



Australian Government

Australian Antarctic Treaty Inspections December 2023

Report of Inspections under Article VII of the Antarctic Treaty and Article 14 of the Protocol on Environment Protection to the Antarctic Treaty

Dumont d'Urville Station (France)
Robert Guillard Station (France and Italy)
L'Astrolabe Vessel (France)



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1. Executive Summary

1.1. Overview of inspection activities

During the period 12 to 15 December 2023 a team of three Australian observers conducted inspections of one year-round Antarctic research station, one seasonal facility and one vessel, in accordance with the provisions of Article VII of the Antarctic Treaty and Article 14 of the Protocol on Environmental Protection to the Antarctic Treaty (Environmental Protocol):

- Dumont d'Urville station (France) – 12 to 15 December 2023
- Robert Guillard station (France and Italy) – 13 December 2023
- *L'Astrolabe* vessel (France) – 15 December 2023

Dumont d'Urville station had not been inspected since 1995 (United States) and *L'Astrolabe* and Robert Guillard station had not previously been inspected.

The inspection team was given full access to all areas of the facilities visited and the vessel, and observed a strong commitment to Antarctic research and environmental protection in all discussions and interactions with personnel.

In accordance with Article 14(4) of the Environmental Protocol, Australia provided copies of the report to France and Italy for comment. Comments received were considered and addressed as appropriate when finalising the report.

1.2. Inspection of Dumont d'Urville station (France)

Dumont d'Urville station is a long-standing, active and productive facility that supports a comprehensive program of scientific research activities in the Pointe Géologie Archipelago and serves as an important logistics hub for French and international research and operations deep into the interior of the Antarctic continent. The inspection team visited all parts of the main station area on Petrel Island and Lion Island, and observed the facilities to be operating in full compliance with the Antarctic Treaty.

The inspection team also observed a high level of compliance with the Environmental Protocol and noted that, like other ageing Antarctic facilities, there are opportunities to enhance some aspects of the station's environmental management, primarily related to waste water management and energy production. These issues have been acknowledged and are the subject of underway or planned initiatives, including a major station modernisation process. Renewing the station will require overcoming a range of practical challenges including the limited accessible ice-free terrain on Petrel Island, the presence of wildlife colonies throughout and surrounding the facilities and station operational areas, and the importance of maintaining long-term research and monitoring locations and datasets. Further efforts to manage the risk of introducing non-native species and disease, including Highly Pathogenic Avian Influenza (HPAI), will also be important given the close proximity and environmental and scientific significance of the wildlife colonies.

Following the inspection of Dumont d'Urville station, the Australian inspection team recommends that France:

1. Proceeds with and prioritises planned efforts to enhance aspects of the environmental management of Dumont d'Urville station and associated operations, including:
 - installation of waste water treatment facilities, noting in particular the potential risks of untreated effluent for wildlife colonies on and surrounding Petrel Island
 - provision of biosecurity cleaning kits on board *L'Astrolabe* to minimise the risk of introducing non-native species and disease (including HPAI) to the biodiversity hotspot represented by the Dumont d'Urville area of operations
 - developing and implementing a plan to minimise the risks to wildlife and human health associated with a potential future outbreak of at Dumont d'Urville associated with potential outbreak HPAI
 - developing and implementing procedures and practical capacity for responding to fuel and oil spills in the terrestrial or marine environment at Dumont d'Urville station
 - investigating options to modernise the energy system at Dumont d'Urville including utilising renewable energy sources
 - removing from Antarctica disused structures and equipment, and stockpiled waste materials.
2. Investigates and applies appropriate south-bound pre-departure biosecurity measures, including cleaning and inspecting cargo and expeditioner clothing and baggage to minimise the risk of introducing non-native species and disease.
3. Ensures that relevant information routinely collected in the course of the administration of Dumont d'Urville is shared with other Parties via the Antarctic Treaty Secretariat Electronic Information Exchange System, in accordance with reporting requirements under the Antarctic Treaty and Environmental Protocol (e.g. science activities, military personnel, taking or harmful interference with fauna and flora, protected area entries, waste management plans).

1.3. Inspection of Robert Guillard station (France and Italy)

Robert Guillard station is a compact and functional facility that plays a significant role in supporting research and logistical activities at Concordia station and on inland traverses, as well as some local research in the vicinity of Cap Prud'homme and the Astrolabe Glacier. The inspection team visited the main station and the nearby inland traverse staging area, and observed the facilities to be operating in compliance with the Antarctic Treaty and Environmental Protocol. Like at Dumont d'Urville station, the inspection team noted opportunities to develop and apply documented procedures to manage the risk of non-native species and disease introduction, and to respond to fuel and oil spills. The team heard about the increasing demand for access to the facility to support science in the local area and noted the challenges to construction and expansion that would be presented by the limited ice-free area, challenging topography and presence of breeding Adélie penguins throughout the area.

Following the inspection of Robert Guillard station, the Australian inspection team recommends that France and Italy:

1. Collaborate to extend the application and implementation to Robert Guillard station of the biosecurity and spill response plans recommended for Dumont d'Urville station.

1.4. Inspection of *L'Astrolabe* vessel (France)

L'Astrolabe is a modern, purpose-built vessel that primarily provides logistics support for the French Antarctic Program (and French-Italian activities at Concordia), and also serves as a platform for some marine research. The inspection team was accommodated on board *L'Astrolabe* during a round-trip voyage from Hobart to Dumont d'Urville station, and undertook formal inspection activities during a defined period during the resupply of Dumont d'Urville station. The team observed the vessel to be operated by a professional and well-trained crew from the French Navy, in compliance with the Antarctic Treaty and Environmental Protocol. The inspection team noted opportunities to better utilise and expand the scientific capabilities of the ship to serve a growing demand for in-transit marine research, and to enhance the efficiency of resupply operations at Lion Island through a planned review and upgrade of maritime infrastructure.

Following the inspection of *L'Astrolabe*, the Australian inspection team recommends that France:

1. Within the practical constraints of the vessel's primary logistics support role, considers whether there are opportunities to utilise the existing capabilities of *L'Astrolabe* to support further marine scientific research.
2. Reviews the presence of a non-native plant carried on board *L'Astrolabe* within the Antarctic Treaty area for compliance with French legislation, in light of requirements of Annex II, Article 4.

2. Introduction

2.1. Background

The Antarctic Treaty and Environmental Protocol provide for Antarctic Treaty Consultative Parties to designate observers to undertake inspections of other Parties' facilities and assets in Antarctica, to promote the objectives of the agreements and observe compliance.

Observers designated under Article VII of the Antarctic Treaty have complete freedom of access at any time to any area of Antarctica to conduct inspections, including all stations, installations and equipment, and all ships and aircraft at points of discharging or embarking cargoes or personnel. Aerial observation may also be carried out at any time over any area of Antarctica. Article 14 of the Environmental Protocol provides that inspections can also consider all matters covered by the Protocol.

Inspection rights are broad, covering all provisions of the Antarctic Treaty and Environmental Protocol. However, inspections normally concentrate on key provisions relating to peaceful use and non-militarisation, environmental protection, cooperation in science, freedom of access for scientific research, and compliance with prohibitions on mineral resource activities, military activities, nuclear explosions, and disposal of radioactive waste. Inspections also serve to highlight examples of best practice, support opportunities for international cooperation, and promote key activities and achievements of the inspected Party.

Inspection reports are shared with the inspected Party for comment, and are then circulated to all Parties, considered by the Antarctic Treaty Consultative Meeting (ATCM) and Committee for Environmental Protection (CEP), and made publicly available.

Over the life of the Antarctic Treaty the inspection provisions have been exercised regularly and by many Parties. Most stations have been inspected, although some remote or difficult to access facilities, and newer facilities, have never been inspected, or have not been inspected since the entry into force of the Environmental Protocol. The Antarctic Treaty Secretariat (ATS) maintains an Inspections Database:

<https://www.ats.aq/devAS/Ats/InspectionsDatabase>.

Australia has a long history of undertaking inspections, dating back to the early 1960s, and is one of the most active nations in conducting inspections. Australia most recently conducted inspections in early 2020. The *Australian Antarctic Strategy and 20 Year Action Plan – 2022 Update* includes a commitment to undertake further inspections.

Australia and France agreed to undertake a program of reciprocal inspections during the 2023-24 season, involving an Australian inspection at France's Dumont d'Urville station in December 2023 and a French inspection at Australia's Casey station in February 2024. All operational support for each inspection team was provided by the National Antarctic Program of the other Party, but inspections were conducted independently and impartially. To this end, draft inspection reports were only shared between Australia and France following the conclusion of both inspections.

2.2. Inspection team composition and itinerary

During the period 12 to 15 December 2023 a team of three Australian observers conducted inspections of one year-round Antarctic research station, one seasonal facility and one vessel,

in accordance with the provisions of Article VII of the Antarctic Treaty and Article 14 of the Protocol on Environmental Protection to the Antarctic Treaty (Environmental Protocol):

- Dumont d'Urville station (France) – 12 to 15 December 2023
- Robert Guillard station (France and Italy) – 13 December 2023
- *L'Astrolabe* vessel (France) – 15 December 2023

Dumont d'Urville station had not been inspected since 1995 (United States) and *L'Astrolabe* and Robert Guillard station had not previously been inspected.

The Australian inspection team comprised:

- Mr Ewan McIvor, Senior Environmental Policy Advisor / Acting Manager International Section, Policy and Strategy Branch, Australian Antarctic Division (AAD), Department of Climate Change, Energy, the Environment and Water (DCCEEW).
- Ms Rhonda Bartley, Manager, Science Planning and Coordination, AAD, DCCEEW
- Mr Russell Miles, Director, International Antarctic Policy and Law Section, International Law Branch, Legal Division, Department of Foreign Affairs and Trade



Figure 1. Australian inspection team at Dumont d'Urville station

In accordance with Article VII of the Treaty, and consistent with ATCM Decision 2 (2019), Australia notified all Antarctic Treaty Consultative Parties of the designation of observers, via ATS Circular 27/2023 (29 November 2023).

