Otway Offshore Project
2020-2023 Program

beach

Beach Energy is continuing development of the Otway offshore basin natural gas reserves within existing Commonwealth offshore exploration permits and production licenses.

The Otway Offshore Project will ensure ongoing production at the Otway Gas Plant, which supplies natural gas to the Australian east coast gas market. Activities will occur in Commonwealth waters 32 to 80 km from Port Campbell.

Activities will run over several phases, starting with assessing seabed locations and existing infrastructure, drilling exploration and production wells and installing additional seabed infrastructure to tie-in new wells to the existing offshore platform and pipeline.

Seabed Assessments

- Assessed seabed and subsea for anchoring and drilling rig placement
- Inspected existing infrastructure
- Surveyed well and flowline locations

October 2019 to February 2020

Exploration and Production wells

- 18 to 24 month program
- One exploration well completed March 2021
- Further exploration well to be drilled
- 6 production wells to be drilled and connected

February 2021 to December 2022

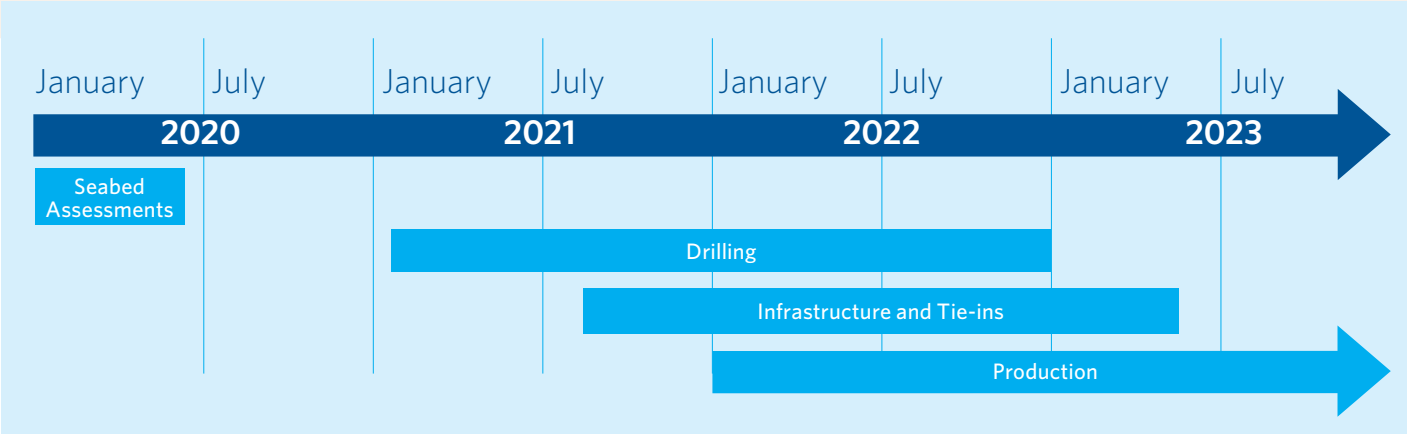
Seabed infrastructure to connect wells

- Installation using a construction support vessel and Remote Operated Vehicles
- Production flowlines to connect wells to existing pipeline
- Cables and controls for remote monitoring and control of wells
- Final commissioning of wells

