Report of the Joint Inspections Program undertaken by Argentina and Chile under Article VII of the Antarctic Treaty and Article 14 of the Environmental Protocol

INDEX

1. Introduction

Figure 1 – Inspection team at Teniente R. Marsh Airport. Presidente Eduardo Frei Montalva base

Between February 17th and March 2nd 2019, a multidisciplinary team of observers from Argentina and Chile conducted joint inspections of four foreign facilities located on the west coast of the Antarctic Peninsula, in accordance with the provisions of articles VII of the Antarctic Treaty and 14 of the Protocol on Environmental Protection to the Antarctic Treaty ("the Environmental Protocol").

To that end, each country appointed four observers, which was notified to the other Consultative Parties in terms of Article VII of the Treaty, and also to the Antarctic Treaty Secretariat pursuant to Decision 7 (2013).

An observer from the Oriental Republic of Uruguay and an observer from the Republic of Korea were also invited.

Consequently, on February 21st, 2019, the team inspected Palmer station, managed by the United States Antarctic Program (USAP) and the National Science Foundation. On February 22nd, Akademik Vernadsky station, managed by the National Antarctic Scientific Centre of Ukraine (NASC) and the Historic Site and Monument N° 61, Port Lockroy, managed by the United Kingdom Antarctic Heritage Trust (UKAHT) were also inspected. Lastly, on February 26th, St. Kliment Ohridski station, managed by the Bulgarian Antarctic Institute was inspected.

The designated observers were:

From Chile:

- Minister-Counsellor Camilo Sanhueza (Antarctic Director, Ministry of Foreign Affairs)
- First Secretary Carlos Gajardo, (Antarctic Directorate, Ministry of Foreign Affairs)
- Retired Colonel Rafael Castillo (Defense Under-Secretariat)
- Mg. Verónica Vallejos (Chilean Antarctic Institute)

From Argentina:

- Counsellor Juan Antonio Barreto (National Directorate for Antarctic Foreign Policy, - Ministry of Foreign Affairs and Worship)
- Third Secretary Carlos Bunge (National Directorate for the Antarctic - Ministry of Foreign Affairs and Worship)
- Dr. María Mercedes Santos (Argentine Antarctic Institute - Ministry of Foreign Affairs and Worship)
- Commander Gabriel Maldonado (Antarctic Joint Command – Ministry of Defense)

- From the Oriental Republic of Uruguay: Dr. Alvaro Soutullo (Uruguayan Antarctic Institute)
- From the Republic of Korea: Dr. Sang Hoon Lee (Korea Polar Research Institute, KOPRI)

The team´s work methodology included the use of "*Checklist A: Antarctic Permanent and Subsidiary Installations"*, Resolution 3 (2010) of the XXXIII Antarctic Treaty Consultative Meeting (ATCM), as a guideline for observers to carry out on-site activities. This was complemented with personal interviews and a visual inspection of the stations' facilities. Before conducting the inspections, observers collected information from the Antarctic Treaty Electronic Information Exchange System (EIES), the Council of Managers of National Antarctic Programs (COMNAP) website, reports from previous inspections, websites of the relevant National Antarctic Programs and the Antarctic Treaty database on Environmental Impact Assessments.

Figure 2 – Chilean Navy ship "Aquiles"

2. Acknowledgments

The team of observers would like to especially thank the Chilean Air Force (FACH) and Navy for all the logistic support for the transportation of the inspection team in both stages. Firstly, in a FACH Lockheed C-130 Hercules from Punta Arenas to President Eduardo Frei Montalva station, where they boarded the AP-41 "Aquiles" of the Chilean Navy on route to Palmer, Vernadsky and Port Lockroy facilities. During the second stage and after logistic operations deployed by the vessel, the inspection team was taken to St. Kliment Ohridski station.

This acknowledgement is also extended to the personnel at President Eduardo Frei Montalva station, particularly to the station leader, Group Commander Héctor Contreras, for the warm reception of the inspector team The team is also grateful to Lieutenant Colonel Miguel Pérez and the staff at O´Higgins Station (Chilean Army) for the warm reception, and to the station leader at the Republic of Korea's King Sejong Station, Mr. Sung-Ku Lee, and its personnel for the courtesy reception offered.

The Argentine Delegation is particularly thankful for the kind assistance of the Consul General of the Argentine Republic in Punta Arenas, Mr. Jorge Insausti.

Lastly, thanks are due to the personnel of the inspected stations from the United States of America, Ukraine, the United Kingdom and the Republic of Bulgaria, for the assistance provided during the inspections and their comments to the relevant inspection reports, which were incorporated at the end of this document.

3. General Considerations and Recommendations

Figure 3 – Inspection team visiting the Chilean Antarctic Institute (INACH) in Punta Arenas

Figure 4 – Inspection team disembarking near Port Lockroy

The experience of conducting a third round of joint inspections in four years, allows Argentina and Chile to propose some observations regarding this useful instrument, established in article VII of the Antarctic Treaty and article 14 of the Environmental Protocol.

Apart from being a right awarded by the Antarctic Treaty to the Parties, inspections have become a valuable tool, given the opportunity to learn new techniques and good practices from the management and administration of other Antarctic stations, experiences that enrich the inspection team and their national Antarctic programs.

Both Argentina and Chile have a privileged geographical position in terms of access to Antarctica, as well as logistic facilities in the cities of Punta Arenas and Ushuaia. Such advantages allow for a wide array of aerial and naval operations to the Antarctic continent, as well as availability of several stations and facilities in the Antarctic Peninsula.

