

DEPARTMENT OF INDUSTRY, SCIENCE AND RESOURCES

MS24-000325

To: Minister for Resources (For Decision)

DECLARATION OF IDENTIFIED GHG STORAGE FORMATION - CALLIANCE (G-8-AP)

Timing: Urgent – 7 business days, by 29 March 2024.

Recommendations: That you			
1. Agree to declare the Calliance identified greenhouse gas storage formation within greenhouse gas assessment permit G-8-AP in accordance with sections 21 and 312 of the <i>Offshore Petroleum and Greenhouse Gas Storage Act 2006</i> (OPGGGS Act).			
Agreed / Not agreed			
2. Sign the letter <u>and</u> instrument at <u>Attachment A</u> , communicating your decision as the responsible Commonwealth Minister (RCM) to declare Calliance as an identified GHG storage formation, and have your office send the signed letter <u>and</u> instrument to <u>ghg@nopta.gov.au</u> for issue to the applicant and gazette office respectively.			
Signed / Not signed			
Minister:		Date:	
Comments:			
Clearing Officer:	Cliff Weeks	General Manager, Offshore Resources Branch	Ph: s22 M: s22
Contact Officer:	s22	A/g Manager, Offshore CCS Section	Ph: s22
For Parliamentary Services' use only.			
Date Submitted to the Minister's office in PDMS:			20/03/2024

Key Points:

1. As the RCM, your decision is sought on whether to declare Calliance as an identified GHG storage formation within greenhouse gas assessment permit G-8-AP (G-8-AP).
2. A declaration of identified greenhouse gas (GHG) storage formation (DoSF) is the mechanism to transition to a GHG injection licence, so that injection and storage operations can commence. Background outlining a DoSF is at Attachment B.

3. G-8-AP was granted to Woodside as part of the 2021 offshore greenhouse gas storage acreage release. Woodside submitted a DoSF application for Calliance within G-8-AP on 20 July 2023. Woodside's application is at Attachment C.

s47(1)(b)

5. The National Offshore Petroleum Titles Administrator (NOPTA) has assessed the application and recommends the RCM declare Calliance as an identified GHG storage formation. NOPTA's full assessment is at Attachment D
 - a. Offshore Resource Branch (ORB) has prepared a summary of NOPTA's assessment report, which is at Attachment E.
6. In summary, NOPTA is satisfied that:
 - a. part of the geological formation within G-8-AP is an eligible GHG storage formation;
 - b. the Calliance storage formation spatial extent is confined within the title area; and
 - c. the fundamental suitability determinants have been adequately described, meeting the requirements of the OPGGS Act and the *Offshore Petroleum and Greenhouse Gas Storage (Greenhouse Gas Injection and Storage) Regulations 2011*.
7. ORB recommends that as the RCM, you agree to declare Calliance as an identified GHG storage formation within G-8-AP as the applicants have met the requirements of sections 21 and 312 of the OPGGS Act and associated regulations.
8. Should you agree with the recommendations, a decision letter to the Titles Administrator and instrument is at Attachment A for your signature. This declaration will allow the titleholders to apply for an injection licence and site plan.
9. NOPTA has identified matters the titleholders s47C

s47C

Data referenced: N/A

Consultation with the Cities and Northern Australia Division, Department of Infrastructure, Transport, Regional Development, Communications and the Arts: NIL

s22

Other Consultation: s22

s22

[Redacted]

s22

s22

s22

D: NOPTA's advice and assessment report, including RFIs and applicant responses.

E: Summary of NOPTA's advice and assessment report.



Australian Government

National Offshore Petroleum Titles Administrator

Responsible Commonwealth Minister for Decision

23 February 2024

APPLICATION FOR A DECLARATION OF AN IDENTIFIED GREENHOUSE GAS STORAGE FORMATION GREENHOUSE GAS ASSESSMENT PERMIT G-8-AP

Purpose: To inform the decision of the Responsible Commonwealth Minister in relation to an application made under sections 312 of the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* ([the OPGGS Act](#)), *Offshore Petroleum and Greenhouse Gas (Greenhouse Gas Injection and Storage) Regulations 2011* ([the GHG Regulations](#)), and the *Offshore Greenhouse Gas Guideline for Declaration of Identified Greenhouse Gas Storage Formation (including under a Cross-boundary Greenhouse Gas Assessment Permit) and Notification of an Eligible Greenhouse Gas Storage Formation* ([the Guideline](#)).

TITLE	Greenhouse Gas Assessment Permit G-8-AP (G-8-AP)
APPLICANT	Woodside Energy Ltd. (Woodside) (applicant).
TIMING OF APPLICATION	Validly submitted on 20 July 2023.
RELEVANT LEGISLATIVE REQUIREMENTS	Sections 21 and 312 of the OPGGS Act. Part 2 and Schedule 1 of the GHG Regulations.
RELEVANT GUIDELINES	Items 1 to 4, Appendices A (Summary of contents for an application for a declaration of identified GHG storage formation) and B (Information to support an application for a declaration of identified GHG storage formation) of the Guideline.
PROPOSED FORMATION NAME	Calliance Storage Formation
NOMINATED GRATICULAR BLOCKS	Map Sheet SD51 (Brunswick Bay) Blocks 2106, 2107, 2108, 2178, 2179, 2180, 2181, 2250, 2251, 2252, 2253, 2322, 2323, and 2324
NOTIFICATION UNDER SECTION 451	Applicant notified responsible Commonwealth Minister via NOPTA of an Eligible Greenhouse Gas (GHG) storage formation on 14 December 2022.
REQUESTS FOR FURTHER INFORMATION	Yes. A request for information dated 21 September 2023 was sent to the applicant on 22 September 2023 (Attachment A). NOPTA requested further clarification on 21 December 2023 (Attachment B). In response, the applicants varied the application under subsection 312(7) of the OPGGS Act. The applicants' responses can be found in Attachments C and D .
CONSULTATION	NOPTA consulted NOPSEMA on the requests for further information and in relation to the assessment of the application. NOPTA formally consulted NOPSEMA on 19 December 2023 for information and advice (Attachment E). NOPSEMA's response (Attachment F) is incorporated into the assessment report at Appendix A .
SUMMARY OF ASSESSMENT	<p>NOPTA, in consultation with NOPSEMA, is satisfied that the applicant has demonstrated that they have reasonable grounds to believe that a part of a geological formation is an eligible storage formation within graticular blocks 2106, 2107, 2108, 2178, 2179, 2180, 2181, 2250, 2251, 2252, 2253, 2322, 2323, and 2324 of Map Sheet SD51 (Brunswick Bay), and wholly within G-8-AP.</p> <p>NOPTA agrees that the spatial extent of the Calliance Storage Formation is laterally confined to graticular blocks 2106, 2107, 2108, 2178, 2179, 2180, 2181, 2250, 2251, 2252, 2253, 2322, 2323, and 2324 of Map Sheet SD51 (Brunswick Bay) and the vertical spatial extent is in the combination saline aquifer-structural trapping associated the J50.0 to K50.0 regional seal and the J10 to J40 reservoir.</p> <p>NOPTA in consultation with NOPSEMA is satisfied that the application sets out the fundamental suitability determinants (Table 1) and the estimate of the spatial extent that</p>

support the reasonable grounds to declare the Calliance Storage Formation as an identified GHG storage formation.