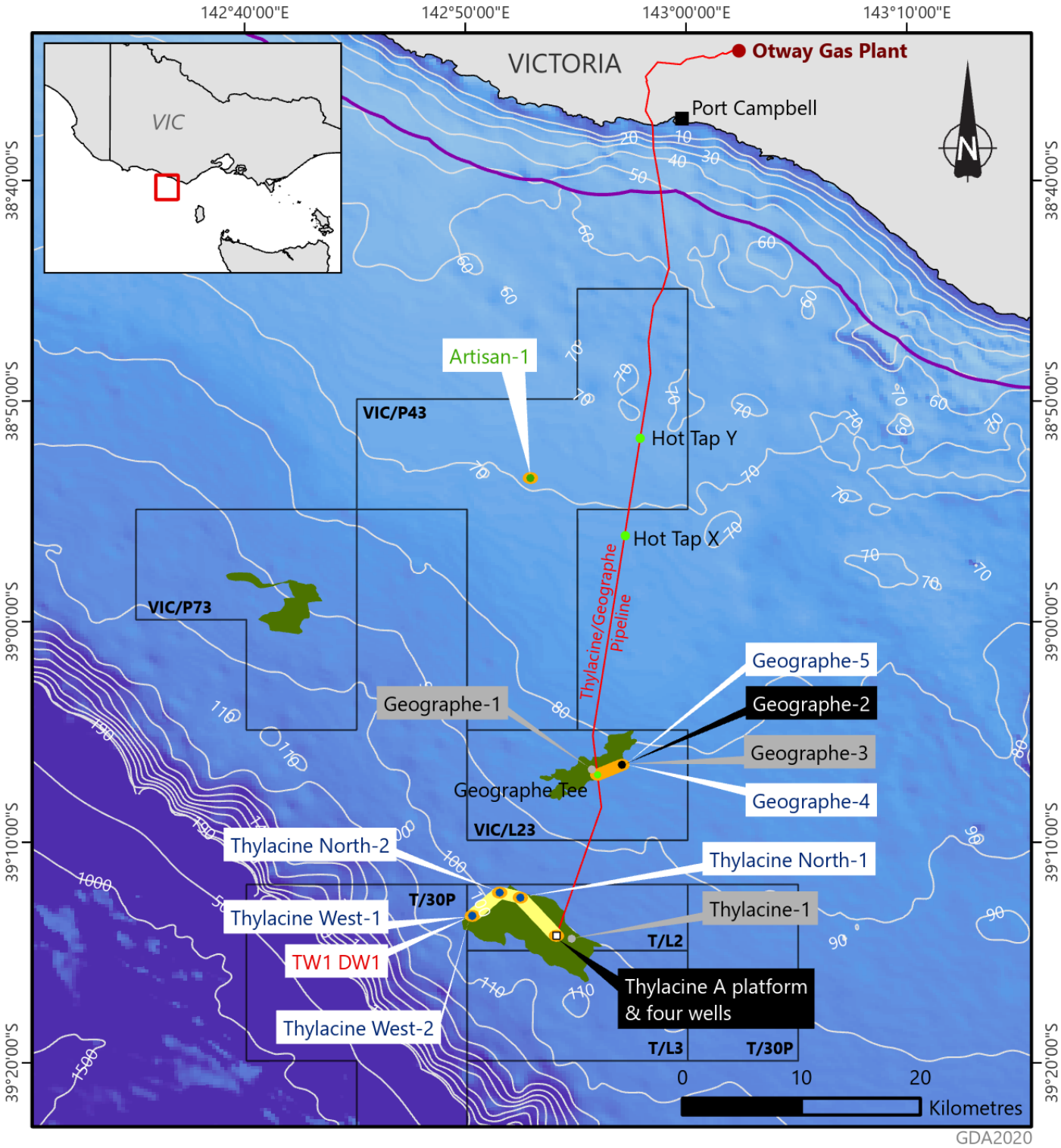
August 2021 to June 2023

Project timing

The timeline shows activities over several phases, with indicative timeframes which may vary over the life of the project.



Location Map



- Existing production wells
- Suspended wells
- Exploration well
- New production wells
- Future production well
- Hot tap tees
- Thylacine platform
- Existing gas pipeline
- Beach permits
- Coastal waters (3nm limit)
- Gas fields
- Existing PSZ (6.50 Km^2)
- Planned PSZ (5.65 Km^2)

This map shows proposed locations which may be subject to change.

Otway Offshore Background

The unique geological characteristics of the Otway Basin mean it is an abundant source of natural gas which has been produced in the region for many years.

The Otway Offshore Project commenced in 2004 by Woodside Petroleum Ltd under a joint venture arrangement. First gas was produced by Woodside in mid-2007, then in March 2010, Origin Energy Resources Ltd commenced operatorship of the joint venture. In January 2018, Beach Energy (Beach) acquired the Otway Offshore Project assets and is now the operator.

Three development phases have been completed:

- Construction of the Otway Gas Plant
- Construction of the Thylacine offshore platform, subsea and seabed infrastructure
- Exploration and the development of current wells.

A seabed pipeline was constructed from the offshore wells, crossing the shore near Port Campbell, then buried in the onshore section to the Otway Gas Plant.