This particular position grants a variety of alternatives when conducting inspections, such as the availability of naval or air resources, stations and facilities to resort to in cases of *force majeure* or the need of shelter. Nevertheless, the organization of these activities has proven complex, yet very much facilitated by international cooperation.

Joint inspections allow for direct collaboration between available logistic resources of several countries, thus broadening alternatives and contributing to the optimization of available economic resources and associated costs sharing. This synergy facilitates access to more distant stations, which are usually less inspected.

For this third round of joint inspections, the inspection team benefitted from the invaluable collaboration of invited observers from the Oriental Republic of Uruguay and the Republic of Korea, and is therefore in a better position to propose some general recommendations derived from these inspections to the four Antarctic stations, taking into consideration the several disciplines represented and a balanced distribution of nationalities within the inspection team (as in previous joint inspections).

From the perspective of the invited observers, the inspection provided them with a valuable capacity building exercise, and allowed them to learn in detail about facilities with a multiplicity of different purposes, geographical conditions, institutional situations and management methods. Despite those differences, Antarctic operations usually face common challenges, which, however, sometimes have to be met according to a stations particular capabilities. Probably, the most relevant appreciation of the invited observers has been to verify *in situ* that there are multiple ways of approaching challenges while operating in Antarctica and at the same time, while complying with the obligations derived from the Antarctic Treaty. On the other hand, the inspection provided the opportunity to work together with a multidisciplinary group of experimented observers, which provided the invited observers with a first hand view of the many aspects and logistical challenges which these kinds of inspections imply. Having participated in the inspections and in the following discussions with the rest of the team, constituted a unique opportunity for the invited observers, particularly for the capabilities of their own National Antarctic Programs as well as for the assessment of their own facilities in Antarctica. Likewise, their participation in the inspections has enriched the perspective of the two organizing countries, considering the different professional backgrounds of both invited experts. Finally, the time shared by the observers provided an excellent opportunity to strengthen the ongoing cooperation among the four National Antarctic Programs.

As a result of the inspections, Argentina and Chile present to the ATCM and CEP the following general recommendations for consideration and to evaluate future courses of action:

a. The need for increased attention to radio, satellite phone and/or E-Mail communications. Prior to the inspections, the observer team encountered difficulties in establishing contact with the stations to be visited. In this regard, it would be advisable to keep the COMNAP Antarctic Telecommunications Operator Manual (ATOM) updated with the stations' contact information, and for it to be published in a more accessible way, as well as for such updated information to be provided to the Antarctic Treaty Secretariat (ATS), to be made available to all Parties.

b. Availability of information: It was noted that the resources available for the exchange of information are currently being underutilized. In some cases, the information provided by National Antarctic Programs on their own websites is not updated, which in turn is the one reflected on the COMNAP and ATS websites.

c. It would seem desirable to have a wider circulation of "Checklist A: Antarctic Stations and Subsidiary Installations" (Resolution 3, 2010), as well as better training of Antarctic station personnel regarding its proper use. Taking into account the usual limited time for conducting inspections, it is advisable that stations have a completed "Checklist A" available for the inspection team prior to the inspection, to assist in the process. It must be highlighted that of four inspected stations, only one provided a complete and updated checklist for the inspectors, making a decisive contribution to the visit.

d. It would also be beneficial for National Antarctic Programs' websites to carry completed station checklists, which would improve the availability of that useful information prior to inspections, while at the same time enhancing transparency.

e. Consultative Parties might wish to consider discussing the possibility that inspected Parties provide feedback to the following ATCM about the consideration given to the particular recommendations made during inspections. The lack of proper follow-up to the recommendations seems to undermine the effectiveness of the inspection system, with the consequent misuse of significant resources allocated to logistical deployment. Of the four inspected stations, only one had adequately addressed all of the observations made as a result of previous inspections.

f. Regarding medical issues, it would be desirable that the Consultative Parties make available as much updated information as possible on medical facilities they have at their stations, for example, X-ray equipment. This would be a substantive contribution both for the operative and safety coordination between isolated stations, in case of a medical emergency, and for information exchange under COMNAP.

g. The inspections become a very useful exercise for the inspected Party, considering that the recommendations received are an encouragement for improvement and an incentive for resource allocation at the domestic level.

h. Sites and stations that receive visitors should make sure their appropriate personnel are fully available for the inspection team, giving priority to the inspection over attention afforded to tourists whose visits, ideally, should be suspended during inspections. Particularly considering that reasonable notification in advance is provided as to the arrival of the inspection team.

i. Gender issues: It has been noted that there is a male predominance among the crews of the inspected stations. In this regard, the inspection team would like to propose a reflection, if possible, on potential incentives for women to participate more actively in Antarctic Programs. Likewise, we invite station leaders to enhance an adequate and friendly working environment for women, when appropriate.

j. As a result of the present recommendations, and should there be consensus among Consultative Parties, an ICG could be established to discuss general recommendations intersessionally, in order to improve the inspection system established by Article VII of the Antarctic Treaty and Article 14 of the Protocol on Environmental Protection, including aspects pertaining to the follow-up of past recommendations made by the different inspection teams.

k. Parties are encouraged to have relevant documentation, for example, documents related to station operation or contingency plans, in at least one of the Treaty languages, so as to facilitate the observers´ task, as well as to assist potential foreign visitors that may arrive at the station.