Table-1 – Fundamental suitability determinants

s21(8)(a)	The amount of GHG substance that is suitable to store	Maximum storage amount of 145 Mt
s21(8)(b)	The GHG substance that is suitable to store	97 mol% - 100 mol% CO ₂
s21(8)(c)	The injection point or points	Primary injection site: 3-5 injection wells approximately 3 km from each other and 10 km south of the Calliance field. Contingent injection site: 1 injection well located approximately 5 km northeast of Calliance-1.
s21(8)(d)	The injection period	31 years
s21(8)(e)	If subsection 21(1)(b) is applicable, the engineering enhancements	N/A
s21(8)(f)	The effective sealing feature, attribute or mechanism of the storage formation that enables permanent storage	Combination saline aquifer-structural trapping below the J50.0 to K50.0 deep-marine mudstone seal.

s47C

NOPTA ADVICE

NOPTA, in consultation with NOPSEMA, considers that the application for the declaration of an identified storage formation within G-8-AP over graticular blocks 2106, 2107, 2108, 2178, 2179, 2180, 2181, 2250, 2251, 2252, 2323, 2324, 2253 and 2322 of Map Sheet SD51 (Brunswick Bay) satisfies the requirements of sections 21 and 312 of the OPGGS Act and should be approved.

s47C

A draft instrument is attached for your approval and signature (**Attachment G**). Should you approve and sign, a copy of the declaration will be published in the gazette in accordance with subsection 312(14) of the OPGGS Act.

s47C

s47C

	The draft approval letter (Attachment H) addressing this request is attached for your approval and signature.	
NOPTA CONTACT	s22	Tel: s22
ENDORSED BY	Graeme Waters General Manager s22	
Email: ghg@nopta.gov.au		

Figure 1: Insert Location Map (*source NOPTA*).



Appendix A – Assessment Report

Application of Declaration of a Greenhouse Gas Identified Storage Formation Calliance

Greenhouse Gas G-8-AP

TABLE OF CONTENTS

1.	APPLICATION OVERVIEW	2
2.	ASSESSMENT AGAINST THE APPLICATION CRITERIA	4
2.1	Application Requirements.....	4
2.2	Fundamental suitability determinants of the eligible storage formation	10
2.3	Eligible GHG storage formation	17
2.4	Spatial extent of the storage formation.....	17
3.	ADVICE	23

1. APPLICATION OVERVIEW

Greenhouse Gas (GHG) Assessment Permit G-8-P (G-8-AP) was granted on 12 August 2022 to Woodside Energy Ltd (the applicant). G-8-AP comprises 42 graticular blocks (covering ~3,476 km²) within the Browse Basin, offshore Western Australia (Figure A1). The Browse Basin is currently Australia's second largest gas producing offshore basin, including developments such as Ichthys and Prelude and numerous other gas fields under retention leases. G-8-AP covers an area on the continental shelf edge in the outer basin area, in water depths ranging from 200 to 2,000 metres.

s47(1)(b)

Figure A1. G-8-AP Location Map (Source: NOPTA).

G-8-AP overlaps the Calliance and Brecknock gas fields in Petroleum Retention Leases WA-28-R, WA-29-R, WA-31-R and WA-32-R (Figure A1), s47(1)(b)

The combined petroleum development is referred to as the Browse Development. The applicant has submitted an application to declare an identified storage formation (DoSF), herein referred to as the "Calliance Storage s47(1)(b)

The carbon storage element of the project is referred to as Browse Carbon Capture and Storage (Browse CCS).

A request for information dated 21 September 2023 was sent to the applicant on 22 September 2023 (Attachment A). NOPTA requested further clarification on 21 December 2023 (Attachment B). The applicant's responses can be found in Attachments C and D.

In the applicant's response dated 28 December 2023 (received on 2 January 2024) (Attachment D) the applicant confirmed a variation to the application under subsection 312(7) of the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGGS Act). The applicant confirmed that under the varied application the estimated lateral spatial extent for the Calliance Storage Formation is contained within 14 graticular blocks (Table A1). Accordingly, this assessment considers the varied application for a DoSF over these 14 graticular blocks (approximately 1,158 km²) that form part of G-8-AP (see Figure A2).

Table A1. Description of blocks that comprise the estimated extent of the Calliance Storage Formation.

Storage Formation Name		Calliance			
Map Sheet		SD51 (Brunswick Bay)			
Block Nos.					
2106	2107	2108	2178	2179	2180
2181	2250	2251	2252	2253	2322
2323	2324				

s47(1)(b)

Figure A2. Map of G-8-AP, the varied DoSF application area, including undeveloped gas fields, retention leases and existing petroleum wells. Plume extent outlined in green (*Source: Modified from Request for Further Information*).

NOPTA consulted NOPSEMA on the requests for further information and in relation to the assessment of the application. NOPTA formally consulted NOPSEMA on 19 December 2023 for information and advice ([Attachment E](#)). NOPSEMA’s response ([Attachment F](#)) is incorporated into this assessment report.

2. ASSESSMENT AGAINST THE APPLICATION CRITERIA

The responsible Commonwealth Minister must declare an identified GHG storage formation if the criteria in section 312 of the OPGGS Act are met.

Subsection 312(11) of the OPGGS Act requires that if:

- a) an application is made under this section in relation to a part of a geological formation; and
- b) the responsible Commonwealth Minister is satisfied that, using the fundamental suitability determinants set out in the application:
 - i. that part is an eligible greenhouse gas storage formation; and
 - ii. the estimate of the spatial extent set out in the application is a reasonable estimate of the spatial extent of the eligible greenhouse gas storage formation;

the responsible Commonwealth Minister must, by writing:

- c) declare that part to be an *identified greenhouse gas storage formation* for the purposes of this Act; and
- d) declare that, for the purposes of this Act, the spatial extent of the identified greenhouse gas storage formation is the spatial extent estimated in the application; and
- e) declare that the fundamental suitability determinants specified in the application are the *fundamental suitability determinants* of the identified greenhouse gas storage formation for the purposes of this Act.

The assessment against the decision-making criteria is summarised in **Table A2**.

Table A2. Decision-making criteria.

Requirements of subsection 312(11) of the OPGGS Act	NOPTA assessment
a) An application is made under this section in relation to a part of a geological formation.	s47C Refer Section 2.1 (below)
b) Using the fundamental suitability determinants of the eligible greenhouse gas storage formation as set out in the application:	s47C Refer Section 2.2 (below)
i. That part is an eligible greenhouse gas storage formation.	s47C Refer Section 2.3 (below)
ii. An estimate of the spatial extent of the eligible greenhouse gas storage formation is a reasonable estimate of the spatial extent of the eligible greenhouse gas storage formation.	s47C Refer Section 2.4 (below)

NOPTA, in consultation with NOPSEMA, is s47C that the application for a declaration of identified storage formation over the Calliance Storage Formation meets the requirements of sections 21 and 312 of the OPGGS Act and the *Offshore Petroleum and Greenhouse Gas Storage (Greenhouse Gas Injection and Storage) Regulations 2011 (GHG Regulations)*.