The activities of the inspection team in Antarctica were subject to prior environmental impact assessment, and an authorisation issued in accordance with sections 12E and 12F of Australia's *Antarctic Treaty (Environment Protection) Act 1980*, which implements the obligations of the Environmental Protocol in Australia's domestic law.

The French Antarctic Program kindly provided all operational support for the inspection activities. The inspection team travelled to Antarctica on voyage R1 of *L’Astrolabe*, utilising berths available to the Australian Antarctic Program under the 2023-24 *quid pro quo* logistics sharing agreement between the Australian Antarctic Division (AAD) and the French Polar Institute Paul-Emile Victor (IPEV).

L’Astrolabe departed Hobart, Tasmania, Australia on 6 December 2023, arrived at Dumont d’Urville station on 12 December 2023, and departed on 16 December before returning to Hobart on 22 December 2023. The Australian inspection team was accommodated on board *L’Astrolabe* for the duration of the activity, with shore visits to observe facilities in the vicinity of Dumont d’Urville station.

2.3. Preparation for the inspection

In preparation for the inspection, the Australian inspection team reviewed information about Dumont d’Urville and Robert Guillard stations and *L’Astrolabe* available from various sources, including the ATS Electronic Information Exchange System, the Council of Managers of National Antarctic Programs (COMNAP) database and Antarctic Station Catalogue, and the IPEV website.

Shortly before departure from Hobart, France provided the inspection team with a completed copy of *Antarctic Treaty Inspection Checklist A – Antarctic stations and subsidiary installations*, containing information about Dumont d’Urville and Robert Guillard stations. Electronic copies of supporting documents referenced in the completed checklist were made available to the inspection team during the visit to Dumont d’Urville station.

The inspection team’s activities involved direct observations of activities, facilities and the vessel, and discussions with station and vessel personnel. By prior mutual agreement, and with appreciation, the inspection team communicated with French Antarctic Program personnel in English.

2.4. Provision of the report to France and Italy for comment

In accordance with Article 14(4) of the Environmental Protocol, Australia provided copies of the report to France and Italy for comment. Comments received were considered and addressed as appropriate when finalising the report.

2.5. Acknowledgements

Australia expresses its sincere thanks to France for the collaborative approach to undertaking reciprocal inspections during the 2023-24 season, including for the operational support generously provided by the French Antarctic Program. The inspection team also thanks the crew of *L’Astrolabe* and the personnel at Dumont d’Urville and Robert Guillard stations for their warm reception, professionalism and valued assistance.

3. Dumont d'Urville station (France): 12-15 December 2023



Figure 2. Aerial view of Dumont d'Urville station

3.1. Summary

Dumont d'Urville station is a long-standing, active and productive facility that supports a comprehensive program of scientific research activities in the Pointe Géologie Archipelago, and serves as an important logistics hub for French and international research and operations deep into the interior of the Antarctic continent. The inspection team visited all parts of the main station area on Petrel Island and Lion Island, and observed the facilities to be operating in full compliance with the Antarctic Treaty.

The inspection team also observed a high level of compliance with the Environmental Protocol and noted that, like other ageing Antarctic facilities, there are opportunities to enhance some aspects of the station's environmental management, primarily related to waste water management and energy production. These issues have been acknowledged and are the subject of underway or planned initiatives, including a major station modernisation process. Renewing the station will require overcoming a range of practical challenges including the limited accessible ice-free terrain on Petrel Island, the presence of wildlife colonies throughout and surrounding the facilities and station operational areas, and the importance of maintaining long-term research and monitoring locations and datasets. Further efforts to manage the risk of introducing non-native species and disease, including Highly Pathogenic Avian Influenza (HPAI), will also be important given the close proximity and environmental and scientific significance of the wildlife colonies.

3.2. General information

Dumont d'Urville station is located on Petrel Island in the Pointe Géologie Archipelago, Adélie Land (66°39'77.0"S 140°0'08.0"E) (see Figures 2 – 4). Following the establishment on the island in 1952 of the temporary observation facility, Base Marret, which is now designated as HSM 47, Dumont d'Urville station was opened in 1956 to support French involvement in the 1957-58 International Geophysical Year. In 1959 the French Government decided to continue to support scientific research at the location and to expand and operate the station on a year-round basis.

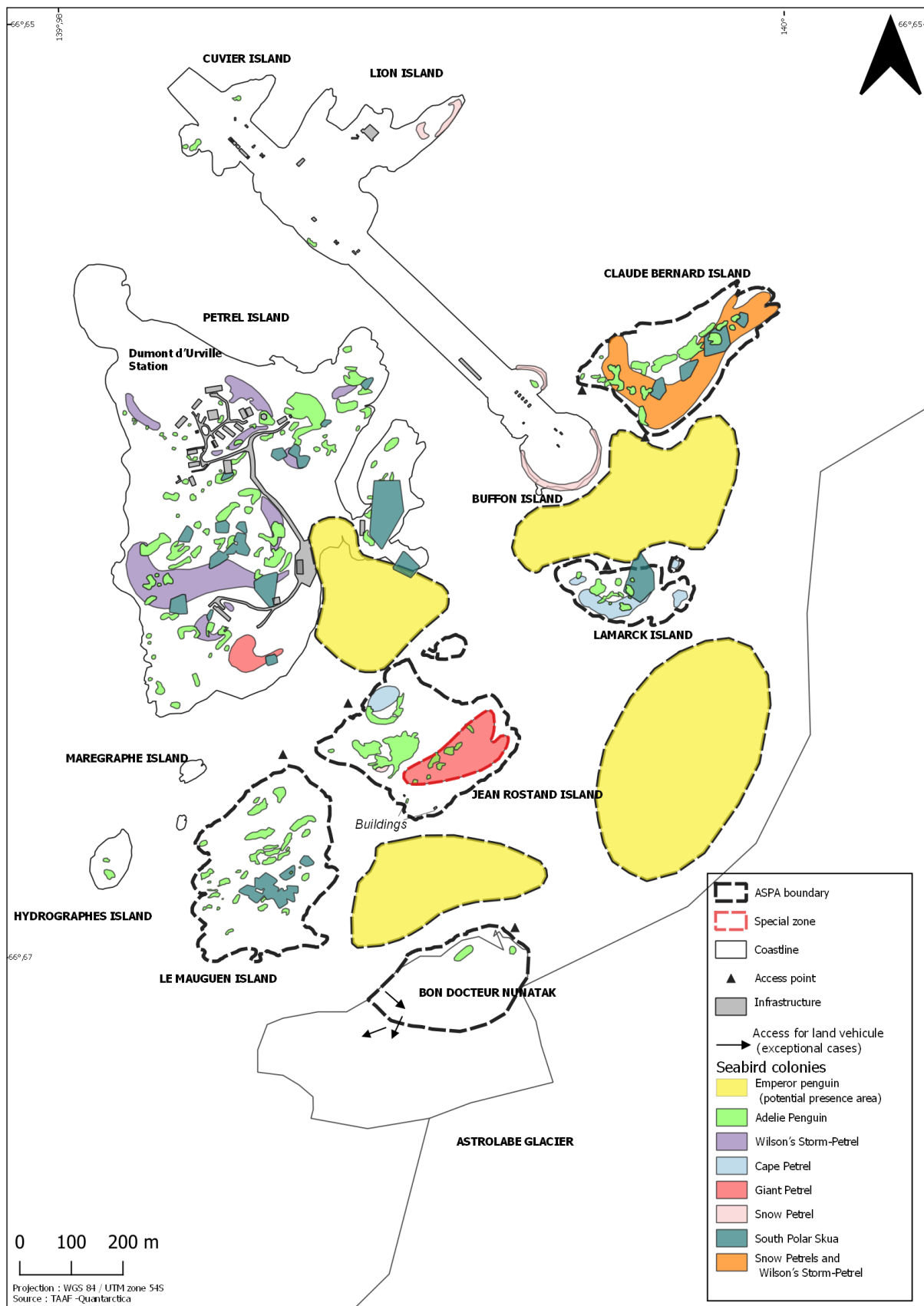


Figure 3. Pointe Géologie Archipelago (Source: Management Plan for Antarctic Specially Protected Area 120)

The station is named after the French explorer Admiral Jules Dumont d'Urville, the first French explorer to set foot on Antarctica, in Adélie Land, in 1840. The location of the landing is approximately 8 km from Dumont d'Urville station, and is designated as Historic Site and Monument (HSM) 81 Landing Rock.

All the islands of the Pointe Géologie Archipelago other than Petrel Island and Lion Island, are designated as Antarctic Specially Protected Area (ASP) 120, to protect the environmental and scientific values associated with the assemblage of seven breeding species of birds and one species of seal. The ASPA also incorporates the sea ice areas used by an emperor penguin breeding colony. Wildlife colonies also extend throughout Petrel Island, and Adélie penguins in particular nest within and throughout the station buildings and operational area. Emperor penguins transit through the station surrounds from breeding sites to the sea.

Scientific research coordination, infrastructure, logistics and technical support activities at Dumont d'Urville station are the responsibility of the French Polar Institute Paul-Émile Victor (IPEV), which is the manager of the French National Antarctic Program. IPEV is a public interest group with a board of directors comprising representatives from the Ministry of Research and Higher Education, the Ministry of Foreign Affairs, Météo-France, Centre national de la recherche scientifique (CNRS), Centre national d'études spatiales (CNES) and Terres Australes et Antarctiques Françaises (TAAF).

TAAF is part of the French Ministry of Internal Affairs and is the National Competent Authority for receiving, examining, authorising applications, and supervising activities carried out in the Antarctic. TAAF provides the Dumont d'Urville Station Leader, and manages public services at the station, including the communications, medical and postal services provided by the French military. The inspection team was advised that TAAF Station Leader and IPEV leadership team have regular meetings to plan and manage activities on station.

The primary purpose of the station is to support scientific research, as summarised in the following section on 'Scientific research activities'. It also serves as an important logistical hub for the French-Italian Concordia research station, located some 1100 km to the south, high on the Antarctic ice sheet. All equipment, fuel, food and some personnel being transported to and from Concordia station transit via Dumont d'Urville station and the nearby French-Italian seasonal station Robert Guillard, located on the continent approximately 5 km to the south-west. There are no other research stations within approximately 1300 km to the east or west along the Antarctic coastline.