l. Regarding renewable energy sources, the inspection team was pleased to confirm the use of solar panels on two of the inspected facilities. Such use, however, corresponds with reduced infrastructure and scientific deployment of low energy consumption, which can therefore rely on this type of energy. In cases of larger stations and scientific deployment, which involve sophisticated monitoring equipment working 24hs, with significant energy consumption, the use of solar panels at this stage may be more symbolic. Perhaps the employment of more efficient construction materials, as well as the implementation of rationalization

measures and consumption reduction plans of the larger operations, could be of value, considering that one of the most important goals National Programs should seek is the reduction of fuel consumption in Antarctica, and not only the replacement of the energy source.

m. Of the four inspected stations, two of them have ATCM designated Historic Sites and Monuments (HSMs). In this regard, we believe that the inspector team's field observations regarding what defines an HSM, as contained in the inspections report, could be a valuable input for ATCM ongoing discussions about HSM designation. Moreover, the inspection team would like to recall that designation of HSMs implies further responsibilities beyond the mere designation, for those Consultative Parties responsible for the HSM management.

Figure 5 – Álvaro Soutullo (Uruguay), Rafael Castillo (Chile), Gabriel Maldonado (Argentina) and Carlos Bunge (Argentina) near St. Kliment Ohridski.

4. Inspection Report Palmer (United States)

Inspected on February 21st, 15:00hs-18:00hs

Figure 6 – Aerial view (photo provided by Palmer station)

Date of prior inspection

December 9, 2012 (Spain, the Netherlands, the United Kingdom)

4.1 Introduction

Palmer is a middle-sized station built on the southeast coast of Amberes/Anvers Island (64° 46´ 27” S, 64° 03´ 12” W). Established in 1968, in time it has turned into an important station in terms of scientific outcome.

Palmer is managed by the National Science Foundation´s United States Antarctic Program (USAP). *Leidos*, a private contractor (“Antarctic support contractor”) is in charge of the operation, which had once been under the responsibility of Lockheed Martin Group. At the time of the inspection, Robert Farrell -a contractor's officer- was responsible for the station. The contractor is a private company with Antarctic experience, coordinating a multidisciplinary team with participation of public research institutions usually responsible for complex scientific equipment. The public-private management structure of the Antarctic facility was noteworthy.

It must also be noted that upon commencement of the inspection, the Station Leader provided the inspection team with a checklist with all the relevant updated information, which complemented the on-site verification carried out. This very well received gesture from the Palmer Station personnel resulted beneficial for the inspection team. The personnel were readily available for inspectors, guided them through the station facilities and assisted them in conducting the inspection. In this respect, inspectors were informed that the station personnel are carefully selected, so as to create the most coherent and harmonized work team possible.

The last inspection made at Palmer station was carried out in December 2012, by the United Kingdom, Spain and The Netherlands. At that time, the inspecting team made two recommendations: one on abandoned

firearms - which was resolved - and the other on improvement of the disposal of wastes discharged into the sea. On this second matter, no changes were observed, as was also informed by the Station Leader.

4.2 Physical description

The station has a total area of 32.736 square meters (approximately 8 hectares). It is built on solid rock and consists of two main buildings with three adjacent smaller ones, as well as two large fuel tanks and a pier. The buildings closest to the coast are connected by an elevated wooden path structure to facilitate mobility, particularly as a considerable number of above ground fuel, water and sewage pipes were observed. Work areas - as well as entertainment and dining areas - are clean, spacious and well organized.

4.3 Scientific Research

The station´s summer Supervisor of Laboratory Operations showed the scientific facilities to the inspection team and presented them with the information about the scientific activities carried out at the station. He shared printed listings of the science team's members since 2000, as well as a copy of Palmer Station´s science projects for this season and a monthly science report called "News from the Lab". He led the science inspection team through the laboratories, answering specific questions.

Along with the checklist, the list of the conducted science projects (PI's, themes, funding agents) was also provided. The documents were thorough and well prepared.

The scientific activities at the station are coordinated and checked by a Supervisor, a Technician and a Scientific Assistant. The year-round activities are developed in two legs: from October to April each year, the summer period; and between April and October, winter period. Researchers stay in the station from one to six months, according to the activity they are involved in.

Figure 7 – Juan Antonio Barreto (Argentina) and Camilo Sanhueza (Chile) interviewing a US scientist.

The inspection team was informed about 21 projects from the 2018-2019 United States' Science Program, which include population biology of seabirds, chemical defenses of marine macroalgae and invertebrates, terrestrial plant biology, ultraviolet radiation measurements and effects on marine organisms, atmospheric physics and chemistry, seismology and marine ecology. A significant portion of the station's research involves Palmer LTER (Long Term Ecological Research) that has been running for 28 seasons, a multidisciplinary project which involves five components (microbial/ biogeochemical, phytoplankton, zooplankton, seabirds and whales), with an ecosystem perspective.

At the time of the visit, 45 people were at the station, 19 of them scientists, mostly related to the LTER program projects. The Supervisor informed the inspection team that 20 to 50 % of researchers at the station are women, depending on the work period (winter or summer).