A detailed assessment against these requirements is provided below.

2.1 Application Requirements

NOPTA confirms that the eligible Calliance GHG storage formation is wholly situated within G-8-AP, which is in force and is the subject of the application (as varied), and the application was submitted in writing by the applicant in accordance with subsections 312(1) and (2) of the OPGGS Act. The application set out the requirements as specified in the OPGGS Act and GHG Regulations (refer to **Table A3** below).

Table A3. Application requirements.

Requirements of subsections 312(3) and (4) of the OPGGS Act		NOPTA assessment
313(3)(a)	Reasons for believing that the part of a geological formation is an eligible greenhouse gas storage formation. <i>(Also refer to subsection 21(1) of the OPGGS Act).</i>	s47C Refer Section 2.3 (below)
313(3)(b)(i)	The fundamental suitability determinants of the eligible greenhouse gas storage formation. <i>(Also refer to subsection 21(8) of the OPGGS Act)</i>	s47C Refer Section 2.2 (below)
313(3)(b)(ii)	An estimate of the spatial extent of the eligible greenhouse gas storage formation. <i>(Also refer to subsection 21(3) of the OPGGS Act)</i>	s47C Refer Section 2.4 (below)
313(4)	An estimate of spatial extent must comply with such requirements as are specified in the regulations. <i>(Refer to Schedule 1, Part 4 of the GHG Regulations)</i>	
313(3)(c)	Such other information (if any) as is specified in the regulations. <i>(Refer to Regulation 2.1 of the GHG Regulations)</i>	s47C Refer to Section 2.1.1, 2.2 and 2.4 (below)

2.1.1 Information about the storage formation

The following section assesses the content of the application against the requirements of Part 2 of the GHG Regulations, as listed under Schedule 1, Part 1.

NOPTA, in consultation with NOSPEMA, considers the applicant provided an adequate description and analysis of the geological features of the storage formation. This included the effective sealing mechanism and information relating to the integrity of the storage s47C

a) Stratigraphy, structure, rock types, and depositional model of the storage formation (both reservoir and seal rocks)

The Calliance and Brecknock s47(1)(b)

NOPTA considers that a large amount of data has been collected by the applicant since the original drilling of the Brecknock-1 well in 1979. This includes a total of eight exploration and appraisal wells, with extensive core and, drill stem test data. Seven key 3D seismic surveys that provide continuous 3D data over almost all of the DoSF area with the core coverage being provided by the 1997 Brecknock 3D and 1999 Brecknock South 3D. Using this seismic data the applicant has s47(1)(b)

The applicant has s47C

b) Identification of any faults in the storage formation and seal

A detailed depth structure map of the top of the proposed injection interval s47(1)(b) shows s47(1)(b)

s47(1)(b)

c) Porosity and permeability of the storage formation reservoir, and seal

There are many porosity and permeability measurements available from Calliance and Brecknock core samples of the reservoir interval. s47C

In addition to core measurement, the applicant has s47(1)(b)

s47(1)(b)

s47(1)(b)

The well data s47(1)(b)

The applicant has s47(1)(b)

s47C

d) Reactivity of rock types with the proposed GHG substance in both the reservoir and seal

Testing has been carried out on core plugs s47(1)(b)

e) Geomechanics (local stress regime, fracture gradients, fault stability and response of the storage formation to injection)

s47(1)(b)

s47(1)(b)

f) Fluid parameters of the storage formation, including chemical composition, pressure and temperature

NOPTA considers that due to the extensive sampling from multiple appraisal wells, the applicant has an excellent understanding of the fluid properties and subsurface conditions relevant to the Calliance Storage Formation.

s47(1)(b)

s47(1)(b)

g) Seismicity, including the history of earthquake activity in the area

s47(1)(b)

NOPTA observes that the north-west edge of the continent of Australia is classified as a passive margin in general plate tectonic terms. s47C

h) The conduct of previous exploration and production activity in the area

There is no history of production occurring within the area covered by G-8-AP. The 14 graticular blocks of the DoSF application area overlie the undeveloped Calliance gas field and part of the undeveloped Brecknock gas field (Figure A2).

The first indication of gas was at Brecknock-1 in 1979. In 1997 3D seismic was acquired for the first time, followed by further 3D surveying in 1999 and the drilling of and Brecknock South-1 in 2000. This discovery triggered an intensive campaign of exploration and appraisal that ran until 2009. Further 3D seismic surveys were acquired in 2005 and 2008 to explore the surrounds of the Calliance-Brecknock area. These surveys provide continuous 3D coverage of nearly all the DoSF area and much of G-8-AP.

A total of eight exploration and appraisal wells, with significant cored intervals and drill stem test data have been drilled on the Calliance and Brecknock fields. The hydrocarbon results of the wells within

s47(1)(b)

s47C

i) The existence of abandoned wells and any available relevant information on their nature (well location map, well plugging, type of cement used, etc.).

The DoSF application area contains the following wells on the Calliance structure: Brecknock South-1 (2000), Calliance-1 (2005), Calliance-2 (2007) Calliance-3 (2008); as well as Brecknock-2 on the Brecknock structure.

The applicant has provided details s47(1)(b) (Brecknock South-1, Calliance-1, Calliance-2 and Calliance-3), which include their current status and the type and location of cement plugs. s47(1)(b)

s47(1)(b) is also provided for each of these wells based on the individual attributes in each case.

s47(1)(b)

In support of the above, NOPSEMA's response to NOPTA ([Attachment F](#)) NOPSEMA stated:

s47C

[REDACTED]

In summary, s47C

s47C

2.2 Fundamental suitability determinants of the eligible storage formation

The following section assesses the content of the application against the requirements of subsections 21(1) and 21(8), paragraph 312(3)(b)(i) and subsection 312(11) of the OPGGS Act, and Part 2 of the GHG Regulations, as listed under Schedule 1, Part 3 (engineering enhancements).

s47C

a) The particular amount to be stored
s47(1)(b)

s47C

b) The particular GHG substance to be stored

s47(1)(b) The applicant indicates the substance to be stored will be primarily composed of 97–100% CO₂ (on a dry mol% s47(1)(b))

NOPTA considers the CO₂ content within the proposed GHG substance to be injected is consistent with section 7 of the OPGGS Act.

s47(1)(b)

c) The particular point or points of injection

s47(1)(b)

s47C

d) The particular period over which injection will take place

The expected CO₂ injection period is approximately 31 years s47(1)(b)

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

s47(1)(b)

s47C

[Redacted]

e) Any applicable engineering enhancements

There are no proposed engineering enhancements given the physical properties of the storage formation. s47(1)(b)

[Redacted]

A description of the proposed engineering enhancements to the storage formation

NOPTA considers that there are no engineering s47(1)(b)

[Redacted]

s47(1)(b)

s47C

Acceptable risks and risk assessment analysis

The applicant does not propose engineering enhancements directly related to the storage activity.
s47(1)(b)

A description of the risks

s47C

The possible consequences of identified risks, their probability of occurrence, and risk mitigation strategy (elimination or reduction to as low as practicable)

s47(1)(b)

s47(1)(b)

s47C

s47(1)(b)

s47C

s47(1)(b)

s47(1)(b)

s47C

s47C

f) The effective sealing feature, attribute or mechanism that enables permanent storage

The permanent storage of the injected GHG substance will be facilitated by the presence of suitable sediments above those that define the Calliance s47(1)(b)

s47C

s47(1)(b)

s47C

2.3 Eligible GHG storage formation

The following section assesses the content of the application against the requirements of subsections 21(1) and (2) of the OPGGS Act. Subsection 21(3) of the OPGGS Act is discussed in Report Section 2.4.

