NORTHERN TERRITORY GEOLOGICAL SURVEY

Petroleum geoscience data from the Warburton, Pedirka and Eromanga basins, Northern Territory

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Digital Information Package DIP 034
April 2023

NORTHERN TERRITORY GOVERNMENT

DEPARTMENT OF INDUSTRY, TOURISM AND TRADE
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NORTHERN TERRITORY GEOLOGICAL SURVEY
EXECUTIVE DIRECTOR: Ian Scrimgeour

BIBLIOGRAPHIC REFERENCE: Doig A and Jarrett AJM, 2023. Petroleum geoscience data from the Warburton, Pedirka and Eromanga basins, Northern Territory. *Northern Territory Geological Survey, Digital Information Package* DIP 034.

(Digital Information Package / Northern Territory Geological Survey ISSN 1445-5358)
Version: April 2023

DATA FORMATS: MS Excel

Keywords: geoscientific information, shale, coal, total organic carbon, source rock analysis, petrology, reflection, well data, adsorption, hydrocarbons, palynology, desorption, Warburton Basin, Pedirka Basin, Eromanga Basin.

Cover photo: Sandstones and coals from the Purni Formation in drill core CBM93 2, Tray 08, 892.0 m to 895.6 m.

Editor: GC MacDonald. Graphics and layout: KJ Johnston

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SUMMARY

The Northern Territory Geological Survey (NTGS) is undertaking a compilation of petroleum geoscience data used to assess the petroleum and mineral resource potential of key onshore basins in the Northern Territory.

This digital information package (DIP) is a compilation of petroleum geoscience data from the stacked western Warburton, Pedirka and Eromanga basins in the southeast of the Northern Territory. The data is sourced from open file company reports, core sampling reports (CSR), and government publications from drill core held at NTGS Core Facilities and the Geoscience Australia Repository.

Key datasets include:

- well header information
- formation tops
- hydrocarbon shows
- casing information
- core and sidewall core information
- deviations
- bottom hole temperature (BHT) data
- drill stem tests
- references to petrophysical logs
- total organic carbon (TOC) and programmed pyrolysis
- organic petrology and reflectance
- extracted organic matter
- hydrocarbon geochemistry
- gas geochemistry
- sorption isotherms
- desorption data
- bulk isotopes
- biostratigraphy
- detrital zircon geochronology

Digital Information Package 034 (DIP 034) contains data for 1537 samples acquired up until April 2023.

CONTENTS

DIGITAL FILE CONTENT

FIGURE

INTRODUCTION

The early Palaeozoic western Warburton Basin, late Palaeozoic Pedirka Basin, and Mesozoic Eromanga Basin are three stacked basins located in the southeastern corner of the Northern Territory (Simpson Desert area) and extending into Queensland, South Australia and New South Wales (**Figure 1**; Ahmad and Munson 2013). In the Northern Territory, the basins cover a relatively large, sparsely explored, prospective area of 100 000 km^2. The Pedirka and Eromanga basins are locally poorly exposed and have many significant structural features in common. The underlying Warburton Basin is unexposed. The identified petroleum systems in these basins are considered interbasinal, and the stacked basins are traditionally considered together in NTGS reports (see Munson 2014 and references therein).

The Pedirka Basin contains elements of the Permian–Triassic Gondwanan Petroleum Supersystem of Bradshaw (1993). The Eromanga Basin, a significant oil/gas producer in both Queensland and South Australia, contains elements of the Murta Petroleum Supersystem (Bradshaw 1993).

At least three basin-scale petroleum systems are present in the region, including source rocks of the Permian Purni and Triassic Peera Peera formations (Pedirka Basin), and the Early Jurassic Poolowanna Formation (Eromanga Basin). A number of possible reservoir units with identified structural and stratigraphic traps are present throughout these two basins (Questa 1990, Ambrose *et al* 2002, Munson 2014). There are currently no petroleum systems identified in the Warburton Basin in the area.

Petroleum exploration commenced in the region in 1959 and has continued intermittently until present day. In the Northern Territory portion of the region, the most significant explorers were Beach Petroleum Ltd (now Beach Energy Ltd), which maintained a continuous presence from 1960 to 1989 (Questa 1990); Central Petroleum Limited, which acquired exploration tenements over most of the region in the late 2000s; and Santos Limited, which farmed into and assumed operatorship of Central Petroleum's tenements in 2012.