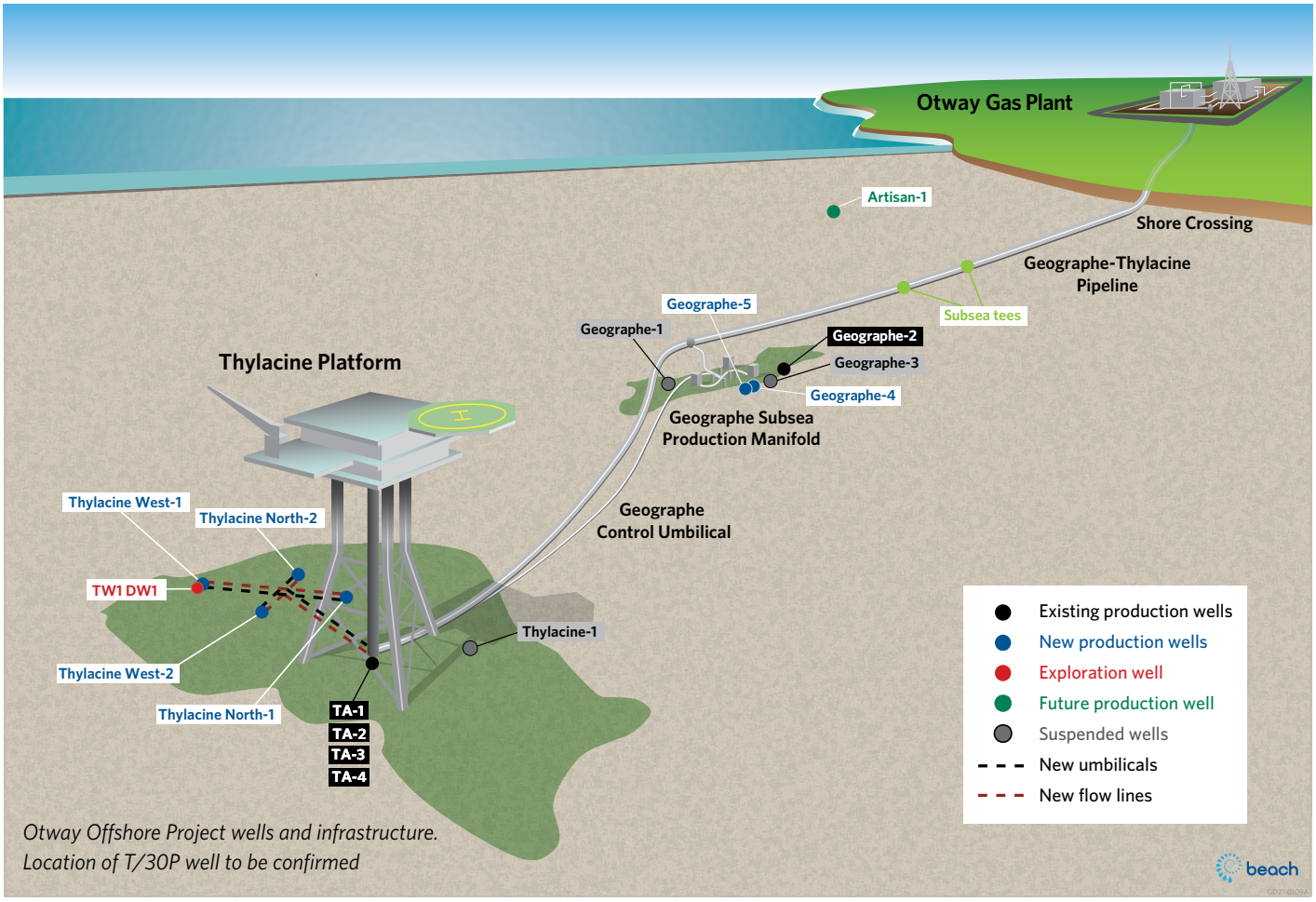
Future development

To maintain natural gas production at the Otway Gas Plant that supplies the Australian gas market, further phases to develop additional offshore wells are being undertaken.

Beach holds offshore exploration permits and is required to complete exploration activities within timeframes set by the commonwealth National Offshore Permit Titles Administrator (NOPTA). The Artisan-1 exploration well in Exploration Permit Vic/P43 was drilled in March 2021 and is suspended until it will be developed as a production well. Beach is also proposing to drill a future exploration well (TW1 DW1) to appraise the adjoining T/30P Exploration Permit.

Consultation and feedback

This information sheet provides an overview of activities, the regulatory framework for safety and environment protection, potential impacts and risks in carrying out these activities, and measures to reduce and manage them in accordance with Commonwealth regulations. It has been prepared to inform stakeholders, invite feedback and seek consultation with stakeholders who may be affected by the activities.



Otway Offshore Project wells and infrastructure. Location of T/30P well to be confirmed

Environment Protection

Regulatory framework

Activities are regulated under the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act) which requires an Environment Plan (EP) for each activity type. Environment Plans are assessed by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) who regulates activities under the OPGGS Act.

Environment Plans include a description of the existing environment and the proposed activity, an evaluation of the impacts and risks associated with the activities, environmental performance outcomes and associated control measures, implementation strategy, and reporting requirements. In each Environment Plan, Beach must demonstrate how it will conduct the activities to ensure that potential impacts and any residual risks are reduced to "As Low As Reasonably Practicable" (ALARP) and are of an acceptable level.

In developing the Environment Plans, relevant up-to date technical and scientific studies will be taken into consideration, along with stakeholder feedback.

Existing Environment Plans

Existing Environment Plans can be viewed at:

info.nopsema.gov.au/activities/11/show_public

info.nopsema.gov.au/activities/390/show_public

info.nopsema.gov.au/environment_plans/532/show_public

Further Environment Plans

Over the course of the Otway Offshore Project, additional Environment Plans will be developed, and a current operational Environment Plan will be revised for the different activities. Environment Plans currently under review or development are set out below:

- Environment Plan for the installation and commissioning of the equipment connecting the Geographe-4 and Geographe-5 production wells to the existing subsea pipeline
- Revision of the existing Otway Offshore Operations Environment Plan to include operation of the new Geographe-4 and Geographe-5 production wells
- Environment Plan for drilling the TW1 DW1 exploration well, drilled from the TW-1 well tophole, to appraise the T/30P Exploration Permit area
- Environment Plan for the pre-installation of a module at the seabed that will enable connection of the new Thylacine production wells by a Remote Operated Vehicle (ROV)
- Environment Plan for the subsea installation and commissioning the new Thylacine production wells
- Further revision of the existing Otway Offshore Operations Environment Plan to include operation of the new Thylacine production wells.