Subsection 21(1) of the OPGGS Act outlines an eligible greenhouse gas storage formation is a part of a geological formation, where that part:

(a) is suitable, without engineering enhancements, for the permanent storage of a particular amount of a particular greenhouse gas substance injected at a particular point or points into that part over a particular period; or

(b) is suitable, with engineering enhancements, for the permanent storage of a particular amount of a particular greenhouse gas substance injected at a particular point or points into that part over a particular period.

Subsection 21(2) states that the amount referred to in paragraph 21(1) (a) or (b) must be at least 100,000 tonnes.

In accordance with paragraph 312 (11)(b)(i) of the OPGGS Act, NOPTA considers that the applicant has provided adequate information about the storage formation, that when taken with the description of the fundamental suitability determinants (see Section 2.2) and spatial extent (see Section 2.4), demonstrate that part is an eligible greenhouse gas formation.

2.4 Spatial extent of the storage formation

The following section assesses the content of the application against the requirements of subsections 21(3), 312 (3), (4), and (11) of the OPGGS Act and Part 2 of the GHG Regulations under Schedule 1, Part 2 and Part 4.

In accordance with paragraph 312 (11)(b)(ii) of the OPGGS Act, NOPTA, in consultation with NOPSEMA, considers that the spatial extent of the storage formation as set out in the application is a reasonable estimate of the spatial extent of the eligible greenhouse gas formation and has been adequately determined based on the modelling presented (as described below), which demonstrates the lateral and vertical extent of the Calliance Storage Formation, meeting the requirements of Part 2 of the GHG Regulations (as listed in Part 2 and Part 4 of Schedule 1).

The horizontal spatial extent (defined as the plume aerial extent) s47(1)(b)

The vertical extent of the Calliance Storage s47(1)(b) _____ s vertically confined between the J10.0 and J50.0 horizons (Plover and Lower Vulcan formations).

s47(1)(b)

The applicant has applied for 14 graticular blocks within the Brunswick Bay SD51 Mapsheet, which covers an area of approximately 1,158 km², and is considered to constitute the spatial extent of the Calliance Storage Formation (Figure A9). These graticular blocks cover all plume migration pathways which have a 10% or greater probability s47(1)(b)

The modelling basis of this plume extent is discussed further below.

s47(1)(b)

Plume migration and predictions

a) Expected migration pathways

s47(1)(b)

Data used to generate plume migration models

The data used includes that derived from the four exploration and appraisal wells available at Calliance, as well as the comprehensive 3D seismic dataset described previously. s47(1)(b)

Plume migration modelling methodology, spatial resolution, types of models and assumptions

Deterministic injection site models and uncertainty analysis

s47C

s47(1)(b)

s47(1)(b)

s47(1)(b)

s47(1)(b)

s47(1)(b)

s47(1)(b)

bs Predictions of plume migration pathways and associated probability distributions.

s47C

Probabilistic plume simulations
s47(1)(b)

3. ADVICE

NOPTA, in consultation with NOPSEMA, considers that the application for a DoSF over the Calliance Storage Formation within G-8-AP over the Graticular Blocks 2106, 2107, 2108, 2178, 2179, 2180, 2181, 2250, 2251, 2252, 2323, 2324, 2253 and 2322 of Map Sheet SD51 (Brunswick Bay), satisfies the requirements of sections 21 and 312 of the OPGGS Act and should be approved.

NOPTA therefore, recommends that in accordance with subsection 312(11) of the OPGGS Act the responsible Commonwealth Minister declares an identified GHG storage formation over the Calliance Storage Formation.

s47C



**THE HON MADELEINE KING MP
MINISTER FOR RESOURCES
MINISTER FOR NORTHERN AUSTRALIA**

MS23-001433

s22

ghg@nopta.gov.au

Dear s22

I refer to the application validly submitted to the National Offshore Petroleum Titles Administrator (NOPTA) on 20 July 2023 under section 312 of the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGs Act), for the declaration of an identified Greenhouse Gas (GHG) storage formation in respect of the proposed Calliance storage formation within Greenhouse Gas Assessment Permit G-8-AP.

Under the OPGGS Act, I am the decision maker for this application as the responsible Commonwealth Minister. NOPTA provides information, assessment, analysis, reports and recommendations to inform any decisions I take in relation to the application.

After reviewing the application, NOPTA advises that further information is required to assess the application. In accordance with subsection 312(5)(a) of the OPGGS Act, I ask that you provide responses to the further requests for information enclosed with this letter.

Please note that in accordance with subsection 312(6) of the OPGGS Act, a failure to provide the requested information may result in my refusing to consider the application, refusing to take any action, or any further action in relation to the application.

Please provide the information within 60 days of the date of this letter. If you have any queries regarding this letter or require additional time, please contact s22 in NOPTA on s22 r ghg@nopta.gov.au.

s22 Yours sincerely

Madeleine King MP

21/9/2023

Enc (1) – Request for further information

s47C Request for further information

s22



10 November 2023

Strictly Confidential

Attn: Mr Graeme Waters, Titles Administrator
National Offshore Petroleum Title Administrator
Level 8, 58 Mounts Bay Road
Perth WA 6000

Woodside Energy Pty Ltd.

ACN 005 482 986

Mia Yellagonga

11 Mount Street

Perth WA 6000

Australia

T +61 8 9348 4000

www.woodside.com.au

BY EMAIL

Dear Graeme,

**TITLEHOLDER RESPONSE TO REQUEST FOR FURTHER INFORMATION: APPLICATION FOR
DECLARATION OF IDENTIFIED GREENHOUSE GAS (GHG) STORAGE FORMATION**

In response to NOPTA's request for further information dated 21 September 2023, Woodside Energy Pty Ltd (the Titleholder) submit via email the attached document. The document provides the information requested, including:

s47C

The Titleholder previously submitted an application for Declaration of Identified Greenhouse Gas Storage Formation on 20 July 2023, which is referred to throughout the response.

Please do not hesitate to contact myself or s22 should you require any further details.

Yours sincerely

s22

Woodside Browse Pty Ltd



**Response to Request for Further Information: G-8-AP
Application for Declaration of Identified Greenhouse Gas
(GHG) Storage Formation**

s47(1)(b)

s47(1)(b)

s47(1)(b)

s47(1)(b)

CONFIDENTIAL



21 December 2023

Alluvion Building
Level 10, 58 Mounts Bay Road Perth WA 6000
GPO Box 7871, Perth WA 6850
www.nopta.gov.au

ABN 46 252 861 927

s22

Dear s22

VARIATION OF APPLICATION FOR A DECLARATION OF AN IDENTIFIED GREENHOUSE GAS STORAGE FORMATION RELATING TO GHG ASSESSMENT PERMIT G-8-AP

I refer to the application validly submitted on 20 July 2023 under section 312 of the *Offshore Petroleum and Greenhouse Gas Storage Act 2006 (the OPGGS Act)*, for the declaration of an identified greenhouse gas (GHG) storage formation (**the Application**) in respect of the Calliance formation within GHG Assessment Permit G-8-AP (**G-8-AP**).