3.3. Conduct of the inspection

The Australian inspection team visited Dumont d'Urville station and made observations during the period 12-15 December 2023. Transport to and around the station was largely on foot, from *L'Astrolabe*, located at a temporary wharf adjacent to Lion Island. The inspection involved discussions with key station personnel, including the TAAF Station Leader and IPEV Operational Manager, Deputy Operational Manager, Technical Manager, Science Coordinator, and Project Lead for the station rebuild project, as well as many scientists and support personnel on station. The inspection team was also accompanied throughout by a representative of the TAAF Environment Directorate. The inspection team undertook guided or unguided visits to all parts of the station.

3.4. Description of the station

3.4.1. Station infrastructure and logistics

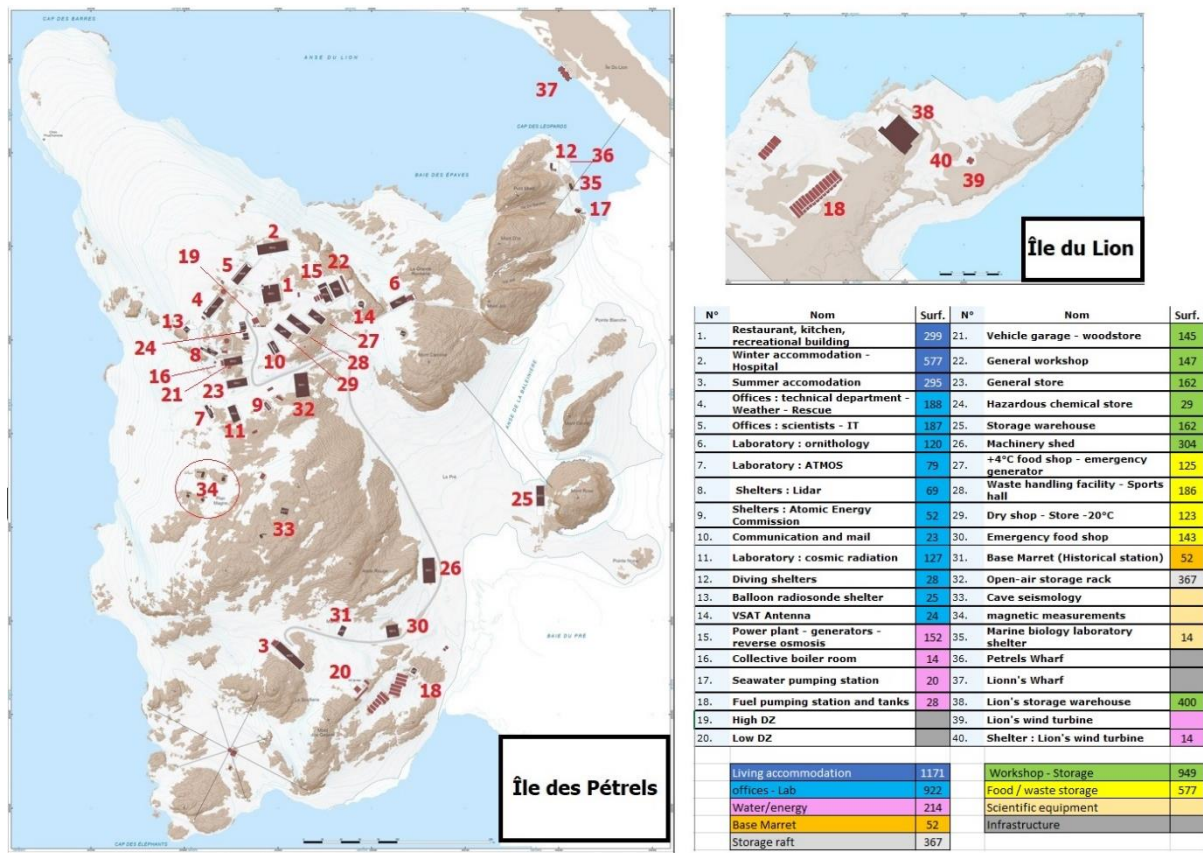


Figure 4. Map showing Dumont d'Urville station buildings on Petrel Island and Lion Island (Source: IPEV)

The Dumont d'Urville station complex comprises approximately fifty buildings and associated ancillary infrastructure, and covers an area of approximately 5000 m² (see Figure 4). The upper station area on Petrel Island contains the main station facilities, including year-round living quarters, kitchen and mess, power and water production, laboratories, offices and workshops. The lower station area comprises the summer dormitory, annual bulk fuel storage tanks and emergency power house. The upper and lower station areas are connected by a 600 m gravel road, and a more direct pedestrian route.

Many of the buildings and structures date from the 1960s – 1970s and the 1990s, and have been maintained and updated to continue to serve the needs of the station, with relatively few new structures established in recent decades. There are various service networks throughout the station area (e.g. for electricity, freshwater, brine, fuel, and waste water), although some of these do not service all facilities.

Lion Island, located adjacent to Petrel Island, is an 1100 m long artificial island created by major construction works undertaken by France in the early 1990s, which joined three main separate islands (Lion, Cuvier and Buffon) to establish a runway for use by heavy aircraft. Following completion of the construction, and before the runway had been used to support aviation operations, a storm in early 1994 damaged the runway. As indicated in the Final Comprehensive Environmental Evaluation for the construction and operation of Concordia

Station, the French Government decided not to repair the runway, taking into account the cost involved and ecologists' concern about its use and impacts on local wildlife.

The inspection team was advised that there were no plans to utilise Lion Island to support fixed wing aircraft operations. The D10 skiway inland from Robert Guillard station at Cap Prud'homme meets the station's requirements for air transport of personnel and light cargo. Instead, Lion Island continues to serve as a logistics, staging and storage area for operations at Dumont D'Urville station, as well as the French-Italian Robert Guillard and Concordia stations, and is used as the wharf area for *L'Astrolabe* (see Figure 5).



Figure 5. Resupply operations underway on Lion Island

A variety of heavy and light vehicles are utilised around Dumont d'Urville station. Ground access from Lion Island to Petrel Island is via a sea ice crossing, with vehicles utilising a snow-covered road to access the Dumont d'Urville station area. Pedestrians are able to use an elevated walkway from the coast of Petrel Island to the main station (see Figure 6). The walkway gives an accessible path through steep and rocky terrain, and also assists to provide some separation from the breeding colonies of birds, in particularly Adélie penguins, that are located across the island and throughout the station area. Helicopters are used to transfer cargo between *L'Astrolabe*, Lion Island and Petrel Island, and in support of logistics and scientific operations at Cap Prud'homme and other locations in the vicinity, with helipads located in the upper and lower station areas (see Figure 7).



Figure 6. Elevated walkway from the east coast of Petrel Island to the upper station area



Figure 7. Helipad in the upper station area

The transport of personnel and freight to and from Dumont d’Urville station is primarily undertaken by the French polar logistics vessel *L’Astrolabe*, which generally undertakes five round-trip voyages, or ‘rotations’, between Hobart and Dumont d’Urville station between November and February. The ship utilises a floating wharf adjacent to Lion Island, and close to the sea ice crossing to Petrel Island. Some personnel are transported to Dumont d’Urville station by aircraft either from Hobart or Christchurch, with connections to the D10 skiway via the Australian Casey station or the Italian Mario Zucchelli station.

The inspection team observed the sites of construction activities planned or underway during the 2023/24 season, including a new organic waste storage and boiler room near the mess building to be constructed pending authorisation from TAAF¹, a new double-walled fuel tank to be installed in the lower station area, and a new wind profiler station for the Atmospheric

¹ When reviewing the inspection report in March 2024, France advised Australia that the authorisation was granted and officially communicated on 21 December 2023, and the building works had been completed.

Water over Antarctica, past, present and future (AWACA) research project. The latter was being constructed on an extended platform near the upper station helipad during the visit. The inspection team was also advised of plans to replace the three main station fresh water tanks, with the new tanks to be purchased and delivered during the 2024/25 season and installed in the 2025/26 season.

3.4.2. Water supply

Fresh water for the station is primarily produced by desalinating water drawn from the sea between Petrel Island and Lion Island, using a boiler. A reverse osmosis unit is also used to provide additional fresh water capacity for the increased population during summer. The inspection team was advised of plans to install a second reverse osmosis unit, with the new unit to be delivered later in the 2023/24 season and installed during the 2024/25 season.

Fresh water is stored in 3 x 15 m³ tanks located adjacent to the power station. An additional 20 m³ tank located at the summer dormitory which is filled every two weeks during the summer season by pumping from the main station tanks (see Figure 8). As noted above, the inspection team was advised of plans to replace several fresh water tanks.



Figure 8. Fresh water tanks in the upper station area

Water is filtered and UV treated to be suitable for human consumption. The inspection team was advised that approximately 5-6 m³ of fresh water is produced per day in summer, with production matched closely to demand to minimise the fuel used in the desalination process.

Warm brine is generated by the boiler and is circulated with the elevated site services to prevent freezing of freshwater and waste water pipes. Brine is also used for flushing of some toilets to reduce use of fresh water.

The station doctor undertakes monthly analyses of freshwater samples, in accordance with a documented protocol that was shared with the inspection team. A comprehensive annual analysis of samples is also undertaken by a laboratory in Hobart.

3.4.3. Power generation and management

The main powerhouse is located in the upper station complex. The building dates from the 1970s and the three 180 kVA Caterpillar diesel generators are from the late 1990s (see

Figure 9). The station technical team endeavours to manage station electrical load requirements – including through use of an electrical load-shedding system in some facilities, and by raising awareness with station personnel on the importance of minimising energy use – to ensure that only a single generator is required at any one time. A second generator is ready to enter operation at any time if required, with the third undergoing routine maintenance. The summer dormitory is not used during winter, which also reduces energy requirements during that part of the year.

Protection of critical systems is ensured in the case of a blackout through the use of uninterruptible power supplies (UPS). The main powerhouse provides electricity for all station electrical appliances as well as heating (through cogeneration) for several nearby buildings. Other buildings are heated by collective or individual boilers or small individual heaters.