As reported by the staff, scientific activities in progress included:

- Global Seismograph Network Site at Palmer Station (GSN)
- The Omnivore's Dilemma: The effect of autumn diet on winter physiology and condition of juvenile Antarctic krill
- Ultraviolet (UV) spectral irradiance monitoring network
- Protein folding and embryogenesis in Antarctic fishes: A comparative approach to environmental stress
- The next generation of geospace research facilities at Palmer Station
- Antarctica as a model system for responses of terrestrial carbon balance to warming
- Production and fate of oxylipins in waters of the Western Antarctic Peninsula: Linkages between UV radiation, lipid peroxidation, and carbon cycling
- Spring blooms of sea-ice algae in the Western Antarctic Peninsula: Effects of warming and freshening on cell physiology and biogeochemical cycles
- Reconstructing Late Holocene ecosystem and climate shifts from peat records in the Western Antarctic Peninsula
- Operation and maintenance of a CTBT radionuclide monitoring station at Palmer Station, Antarctica
- A study of atmospheric oxygen variability in relation to annual to decadal variations in terrestrial and marine ecosystems
- Collaborative research: Antarctic ELF/VLF observations of Q-bursts, radio atmospherics, and energetic particle
- Troposphere-ionosphere coupling via atmospheric gravity waves
- GPS continuously operating reference station
- Continental-scale studies of mesospheric dynamics using the Antarctic Gravity Wave Instrument Network (ANGWIN
- TeraScan Satellite Imaging System
- Palmer, Antarctica Long Term Ecological Research (LTER): Land-shelf-ocean connectivity, ecosystem resilience and transformation in a sea-ice influences pelagic ecosystem – Microbial loop
- Palmer, Antarctica Long Term Ecological Research (LTER): Land-shelf-ocean connectivity, ecosystem resilience and transformation in a sea-ice influences pelagic ecosystem – Seabird ecology
- Palmer, Antarctica Long Term Ecological Research (LTER): Land-shelf-ocean connectivity, ecosystem resilience and transformation in a sea-ice influences pelagic ecosystem – Whales
- Palmer, Antarctica Long Term Ecological Research (LTER): Land-shelf-ocean connectivity, ecosystem resilience and transformation in a sea-ice influences pelagic ecosystem – Phytoplankton ecology
- Palmer, Antarctica Long Term Ecological Research (LTER): Land-shelf-ocean connectivity, ecosystem resilience and transformation in a sea-ice influences pelagic ecosystem – Zooplankton ecology

4.3.1 Facilities for Science

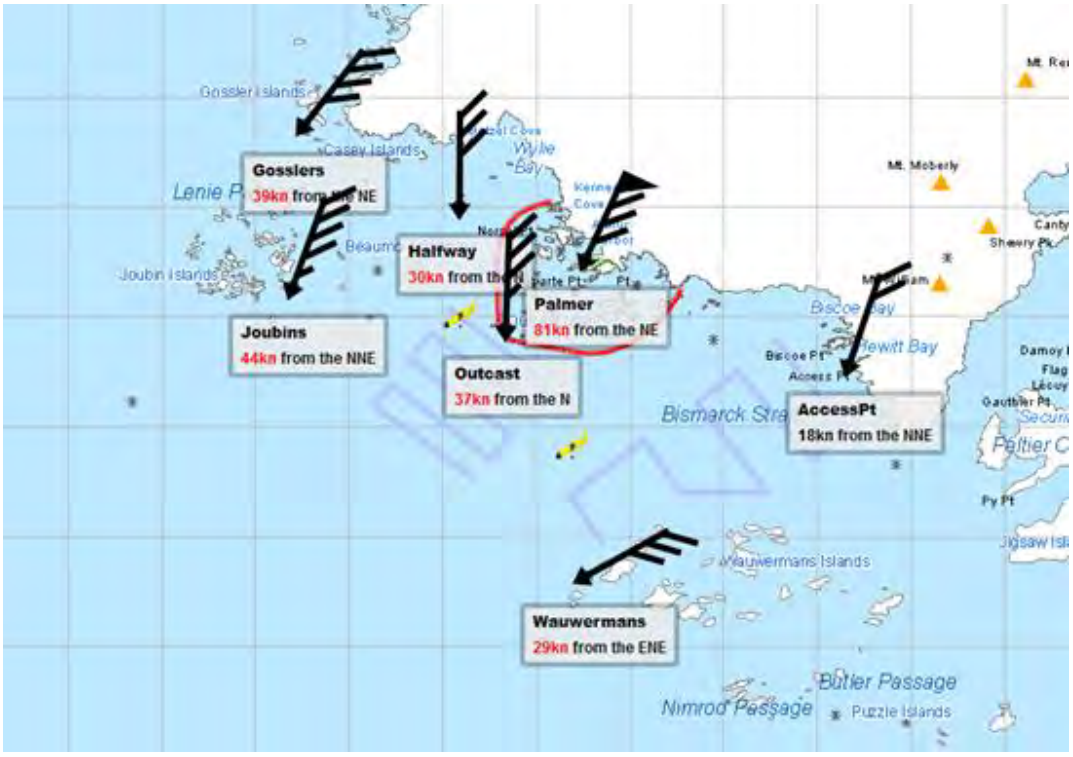
Science facilities include a biology laboratory building, the "Mary Alice McWhinnie Marine Science Center", including indoor and outdoor aquaria, a "reefer station" to carry out experiments under controlled

temperature, a chemistry laboratory, a radioisotopes laboratory, general laboratories, a dry work space and science library; a TerraLab building which houses a seismometer, a radionuclide sampler/analyzer, a magnetometer, a gravity wave imager, a troposphere ionosphere coupling, a UV monitor, carbon cycle air sampler, halocarbon air sampler, a weather suite, tide gauge, and a weather satellite imagery. The acquired data is regularly sent to the US institutions for processing. The station also has a boat house/dive locker to support the scientific diving activities and collecting of marine samples.