The petroleum prospectivity of the region has been discussed and summarised in numerous publications, significantly in Moore 1986, Questa 1990, Alexander *et al* 1996, Ambrose *et al* 2002, Ambrose 2006, Radke 2009, Sayers *et al* 2012, and Munson 2014.

NTGS has built a dataset to manage and provide petroleum geoscience data on various onshore basins in the Northern Territory. These datasets are fundamental to assess the petroleum and mineral resource potential of these key basins . The compilation of petroleum geoscience data started with the greater McArthur Basin under the Northern Territory Government's renewed *Creating Opportunities for Resource Exploration* (*CORE*) initiative. This work is now continuing and expanding under the 2016–2022 *Resourcing the Territory* initiative to support industry exploration programs and to promote and facilitate the development of resources and primary industries.

This digital information package (DIP) is a compilation of petroleum geoscience data from the stacked western Warburton, Pedirka and Eromanga basins (**Figure 1)**. Well data summaries and geochemical, geophysical, and other petroleum data are included as two separate spreadsheets. The majority of the petroleum data in DIP 034 comprises data from the coal-rich Purni Formation of the Pedirka Basin. Minor data inclusions are from the Todd River Dolostone equivalent of the Warburton Basin, the Crown Point, Walikandi and Peera Peera formations of the Pedirka Basin, and the Poolowanna, Cadna-Owie and Wallumbilla formations of the Eromanga Basin (**Figure 1**).