I note that in your response on 10 November 2023 to NOPTA’s request for information (**RFI**) dated 21 September 2023, you have indicated a change to the block listing in relation to the Calliance Storage Formation. NOPTA considers this to be a variation of the Application under subsection 312 (7) of the OPGGS Act.

NOPTA therefore requests that Woodside Energy Ltd. (**Woodside**), confirms the following in writing:

1. Woodside is seeking to vary the Application under subsection 312(7) of the OPGGS Act.
2. Confirm that under the varied Application the estimated lateral spatial extent for the Calliance Storage Formation is within the blocks described in the Table below.

Storage Formation Name		Calliance			
Map Sheet		SD51 (Brunswick Bay)			
Block Nos.					
2106	2107	2108	2178	2179	2180
2181	2250	2251	2252	2323	2324
2253	2322				

s47(1)(b)

4. Confirm that NOPTA has correctly understood the following fundamental suitability determinants for the Calliance Storage Formation, as outlined in the Application:

Subsection 21(8)(a)	The amount of GHG substance that is suitable to store	Maximum storage amount of 145 Mt.
Subsection 21(8)(b)	The GHG substance that is suitable to store	97 mol% -100 mol% CO ₂
Subsection 21(8)(c)	The injection point or points	Primary injection site: 3-5 injection wells approximately 3 km from each other and 10 km south of the Calliance field. Contingent injection site: 1 injection well located approximately 5 km northeast of Calliance-1.
Subsection 21(8)(d)	The injection period	31 years
Subsection 21(8)(e)	If subsection 21(1)(b) is applicable, the engineering enhancements	N/A
Subsection 21(8)(f)	The effective sealing feature, attribute or mechanism of the storage formation that enables permanent storage	Combination saline aquifer-structural trapping below the J50.0 to K50.0 deep-marine mudstone seal

s47C

Please note that should the responsible Commonwealth Minister approve the Application, the information provided under Spatial Extent, Block Listing and the Fundamental Suitability Determinants (outlined in questions 2-4 above) will be included in an instrument that will be publicly available on the NOPTA website.

Please provide the information within 14 days of the date of this letter. If you have any queries regarding this letter, please contact ^{s22} or ^{s22} or ghg@nopta.gov.au.

^{s22} Yours sincerely

National Offshore Petroleum Titles Administrator



Woodside Energy Ltd.

ACN 005 482 986

Mia Yellagonga

11 Mount Street

Perth WA 6000

Australia

T +61 8 9348 4000

www.woodside.com

28 December 2023

Confidential

Attn: s22 General Manager
National Offshore Petroleum Titles Administrator
 Level 8, 58 Mounts Bay Road
 Perth WA 6000

Dear s2

TITLEHOLDER RESPONSE TO REQUEST FOR FURTHER INFORMATION: VARIATION OF APPLICATION FOR A DECLARATION OF AN IDENTIFIED GREENHOUSE GAS STORAGE FORMATION RELATING TO GHG ASSESSMENT PERMIT G-8-AP

In response to:

- NOPTA's request for further information dated 21 December 2023 referring to the application validly submitted on 20 July 2023 under section 312 of the Offshore Petroleum Greenhouse Gas Storage Act 2006 (**the OPGGS Act**), for the declaration of an identified greenhouse gas (**GHG**) storage formation (**the Application**) in respect of the Calliance storage formation within GHG Assessment Permit G-8-AP (G-8-AP), and
- The preceding response to the request for further information (**RFI**) dated 21 September 2023, submitted to NOPTA on 10 November 2023

Woodside Energy Ltd. (**Woodside**) is seeking to vary the Application under subsection 312(7) of the OPGGS Act.

Woodside confirms that under the varied Application the estimated lateral spatial extent for the storage formation (Calliance Storage Formation) is within the 14 graticular blocks listed in the table below:

Storage formation Name			Calliance		
Map Sheet			SD51 (Brunswick Bay)		
Block Nos.					
2106	2107	2108	2178	2179	2180
2181	2250	2251	2252	2323	2324
2253	2322				

s47(1)(b)

We confirm that NOPTA correctly understood the following fundamental suitability determinants for the Calliance Storage Formation as outlined in the Application and appropriately characterised in the table below, and that no further variations to the Application are required.

Subsection 21(8)(a)	The amount of GHG substance that is suitable to store	Maximum storage amount of 145 Mt.
Subsection 21(8)(b)	The GHG substance that is suitable to store	97 mol% -100 mol% CO ₂
Subsection 21(8)(c)	The injection point or points	Primary injection site: 3-5 injection wells approximately 3 km from each other and 10 km south of the Calliance field. Contingent injection site: 1 injection well located approximately 5 km northeast of Calliance-1.
Subsection 21(8)(d)	The injection period	31 years
Subsection 21(8)(e)	If subsection 21(1)(b) is applicable, the engineering enhancements	N/A
Subsection 21(8)(f)	The effective sealing feature, attribute or mechanism of the storage formation that enables permanent storage	Combination saline aquifer-structural trapping below the J50.0 to K50.0 deep-marine mudstone seal.

Please do not hesitate to contact myself or [s22](#)

should you require further details.

Yours sincerely,

[s22](#)

Woodside Browse Pty Ltd.



19 December 2023

Alluvion Building
Level 10, 58 Mounts Bay Road Perth WA 6000
GPO Box 7871, Perth WA 6850
www.nopta.gov.au

ABN 74 599 608 295

Ms Sue McCarrey
Chief Executive Officer
NOPSEMA
Level 10, 58 Mounts Bay Road
PERTH WA 6000
Via email to: submissions@nopsema.gov.au

Dear Ms McCarrey

**REQUEST FOR ADVICE AND INFORMATION RELATING TO AN APPLICATION FOR
DECLARATION OF AN IDENTIFIED GREENHOUSE GAS STORAGE FORMATION WITHIN
GREENHOUSE GAS ASSESSMENT PERMIT G-8-AP**

On 20 July 2023, the registered titleholders of Greenhouse Gas Assessment Permit G-8-AP, submitted an application pursuant to section 312 of the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (the **OPGGS Act**), seeking a declaration of an identified greenhouse gas storage formation (the **Application**).

The responsible Commonwealth Minister (**RCM**) must declare a part of a geological formation to be an identified greenhouse gas storage formation if the RCM is satisfied as to the matters set out in subsection 312(11) or refuse to declare a part of a geological formation to be an identified greenhouse gas storage formation under subsection 312(15) of the OPGGS Act.

s47C

s47C To assist with the provision of advice to the RCM by NOPTA

To enable NOPSEMA to provide its advice, and in accordance with section 695W of the OPGGS Act, NOPTA has made the Application and any relevant offshore information it holds available to NOPSEMA.