The Scientific assistant supports fourteen projects throughout the year, collecting data and sending the information or samples to the United States as required. Most of those projects are those with instruments at the TerraLab, minimizing the number of researchers in the field.

Palmer has incorporated weather-recording stations in the area for better planning of sea operations, which have been distributed as highlighted in the following map:

Figure 8 - Map provided by Palmer station: weather sensors data collection



4.3.2 International collaboration

At the time of inspection, no exchange of scientists from other Antarctic programs was observed at the station. However, the Supervisor informed the inspection team that the station has informal collaboration with Argentina, Chile, Colombia, Portugal, Spain, Ukraine and United Kingdom, mostly with logistic support between stations and vessels navigating in the area.

4.4 Management of dangerous elements

4.4.1 Hazardous Chemicals

Reports and documentation provided by the environmental officer confirmed that various types of chemicals are used for scientific research, medical support, maintenance and cleaning.

Chemical products and their corresponding waste are stored in separate well kept compartments, and under constant supervision. The station has specialized personnel for handling of chemical products.

Chemical waste is sent by sea every two years to McMurdo Antarctic station and from there to the US for final disposal.

Palmer has a specially prepared container to process and categorize all hazardous wastes produced at the station. In addition, chemical wastes generated on board US Antarctic research vessels are temporarily stored at the station. Used batteries, radioactive materials, fuel and lubricant residues with high levels of heavy metals, as well as chemically treated wood and paint are mainly shipped off the station.

Palmer also houses research projects that require the use of small quantities of low-level radioactive products, mainly for use in biological experiments. The radioactive waste resulting from these experiments is classified as wet or dry and carefully labeled and packaged, and specially monitored until its final disposal.

Figure 9 – A specially assigned sector, separated from other buildings for storage of hazardous chemical products in adapted containers that include chemical shower in case of spill or accidents.

Apart from especially trained personnel to deal with fuel or chemical spills, all logistics and scientific personnel receive training and guidance in prevention and response to these types of emergencies, and the station carries especially designed plans for these contingencies. It should be noted that this station performs periodic staff training exercises for response to environmental emergencies.

In different sectors of the station, barriers and appropriate products have been prepared for oil spill mitigation, while containment materials for larger spills is stored separately, both on land and at sea. The hydrocarbons spill prevention equipment includes plastic containers with built-in spill containment for transport and storage of 205-liter fuel drums, which provide a greater margin of safety.

Figure 10 - Container for storage of different oil spill mitigation materials (left). Anti-spill materials available at different points of the station. (right)

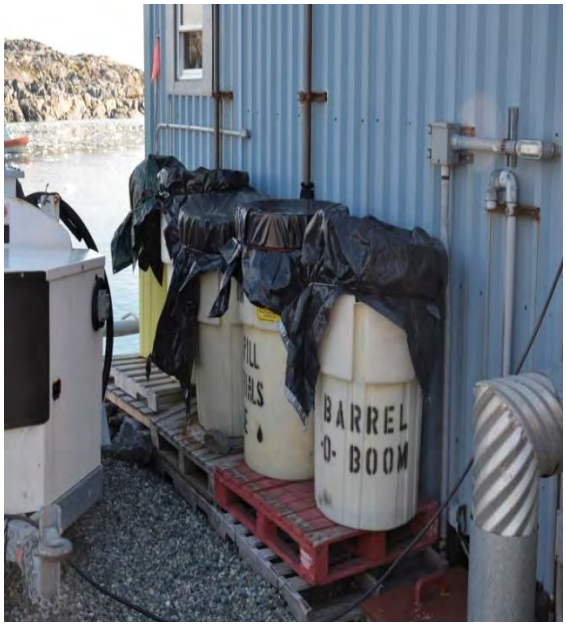


Figure 11 – Plastic Containers for storage and transport of fuel barrels.

4.4.2 Explosive elements and firearms

No weapons or explosives were reported. Minimum amount of flares are available, which are kept in cases to be used in emergencies. The surplus material is stored in small metal containers. Expired explosives are reported to the NSF.

With regard to the recommendation made in the last inspection (Spain, the Netherlands and the United Kingdom) regarding the two firearms - a pistol and a rifle which were no longer used - the station manager reported that they were destroyed in October 2016, a procedure that was documented and submitted to the national Antarctic authorities.

4.5 Matters related to the Madrid Protocol

4.5.1 Managing of scientific waste

Most of the waste produced by the scientific activity is stored and transported outside of Antarctica in regular trips by the US research vessels based in Punta Arenas, Chile. The waste of that activity is stored and transported onboard the RV "Nathaniel B. Palmer" to McMurdo Station, for onward transportation to California, United States, for the appropriate treatment and final disposal.

To the questions of the inspection team on the use and permit of the radionuclides, the science supervisor stated that the lab uses 3H and 14C, and the plans for use and the types of radionuclide were included in the annual report to ATCM. He also added that the lab keeps the log on the amount of the radionuclides carried into the station and the amount used for experiments. The station is equipped with scintillation counters, so that the prepared sample from experiments can be processed on site. As per the management plan on the used radionuclides, the station collects the waste, both liquid and dry, and transports them back to US for further processing. A swipe test is performed on a regular basis, at least once or twice a week, again to minimize contamination risk. The floor of the lab, where radionuclide handling takes place, is covered with plastic sheeting to facilitate decontamination procedures. A diagram is posted on the lab wall to indicate swiping areas and those which can be more easily or frequently contaminated. The lab also produces hazardous, chemical and/or biological wastes, which are properly collected separately from regular waste, and removed from the station for further processing. Particular precautions are taken with avian lab wastes. They are either incinerated or packaged and transported out of Antarctica.

