbrian Coast, Appleby and Zechstein groups.

Triassic

Triassic sediments are well developed and widespread in offshore Ireland and UK onshore nomenclature has been applied at group level. The majority of the Triassic of offshore Ireland is represented by non-marine (fluvio-lacustrine) sediments (Sherwood Sandstone and Mercia Mudstone groups) capped by a marine interval in the uppermost part (Penarth Group). New lithostratigraphic names are applied for the formations and members within the Sherwood Sandstone and Mercia Mudstone groups. The reservoir sandstone in the Corrib Field is named the Corrib Sandstone Formation. One volcanic unit is recognised (Merrow Member) in the Rockall Basin. Lithostratigraphic nomenclature previously defined for the East Irish Sea Basin, offshore UK, has been applied in the Kish Bank and Central Irish Sea basins.

Three broad depositional sequences can be recognised in the Triassic succession, Tri10, Tri20 and Tri30, equating

essentially to the three lithostratigraphic groups.

Lower Jurassic

Lower Jurassic sediments are well developed and widely distributed in offshore Ireland, particularly in the Slyne, Fastnet and North Celtic Sea basins. Chronostratigraphically, it is not usually possible to separate the Lower and Middle Jurassic on biostratigraphic data from wells and boreholes. Lower and Middle Jurassic deposition appears to have been contiguous from UK onshore (Britain and Northern Ireland) to UK offshore areas to offshore Ireland.

The Lower Jurassic Lias Group in offshore Ireland is developed in mixed claystone, carbonates and clastics. Sandstones are developed at several levels. The newly named Neaskin Member, of estuarine origin, contains sandstones which comprise the reservoir in the 27/4-1 (Bandon) Discovery, in the Slyne Basin. Further significant sandstone developments include the Sinemurian aged Gara and Loughbaun Sandstone members (of the Glenbeg Formation) in the Fastnet and Celtic Sea basins.

The Lias Group contains several organic-rich formations that show good to excellent source rock potential. These are, in descending stratigraphic order, the Tacumshin, Whitby Mudstone, Dun Caan Shale, Pabay Shale, Glenbeg, Currane and Leane formations. These formations occur in the North and South Celtic Sea basins, the Fastnet and Goban Spur basins, as well as in the Slyne Basin. In particular, the Whitby Mudstone Formation and the Pabay Shale Formation in the Slyne Basin area show very good to excellent oil-prone source rock potential.

Middle Jurassic

Middle Jurassic sediments are widespread in offshore Ireland and occur in the same areas as Lower Jurassic sediments, typically in stratigraphic continuity, with no major unconformity between the two. The Middle Jurassic is dominated by fully marine Aalenian to Bathonian, mixed clastic-carbonate successions. While some individual units of the Ireland Middle Jurassic successions do compare to those from the UK onshore and offshore area, in overall terms there are sufficient differences to warrant a complete new lithostratigraphic nomenclature for the Middle Jurassic sediments of Ireland. Two new groups, the Kite Group (west of Ireland basins) and Eagle Group (south and east of Ireland basins) are defined, above the Lias Group.

On the basis of the results of this study, no Bathonian section has yet been identified in any well or borehole drilled west of Ireland. This is due largely to the existence of an unconformity between the base of the Oxfordian Minard Formation and the top of the Bajocian Kestrel Formation (Kite Group) in offshore Ireland (Slyne Basin). This contrasts with some previous workers who identified Bathonian section in west of Ireland basins, for example in the Connemara Field (block 26/28). Here, the non marine red beds succession that was formerly considered to be of Bathonian age is now regarded in the current study as being of Oxfordian age. This, therefore, is the age of the lower part of the reservoir section in the Connemara Field.

Seventeen (17) stratigraphic sequences are recognizable through the Lower and Middle Jurassic of offshore Ireland. J sequences that have been previously recognised in the North Sea Basin and onshore Britain can be recognised in offshore Ireland.