Throughout the Otway Offshore Project, updates will be provided for any new activities and Environment Plans that may be required for those activities.

Oil pollution emergency plan

An Environment Plan must also include an Oil Pollution Emergency Plan (OPEP) for managing any hydrocarbon release.

When conducting offshore activities, there is an unlikely risk of release of hydrocarbons (which are primarily gas) or a spill from vessels in the event of an accident. Beach has amended its existing OPEP to ensure it includes potential risks associated with the proposed activities. The OPEP forms part of an Environment Plan required to be accepted by NOPSEMA for each activity.

Preparing an OPEP involves using hydrocarbon release modelling information for the local area based on the most conservative credible case scenario. Modelling calculates the transport, spreading, entrainment and evaporation over time, of released hydrocarbons. This uses data on the prevailing metocean conditions (wind, wave and climate), the volume released and the physical and chemical properties of the hydrocarbons. The plans also assess the likelihood and consequences of any hydrocarbon release which must be reduced to ALARP through a range of control measures and must include detailed response plans.

An OPEP describes the arrangements for responding to and monitoring any release of hydrocarbon, including:

- 24/7 on-call team for rapid response clean-up actions including mobilising of personnel and equipment
- 24/7 on-call team for modelling and monitoring of a hydrocarbon release to inform response activities, and monitoring response effectiveness
- Control measures necessary for ensuring rapid response and ongoing maintenance of capabilities (personnel and equipment)

These arrangements are based on the worse case event associated with the proposed activities to ensure that Beach has the appropriate level of response arrangements and capability.

Marine environment

Beach recognises the environmental, heritage, social and economic values in the areas in which we operate.

The activities will be conducted in water depths ranging from 60 to 500 metres where there is a variety of marine fauna including the presence of:

- Blue, humpback and fin whales, particularly during the summer months
- Southern right and minke whales, particularly during the winter months
- Common dolphins and sharks species throughout the year
- New Zealand and Australian fur seals throughout the year
- Loggerhead, green turtle and leatherback turtles throughout the year
- Commonwealth managed fisheries, including southern and eastern scalefish and shark; and southern squid jig fishery
- Victorian managed fisheries, including rock lobster and giant crab
- Commercial shipping activity.

The Australian Marine Parks, Apollo and Zeehan, and State Marine Protected Areas, Twelve Apostles Marine National Park and The Arches Marine Sanctuary, are outside the proposed activity areas at a minimum distance of 20 km.

Operating Safely

Maritime safety

At Beach, safety is our number one priority. The marine vessels and drilling rig contracted by Beach will operate in accordance with Australian Maritime Standards, regulated by the Australian Maritime Safety Authority (AMSA) and will have their specific safety cases reviewed and accepted by NOPSEMA. This includes adherence to the following protocols at sea:

- Notifications to AMSA will be issued by the vessel contractor and drilling rig operator before they mobilise to the permit areas, and before demobilisation
- Communication with other vessels and marine users will occur using standard maritime protocols
- Safe operating distances will be maintained around all vessels and the drilling rig at all times.

Exclusion zones

During drilling, all vessels are required to be abide by a 2 km radius cautionary zone around the drilling rig. The cautionary zone is to allow for anchors, mooring chains and wire to be placed within the operational area during the drilling program. Exact locations of mooring chains and anchors will be made available at commencement of drilling each well.

There will also be a temporary Petroleum Safety Zone (PSZ), which is a zone of 500 m around the drilling rig, for each well. The PSZ is a formal safety exclusion zone and will be communicated via a 'Notice to Mariners' by the Australian Hydrographic Office (AHO) outlining the exclusion zone and timeframe for the activities. PSZs for the wellheads installed on the ocean floor will remain in place after drilling. New PSZs will be created for seabed infrastructure required to connect the wellheads to the existing Thylacine pipeline and offshore platform. Existing and proposed PSZs are show on the map on page 2.

To avoid entanglement and safety risks, fishing nets, lines or pots should not be placed near seabed assessment areas or drilling exclusion zones. The temporary PSZs will be monitored by support vessels once the drilling rig is anchored into position.

Commercial fishing

The project activities will occur among commercial shipping routes and designated Commonwealth and State fisheries, which cover vast areas. The seabed assessments and drilling activities require access to relatively small areas for short periods of time.

We are committed to minimising the impact of our activities and will consult with commercial fishers on arrangements to ensure each other's operational plans are understood, helping to minimise any impacts to fishing activities and to the Otway Offshore Project.