4.5.2 Environmental management

This station evidences a strong commitment to observance of the Protocol on Environmental Protection to the Antarctic Treaty ("the Environmental Protocol"), particularly regarding Antarctic flora and fauna conservation, waste management and implementation of measures to prevent and mitigate hazardous waste spills.

4.5.3 Environmental impact assessment

All planned activities were assessed in advance of their implementation by the competent National environmental authority, based in Denver, Colorado. As informed during the on-site interview with the environmental officer, since December 2006, only one Initial Environmental Evaluation had been conducted.

Regarding eventual environmental impact of the discharge of household wastes and sewage waters into adjacent sea areas, an analysis thereof is annually carried out to verify that only household wastes are discharged and to record the total load of nutrients and solids discharged into the sea.

4.5.4 Waste management

Based on the information provided to the inspection team, all non-hazardous wastes are sorted at the source according to the categories used in Punta Arenas, Chile (city of final disposal). Containers for different wastes are placed in different areas of the station.

The station's environmental officer is given specific training in waste management, including hazardous and radioactive wastes. A waste management manual is available at the station, and personnel are responsible for correctly sorting wastes. The environmental officer verifies wastes are adequately stored for subsequent transportation by sea to Punta Arenas.

Plastic and paper wastes are separated, compacted and stored in labeled containers for subsequent transportation. Glass is crushed and stored in empty 205 lt. drums. Metal scraps, already sorted, are transported off station in wooden boxes.

In turn, organic wastes are crushed, macerated and then discharged into the sea jointly with household wastes and sewage waters, except for fish remains, egg shells and poultry carcasses, which are incinerated, and the ash thereof is transported to Punta Arenas for final disposal. As stated by the environmental officer, 1.3 kg of waste per person is generated daily, without considering wastes discharged into the sea.

Figure 12 - Fuel drums storage area, in protective containers with built-in anti-spill containment, to prevent accidental spills

Figure 13 - Example of waste storage area (A), which facilitates sorting and subsequent treatment of certain types of wastes in a compactor (B).

A. waste storage area

B. compactor

4.5.5 Effluent treatment

The station toilets operate with salt water discharge systems. For such use, there is a pumping system adjacent to the coastline. As reported by the environmental officer, these sewage waters do not have an evident impact on the environment; however, the station does not have a treatment plant. Sewage waters and food wastes are not treated, but macerated and then discharged through pipelines directly into the sea, except for poultry waste and egg shells, which are incinerated and shipped out as non-hazardous waste.

The station area is monitored annually by the National authority in order to verify the impact of such waste (nutrients and solids) discharged into the sea. Station analyses are carried out twice a year to verify the quality of water according to the standards of the World Health Organization (WHO) and the United States Environmental Protection Agency (EPA).

4.5.6 Conservation of flora and fauna

Prior to its deployment to Antarctica, all personnel receive environmental training related to the protection of Antarctic flora and fauna, and in connection with proper waste management. Upon arrival at the station, the crew participates in informative meetings, and receives a printed guide with background information relating to the protection of flora and fauna. In the same way, such briefings are delivered to occasional visitors.

Located close to the station are the Antarctic Specially Protected Area (ASPA) No. 139 and No. 113, and the Antarctic Specially Managed Area (ASMA) No. 7; however, strictly speaking, no permanent monitoring of the zones is carried out, nor of the impact of human activities on them. There are scientific projects that monitor some outstanding scientific values of these areas. Everything related to the management of the fauna and flora has permits filed directly with the National Science Foundation (NSF).

At the same time, in different sectors of the station and on smaller vessels and yachts, visitors are provided with protected area management plans and maps, which are also informed to approaching vessels or those transiting the vicinity.

In order to avoid the introduction of non-native species, the staff is also provided with guidelines before arrival to Antarctica, and although there are no records of permanent presence of non-native species in the area, when organisms associated with the incoming cargo are detected, they are controlled on the spot.

4.5.7 Protected areas

As explained by the station manager, the entire staff was aware of the regulations of the Environmental Protocol, and the existence of ASMA No. 7, as well as the two ASPAs (No. 139 and No. 113) in the vicinity of the station. Only scientific personnel enter these zones, with the corresponding permits issued by the NSF. The station carries copies of issued permits, which provided during the inspection. Access to these areas is only authorized for research purposes or for security reasons and the entry ban is also transmitted to tourists and occasional visitors.

4.5.8 Training in matters related to the Environmental Protocol

During the inspection, the station manager, scientists and the environmental officer demonstrated knowledge of the scope of the Antarctic Treaty and the Environmental Protocol. As verified in different interviews, the staff is also familiar with the Environmental Protocol, with mandatory training prior to its deployment. Copies in English of the Treaty and the Environmental Protocol were available in digital and hard-copy format.

4.6 Logistics and operations

The station has 4 communication facilities. One of them is located in the unit called "Bio Lab" and consists of two 200W (HF) radio stations, an Iridium satellite telephone system, a VHF communications system for maritime communications and a VHF AM system for air communications. The second communication facility consists of an HF amateur radio device (call signal KC4AAC). The third facility is a Radomo-type ground station (Domo) and its corresponding installation contains an Iridium telephone and SATCOM system to allow voice and data communication via California, United States. This is kept in the "Stand-by" operating mode for maritime communications, Channel 27 and a UHF repeater.