Upper Jurassic

The Upper Jurassic of offshore Ireland is represented by a succession of Oxfordian to Tithonian sediments ranging from non-marine (fluvio-lacustrine) to marine in origin. In addition, two extrusive igneous members, the Selkie Member (Dursey Formation) and the Púca Member (Galley Formation) are defined and assigned tentative Late Jurassic (Kimmeridgian/Tithonian) ages. Well-developed Upper Jurassic successions are proven in both the western (Porcupine, Slyne-Erris, Rockall basins) and eastern (Fastnet-Celtic Sea basins) regions of offshore Ireland. Seismic interpretations indicate that during the Late Jurassic, the basins south and east of Ireland (Fastnet, North Celtic Sea)

were separate depositional areas from those basins to the west (Porcupine, Slyne, Erris, Rockall), hence different lithostratigraphic nomenclature schemes have been erected for the two regions. A completely new set of lithostratigraphic terms are defined here for the Upper Jurassic of offshore Ireland. No appropriate prevailing terminology exists, and it has not been possible to extend any of the rock units into Ireland from the contiguous areas of offshore UK.

The base of the Upper Jurassic is unconformable in all well sections seen offshore Ireland. In the west of Ireland basins, the Oxfordian Minard Formation either overlies highly truncated Lower Jurassic section, as in the northern Porcupine Basin area or older rocks, such as Carboniferous in the Connemara, block 26/28 area. In the Fastnet Basin, the Upper Jurassic interval is either absent or overlies the Lower Jurassic Lias Group with significant unconformity. In the North Celtic Sea Basin, Late to Middle Oxfordian aged section (Dunbrattin Formation) unconformably overlies, in the most complete sections, Middle Jurassic sediments (Bathonian age, Peregrine Formation).

There is no strong evidence for the presence of Callovian sediments in any offshore Ireland wells or boreholes studied. This section appears to be omitted at the base Upper Jurassic unconformity. One well, 12/2-2, a single section ("12/2-2 Lower Sandstone") is age dated within the range of Bathonian-Callovian, however.

Five depositional sequences can be recognised in the Upper Jurassic in both west and east of Ireland basins; these are newly defined sequences within the succession and integrate key seismic sequence boundaries with well based sequences. It is not possible to fully apply the North Sea J sequences to the Upper Jurassic over most of the area, however, some strong parallels are apparent between the Oxfordian – Tithonian successions of the Rockall Basin and the Heather and Kimmeridge Clay formations in the North Sea. It has been possible to recognise some of the North Sea J sequences in the Slyne and Rockall basins.

A completely new set of lithostratigraphic terms are defined here for the Upper Jurassic of offshore Ireland, including the new Beara, Muckross and Hook groups. No appropriate prevailing terminology exists, and it has not been possible to extend any of the rock units into Ireland from the contiguous areas of offshore UK. Seismic interpretations indicate that during the Late Jurassic, the basins south and east of Ireland (Fastnet, North Celtic Sea) were separate depositional areas from those basins to the west (Porcupine, Slyne, Erris, Rockall), hence different lithostratigraphic nomenclature schemes have been erected for the two regions.

Two extrusive igneous members, the Selkie Member (Dursey Formation, in the 16/28-sb01 borehole) and the Púca Member (Galley Formation, in well 62/7-1) are assigned tentative Late Jurassic ages, based on a combination of radiometric dating and stratigraphic position.

Upper Jurassic reservoirs include those in the Connemara Field (block 26/28) which are allocated to the Oxfordian aged Minard Formation and Tithonian aged Dursey Formation (Streedagh Sandstone Member). The Spanish Point Discovery (well 35/8-2) reservoir is named the Leck Sandstone Member (of the Dursey Formation). The Helvick Discovery (49/9-2), in the North Celtic Sea Basin and the Dragon Discovery (UK 103/1-1) are reservoired in the Dunworly Sandstone Member (Dunbrattin Formation), which is of Oxfordian age and correlates with the Minard Formation in the Porcupine and Slyne basins. The Helvick Discovery also contains hydrocarbons in the Galley Formation (Kimmeridgian).

Two significant seismic horizons are identified around the Jurassic/Cretaceous boundary. In the Porcupine Basin, this is the Base Cretaceous (Base Cromer Knoll) horizon. In the North Celtic Sea and Fastnet basins this is the Berriasian (Intra Perch) horizon. Both are similar in that they mark significant seismically defined unconformities. Their ages appear to be slightly different, the former appearing to fall at the Berriasian/Tithonian boundary and the Berriasian (Intra Perch) horizon occurring within the Berriasian. Both these horizons are older than the Base Cretaceous horizon

in the North Sea.