Figure 9. Diesel generators in the main powerhouse

The inspection team was advised that the powerhouse is currently meeting the station's energy needs, but is reaching its limit, and that the building is surrounded by built-up ice which is making it harder to maintain and ventilate. Further, the technology utilised does not include emissions filtering or monitoring and, due to an obsolete alarm system, requires in-person monitoring of the powerhouse at all times.

An emergency powerhouse with a single (identical) 180 kVA diesel generator is located in the lower station area.

The inspection team was shown annual fuel consumption (Special Antarctic Blend diesel) figures for the station in 2023, including 202 m³ for the power station, 101 m³ for boilers and 39 m³ for vehicles.

A single 20 kW vertical-axis wind turbine is located on Lion Island and provides some power to the nearby warehouse building. It was erected in 2017 and, although largely intended as a test case for future wind energy at the station, has saved approximately 20 m³ of fuel over that time (see Figure 10).



Figure 10. Wind turbine at Lion Island

As noted below, master planning for the future of Dumont d'Urville station will consider options for energy supply, and the inspection team was advised of ambitions to plan and construct a new powerhouse within approximately 10 years.

3.4.4. Fuel handling and storage

There are several short- and long-term fuel storage areas on Lion Island and Petrel Island. All bulk fuel tanks are double-walled, except for one smaller tank in the lower station area that was to be replaced later in the 2023/24 season. The fittings are located at the top of the tanks to prevent damage and leaks from built-up ice, and are surrounded by an elevated perimeter to contain any minor spills during fuel transfer. A large number of aviation fuel drums were stored on the ground at the southern end of Lion Island.

The inspection team was provided with copies of fuel transfer procedures, was informed of fuel handling practices, and was advised that there had been no major leaks or spills for approximately twenty years. Spill kits with response materials (absorbents) were observed at several fuel storage, transfer and use sites around station, and the inspection team was provided with a copy of a poster providing instructions for their use.

An annual fuel supply of Special Antarctic Blend diesel for Dumont d'Urville station is transported from Hobart to Antarctica on board *L'Astrolabe*, and is transferred to bulk storage tanks on Lion Island (total capacity 1080 m³, to accommodate annual fuel consumption of ~300 m³ at Dumont d'Urville station, ~300 m³ at Concordia station and ~300 m³ for inland traverses) (see Figure 11). The inspection team observed the commencement of transfer operations for the 260 m³ of fuel delivered from the vessel. This involved collaboration between the ship's crew, overseen by the Chief Engineer, and the station crew, overseen by the plumbing manager. The process appeared to be organised and well-practiced, involving the use of flexible hoses, containers to capture any leaks at connection points, constant in-person monitoring at the ship and fuel tank ends and regular observations in between (see Figure 12). The inspection team was advised that the fuel hose had been pressure tested with air in advance, that pumping pressure was gradually increased before full operating pressure was maintained, and that compressed air was blown through the line to clear residual fuel on completion. Spill response kits with absorbent materials were available nearby. A new flexible hose has been delivered to be used from the 24/25 season.



Figure 11. Bulk fuel storage tanks on Lion Island



Figure 12. Leak containment precautions at a connection point in the fuel line from ship to bulk fuel storage tanks on Lion Island

Once a year, approximately 300 m³ of fuel is transferred from Lion Island to the annual storage tanks in the lower station area on Petrel Island (total capacity 640 m³ – approximately two years of fuel requirements for the station) (see Figure 13). This involves use of flexible hoses from the Lion Island tanks to a shelter on the coast of Petrel Island, and a fixed steel pipe from there to the annual storage tanks. The inspection team was advised that this practice minimises the risk of leaks by avoiding pumping at high pressure directly from the ship during resupply operations. The inspection team was advised that work to upgrade the fixed fuel line had commenced in 2022/23 and was expected to be completed later in 2023/24². Fuel is then transferred from the annual tanks to central tanks in the upper station area (total capacity 58.5 m³) every three weeks during summer and every two months during winter (see Figure 14).

² When reviewing the inspection report in March 2024, France advised Australia that these works had been delayed until the 2024/25 season.



Figure 13. Annual bulk fuel tanks in the lower station area



Figure 14. Bulk fuel tanks in upper station area

Each year a further 640m³ of fuel is transferred in tanks via a winter sea ice traverse from Lion Island to Cap Prud'homme for use at Robert Guillard and Concordia stations, and inland traverses.

The inspection team was advised that there is no response plan for a major spill affecting terrestrial or marine environment at Dumont d'Urville station. However, a project led by TAAF with the assistance of IPEV to develop and implement such a plan was expected to commence in 2024 with the support of the French national maritime pollution unit (POLMAR) at the DGAMPA (Direction générale des affaires maritimes, de la pêche et de l'aquaculture)³.

3.4.5. Personnel

The inspection team was advised that 23 people over-wintered in 2023, and that 24 will over-winter in 2024. The winter dormitory in the upper (main) station area provides accommodation for up to 65 people, and the summer dormitory in the lower station area

³ When reviewing the inspection report in March 2024, France advised Australia that an emergency response plan (including pollution response) was prepared at the end of 2023 and was being finalised, including in light of an emergency response exercise undertaken in February 2024.

provides accommodation for an additional 34 people during the peak season (see Figures 15 and 16). The optimal station capacity over summer is 75 people.



Figure 15. Winter dormitory in the upper station area



Figure 16. Summer dormitory in the lower station area

During the inspection visit the station was at capacity, with a combined population across Dumont d'Urville and Robert Guillard stations of 112 people. The inspection team was advised that this comprised 30 scientists and 70 technical / logistic personnel, plus 12 visitors including the inspection team.

The annual station complement includes a civilian communications officer, post officer and a doctor, all of which are recruited by the French military, and who perform these roles on behalf of TAAF and IPEV. Among other roles, the communications officer records access to nearby ASPA 120 (as discussed below), and the doctor is also responsible for search and rescue and first aid training. The inspection team observed that details of military personnel at the station, which had been presented in the completed inspection checklist provided by France, were not available in France's reports under the Antarctic Treaty via the ATS Electronic Information Exchange System.

The inspection team was advised that TAAF is considering establishing an environmental officer position on station, in particular for the summer season, to develop and oversee environmental measures⁴.

3.4.6. Training

The inspection team was advised that wintering expeditioners attend a week-long pre-departure seminar in France, which covers a variety of topics such as Antarctic science, environmental protection, fire and safety. The seminar also provides an opportunity for expeditioners to undertake team building and meet with head office personnel before deployment to Antarctica. Summer expeditioners complete a compressed (~2 hour) online version of the seminar covering similar topics. Personnel undertaking specialised roles on station (e.g. fire-fighting team) receive additional, dedicated pre-departure training.

The inspection team was provided with an English language version of an Instruction Guide provided by IPEV to all personnel travelling to Antarctica with the French Antarctic program. As well as useful practical information for expeditioners (e.g. summary information about Antarctica and French Antarctic stations, medical requirements, living arrangements and communications in Antarctica) the guide presents an overview of the Antarctic Treaty and Environmental Protocol, and general guidance on preventing the introduction of non-native species and avoiding wildlife disturbance while at Dumont d'Urville station.

On arrival at Dumont d'Urville station all expeditioners receive an induction briefing by the Station Leader, covering issues such as safety and sea ice travel, the anti-harassment policy (which was also emphasised on posters around the station), and the Antarctic Treaty and Environmental Protocol. The induction includes a focus on environmental protection, such as avoiding wildlife disturbance (e.g. 40 metre minimum separation distance for emperor penguins), responsible use of resources (e.g. water, fuel), management of waste, and strict requirements for prior authorisation to interfere with wildlife, take samples or enter ASPA 120.

The inspection team observed several examples of experienced expeditioners – both scientists and technical / logistics roles – supporting and training new personnel, demonstrating a positive teaching and learning culture on station.

3.5. Scientific research activities

It was evident that a substantial scientific research program was underway at and proximate to Dumont d'Urville station, and that the research activities align with and progress the objectives of the Antarctic Treaty system. As well as supporting research activities on Petrel Island, Dumont d'Urville station acts as a staging and coordinating point for research undertaken at Cap Prud'homme, Astrolabe Glacier, and deep into the interior of the Antarctic continent, including at Concordia station.

The selection of science projects to be undertaken at Dumont d'Urville station involves a multi-stage assessment process. Projects are assessed for their scientific merit and feasibility through a scientific project evaluation committee whose secretariat is provided by IPEV. The French Environment Polar Committee, convened by TAAF, assesses the environmental

⁴ When reviewing the inspection report in March 2024, France advised Australia that the appointment of an environment officer on station would depend on the availability of berths available at the station and on the ship. If not feasible, this role would be taken on by personnel on site.

impact of projects based on the requirements of the Environmental Protocol and the corresponding national regulations. The committee also considers the cumulative impact of projects to ensure that environmental impacts and disturbance of particular species and locations is managed. All science projects also undergo an environmental impact assessment by TAAF resulting in either a declaration (where impact is less than minor or transitory) or authorisation including conditions to manage associated environmental impacts. Discussions with station personnel reflected a strong commitment to science and to facilitating scientific endeavour at the stations and surrounds.

Key areas of physical scientific research underway at Dumont d'Urville station at the time of the inspection included:

- magnetic observations – enabling modelling of the Earth's magnetic field
- long term seismic observations across a number of station facilities and locations – contributing to global data networks including the global tsunami warning network
- cosmic ray observations – collecting data on solar particle emissions since the 1960s (see Figure 17)
- glaciology – year-round monitoring of Astrolabe Glacier, including with a weather and Global Positioning System (GPS) station and seismic monitoring
- snow and atmospheric composition – measuring compounds, and use of light detection and ranging (LIDAR) to study stratospheric ozone (see Figure 17)
- meteorology – observations and forecast activities including daily sounding balloon release (see Figure 18).