Locations

All activities will take place in Commonwealth waters approximately 32 to 80 km from Port Campbell. The map on page two shows the locations of planned and proposed drilling activities.

Coordinates of all locations will be made available to relevant stakeholders after completion of planning, before activities commence and if there are any changes.

Project timings

The timeline on page one shows indicative timeframes of the different activities. Drilling of the Artisan well was completed in March 2021. The timings and locations for the Geographe and Thylacine wells are set out in the separate "Drilling locations and timings" information sheet at beachenergy.com.au/vic-otway-basin/ which will be updated as the project progresses.

Approximate durations of key activities are:

- Seabed assessments: 3 to 12 days each
- Drilling exploration wells: 18 to 55 days each
- Drilling production wells: 70 to 90 days each
- Installation and commissioning of the production wells: 30 to 50 days each.

After activities commence, exact timings will also depend on fair sea state conditions.

Regular updates

Potentially impacted stakeholders will be provided with specific locations and timings prior to the commencement of the activity and can opt-in to a SMS message service for updates, simply by phoning or emailing Beach to provide their contact details.

The Diamond Ocean Onyx drill rig.
Source: Diamond Offshore Drilling, 2018.

Seabed Assessments

Purpose

Seabed assessments involves mapping the topography of the seabed and any features immediately below the seabed, measuring water depth and temperature. These activities are carried out to:

- Identify possible hazards from man-made, natural and geological features which may compromise the positioning of a drilling rig
- Determine suitable locations for anchoring and drilling rig placement, and installing infrastructure to tie-in new wells to the existing platform or pipeline
- Inspect seabed infrastructure for future tie-ins.

Approach and equipment

A range of commonly used techniques and equipment are used depending on different marine environments. The survey vessel may use equipment, such as:

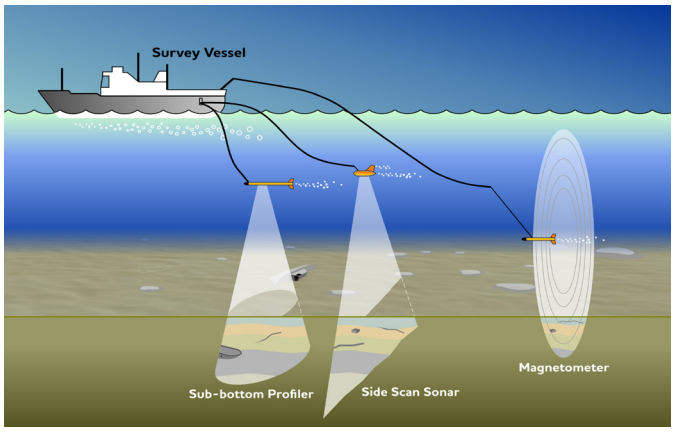
- Single-beam dual-frequency echo sounders, to measure water depths
- Motion-corrected multi-beam echo sounders, to conduct bathymetry mapping of water depths
- High-resolution side scan sonars for delineating seabed features
- Sub-bottom acoustic profilers used to acquire and assess features immediately below the seabed
- Marine magnetometer, to detect and map ferrous objects such as sunken ships, anchors and pipelines
- Seabed grab samples may be taken at the seabed
- Core samples may be taken as far as 6 m below the seabed to confirm if the seabed will be suitable for the drilling rig to anchor and the subsea infrastructure to be installed

Sound from the seabed site assessment equipment is significantly lower intensity than that produced from seismic surveys. An assessment of sound impacts on marine fauna is undertaken and included in Environment Plans for each project.

The diagram below shows a common setup for seabed site assessments.

Completed Seabed Assessments

In February 2020, Beach successfully completed the first phase of seabed assessment activities. Beach was planning further seabed assessments for the T/30P Exploration Permit. However, this will not be required as Beach will be drilling a side-track exploration well (TW1 DW1) from the Thylacine West-1 well location to appraise the T/30P Exploration Permit area.



Common site assessment equipment.
Source: Innderspace Exploration Team (Illustration only, not to scale)

Offshore Drilling

The program currently includes up to 8 wells to be drilled over approximately 18 to 24 months. Drilling commenced on 23 February 2021 with the Artisan-1 exploration well, which was completed on 19 March 2021. Six production wells and a further exploration well are expected to be completed by the end of December 2022.