Should NOPSEMA hold any offshore information that is relevant to its assessment of the Application, and in accordance with section 695W of the OPGGS Act, please make this available to NOPTA at the time of responding to this letter.

As NOPTA and NOPSEMA officials have already shared and discussed the application in detail, I would appreciate your response by **8 January 2024**. Should you require additional time or have any queries regarding this matter, please contact ^{s22} on ^{s22} or ghg@nopta.gov.au.

Yours sincerely

^{s22}

National Offshore Petroleum Titles Administrator

^{s22}

Our ref: ID: A1058129

s22

Acting General Manager
National Offshore Petroleum Title Administrator
Level 10, 58 Mounts Bay Road
PERTH WA 6000

s22

@nopta.gov.au

Dear s22

RE: REQUEST FOR ADVICE AND INFORMATION RELATING TO AN APPLICATION FOR DECLARATION OF AN IDENTIFIED GREENHOUSE GAS STORAGE FORMATION WITHIN GREENHOUSE GAS ASSESSMENT PERMIT G-8-AP

Background

NOPSEMA was requested to review the G-8-AP Declaration of Storage Formation application and provide advice and relevant information to NOPTA pursuant to section 646(gr) of the OPGGS act, on matters that the RCM must consider under the broad requirements of section 312 of the OPGGS Act, including section 21(8) and Schedule 1 of the Offshore Petroleum and Green House Storage (Greenhouse Gas Injection and Storage) regulations 2011 (The GHG Regulations)

s47C

NOPTA has provided NOPSEMA with a copy of the application and further correspondence under clause 695W of the OPGGS Act.

Advice in relation to assessment of the G-8-AP DoSF

s47C

s47C

Legacy Wells

NOPSEMA's analysis of the information provided in the declaration of storage formation, and records from s47C

Kind regards,

s22

12 February 2024

cc ghg@nopta.gov.au

s21 Eligible greenhouse gas storage formation

(8) For the purposes of this Act, the following are the <i>fundamental suitability determinants</i> of an eligible greenhouse gas storage formation;	
(c) the particular point or points referred to in whichever of paragraph (1)(a) or (b) is applicable;	s47C
(e) if paragraph (1)(b) is applicable—the engineering enhancements referred to in that paragraph;	s47C
(f) the effective sealing feature, attribute or mechanism that enables the permanent storage referred to in whichever of paragraph (1)(a) or (b) is applicable	s47C
(1) For the purposes of this Act, an <i>eligible greenhouse gas storage formation</i> is a part of a geological formation, where that part:	
(a) is suitable, without engineering enhancements, for the permanent storage of a particular amount of a particular greenhouse gas substance injected at a particular point or points into that part over a particular period; or	s47C
(b) is suitable, with engineering enhancements, for the permanent storage of a particular amount of a particular greenhouse gas substance injected at a particular point or points into that part over a particular period.	s47C

Schedule 1 Part 3 - Information about engineering enhancements

(1) A description of any proposed engineering enhancements that will be made in relation to the storage formation.	s47C
--	------

(2) The description must be set out in sufficient detail to satisfy the responsible Commonwealth Minister that any risks relating to the containment of the greenhouse gas substance in the storage formation are likely to be acceptable, taking into account the proposed engineering enhancements.	s47C
Details of the risk assessment analysis used by the applicant to support the proposed engineering enhancements, including, for each risk factor:	
(a) a description of the risks associated with the storage formation; and	s47C
(b) the possible consequences of each risk factor; and	s47C
(c) an assessment of the probabilities of occurrence and possible consequences; and	s47C
(d) an explanation of how the risk has been, or will be eliminated or reduced to as low as practicable.	s47C

Schedule 1 Part 4 – Information about the estimated spatial extent of the storage formation

4.3 An explanation of the three-dimensional extent of the effective sealing mechanism	s47C
---	------

<p>within the spatial extent of the storage formation.</p>	<p>s47C</p>
--	-------------

Schedule 1 Part 1 - Information about the storage formation

<p>(1) A description of the geological features of the storage formation, including the effective sealing mechanism.</p>	<p>s47C</p>
<p>(2) (f) a geomechanical analysis of the storage formation, including an assessment of:</p>	
<p>(i) the local stress regime; and</p>	
<p>(ii) fracture gradients; and</p>	
<p>(iii) fault stability; and</p>	
<p>(iv) the geomechanical response of the storage formation to injection;</p>	
<p>(2) The information must, as a minimum, identify or refer to the following matters:</p>	
<p>(j) the existence of abandoned wells, including a map showing the location of each abandoned well, and any information available to the applicant about:</p>	
<p>(i) their location; and</p>	
<p>(ii) the history of their construction; and</p>	
<p>(iii) how they were plugged; and</p>	<p>s47C</p>
<p>(iv) the kind of cement that was used to plug them; and</p>	<p>s47C</p>
<p>(v) other aspects of the nature of the wells.</p>	<p>s47C</p>
<p>(5) Any other geological information that may be relevant to the long-term safe and secure storage of the greenhouse gas substance, including information that relates to an area outside the permit area, lease area or licence area.</p>	<p>s47C</p>

s47C



**THE HON MADELEINE KING MP
MINISTER FOR RESOURCES
MINISTER FOR NORTHERN AUSTRALIA**

MSXX-XXXX

s22

ghg@nopta.gov.au

Dear s22

RE: APPLICATION FOR A DECLARATION OF IDENTIFIED GREENHOUSE GAS STORAGE FORMATION – GREENHOUSE GAS ASSESSMENT PERMIT G-8-AP (CALLIANCE STORAGE FORMATION)

I refer to the application validly submitted on 20 July 2023 under section 312 of the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (the OPGGS Act), for the declaration of an identified greenhouse gas (GHG) storage formation in respect of the Calliance storage formation within Greenhouse Gas Assessment Permit G-8-AP.

s47C

A copy of the declaration is enclosed for your records. A copy will also be published in the Commonwealth Government Gazette. The particulars of the declaration will also be made available on the Register of Identified Greenhouse Gas Storage Formations on NOPTA's website.

Should you have any queries regarding the content of these documents, please contact s22
s22 on s22 or ghg@nopta.gov.au.

Yours sincerely

Madeleine King MP

/ /2024

Enc. Instrument - Declaration of Identified GHG Storage Formation

COMMONWEALTH OF AUSTRALIA

Section 312 *Offshore Petroleum and Greenhouse Gas Storage Act 2006*

DECLARATION OF IDENTIFIED GREENHOUSE GAS STORAGE FORMATION

I, **HON MADELEINE KING MP**, the responsible Commonwealth Minister, hereby declare the following blocks to be an identified greenhouse gas storage formation.

INTERPRETATION

In this document, “the Act” means the *Offshore Petroleum and Greenhouse Gas Storage Act 2006*, and includes any Act with which that Act is incorporated, and words used in this document have the same respective meanings as in the Act.

DESCRIPTION OF BLOCKS

The reference hereunder is to the name of the map sheet of the 1:1,000,000 series prepared and established for the purposes of the Act and to numbers of the graticular sections shown thereon.