Lower Cretaceous

In offshore Ireland, apparently complete marine Lower Cretaceous successions are developed in the Goban Spur, Porcupine, Slyne, Erris and Rockall basins, ranging in age from Berriasiain to Albian. In this area, the successions are comparable to the UK offshore area and hence they are referred to the Cromer Knoll Group which includes the Valhall, Carrack and Rodby formations. Biostratigraphic associations are also very similar to the North Sea, as is sequence development.

In the northern part of the Porcupine Basin, a shallow marine facies is developed over the Aptian to Albian interval, which is referred to the newly defined Bradán Formation. A correlative interval in the Slyne Basin is referred to the Spurdog Formation. Shallow marine sands are well developed in the Bradán Formation and include the Daba Sandstone Member (Middle-Late Albian). Deep marine sandstones are present in the lower part of the formation and are named as the Boladh Sandstone Member; this sandstone is hydrocarbon bearing in the Burren Discovery (35/8-1 well) in the Porcupine Basin.

Carbonates are well developed in the Barremian-Hauterivian interval in west of Ireland basins, particularly in southern parts of the region. Limestone developments at this level have been given different names depending on area, including Leathóg, Doingean (typified by the 44/23-1 well) and Troscín limestone members. These limestones correlate with the Tuxen Formation in the North Sea and are similar in nature to the Tuxen, in being developed on intra basinal highs. In the Goban Spur and Pendragon basins, carbonate deposition dominates the Lower Cretaceous and comprises the newly defined Gurnard, Ballach and Salán formations.

In the Fastnet and Celtic Sea basins, by contrast, the lower part of the Lower Cretaceous (Berriasian – Barremian) is developed in predominantly non-marine to marginal marine facies (Purbeck Group, overlain by the Wealden Group). This applies to the bulk of the North Celtic Sea Basin, north east of the Seven Heads Field area (east north east Quadrant 48). To the south west of the latter area, however, there are strong marine influences through the Barremian to Aptian interval, and the interfingering of marine and non-marine sedimentation here allows the recognition of a distinct new marine formation within the Wealden Group, namely the Eel Formation. The interfingering of non marine and marine facies also allows the recognition of distinct depositional sequences, which can be correlated with those recognised in western offshore Ireland basins.

Several major unconformities are developed within the Lower Cretaceous west of Ireland, which can be tied to the well data and seismic. This has allowed the recognition of a succession of stratigraphic sequences which can be matched with the North Sea K sequences. The most significant unconformity is of Late Aptian age and is strongly developed in the Porcupine Basin; this equates to the Aptian (near base Bradán) seismic horizon and to the base of the K45 sequence. This same event is present in the Fastnet and Celtic Sea areas, where it relates to an unconformity within the Wealden Group. A further major unconformity is that at the base of the Gault Formation (Selborne Group) in the Fastnet Basin and Celtic Sea area, of intra Albian age.

Extrusive igneous rocks are known within the Lower Cretaceous in two areas. Late Albian submarine lavas are known from the Goban Spur area and are referred to the Oakshee Member (of the Rodby Formation). Water lain tuffs deposited within the Albian of the 35/8-1 well (Porcupine Basin) are referred to the Sheerie Member (of the Bradán Formation).

The most prolific reservoirs in offshore Ireland are within the Lower Cretaceous interval. Reservoir sandstones are present in the Lower Cretaceous principally in the North Celtic Sea Basin, where sandstones within the Wealden Group and/or Gault Formation (Bream and Agone sandstone members) have produced hydrocarbons in the Kinsale

Head (48/25 block), Seven Heads (48/24 block) and Barryroe (48/24 block) fields and are hydrocarbon bearing in the Hook Head (50/11 block), Ardmore/Nemo (49/14), 57/9-1, Dunmore (50/6 block), Schull (57/2), Carrigaline (48/24-4), Baltimore (48/19-2), South West Kinsale (48/25-3), Old Head of Kinsale (49/23-1) and Midleton (49/11-3) discoveries. In addition, the Purbeck Group (Pike Formation) comprises the reservoir in the Ram Head (49/13-1) discovery. West of Ireland, hydrocarbons are proven in the Lower Cretaceous of the Burren Discovery (35/8-1; Boladh Sandstone Member, Bradán Formation, Aptian age), in the Porcupine Basin.