Two different types of wells are proposed as part of the drilling program:

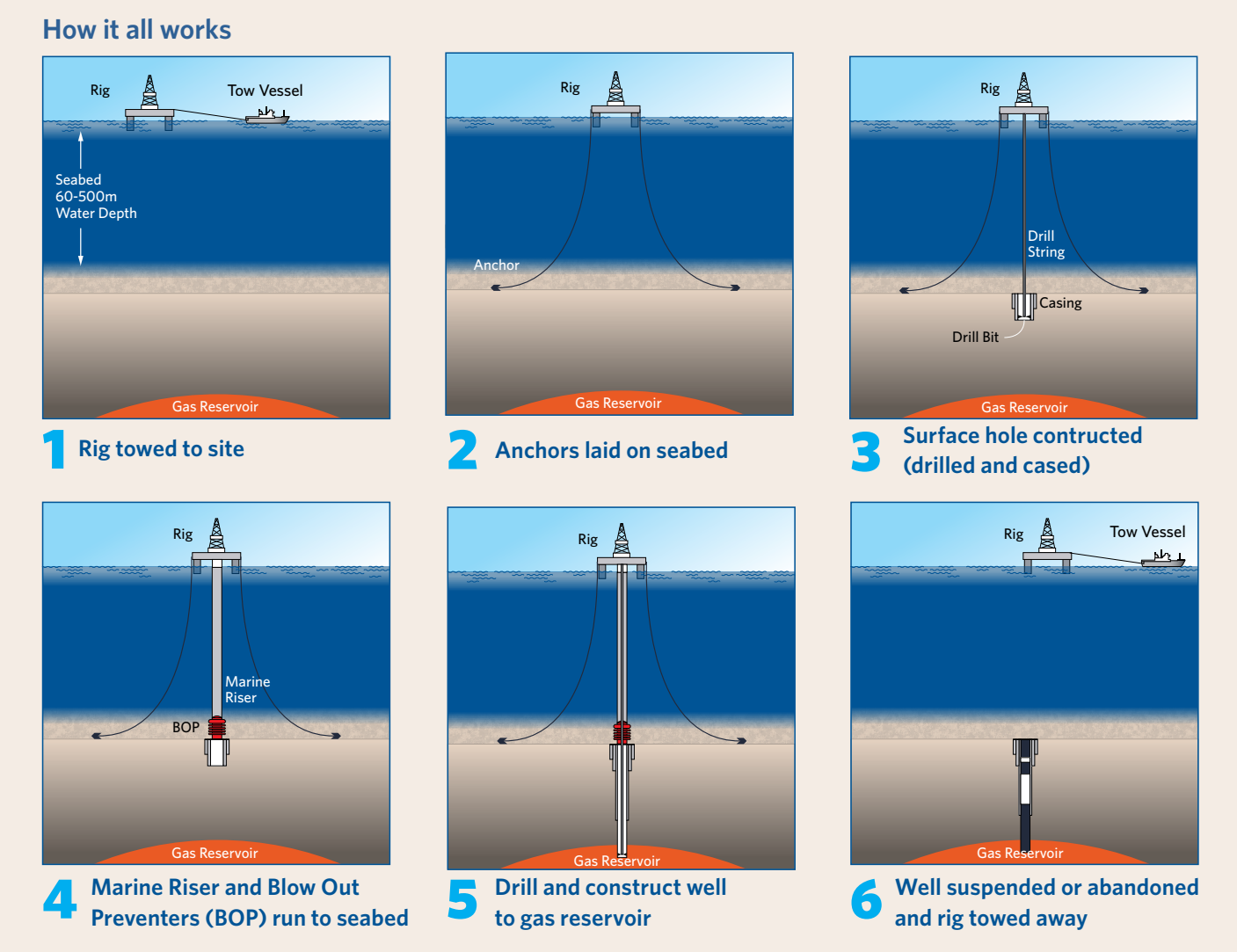
- **Exploration well**
  The first well drilled into a prospective gas reservoir to determine if hydrocarbons exist. This project will involve both vertical and side-track well types.
- **Production well**
  A well that has successfully reached a proven reserve and will be tied into seabed infrastructure to supply raw gas for processing.

Approach and equipment

Beach has contracted the Diamond Ocean Onyx semi-submersible drilling rig for the Otway Offshore project.

The approach to drilling is summarised in the following steps and shown in the diagram below:

- Using an approved shipping route, up to two tugs will tow the drilling rig into place
- Anchors will be pre-laid by specialist anchor handling vessels and the rig will be anchored at sites determined as suitable by the seabed assessments
- A surface hole will be drilled and cased, then a marine riser and Blow-out Preventer (BOP) installed
- The well will be drilled to reach the gas reservoir beneath the seabed either directly or via a side-track
- The rig will be moved from one well to the next, repeating the anchoring and drilling process
- After all wells are completed, the drilling rig will be towed to an agreed demobilisation point
- Production wells will be completed with a wellhead remaining above the seabed ready for connection to the existing pipeline
- Exploration wells may be suspended or formally abandoned.



An outline of the drilling process that will be used in the offshore Otway Basin drilling program

Drilling methodology

Beach is using a typical semi-submersible drilling rig (the *Ocean Onyx*) commonly used in Australian waters. It can operate in waters up to 3,000m deep, drill for gas at up to 10,000m deep and accommodate around 150 crew.