Figure 17. Scientific facilities, including cosmic radiation laboratory (front left), atmospheric laboratory (front right) and facilities for magnetic measurements (right mid-ground)



Figure 18. Meteorological balloon launching building

The location of Dumont d'Urville station and its proximity to breeding colonies of emperor and Adélie penguins, snow petrels, Wilson's storm petrels, southern giant petrels, Cape petrels, skuas and Weddell seals has allowed continuous wildlife observations spanning back, in some cases, more than 50 years (see Figure 19). As well as monitoring the overall abundance of species on an annual basis, the science program also involves monitoring of individual birds to assess breeding success and foraging behaviour, as well as recapture to measure physical development (e.g. growth, age). Automated cameras and weigh bridges are also in place to maintain records of bird behaviour (breeding and fledging), colony dynamics and population distribution. These detailed and long-standing monitoring activities provide a significant temporal record of seabird activity at and proximate to Petrel Island. This information contributes to the Antarctic Treaty system through the CCAMLR Ecosystem Monitoring Program (CEMP).



Figure 19. Scientist monitoring Adélie penguins in a colony on Petrel Island

The provision of data to support global data programs and monitoring covered by other international agreements, such as the Comprehensive Nuclear Test Ban Treaty Organization (CNTBTO) monitoring network, was also noted (see Figure 20).



Figure 20. Comprehensive Nuclear Test Ban Treaty Organization monitoring facility

Seismic and glaciological studies on the nearby Astrolabe Glacier are informing understanding of the glacier composition and change – essential for estimates of localised climate change impacts (including sea level rise) and global implications. Integration with research activities at Concordia station provides multiple data points to inform and calibrate findings, especially with regard to ice core measurements.

The AWACA project to measure meteorological events (such as wind and snow) between Dumont d'Urville and Concordia stations was a good example of the use of existing capabilities and resources (i.e. the well-established inland traverse) to install multiple sensors to collect physical data without requiring additional environmental footprint or logistical investment. Daily clean air sampling is undertaken to detect water vapour and pollutants indicative of ice-atmosphere interactions.

It was noted that the composition of research teams reflects a commitment to supporting and developing early and mid-career researchers. The research cohort on station during the inspection visit included several researchers with many years of experience at Dumont d'Urville and Concordia stations, who were working closely with students to build capacity and ensure continuity of scientific knowledge and operations.

International and multidisciplinary collaboration was highly visible in science projects underway. Information and data sharing across international programs was evident as was the importance of scientific outreach and publication. It was noted that IPEV and TAAF have a particular role to promote Antarctic science including through media and arts programs.

Discussions with station personnel and scientists on site indicated significant interest in expanding the science program at Dumont d'Urville station, however capacity was limited due to station size and operational capability.

3.6. Waste management

3.6.1. Solid wastes

The inspection team was informed about, and received copies of, procedures for waste management at the station, as well as records of waste generated and removed from Antarctica in recent seasons. Consistent with Annex III of the Environmental Protocol, solid wastes are sorted into several categories and collection points are provided in all station buildings. Waste categories include: plastic, paper and cardboard, glass, steel, aluminium, medical waste, electronics, incineration ash, organic material, composite, batteries, hazardous chemicals, used oil. In accordance with a documented procedure that was provided to the inspection team, each category of waste is stored and secured in a suitable container (e.g. empty 200 litre fuel drums for metal, dedicated secure containers for batteries, containerised storage for organic wastes to prevent access by wildlife). Waste containers are centralised in the machinery and temporary waste storage building on Petrel Island (see Figure 21), and then transported to Lion Island for storage / loading onto *L'Astrolabe* for removal from Antarctica (see Figure 22).



Figure 21. Temporary solid waste storage in machinery and temporary waste storage building



Figure 22. Solid wastes in containers on Lion Island awaiting removal from Antarctica

Clean steel is transported from Dumont d'Urville station to Hobart on *L'Astrolabe* and is recycled in Tasmania by a waste contractor. All other wastes removed from Antarctica, including organic waste (transferred in a -20°C container), are currently returned to Hobart on *L'Astrolabe*, and are then transported onwards by cargo ship to France for treatment and disposal. The inspection team was advised that this practice comes at a high cost and

restricts the amount of waste which can be removed each season. IPEV is seeking a solution in discussion with the Australian Government to allow for the import of additional waste to Tasmania for treatment and disposal.

The inspection team was advised that the incinerator is used every two or three days during the summer season for dry combustible wastes (e.g. paper, wood) but is old and inefficient (see Figure 23). The incinerator is located close to the clean air laboratory building, meaning that air monitoring must be paused while the incinerator is in operation. The inspection team was advised that IPEV had commissioned a study into future options for incineration, due to be completed in December 2023, and was provided with a copy of related project documentation. The inspection team was also advised that charred remains observed in an old detached truck bed at the northern end of Lion Island were the result of burning of wastes undertaken in a recent season (see Figure 24). The inspection team suggests that any such practice in future should be reviewed for consistency with Annex III to the Environmental Protocol.



Figure 23. Incinerator



Figure 24. Remains of burnt waste in detached truck bed on Lion Island

Station personnel noted that to reduce the volume of waste generated at Dumont d'Urville station, IPEV requests suppliers and expeditioners to minimise packaging on items bound for Antarctica. In accordance with the requirements of Annex III to the Environmental Protocol, the use of polystyrene packaging chips is prohibited.

The inspection team was advised of future plans to remove a range of disused equipment and materials, including a large number of old vehicles stored at the southern end of Lion Island (several of which were to be removed later in the 2023/24 season) (see Figure 25), six single-walled bulk fuel tanks located at the northern end of Lion Island (all intended to be removed during the season) (see Figure 26) and four single-walled bulk fuel tanks from the annual fuel tanks on Petrel Island.



Figure 25. Disused vehicles on Lion Island awaiting removal from Antarctica



Figure 26. Disused bulk fuel tanks on Lion Island awaiting removal from Antarctica

Station personnel highlighted the disused shipping containers located at the northern end of Lion Island (see Figure 27), which were no longer certified for use on *L'Astrolabe*, and advised the inspection team of underlying practical difficulties. They noted that the frequency of recertification every two years was challenging for shipping containers used to transport materials to Concordia station, arising from the logistics involved in ship transport to Dumont d'Urville station during summer, sea ice transport to Robert Guillard station during winter,

transport by traverse to Concordia station during the following summer, and return to Dumont d'Urville station over sea ice the following winter, before the containers were available to be reused on *L'Astrolabe*. The inspection team was advised that consideration was being given to bringing a qualified official to Dumont d'Urville station to allow for the recertification, reuse and removal of the stockpiled shipping containers.



Figure 27. Shipping containers on Lion Island awaiting recertification for removal from Antarctica

3.6.2. Waste water management

Waste water produced at the station is macerated and released untreated from outlet pipes at three locations on Petrel Island – below the winter dormitory, the marine biology laboratory, and the summer dormitory. The outlet pipes do not extend to the sea, meaning effluent is discharged on land (snow-covered ice-free ground), where it subsequently drains down steep slopes to the sea (see Figures 28 and 29). The responsible station personnel were aware that this practice does not comply with the requirements of Annex III to the Environmental Protocol, which provides that sewage and domestic liquid wastes may be discharged 'directly into the sea'. They highlighted the significant practical and safety challenges with accessing and repairing outlet pipes, which are located in steep and difficult to access terrain, and damaged regularly by ice.



Figure 28. Waste water outlet from winter dormitory in upper station area



Figure 29. Waste water outlet from summer dormitory in lower station area

The inspection team was advised of plans for a study to investigate use of a containerised commercial waste water treatment system at the summer dormitory, for installation within 2-3 years. Following an assessment of the effectiveness of the trial system, the aim was to implement waste water treatment for the remainder of the station.

The inspection team was also advised of ongoing actions to manage pollutant inputs to the waste water system, including the central provision of appropriate, environmentally-friendly, personal care and cleaning products for use by station personnel. Further, and noting the presence and proximity of bird colonies, no poultry waste is introduced into the waste water system.

3.7. Environmental impact assessment

All the station personnel with responsibilities for operations, logistics and scientific activities that the inspection team spoke to were aware of the environmental impact assessment (EIA) requirements of the Environmental Protocol, and the environmental authorisation process administered by TAAF for activities at Dumont d'Urville station.

IPEV representatives outlined the EIAs in place for ongoing operations / support activities, which are updated every three years, including for traverse activities, terrestrial vehicle use, and sea ice travel. They advised that work was currently underway on an assessment for all current and recurring activities at Dumont d'Urville station, and noted that much of the station infrastructure was constructed prior to the Environmental Protocol, with recent works largely involving maintenance and recladding of existing buildings.

The inspection team was advised that all proposed activities receive prior assessment and authorisation by the Prefect (senior administrator of TAAF), following consideration by a panel of experts that constitute the French National Polar Committee for Antarctica. The Station Leader represents the Prefect on site at Dumont d'Urville station. The Station Leader had ready access to all authorisations and was responsible for monitoring and ensuring compliance with conditions (e.g. quantity of samples, timing of activities to avoid sensitive wildlife periods, number of visits to protected areas).

3.8. Conservation of fauna and flora

3.8.1. Avoiding wildlife disturbance

Petrel Island is home to breeding colonies of Adélie penguins and several species of flying seabirds, with nesting sites throughout the station area (see Figure 30). Access to the island from Lion Island, while sea ice is still present, intersects a route used by penguins (emperor and Adélie) to access open water. The proximity of wildlife to station and support activities (e.g. helicopter operations, vehicle movements) in many locations does not allow for significant separation distances between station personnel and wildlife. As noted above, the elevated walkway in place through parts of the station ensures some separation from nesting Adélie penguins and assists to prevent damage to nesting sites.



Figure 30. Walkway and example of Adélie penguin nests located in close proximity to station buildings

The inspection team was advised that the results of ornithological studies have shown that Adélie penguin breeding success, behaviour and physiological markers were not affected by the presence of humans, and the colonies around the station show a stable population across years and are more sensitive to environmental disturbance than human activities.

The inspection team did not observe any handling or deliberate interaction with wildlife. Station personnel were seen to observe appropriate separation distances on foot and in vehicles. While some disturbance of nearby penguins was noted during helicopter operations from the upper station helipad, this appeared to be localised and transitory.