Upper Cretaceous

Upper Cretaceous successions are widespread in offshore Ireland where they are developed primarily in chalk and limestone facies referred to the Chalk Group, which appears contiguous with western offshore UK areas. In the Rockall Basin area, the age equivalent claystone dominated, Shetland Group is developed, similar to northern parts of the UK offshore area (for example the UK Rockall area). The formations in the Chalk Group are named as new by use of Irish names that are equivalent in meaning to corresponding formations in the UK North Sea, and include the Cadóg, Scadán, Leith, Ronnach, Trosc and Mangach formations, the latter being of early Paleocene (Danian) age.

Sandstones are developed in the lower part of the Chalk Group, Cadóg Formation (Cenomanian age), and include the Squid Sandstone Member west of Ireland and the Pomfret Sandstone Member and sandstones within the Blenny Member in the North Celtic Sea Basin.

Major unconformities are developed at the base and top of the Chalk/Shetland group in many areas of offshore Ireland. In addition, in some areas, a significant seismic and well based sequence boundary is evident within the succession, approximating to the top Santonian level, and falling at the top of the Leith Formation.

A submarine lava, termed the Changeling Member, is present within the uppermost formation of the Chalk Group, the Mangach Formation, in the northern part of the Porcupine Basin.

Cenozoic

Post Chalk/Shetland groups Cenozoic stratigraphy is complex in the offshore Ireland area with the development of many different lithofacies, often displaying considerable lateral facies changes, together with numerous unconformities and seismic sequence boundaries recognisable. Some of these surfaces are severely erosional in some areas and several can be recognised across large areas of offshore Ireland, from the west (Rockall, Porcupine basins) to the east (Fastnet Basin). These major surfaces have been used as the basis for the lithostratigraphic subdivision of the Cenozoic succession, in instances where lithological changes are also evident.

Many new lithostratigraphic names have been introduced in the Cenozoic interval although some formation names from contiguous UK offshore areas have been extended into offshore Ireland, over the Miocene to Quaternary interval. In addition, the UK names Stronsay Group and Hebrides Margin Group are utilised in the Paleogene interval in the Rockall Basin area, the Toirsgian Group for the Oligocene-Miocene and the Brython Glacigenic, Demetae and Hebrides Margin, Eilean Siar Glacigenic groups for the Pliocene-Pleistocene of offshore Ireland.

A characteristic feature of Cenozoic sediments is the lateral passage from clastic to carbonate (including deep sea ooze) deposition. Biostratigraphic recovery is generally very good, which, together with overall high quality seismic data (particularly from western offshore areas) allows complex lateral relationships to be defined within the Cenozoic interval.

A new sequence stratigraphic scheme is defined for the Cenozoic, comprising 13 sequences (C5 to C110) and defined by a succession of key boundaries (unconformities, conformities and maximum flooding surfaces) identifiable in well and seismic data (12 seismic horizons). These have been integrated with major seismic sequence boundaries that

have been previously described (e.g. C30, C10) for the Rockall Basin area, with a sequence nomenclature adopted to match.

Several major sandstone developments occur in the Cenozoic interval and most are named as new members of new formations, for example the Kilkieran, Oranmore, Brandon and Blacksod sandstone members within the Ypresian aged Gweedore Formation in the Porcupine Basin. One sandstone unit, the Bertraghboy Sandstone Member, has been identified in the Paleocene in the northern part of the Porcupine Basin. Two reworked chalk members, the Broadhaven and Sheephaven chalk members have been identified in the Paleocene in the Porcupine and the Rockall basins. Two submarine lavas are identified in the Eocene, the Péist Member, of the Gweedore Formation (Ypresian of the 43/13-1) and the Druid Formation, in the Stronsay Group of the Slyne Basin; the latter is very extensive and is typically developed above the Chalk Group in a number of wells in the Corrib (block 18/20) area.

One interval of limited source rock potential, the Paleocene-Ypresian aged Gweedore Formation, has been identified, in the Porcupine Basin, due largely to the presence of coals.