Formation Name	Calliance		
Map Sheet	SD51 (Brunswick Bay)		
Block Nos.			
2106	2107	2108	2178
2179	2180	2181	2250
2251	2252	2253	2322
2323	2324		

Assessed to contain 14 blocks (Map at **Attachment 1**).

ESTIMATE OF SPATIAL EXTENT

The estimated lateral spatial extent for the Calliance Storage Formation is within the blocks described in the Table above. The vertical spatial extent of the Calliance Storage Formation is between the J10.0 and K50.0 horizons. This encompasses the Plover and Lower Vulcan, in addition to the Upper Vulcan, Echuca Shoals and Jamieson formations.

FUNDAMENTAL SUITABILITY DETERMINANTS

The fundamental suitability determinants of Calliance formation are:

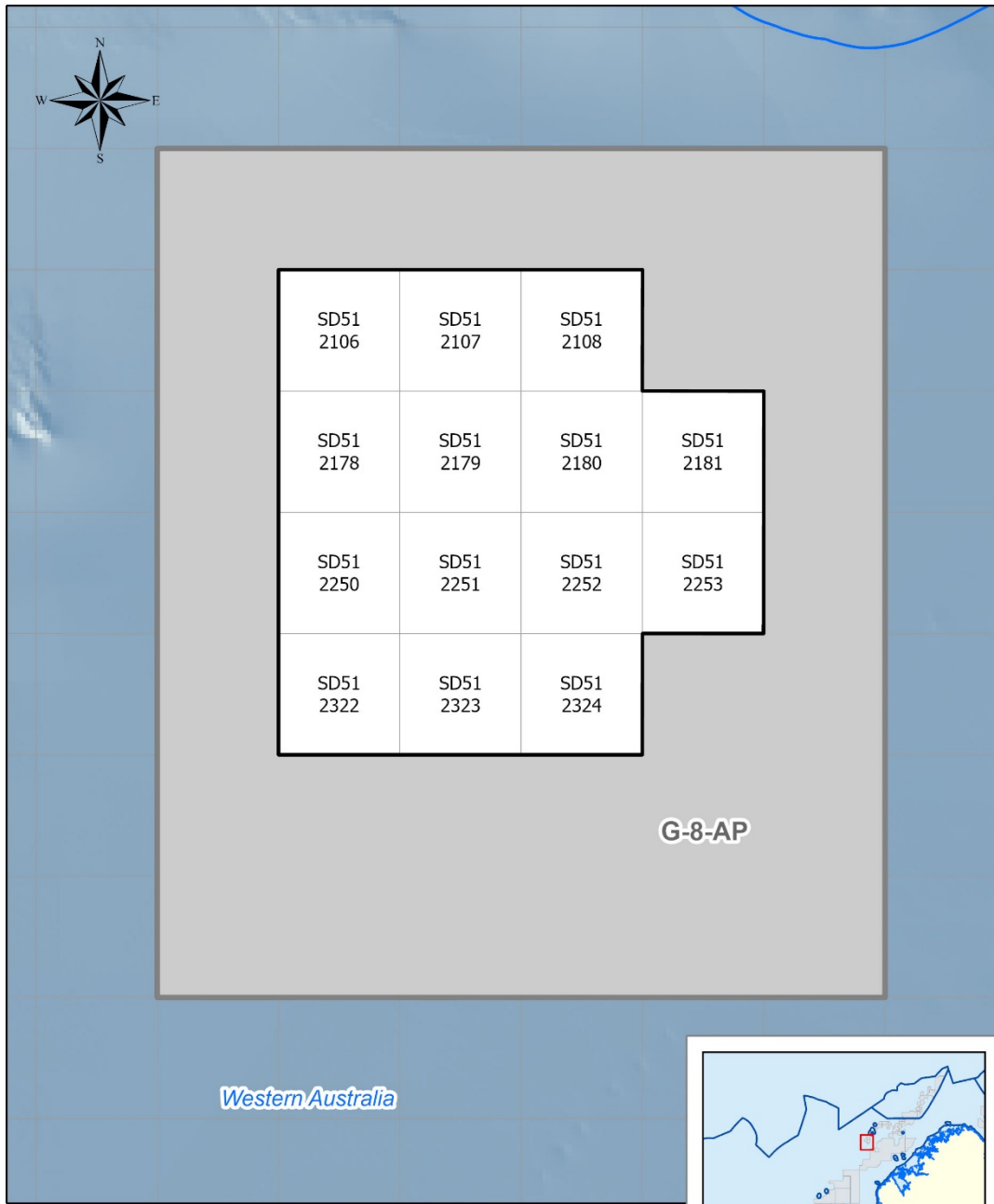
Subsection 21(8)(a)	The amount of GHG substance that is suitable to store	Maximum storage amount of 145 Mt
Subsection 21(8)(b)	The GHG substance that is suitable to store	97 mol% -100 mol% CO ₂
Subsection 21(8)(c)	The injection point or points	Primary injection site: 3-5 injection wells approximately 3 km from each other and 10 km south of the Calliance field. Contingent injection site: 1 injection well located approximately 5 km northeast of Calliance-1.
Subsection 21(8)(d)	The injection period	31 years
Subsection 21(8)(e)	If subsection 21(1)(b) is applicable, the engineering enhancements	N/A
Subsection 21(8)(f)	The effective sealing feature, attribute or mechanism of the storage formation that enables permanent storage	Combination saline aquifer-structural trapping below the J50.0 to K50.0 deep-marine mudstone seal.

Dated this date day of Month Year

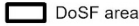

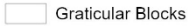
Made under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006*
of the Commonwealth of Australia

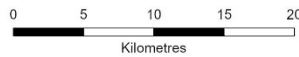
HON MADELEINE KING MP
MINISTER FOR RESOURCES AND NORTHERN AUSTRALIA

ATTACHMENT 1



Attachment 1 Declaration of Identified Storage Formation (G-8-AP)

-  DoSF area
-  G-8-AP
-  Graticular Blocks

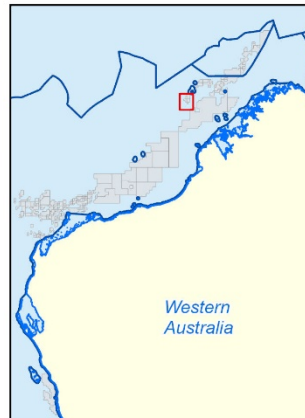


1:400,000 at A4

The displayed boundary is defined by the following datasets
 - AMB2014 (Coastal Water Boundary),
 - APB2019 (Australian Petroleum Blocks, 5' x 5').
 Data source: Geoscience Australia



Australian Government
National Offshore Petroleum
Tides Administrator



ATTACHMENT E

SUMMARY OF NOPTA’S ADVICE AND ASSESSMENT REPORT

Greenhouse Gas Assessment Permit G-8-AP (G-8-AP) was granted over GHG21-3 to Woodside Energy Ltd (Woodside) on 12 August 2022 as part of the 2021 GHG acreage release.

On 14 December 2022, Woodside submitted a notification of an eligible GHG storage formation within G-8-AP under section 451 of the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act). This notification, which is a legislative requirement for GHG assessment permittees, was acknowledged by the responsible Commonwealth Minister (RCM) on 16 February 2023. On 20 July 2023, Woodside applied to declare an identified GHG storage formation (DoSF) within G-8-AP under section 312 of the OPGGS Act.