3.8.2. Management of non-native species and disease risks

The inspection team was advised that there are currently no Antarctic-specific biosecurity checks of cargo transported on *L'Astrolabe*, prior to departure from Hobart. However, cargo transported from France to Australia was required to meet biosecurity requirements for importing goods to Australia and, other than food, was fumigated at the point of departure from France.

Some guidance was given to personnel to clean clothing and equipment pre-departure, but there were no facilities on *L'Astrolabe* to clean and undertake inspections of clothing and equipment before disembarking. No other biosecurity measures were observed when

disembarking the ship or moving around station (i.e. no boot / equipment cleaning, disinfectant etc.). Such practices are in place for the French sub-Antarctic territories and TAAF is considering similar measures for Antarctic stations. The inspection team was advised of plans to provide a biosecurity cleaning kit (e.g. vacuum, brushes, boot mats, sterilising agent) on *L'Astrolabe* in future, hopefully later in this season, reflecting similar kits provided on vessels used to support activity at the French sub-Antarctic islands.

The inspection team noted the last inspection of Dumont d'Urville station by the United States in 1995, prior to the entry into force of the Environmental Protocol, had identified the presence of non-native plants inside some station buildings. No non-native species were observed in station buildings or in surrounding areas.

The risk posed to penguins and flying seabirds by Highly Pathogenic Avian Influenza (HPAI) was well understood by station personnel and leadership. In the 2023-24 summer season. A veterinarian onsite as part of a biological research study was responsible for monitoring for avian influenza. Testing facilities on station were limited to detection of Type A influenza. TAAF and IPEV have identified the need to develop a response plan for avian influenza including modified bird handling and hygiene requirements. The challenge of preventing transmission by humans between colonies in such close proximity was noted and discussed in the context of other biosecurity measures (such as boot washing, use of gloves etc).

3.9. Protected area management

As noted above, all the islands of the Pointe Géologie Archipelago, except for Petrel Island and Lion Island, are located within ASPA 120, which is designated primarily to protect the large breeding colony of emperor penguins. The ASPA also covers the breeding locations of emperor penguins on the sea ice between the islands, plus a 40 m buffer around the limits of the colony.

The importance of adhering to the ASPA management plan, and in particular only accessing the area with prior authorisation for approved scientific purposes, was clearly emphasised in the station induction provided by the Station Leader. In accordance with the management activities identified in the ASPA management plan, copies of the management plan and maps of the ASPA boundary were available in multiple locations at the station (see Figure 31), and on *L'Astrolabe*. The inspection team was advised that copies of the management plan were also readily accessible on the station intranet, and information about the ASPA and requirements for access was also communicated during pre-departure briefing for all expeditioners.



Figure 31. ASPA 120 map and management plans displayed in mess building

Copies of authorisations for all activities within the ASPA were held by the Station Leader and the communications officer held records of all entries as part of the standard procedures for expeditioner sea ice travel around the station. The Station Leader was responsible for ensuring compliance with authorisation conditions. The inspection team observed that France's recent annual reports under the Environmental Protocol, via the ATS Electronic Information Exchange System have not included details of entries to ASPA 120, which are evidently recorded and available. The representative of the TAAF Environmental Directorate undertook to follow up on this matter.

The inspection team briefly visited HSM 47 Base Marret, a wooden building located in the lower station area on Petrel Island, where seven persons under the command of Mario Marret overwintered in 1952 following the fire at the former French base at Port Martin. The building was surrounded on several sides by snow and ice built up during the winter (see Figure 32), but the interior was largely clear and in good condition considering the age of the structure (see Figure 33)⁵.

⁵ When reviewing the report in March 2024, France advised Australia that a heritage plan adopted by TAAF in June 2023 included conservation actions related to Base Marret, and that a specific mission was planned for the 2024/25 season to digitise the sites and identify detailed actions to be integrated into the heritage plan.



Figure 32. HSM 47 Base Marret exterior



Figure 33. HSM 47 Base Marret interior

3.10. Tourist and non-governmental activities

The inspection team was advised that the last tourism visit involving a landing at Dumont d'Urville station was in February 2012. TAAF representatives advised that a request had been made at short notice during the 2022/23 season to land passengers from a tourist vessel to visit the station and surrounds, however the request was not supported as the station visit had not been authorised in advance. The vessel instead undertook small boat cruises in the surrounding waters and put passengers ashore at a small island approximately 8 km away to visit HSM 81 Landing Rock, where Admiral Dumont d'Urville and his crew landed in 1840.

The inspection team was advised that there was no written procedure or guideline for tourism visits to Dumont d'Urville station, although any such visit, if authorised, would be closely supervised to limit impacts to the environment and national Antarctic program activities. Several station personnel expressed the view that tourism visits to the station were undesirable due to the potential for disturbance of wildlife and disruption to scientific research.

3.11. Future plans for the station

During the One Planet – Polar Summit held in Paris from 8 to 10 November 2023, shortly before the Australian inspection, the French President, Emmanuel Macron, announced increased funding for polar research, including plans to rebuild Dumont d’Urville station.

The inspection team was briefed on the development of a master plan for the station and associated facilities which is expected to be completed by 2025. There was not yet a budget or schedule for construction, and the master planning work was being advanced in two stages.

The first stage will consider critical maritime infrastructure, involving developing a plan and identifying construction technology for a new wharf at Lion Island, to improve access for *L’Astrolabe* and provide for easier and safer cargo and personnel transfer than is currently possible with the use of a temporary floating wharf. This stage will also consider alternatives for future-proofing the delivery of fuel to Robert Guillard station at Cap Prud’homme if sea ice does not remain viable for the winter transfer of fuel.

The second stage will involve a station master planning project, to be undertaken by a contracted engineering company with expertise in polar architecture and logistics. Among other things, this stage will consider how to accommodate a construction crew to undertake building works while maintaining science, and the potential for utilising Lion Island as a location of the main station infrastructure, although noting the low elevation (~4 m) and risks associated with sea level rise and potential damage due to storm surge and glacier calving.

The master planning process will also investigate options to modernise the station energy system, including renewable energy options such as additional vertical-axis wind turbines on Lion Island that can withstand the strong katabatic winds and minimise the risk of bird strike, photovoltaic panels that will perform in the relatively cloudy, snowy and abrasive conditions and that can be applied to exterior surfaces, solar hot water options for buildings isolated from central heating services, and a micro-grid to allow the integration of energy inputs from various sources. To inform this work, IPEV was in discussion with other National Antarctic Programs with recent experience or plans for station modernisation programs and renewable energy options, including Australia, New Zealand, Belgium and United Kingdom. It was also noted that Germany’s experience with wind turbines at Neumayer station would be informative, as would the use of flat solar panels on scientific facilities being deployed along the Concordia station traverse route as part of the AWACA research project.

In discussions about the future rebuild of Dumont d’Urville station, scientific and technical personnel raised a variety of considerations, including:

- the challenges with construction and maintenance of facilities due to the limited flat and accessible ice-free ground available on Petrel Island and the close proximity of wildlife colonies, particularly Adélie penguins
- opportunities to combine and consolidate functions into fewer buildings, including by utilising multi-story structures, to simplifying site services (e.g. heat, water, electricity, waste water) and reduce the overall building footprint
- the option of locating some or most support facilities to Lion Island (as mentioned above) but noting, in addition to the low elevation: Adélie penguins are recolonising the northern and southern ends of the island (see Figure 34); the need for access to

Petrel Island when sea ice is absent across the channel separating the two islands; and the need to maintain long-term time-series data from some specific monitoring locations on Petrel Island

- plans for an internship next year to study solar power application, possibly followed by an initial trial for one building.



Figure 34. Adélie penguin nests near the coast at the northern end of Lion Island

The French Polar Ambassador for Polar and Maritime Affairs was visiting the stations during the inspection visit, after a visit to Concordia station, and held an open consultation session with station personnel on a vision for the future of Dumont d'Urville station.

As well as the planned installation of new facilities, the inspection team was advised of plans to remove six bulk fuel storage tanks from Lion Island later in the 2023/24, as well as four bulk storage tanks from the annual fuel storage area on Petrel Island when snow conditions allowed access by heavy vehicle. The inspection team also heard of ambitions to remove some existing and obsolete infrastructure. This included a large (~60 m) metal communications and instrument tower near the summer dormitory that was erected in the 1960s, and which is supported by steel guy wires that present a bird strike hazard (see Figure 35). A run-down building near the magnetic instrument area also requires removal, and the old research rocket building which is currently used as storage would ideally be removed in future if a central warehouse facility was established (see Figure 36).



Figure 35. Disused communications tower



Figure 36. Disused research rocket launch facility

The inspection team was also advised that TAAF recently developed a Climate Air Energy Plan covering Dumont d'Urville station, which involved an environmental and carbon assessment of the facility and identified strategic objectives for the future, including for example: improving energy efficiency and development of renewable energy sources, reducing the environmental impact of transport, and enhancing waste management.

3.12. Recommendations

Following the inspection of Dumont d'Urville station, the Australian inspection team recommends that France:

1. Proceeds with and prioritises planned efforts to enhance aspects of the environmental management of Dumont d'Urville station and associated operations, including:
 - installation of waste water treatment facilities, noting in particular the potential risks of untreated effluent for wildlife colonies on and surrounding Petrel Island
 - provision of biosecurity cleaning kits on board *L'Astrolabe* to minimise the risk of introducing non-native species and disease (including HPAI) to the biodiversity hotspot represented by the Dumont d'Urville area of operations
 - developing and implementing a plan to minimise the risks to wildlife and human health associated with a potential future outbreak of at Dumont d'Urville associated with potential outbreak HPAI
 - developing and implementing procedures and practical capacity for responding to fuel and oil spills in the terrestrial or marine environment at Dumont d'Urville station
 - investigating options to modernise the energy system at Dumont d'Urville including utilising renewable energy sources
 - removing from Antarctica disused structures and equipment, and stockpiled waste materials.

2. Investigates and applies appropriate south-bound pre-departure biosecurity measures, including cleaning and inspecting cargo and expeditioner clothing and baggage to minimise the risk of introducing non-native species and disease.
3. Ensures that relevant information routinely collected in the course of the administration of Dumont d'Urville is shared with other Parties via the Antarctic Treaty Secretariat Electronic Information Exchange System, in accordance with reporting requirements under the Antarctic Treaty and Environmental Protocol (e.g. science activities, military personnel, taking or harmful interference with fauna and flora, protected area entries, waste management plans).