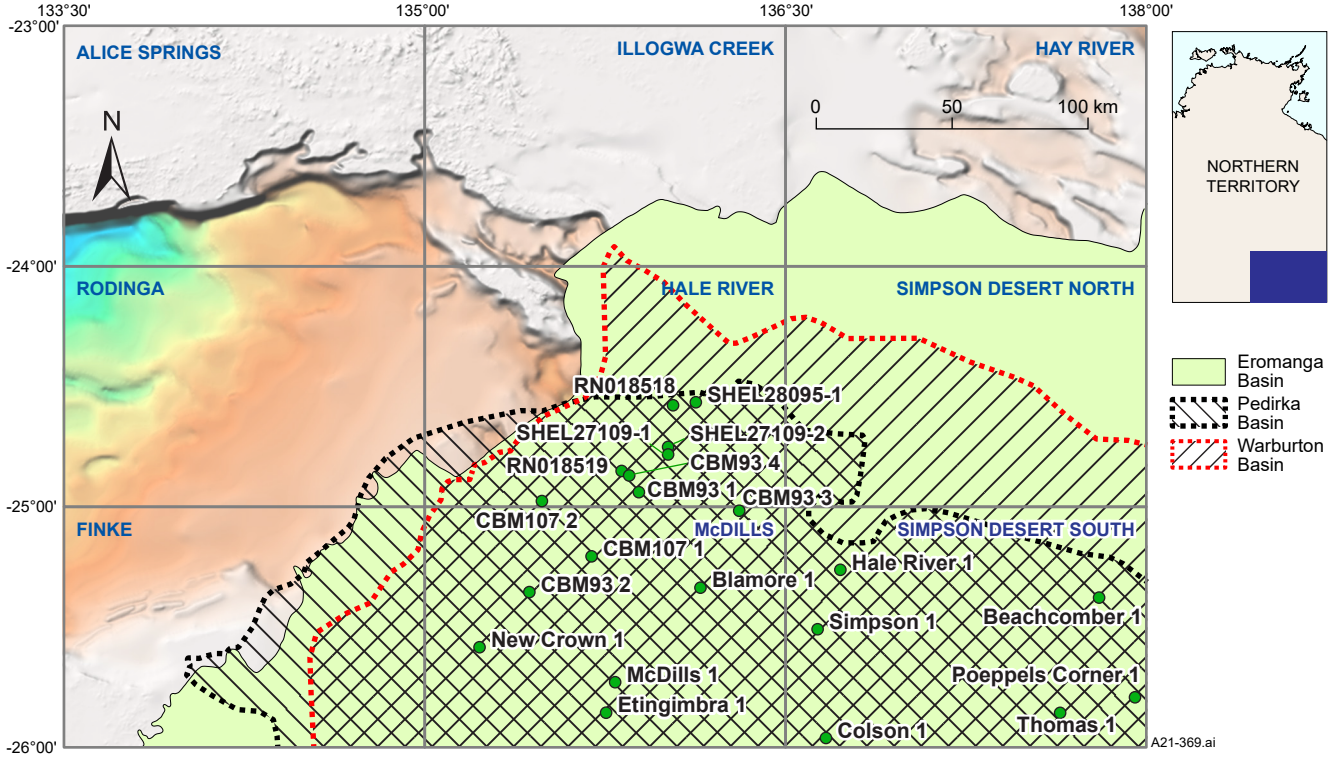

Figure 1. Location of wells (green circles) across the Warburton, Pedirka and Eromanga basin region referenced in DIP 034. Base maps are the Northern Territory SEEBASE® (Geognostics Australia 2021) and the NTGS 250K mapsheet index.

STRUCTURE OF DATASETS

This DIP contains data sourced from drill core and is structured into two spreadsheets:

1. Well data (**DIP034_Welldata.xlsx**)

Well data consists of a summary of all petroleum and water bores that intersect the Warburton, Pedirka and/or Eromanga basins. The dataset contains:

- well header information
- formation tops
- hydrocarbon shows
- casing information
- core and sidewall core information
- deviations
- bottom hole temperature (BHT) data
- drill stem tests
- references to petrophysical logs

2. Petroleum data (**DIP034_Petroleumdata.xlsx**)

Petroleum data has been collected from NTGS open file company reports and core sampling reports from drill core stored in NTGS and Geoscience Australia core repositories. The dataset contains:

- total organic carbon (TOC) and programmed pyrolysis
- organic petrology and reflectance
- extracted organic matter
- hydrocarbon geochemistry
- gas geochemistry
- sorption isotherms
- desorption data
- bulk isotopes
- biostratigraphy
- detrital zircon geochronology

The stratigraphic names of units listed in the 'Reported Formation' column (and as a separate tab in **DIP034_Welldata.xlsx**) are as published in the referenced reports. Where the original reported unit is obsolete, an interpreted formation name has been assigned utilising the Australian Stratigraphic Units Database[1] stratigraphic nomenclature and number to improve the users' ability to group or search the data by stratigraphy. Additionally, some formation names have been reinterpreted where appropriate to ensure consistent nomenclature across the basin. Reinterpretation was based on petrophysical logs, palynology and lithological logs. These reinterpreted formation tops are recorded in the 'Reinterpreted Formation' column and as a separate tab in **DIP034_Welldata.xlsx**.

A complete breakdown of the fields within the datasets are provided in the data dictionaries (**DIP034_Welldata_Dictionary.xlsx** and **DIP034_Petroleumdata_Dictionary**).

The quality of the data in the Petroleum Dataset is variable and sometimes unknown; the quality assurance or quality control practices often cannot be quantified. Values from published sources are listed as they were written in their original publication without any additional correction factors.

This publication follows the structure of DIP014 (Revie *et al* 2021) to ensure that there is consistency across all NT datasets. Each spreadsheet has well ID and sample data at the beginning, followed by raw data analysis, and then the laboratory details and data source. The 'Master' tab details the well ID and sample data followed by the analysis of that sample included within DIP 034. This is followed by the location details of the samples and the well completion or company report relating to the sample as listed in COREDAT. This dataset contains raw data only. Links to the original interpretive reports with all associated plots and imagery are provided in each tab for further reference.

CONCLUSIONS

The NTGS has built a dataset to manage and provide comprehensive petroleum geoscience data for the stacked western Warburton, Pedirka and Eromanga basins in the southeast NT. This information includes published open file company reports and core sampling reports from newer analysis of drill core stored in NTGS and Geoscience Australia core repositories. The petroleum geoscience dataset also records stratigraphic and location information where possible for each sample value, enabling users to generate products tailored for their individual needs. Applications of this dataset include statistical summaries for lithological packages for use in petroleum resource modelling, and GIS outputs displaying regional trends for user-defined stratigraphic intervals.

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[1] https://asud.ga.gov.au/

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