The fourth facility consists of a VHF communications system in a 33.5-meter tower for maritime communications through channel 27, and channel 16 for communications with the station. This allows for transmission of meteorological data and information through frequency 162.550 KHz. In general terms, the equipment is satisfactory and well distributed, permitting communications at all times in all three dimensions (air/sea and land) in an efficient and safe way.

The station has two off-road vehicles of the ATV type and two snowmobiles. It also has eight Zodiac-type boats, three of which are available for immediate use, one of them a 7.6 m long with two outboard motors, two 5m semi-rigid inflatable aluminum cabin-less vessels. (RHIB) and two cabin boats, 10 m long with built-in engine.

Figure 14 - Aluminum-cabin marine boat with interior motors.

A properly adapted dock was observed to operate with small boats, which permits loading and unloading of passengers, as well as general cargo movement. It was reported that since the last inspection, the boats of the station are towed with trailers in and out of the water.

It was reported that the station does not have fixed or rotary wing aircraft for its activities. It does not contemplate aircraft and helicopter operations on a regular basis, but they can operate, in case of need or emergency, on nearby glaciers. There is no heliport although the vicinity of the station can eventually be used for helicopter operation in case of extreme need. This is was the case for the departure of the team of inspectors.

Figure 15 – Chilean Navy helicopter used for inspection team redeployment.

4.6.1 Fuel storage

Palmer uses Antarctic-type diesel fuel, stored in a tank with 378.541 liter capacity, which is generally used for the heating system, power generation and for the use of heavy machinery. Up to 4.164 liters of gasoline are stored at the station, which are used for the operation of outboard motors, snow vehicles and all-terrain vehicles.

The station has two steel tanks that store 473.176 liters each, which is used for daily diesel consumption. In addition, it has a trailer tank for easy diesel supply and distribution. For the storage of gasoline 200 liter drums are used.

Figure 16 - Diesel fuel tanks

The supply of fuel and its transfer to different tanks is maintained under permanent visual observation of lines, valves and tanks. Twice a year, fuel is supplied from the "ARSV Laurence M. Gould" vessel to the station's two main tanks. For the storage of 200-liter drums with gasoline, there is a system of plastic containers with a capacity of four drums that allow to contain any type of spill that is generated in its

handling. The inspectors observed that this type of storage measures and methods is a very good and effective practice to avoid spills in the transfer of these liquids. This method is very convenient to store, classify and handle 200 liter-drums, apart from being very safe, could be an example for other stations and relatively easy to implement.

Figure 17 - 200 liter drum anti-spill storage system.

The station has a fuel distribution system through 10 and 5-centimeter steel pipes connecting the main tanks to those used daily. These are both above and below surface, which increases the visibility and control of spills or leaks. The transfer of fuel is made with electric pumps, which maintains the control and monitoring of these maneuvers.

Figure 18 - Diesel fuel tank for daily use.

The fuel supply from the ship to the station is done by mooring to the dock through a 10-cm pipe and an overall length of 46 meters to the tank. The ship's electric pumps transfer the fuel. The pipes are cleared by gravity and air compressors. The station carries fuel operation and handling manuals. The inspectors were informed that operating manuals and standards are available in the station's management office.

Figure 19 - Supply line of pipes and cables between the different premises.

Spill prevention and safety measures in fuel management prove to be a priority for operations, both in the supply from ships and their transfer to the different systems. In addition to the monitoring of lines, valves and connections, cleaning and wiping material is permanently available, if necessary. The staff is permanently trained in the handling and prevention of spills in terms of response in case of emergency.

4.6.2 Water system

Palmer has two reverse osmosis units for the desalination of water intended for human consumption. There is a plant that supplies high quality water according to WHO and EPA use of drinking water standards. Such standards help observe a measurement model that guarantees water quality and its monitoring.

4.6.3 Energy generation

Palmer has two 250-kW primary electric power generation motors and a 150-kW emergency generator. For the annual operation of the power generators, the station consumes 290 tons of Antarctic diesel. The station does not have other alternative power resources.

Figure 20 - 250 kW engine power generator facility

4.7 Medical facilities

It was reported that the station has a physician and paramedical personnel throughout the year. X-ray equipment is available, as well as a laboratory with telemedicine capacity for inter-consultation with specialists in the medical area of the University of Texas. In addition, it has a hospital bed.

4.8 Support with military activities

It was reported that the station does not have any kind of military support. There is only one air test equipment installed in the "TerraLab" unit in support of the monitoring of radioactive compounds belonging to the Department of Defense within the framework of the Comprehensive Nuclear-Test-Ban Treaty.

Summary

The inspectors commend Palmer Station for the ongoing quality science activities at the facilities.

An adequate logistics operation was observed thanks to the high standards of organization and order, and the spacious premises allowing for adequate storage of supplies and logistics materials.

The maintenance of most pipelines and conduits for conveying liquids and power distribution cables on rails and, therefore, on the surface, allows for visual control of the operation of the logistics systems.

Recommendation

- The inspectors did not notice any changes regarding the recommendation made in the last inspection (2012, Spain, the Netherlands and the United Kingdom) in relation to the treatment of wastes discharged into the sea and possible impact assessment actions.