4. Robert Guillard station (France and Italy): 13 December 2023



Figure 37. Workshop at Robert Guillard station

4.1. Summary

Robert Guillard station is a compact and functional facility that plays a significant role in supporting research and logistical activities at Concordia station and on inland traverses, as well as some local research in the vicinity of Cap Prud'homme and the Astrolabe Glacier. The inspection team visited the main station and the nearby inland traverse staging area, and observed the facilities to be operating in compliance with the Antarctic Treaty and Environmental Protocol. Like at Dumont d'Urville station, the inspection team noted opportunities to develop and apply documented procedures to manage the risk of non-native species and disease introduction, and to respond to fuel and oil spills. The team heard about the increasing demand for access to the facility to support science in the local area and noted the challenges to construction and expansion that would be presented by the limited ice-free area, challenging topography and presence of breeding Adélie penguins throughout the area.

4.2. General information

Robert Guillard station is jointly operated by France and Italy as an annex of the French-Italian Concordia station complex. It is located on a small rock outcrop at Cap Prud'homme, approximately 5 km from Dumont d'Urville station (66° 41.2565' S, 139° 54.4302' E). It was established in 1994 and then known only as Cap Prud'homme. The facility was expanded in 2004, and was officially named Robert Guillard station in 2017.

Situated on the Antarctic continent, the station serves an important role in the operation of Concordia station, facilitating the delivery of equipment, cargo and personnel to and from Dumont d'Urville station and *L'Astrolabe*, as well as the operation and maintenance of equipment supporting logistics and scientific traverses to Concordia station and the deep interior of Antarctica. The traverse staging area is located a few hundred metres further inland from the coast.

Heavy materials including supplies destined for Concordia station, and items being returned, are transported between Dumont d'Urville and Robert Guillard stations over winter sea ice. A

helicopter link is used to transport light freight and personnel during summer when the sea ice cannot be crossed by vehicle.

Robert Guillard station also supports the operation of the D10 skiway, located 5 km inland from the coast (66°42.3167' S, 139°49.3333' E). The 1200 m x 50 m groomed snow airstrip is used to transport personnel and light equipment between Dumont d'Urville, Concordia, Mario Zucchelli (Italy) and Casey (Australia) stations. The inspection team did not have the opportunity to visit the D10 skiway.

4.3. Conduct of the inspection

The inspection team travelled to Robert Guillard station from Dumont d'Urville station by helicopter on 13 December 2023, and visited the station and nearby facilities from approximately 1400 to 1700. The team was accompanied by the IPEV Science Coordinator. The inspection involved a discussion with the Robert Guillard Station Leader (France), scientists currently in residence at the station, and a tour of the facility, surrounding area, and nearby inland traverse staging area (see Figure 38). There were no Italian personnel at the station during the inspection.



Figure 38. Australian inspection team with Robert Guillard Station Leader

4.4. Description of the station

The facility is compact and functional. It has a maximum capacity of 18 beds. There were 15 people in residence during the inspection, including the French Station Leader, scientists and technical personnel; two Italian personnel were participating in a traverse at the time of the inspection and were expected at the facility later in the season. The main building is comprised of cladded shipping containers with living space, kitchen, laundry and bedrooms. Separate buildings comprise a vehicle hangar (providing the only inside working space for vehicle maintenance), workshop building, powerhouse, and storage containers (see Figure 39).



Figure 39. Aerial view of Robert Guillard station

Solar panels on the outside of the main building were intended to charge batteries to provide power overnight and allow the diesel generators to be shut off, avoiding the need for continual in-person monitoring of the powerhouse (see Figure 40). The inspection team was advised that the batteries had ceased working in 2022, and that there were plans to install new batteries and solar panels.



Figure 40. Solar panels on exterior of main station building

Food and fuel are transported from Dumont d'Urville station. Fresh water is produced on site through a snow melting and water filtration unit. There is an incinerating toilet (Incinolet) and waste water is discharged without treatment from an outlet pipe below the station where it drains to the sea. Food and solid waste is sorted into appropriate categories and returned to Dumont d'Urville station (see Figure 41).



Figure 41. Waste sorting containers

The facility primarily serves as a mechanical workshop and centre of operations for inland traverses. The inspection team noted some vehicle maintenance was undertaken outdoors due to limited undercover work areas. Fuel spill precautions and fuel spill kits were evident in the area, as was handling and storage for hazardous chemicals and liquids.

All bulk fuel tanks are double-skinned with fittings at the top of the tanks to reduce the risk of breakage and spills. Written procedures were in place for fuel transfer, and spill kits were available. At the coast below the station is a staging area for fuel transferred from Dumont d'Urville station over winter sea ice, including fuel for use at Robert Guillard station, for the traverse vehicles, and for Concordia station (see Figure 42).



Figure 42. Fuel staging area near the coast at Cap Prud'homme

The inspection team briefly visited the traverse staging area a few hundred metres further inland from the coast, observing various traverse vehicles, sleds and vans (see Figure 43). Two logistics traverses are conducted to Concordia station each season, plus additional

scientific traverses (e.g. a traverse 150 km inland during the 2023/24 season to support the AWACA project).



Figure 43. Traverse staging area near Robert Guillard station

4.5. Scientific research activities

Although primarily a logistics base and staging area for inland traverses during the summer operating season, Robert Guillard station also supports some research activities in the local area. Continental studies of ice thickness and meteorological observations contribute to a network of instruments and data streams monitoring change and variability. The proximity of the station to the Astrolabe Glacier facilitates access to the glacier and supports seismic and mass balance studies in the region.

The AWACA project, installing instruments to measure meteorological data along the 1100km transect between Dumont d’Urville and Concordia stations, is an ambitious new scientific undertaking that will yield significant insights into meteorological processes from the continental coast to inland Adélie Land. This will complement the long record of snow, atmosphere and weather station data collected proximate to Robert Guillard and Dumont d’Urville stations. A strong commitment to supporting science activities, including the traverse and operations at Concordia station, was evident in discussions with station personnel.

There is growing interest in undertaking scientific research activities at Cap Prud’homme and Concordia station. The necessary capacity uplift to accommodate such additional activities is being considered in the broader station redevelopment planning for Dumont d’Urville station.

4.6. Environmental management

The environmental management practices and procedures at Robert Guillard station largely reflect those in place at Dumont d’Urville station (e.g. waste management, fuel handling). Like at Dumont d’Urville, there are Adélie penguin nests in many areas surrounding the station buildings (see Figure 44), although the inspection team did not observe any substantial disturbance as a result of human activity including helicopter or vehicle operations.



Figure 44. Adélie penguin nests located in close proximity to station infrastructure

4.7. Recommendations

Following the inspection of Robert Guillard station, the Australian inspection team recommends that France and Italy:

1. Collaborate to extend the application and implementation to Robert Guillard station of the biosecurity and spill response plans recommended for Dumont d'Urville station.

5. *L'Astrolabe* vessel (France): 15 December 2023



Figure 45. *L'Astrolabe* at Lion Island, Dumont d'Urville station

5.1. Summary

L'Astrolabe is a modern, purpose-built vessel that primarily provides logistics support for the French Antarctic Program (and French-Italian activities at Concordia), and also serves as a platform for some marine research. The inspection team was accommodated on board *L'Astrolabe* during a round-trip voyage from Hobart to Dumont d'Urville station, and undertook formal inspection activities during a defined period during the resupply of Dumont d'Urville station. The team observed the vessel to be operated by a professional and well-trained crew from the French Navy, in compliance with the Antarctic Treaty and Environmental Protocol. The inspection team noted opportunities to better utilise and expand the scientific capabilities of the ship to serve a growing demand for in-transit marine research, and to enhance the efficiency of resupply operations at Lion Island through a planned review and upgrade of maritime infrastructure.

5.2. General information

L'Astrolabe is a modern polar logistics vessel, purpose-built to replace its predecessor of the same name. It was constructed by the French shipyard Piriou, is registered at the Pointe des Galets port on Réunion Island, and was first operated in the Antarctic during the 2017/18 season.

The vessel is owned by TAAF, operated by the French Navy, and chartered by IPEV for 120 days per year to support French Antarctic Program activities at Dumont d'Urville and Concordia stations. Its primary role is to transport freight and passengers between Hobart and Antarctica to support the operation of Dumont d'Urville and Concordia stations, although it also provides a platform for marine research on the transits between Australia and Antarctica, and on occasion supports research activities at other coastal locations in Adélie Land (e.g. Port Martin, Cape Denison).

L'Astrolabe also supports Australian Antarctic Program activities under an annual logistics-sharing *quid pro quo* agreement between IPEV and the Australian Antarctic Division (AAD).

For example, on voyage R1 the vessel travelled via Macquarie Island on its passage south to support a partial changeover of Australian expeditioners.

The vessel's annual Antarctic campaign generally involves five round-trip voyages (known as 'rotations') between November and February. On the first voyage of the season the vessel transports a helicopter to Dumont d'Urville station, which is retrieved on the last voyage. A second helicopter is also carried on the first and last voyages to support resupply operations.

For the remainder of year, the ship undertakes patrol missions in the French Sub-Antarctic islands.

5.3. Conduct of the inspection

In accordance with Article VII of the Antarctic Treaty, the Australian inspection team made observations onboard *L'Astrolabe* on 15 December 2023, from approximately 1600 to 1800, while the vessel was alongside Lion Island undertaking resupply operations at Dumont d'Urville station. This involved a discussion with the Captain and Chief Engineer, and a tour of the vessel. The inspection team also developed general familiarity with the vessel during the round-trip voyage from Hobart to Dumont d'Urville station from 6 to 22 December 2023.