Once the drilling rig is in position and anchored at the well site, a surface hole will be drilled and cased, followed by installation of a marine riser and BOP. Weighing approximately 244 tonnes and measuring 14 m high, the BOP is a highly specialised valve unit used in all offshore drilling. The BOP is used to shut-in and seal off a well for planned operations such as pressure testing and in the event of a pressure build up or 'kick'. It ensures well integrity throughout the drilling process, ongoing safety of personnel and prevention of any environmental incidents.

The drilling process will use four or five stages of drilling, starting with a 36-inch drill head. Drilling will then reduce in diameter to consecutively smaller sizes until it reaches the end target depth. For each section, a casing (steel pipe) will be placed in the hole and cemented, then a smaller drill will be run through the casing to drill a smaller hole to the next target depth and the process repeated to reach the target.

Drilling muds

Offshore drilling operations typically use both water based, and synthetic based fluids called 'muds' to lubricate and stabilise the wellbores in each section and remove drilling cuttings. Drill cuttings are rock chips from the sedimentary layers that emerge from the drilling process and will range in size from very fine to coarse.

Water based mud will be used in the upper parts of the well to remove the cuttings. Water based muds are recycled as much as possible during the drilling process. Cuttings will not require any treatment and will be deposited onto the seabed.

Synthetic based mud will be used in the lower sections of the well and produces cuttings that will require treatment to recover the fluid from the cuttings. The cuttings will be processed on the drilling rig before they are discharged overboard, where they will settle rapidly on the seafloor around the well site. The cuttings will contain small levels of base fluid, which will quickly biodegrade. This is standard industry practice in Australia.

Marine mammals and fish may transit through these areas but will usually avoid the temporary disturbance. Any exposure to suspended sediment before it settles on the seabed will be highly localised and temporary due to high dilution and fast dispersal in the water column.

Production well completions

When the production wells have been completed they will be ready to connect to seabed infrastructure and the existing offshore to onshore pipeline.

Some seabed infrastructure for tying in the new wells is already in place and connected to the existing pipeline. Additional infrastructure for the new Geographe and Thylacine production wells will also be installed to tie-in to the existing pipeline.

New infrastructure will include:

- Integration module of approximately 14 m^2 placed on the seabed near the Thylacine A platform, to be installed and connected to the platform by divers for later connection to the Thylacine production wells
- Flowlines and various subsea connection modules to connect the production wells to the existing platform and pipeline
- Electrical and hydraulic controls within cables that enable remote monitoring and control of the production wells.

A construction support vessel using an ROV will install the equipment and commission the production wells after they are connected.

Exploration well completions

Successful exploration wells will be suspended for future access, by placing a standard wellhead of around one to two metres in height from the seabed. Positions of wellheads will be notified to the AHO and recorded on nautical charts.

If a well is commercially unviable due to limited gas prospectivity, multiple cement plugs will be installed within the well to permanently seal the well and isolate it from formations. A cement plug will be installed at the seabed and all casings will be cut at least 2 m below the mudline to ensure that the seabed is returned to the same condition prior to drilling. This process is called 'plug and abandon'.

The Thylacine platform in the offshore Otway Basin (showing drilling and tug boats in the background).

Questions and Answers

How long will drilling take and when will you start?

Each exploration well will take between 35 to 55 days and each production well, between 70 to 90 days. The entire drilling program will take around 18 to 24 months. Drilling commenced in mid-February 2021 and will continue to approximately the end of December 2022. Timings will depend on final project planning, regulatory approvals, and fair sea states.

How is the drilling rig secured?

Once the drilling rig has been towed to the well site, supported by an 'anchor handling vessel', the tug boats will run out eight anchoring lines which may extend to a kilometre. Specifically designed marine anchors, around 15 – 20 tonnes each, will be used to moor the drilling rig. Positioning of the anchors will be determined by a mooring analysis, based on the results of the seabed site assessment and year-round weather data for the area.

Will the drilling rig be visible from land?

The drilling rig at the Artisan well location was visible from some shore locations. However, given the distance from the shore of the other wells, the drilling rig and support vessels will have low visibility from onshore and may appear similar to other shipping activity. Gas flaring for approximately 2 to 4 days per well will be required for the production wells as part of the final testing and completions.

How many people will work on the drilling rig?

There will be up to 150 crew on the drilling rig at any one time. The crew will be transported to and from the rig via helicopter.

How is safety managed on the drilling rig?

At Beach, safety is our first priority. Offshore drilling activities are highly regulated to stringent safety standards. All drilling rig operations will be managed in accordance with the dedicated Safety Case for the drilling rig, to be accepted by the regulator NOPSEMA. For more information see: www.nopsema.gov.au/safety/safety-case/

How will you reduce collision risks?

The support vessels involved in the activities will operate in accordance with Australian maritime standards and ensure safe operations by:

- Having operational and navigation lighting on all vessels
- Maintaining a 24-hour shipping radar watch
- Monitoring and managing safety and exclusion zones.