In consultation with the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), the National Offshore Petroleum Titles Administrator (NOPTA) provided their assessment of the DoSF application on 23 February 2024. NOPTA assessed the applications against the OPGGS Act, the *Offshore Petroleum and Greenhouse Gas (Greenhouse Gas Injection and Storage) Regulations 2011* (GHG Regulations), and the *Offshore Greenhouse Gas Guideline for Declaration of Identified Greenhouse Gas Storage Formation* (the Guideline).

Summary of NOPTA’s recommendation

NOPTA, in consultation with NOPSEMA, considers that Calliance Storage Formation within G-8-AP satisfies the requirements of sections 21 and 312 of the OPGGS Act and that the application should be approved. NOPTA recommends the RCM declare Calliance as an identified GHG storage formation in accordance with subsection 312(11) of the OPGGS Act.

NOPTA is satisfied that application has met the criteria under section 312 of the OPGGS Act:

Application Requirements – s 312(3) and (4) of the OPGGS Act	NOPTA assessment
Reasons for believing that the part of a geological formation is an eligible GHG storage formation. Refer to s 21(1) of the OPGGS Act.	s/s47C
The FSD of the eligible GHG storage formation. Refer to s 21(8) of the OPGGS Act.	
An estimate of the spatial extent of the eligible GHG storage formation. Refer to s 21(3) of the OPGGS Act.	
Such other information (if any) as is specified in the regulations. Refer to regulation 2.1 of the GHG Regulations.	
An estimate of spatial extent must comply with such requirements as are specified in the regulations. Refer to schedule 1, Part 4 of the GHG Regulations.	

NOPTA agrees that the spatial extent of the Calliance Storage Formation is laterally confined to the title boundaries of G-8-AP, being graticular blocks 2106, 2107, 2108, 2178, 2179, 2180, 2181, 2250, 2251, 2252, 2253, 2322, 2323 and 2324 of Map Sheet SD51 (Brunswick Bay). NOPTA also agrees that the vertical extent of the Calliance Storage Formation is vertically confined between the Plover and Lower Vulcan formations.

NOPTA, in consultation with NOPSEMA, is satisfied that the application sets out the fundamental suitability determinants (FSD) as set out below:

OPGGGS Act	FSD	Details for Calliance Storage Formation
s 21(8)(a)	The amount of GHG substance that is suitable to store	Maximum storage amount of 145 Mt
s 21(8)(b)	The GHG substance that is suitable to store	97 – 100 mol% CO ₂
s 21(8)(c)	The injection point or points	<u>Primary injection site</u> : 3 – 5 injection wells approximately 3 km from each other and 10 km south of the Calliance field. <u>Contingent injection site</u> : 1 injection well located approximately 5 km northeast of Calliance-1.
s 21(8)(d)	The injection period	31 years.
s 21(8)(e)	If subsection 21(1)(b) is applicable, the engineering enhancements	N/A
s 21(8)(f)	The effective sealing feature, attribute or mechanism of the storage formation that enables permanent storage	Combination saline aquifer-structural trapping below the J50.0 to K50.0 deep-marine mudstone seal.

s47C

Application overview

Woodside’s Calliance storage formation will store CO₂ sourced from Browse LNG production over a 31-year period. G-8-AP overlaps four petroleum retention leases; all of which are operated by a Woodside led joint venture with Shell, MIMI, BP and PetroChina. The joint venture is known collectively as the Browse JV. The target gas fields for Browse LNG, Brecknock and Calliance, have high CO₂ ^{s47(1)(b)}

Overview of the Calliance storage formation

NOPTA ^{s47C}

Stratigraphy, structure, rock types, and depositional model of the storage formation

s47C

Identification of any faults in the storage formation and seal

s47C

Porosity and permeability of the storage formation reservoir and seal

s47C

Reactivity of rock types with the proposed GHG substance in both the reservoir and seal

s47C

Geomechanics (fracture gradients, fault stability and response of the formation to injection)

s47C

Fluid parameters of the storage formation

s47C

Seismicity, including the history of earthquake activity in the area

The applicant is considered to have consulted adequate sources of information and s47C

The conduct of previous exploration and production activity in the area

There is no history of production occurring within the G-8-AP area. The 14 graticular blocks of the DoSF application overlie the undeveloped Calliance gas field and part of the undeveloped Brecknock gas field. Extensive 3D surveys and data from 4 wells drilled in the Calliance and Brecknock structures are considered to provide a highly suitable dataset to understand GHG storage capacity within the area.

The existence of abandoned wells and any available relevant information on their nature

The DoSF application area contains the following wells on the Calliance structure: Brecknock South-1 (2000), Calliance-1 (2005), Calliance-2 (2007) Calliance-3 (2008); as well as Brecknock-2 on the Brecknock structure.

s47(1)(b)

s47C

Fundamental suitability determinants of the eligible storage formation

The titleholders have adequately described the Calliance FSD, meeting the requirements of subsections 21(1) and 21(8), paragraph 312(3)(b)(i) OPGGS Act, and Part 2 of the GHG Regulations, as listed under Schedule 1, Part 3 (engineering enhancements).

The particular amount to be stored

s47(1)(b) _____
| s47C |

s47(1)(b)

The particular GHG substance to be stored

s47C

The titleholders indicate the GHG substance will be primarily 97-100% CO₂ (dry mol% s47(1)(b)]

NOPTA considers that the GHG substance composition provided by the titleholders is adequate for the purposes of a DoSF application, and that a GHG project should aim for a high CO₂ content as per section 7 of the OPGGS Act.

The particular point or points of injection

NOPTA considers that the proposed primary and contingent injection sites are adequate, are based on a detailed geological understanding and are supported by dynamic modelling studies.

The particular period over which injection will take place

The expected CO₂ injection period is approximately 31 year s47(1)(b)

Any applicable engineering enhancements

There are no proposed engineering enhancements given the physical properties of the storage formation s47(1)(b)

s47C

s47(1)(b)

s47C

s47C

s47C

s47C

Effective sealing feature that enables permanent storage

The extensive sediments of the Echuca Shoals and Jamieson formations, which is the structural hydrocarbon trap and sealing mechanism, have retained gas for millions of years. This structure prevents the migration of fluids and enables the permanent storage of CO₂ as it is of low porosity and very low permeability.

s47C

Spatial extent of the storage formation

The titleholders have provided a reasonable estimate of the spatial extent of the Calliance storage formation. The titleholders modelling demonstrates the lateral and vertical extent of the formation meeting the requirements of subsections 21(3), 312(3), (4) and (11), and paragraph 312(11)(b)(ii) of the OPGGS Act, and Part 2 of the GHG Regulations, as listed under Schedule 1, Part 2 and Part 4. Modelling suggests the spatial extent will be entirely contained within G-8-AP.

Plume migration and predictions

CO₂ is to be injected down-dip i.e., deeper in the formation, with the CO₂ plume expected to migrate upwards the crest of the field until reaching the sediment sealing mechanism.^{s47C}