5.4. Description of the vessel

L'Astrolabe is a Polar Class 5 Icebreaker, designed, constructed and operated to comply with the International Maritime Organization (IMO) International Code for Ships Operating in Polar Waters (Polar Code) (see Figure 46). The vessel can operate year-round in medium, single-year sea ice conditions and break ice up to 1.2 m thick. Relevant statistics:

- Overall length: 72 m
- Width: 16 m
- Draught: 5.30 m
- Freight: 1,200 tonnes
- Speed: 14 knots
- Diesel propulsion: 4 x 1,600 kW
- Generators: 2 x 500 kWe
- Emergency generator: 1 x 150 kWe
- Bow thruster: 500 kW
- Helideck, with storage underneath.
- Large Crane
- Rear wet deck with crane.



Figure 46. *L'Astrolabe* showing rear helideck and trawl deck

5.5. Personnel and training

L'Astrolabe has a maximum capacity of 64, including 22 Navy crew and 42 passengers. Two identical Navy crews operate the vessel during the Antarctic summer season, the first crew operating rotations R0, R1 and R2, and the second crew operating rotations R3 and R4.

The inspection team observed a high level of awareness and knowledge of Antarctic Treaty and Environmental Protocol provisions and other international agreements applicable in the Antarctic region, including the IMO Polar Code.

The inspection team was informed that the polar waters operating experience of the Captain and crew meets the requirements of the Polar Code. All officers were trained in polar navigation, having undertaken basic and expert courses. The Captain was in his second year of a three-year assignment to *L'Astrolabe* and had more than 80 days of polar experience. In addition, the Executive Officer had polar experience, and an ice pilot with training in polar navigation and more than seven seasons of polar operations experience was also on board. All officers and crew are professional French Navy sailors trained in accordance with the IMO International Convention for the Safety of Life at Sea.

5.6. Scientific research

L'Astrolabe is equipped and able to collect data and make measurements whilst underway, has a large rear wet deck, and has capacity to install containerised scientific laboratories and facilities, although these were not in use at the time of the inspection.

During voyage R1 three primary research and monitoring activities were being undertaken onboard.

- Oceanography – the regular deployment of expendable bathythermograph (XBT) instruments along the transect between Hobart and Dumont d'Urville station (and return) to measure surface and water column temperature to a depth of approximately 900 m. The data collected contribute to the understanding of ocean processes, heating, circulation and variability, ultimately improving models for weather and climate forecasting and understanding ocean energy transference. The

project was being undertaken by IPEV in collaboration with Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Institute for Marine and Antarctic Studies at the University of Tasmania.

- Water sampling – automated underway water sampling and basic isotopic and thermosalinograph analysis (temperature, salinity). This provides a complementary set of measurements to validate the XBT data (and vice versa). This project was also undertaken in collaboration with the CSIRO.
- Meteorology – underway meteorological data (temperature, precipitation, wind speed and direction etc) that feed into international data holdings and used for weather observations and forecasting.

L'Astrolabe has capability to deploy and retrieve moorings (such as Argo floats) directly from the ship or via small watercraft operations, and was scheduled to do so on later voyages in the 2023-24 season. The ship has a trawl / wet deck that can be configured to support marine science activities, although the inspection team was advised that this capability had not been utilised to date. It was evident that there was interest in opportunities to expand marine scientific activities undertaken on *L'Astrolabe* in coming seasons.

5.7. Environmental management

The inspection team was informed, and observed, that the ship had been designed and operated to comply with the environmental requirements of the Environmental Protocol and IMO Polar Code. In separate discussions with TAAF representatives, the inspection team was advised that the operations of *L'Astrolabe* were subject to an ongoing environmental authorisation issued when the vessel entered service in 2017.

5.7.1. Waste and pollution

All food, solid wastes, oily wastes and noxious liquid wastes are stored on board for disposal outside the Antarctic Treaty area, in accordance with Annex IV of the Environmental Protocol. There is limited capacity to store waste water, which is treated before disposal into the sea.

5.7.2. Fuel management

The ship uses light marine fuel, and consumes approximately 28 m³ / day when operating all four engines. The speed of the ship can also be managed to reduce fuel consumption as operational requirements allow. Ad Blue is used to minimise particulate emissions, along with filters in the exhaust system. The ship also carries bulk fuel (Special Antarctic Blend diesel) for use at Dumont d'Urville, Robert Guillard and Concordia stations. All fuel storage tanks are separated from the hull. Spill response kits (booms, absorbent matts and dispersant) are carried on board, and the crew are trained in emergency procedures for response to fire and fuel spills.

5.7.3. Management of non-native species risks

The vessel utilises ballast water management practices and technologies, including a ballast water treatment system (filtration and UV treatment), designed to comply with the requirements of the IMO Ballast Water Management Convention and *Practical Guidelines for Ballast Water Exchange in the Antarctic Treaty Area* (ATCM Resolution 3 (2006)) (see Figure 47). No ballast water is discharged or exchanged in the Antarctic Treaty area. The vessel travels to Antarctica heavy and, after unloading cargo, takes on ballast water for the

return voyage to Hobart. Ballast water is also managed to meet requirements for the vessel's return to port in Hobart.



Figure 47. Ballast water treatment unit

An ultrasound antifouling management system provides biofouling protection for the vessel hull (see Figure 48). Antifouling paint is also used. The inspection team was advised that the hull is cleaned during periodic dry docking every 4-5 years; the hull had last been cleaned in April 2022, with the next dry docking scheduled for 2027.



Figure 48. Ultrasound antifouling management system

As noted for the inspection of Dumont d'Urville station, there were no specific southbound biosecurity practices for cargo carried on *L'Astrolabe*, although the inspection team was advised of plans to provide a biosecurity cleaning kit for expeditioner clothing and equipment later in the 2023/24 season.

The inspection team observed a potted plant (flowering geranium) on the bridge of ship which, for an Australian-operated vessel, would be prohibited in accordance with Australian

law implementing Article 4 of Annex II to the Environmental Protocol (see Figure 49). A label on the pot indicated the plant was a gift from the city of Hobart in 2018.

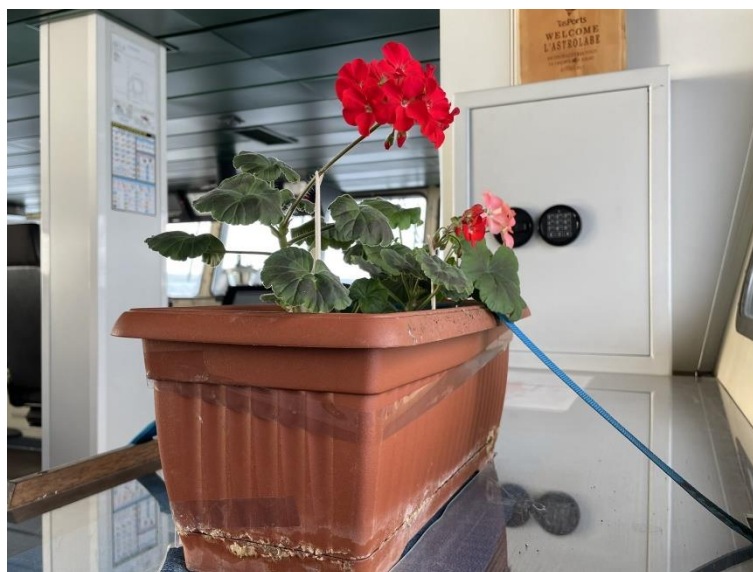


Figure 49. Potted plant on L'Astrolabe

5.7.4. Management of wildlife interactions

The crew manage the ship speed and course to minimise interaction with wildlife, and ensure the safety of the vessel. As needed (when dark) the crew limit deck lighting to minimise risk of attracting birds and bird strike.

5.8. Military

As noted above, *L'Astrolabe* is operated by the French Navy, and has a crew of 22 military (Naval) personnel. When not on Antarctic service the ship operates as a fisheries patrol vessel in the waters surrounding the French sub-Antarctic islands and other southern islands. The inspection team noted that details of military personnel involved in supporting the French Antarctic Program during the 2023/24 were not provided in France's pre-season reporting via the ATS Electronic Information Exchange System.

Weapons on board were secured in locked storage for the duration of the Antarctic deployment.

5.9. Future plans for the vessel

As noted for the inspection of Dumont d'Urville station, the inspection team was advised of work being undertaken by IPEV to review and upgrade maritime infrastructure at Lion Island. The inspection team acknowledged the value of this initiative, having observed some challenges and inefficiencies with accessing the current berthing location, and with undertaking cargo handling and personnel transfers from the current temporary floating wharf (see Figure 50).



Figure 50. Unloading operations supported by ship crane, excavator and floating wharf

The inspection team also noted that the French President's recent announcement of funding for polar research mentioned the possibility of additional scientific capabilities for *L'Astrolabe*, as well as plans for an additional new polar class vessel to be named *Michel Rocard*. Station and ship personnel did not have any further details of these initiatives.

5.10. Recommendations

Following the inspection of *L'Astrolabe*, the Australian inspection team recommends that France:

1. Within the practical constraints of the vessel's primary logistics support role, considers whether there are opportunities to utilise the existing capabilities of *L'Astrolabe* to support further marine scientific research.
2. Reviews the presence of a non-native plant carried on board *L'Astrolabe* within the Antarctic Treaty area for compliance with French legislation, in light of requirements of Annex II, Article 4.

6. Glossary

AAD	Australian Antarctic Division of the Department of Climate Change, Energy, the Environment and Water
AAP	Australian Antarctic Program
ASPA	Antarctic Specially Protected Area
ATCM	Antarctic Treaty Consultative Meeting
ATS	Antarctic Treaty Secretariat
AWACA	Research project: Atmospheric Water over AntarctiCA, past, present and future
CEMP	Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) Ecosystem Monitoring Program
CEP	Committee for Environmental Protection
CNES	Centre National d'Etudes Spatiales (French National Centre for Space Studies)
CNRS	French National Centre for Scientific Research
CNTBTO	Comprehensive Nuclear Test Ban Treaty Organization
COMNAP	Council of Managers of National Antarctic Programmes
DFAT	Australian Department of Foreign Affairs and Trade
EIA	Environmental impact assessment
GPS	Global Positioning System
HPAI	Highly Pathogenic Avian Influenza
HSM	Historic Site and Monument
IMO	International Maritime Organization
IPEV	French Polar Institute Paul-Émile Victor
TAAF	Terres Australes et Antarctiques Françaises
XBT	Expendable Bathythermograph