What is a side-track well?

Beach is proposing to drill an exploration well (TW1 DW1) via a side-track from the Thylacine West-1 well, using a short section of drill pipe diverting from the original well. This common and proven method involves drilling two wells from the same top-hole on the seabed, diverting at a depth below the seabed surface. The TW1 DW1 side-track exploration well will enable appraisal of the nearby T30P Exploration Permit area. The well will then be plugged and abandoned and a further production well may be drilled in the future.

This method of drilling avoids a further relocation of the drilling rig and reduces time and impacts from re-anchoring. The side-track well will take approximately three weeks to drill and use the same method of drilling as described in the Offshore Drilling section above.

Will an exclusion zone exist?

The work will occur among commercial shipping routes and designated Commonwealth and State fisheries. There will be a 2 km radius cautionary zone around the drilling rig for avoidance of mooring chains and anchors. There will also be a PSZ, which is a safety exclusion zone of 500 m around the drilling rig for each well. Formal safety exclusion zones will be communicated via a 'Notice to Mariners' by the AHO. The PSZs will be monitored by support vessels once the drilling rig is anchored into position.

PSZs of 6.5 km^2 already exist for the Thylacine A Platform, existing wells and infrastructure. New PSZs of approximately 5.65 km^2 will be created for the new wellheads and seabed infrastructure required to connect the wellheads to the existing pipeline and offshore platform. Existing and proposed PSZs are show on the map on page 2.

What about impacts on commercial fishing?

The project is located within existing designated Commonwealth and State fisheries. Each fishery covers a vast area, whereas the drilling and installation activities require access to relatively small areas. In February 2020, Beach completed the seabed assessments. A small number of commercial fishers advised they may operate in the area and Beach provided regular updates on its operations to fishing associations during that activity. No issues arose and Beach will continue this approach.

Beach has a *Fair Ocean Access* procedure which sets out Beach's commitment to consultation, minimising impacts of its activities, the circumstances in which a fisher may claim compensation, the evidence required and the claim process.

What about rock lobsters?

Sound from the seabed site assessment equipment is significantly lower intensity than seismic surveys. Sound modelling for the project has identified that sound levels will not reach the impact levels referred to in the Day et al (2016) report[1] at the seafloor and therefore impacts on rock lobster are not predicted.

There will be minimal impact from drilling activities given the wells are usually on flat seabed and avoid typical rock lobster habitat.

Will the activities affect whales and dolphins?

Vessels within the permit area will move slowly. Each vessel will have a trained marine mammal observer whose specific task is to notify the vessel master of any whale or dolphin and advise them of suitable protocols to avoid potential impact. Avoidance of whales and dolphins will be undertaken in accordance with the Environment Protection and Biodiversity Conservation (EPBC) Regulations (2000), including adherence to required speed and distances. All whale sightings will be recorded along with the actions taken to avoid potential impacts.

Are seabed assessments the same as a seismic survey?

No, these activities are not the same as a seismic survey, which uses different technology to map the geology several kilometres below the seabed. The seabed site assessments only map the surface and immediately below the surface, using echo sounders, sonars and a sub-bottom profiler which operate at a much lower energy (intensity) and medium to higher frequency compared to those used in seismic surveys.

Will the drilling impact shipwrecks?

The drilling program will not impact any known shipwrecks. Prior to any drilling commencing, the completed seabed assessments ensure a detailed understanding of the marine environment of each well site. Any new information discovered from these assessments, such as the presence of shipwrecks, will be reported to relevant authorities.

What is ALARP?

ALARP stands for "As Low As Reasonably Practicable". It is an assessment principle commonly used in the oil and gas industry to assess and reduce potential impacts and risks that cannot be completely eliminated. For information on how NOPSEMA assesses ALARP see: www.nopsema.gov.au/about/our-regulatory-activities/

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1 Day, R.D., McCauley, R.M. Fitzgibbon, Q.P., Hartmann, K., Semmens, J.M., Institute for Marine and Antarctic Studies, 2016, Assessing the impact of marine seismic surveys on southeast Australian scallop and lobster fisheries, University of Tasmania, Hobart, October. CC BY 3.0.

Consultation and Feedback

Beach values stakeholder consultation and feedback, which is an important part of the process of preparing Environment Plans.

Beach invites consultation with stakeholders potentially affected by the project activities including those stakeholders with specific local knowledge or an interest in the environmental performance of this project. Feedback and consultation will inform the development of the Environment Plans.

If you are seeking further information about this project specific to your functions, interests or activities, or wish to provide feedback, please contact us.

Beach will consider all feedback, including any concerns or objections. Measures will be explored to reduce any impacts and risks, and responses will be provided to stakeholders.

Please be advised that all stakeholder feedback, records of consultation, copies of correspondence, including emails, will be communicated to NOPSEMA in the preparation of the Environment Plans as required by legislation.

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beachenergy.com.au/vic-otway-basin/