5. Inspection Report Akademik Vernadsky (Ukraine)

Inspected February 22, 2019, 08:00hs-10:00hs

Figure 21 – View of main buildings and chapel

5.1 Introduction

Akademik Vernadsky station is located on Argentine Islands, south of the Le Maire/Lemaire Channel at Latitude 65° 14' 44" S, Longitude 64° 15' 27" W, on a rocky terrain at the northwest end of Galindez Island. It is administered by the National Antarctic Scientific Center of Ukraine (NASC).

At the time of the inspection, biologist Viktor Sytov was responsible for the station, which included 38 people, of whom about 20 were reported to be scientists. It should be taken into account that according to the information provided to COMNAP, the maximum capacity of the station is 24 people, so their operational and security systems could be overstretched. Despite the inspection team's request, no person responsible for environmental issues could identified.

In general terms, it is a station with significant science activity -especially earth sciences-. From the point of view of the facilities, the inspectors could observe some signs of deterioration and obsolescence.

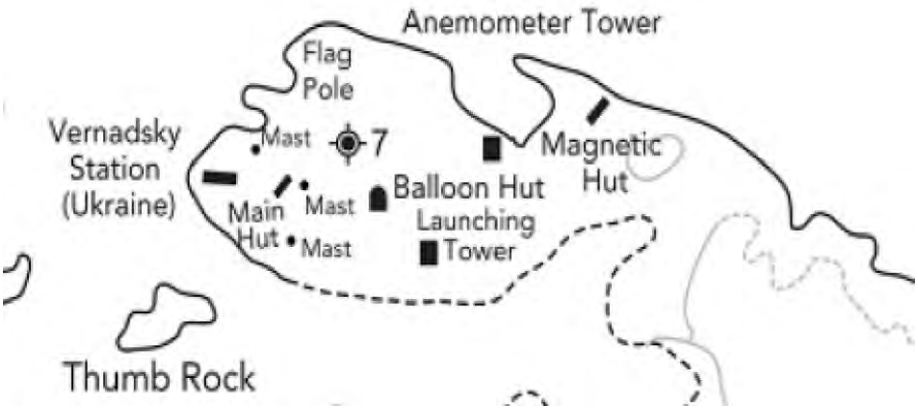
It should be noted that when asked for "Checklist A: Permanent Antarctic Installations and Associated Installations", the staff indicated that they did not know of it. In this regard, the inspecting team draws attention to the need for personnel to be previously trained on the subject, and to consider the possibility of having a checklist previously prepared and updated, both to assist in the personnel's knowledge of the station and in order to facilitate the inspection task.

With regard to the recommendations made during the last inspection by the United Kingdom and the Czech Republic in January 2015, Dr. Sytov said that a new diesel generator had been purchased, and was to arrive

in April 2019. As to the second and third recommendations, regarding the sewage water treatment plant and the waste storage, station staff indicated there had not been any progress. As described in the last inspection report, inspectors again noticed the presence of empty fuel drums and the existence of gray plastic bags with waste, stockpiled outdoors near the coastline, awaiting future removal, with the presence of birds feeding on such waste. Regarding the last recommendation, which then proposed environmental impact assessments prior to any type of construction, Dr. Sytov reported that there was no construction in progress.

It might be advisable for the station to design a plan with clear deadlines and responsibilities in order to follow up on the recommendations made on each inspection.

Figure 22 - Map of buildings, tower and masts of Vernadsky station. (Image obtained from Visitor´s Guidelines for Wordie house, Invierno/Winter Island)



5.2 Physical description

The station consists of twelve buildings, the last being a small chapel of the Ukrainian Orthodox Church, attached to the accommodation building in 2011, and which can only be accessed from outside. The layout of the buildings is basically the same as described in previous inspection reports: a cabin for the magnetometer, emergency building, and building for the generators, for the boats, a sauna and a warehouse for waste. The largest of the buildings holds rooms for staff, laboratories, kitchen, recreation area and even a souvenir shop that is visited with enthusiasm by tourists who arrive in the area.

The general appearance of the buildings is good, although it is inevitable to note that they are relatively antique structures, taking into account that the station dates from 1953 with some extensions made in 1980. A wooden walkway links the main buildings, facilitating the movement of people and cargo.

Figure 23 – Dr. María Mercedes Santos (Argentina), Verónica Vallejos (Chile) and Dr. Sang Hoon Lee (Korea) interviewing a member of the station.

5.3 Tourism

The inspection team arrived minutes before the arrival of a tourism vessel, being able to verify that most of the station staff was mainly dedicated to the attention of tourists. The inspectors noticed staff's concern that the inspection would not affect the disembarkation of visitors. According to the Station Leader, until the day of the inspection, seven cruise ships had visited the station.

At the time of the inspection, contact was also made by inspectors with the "RCGS Resolute" cruise coordinator, navigating for One Ocean Expeditions. The vessel was reported to have departed from Ushuaia with 97 passengers. Unfortunately, due to time constraints, no inspection of the vessel could be carried out to verify compliance with the "B-Ship Checklist in the Antarctic Treaty area". Even though the expedition coordinator in person kindly answered several questions of the inspection team, it would be desirable that when a tourist vessel visits a station where an inspection is taking place, the crew make the necessary arrangements for the inspection team to board the ship for inspection.

5.4 Scientific research

At the time of the inspection, the station was not ready to provide documents on the personnel and the science projects conducted. The inspectors requested information on such subjects to be submitted at a later time. Such information was later sent to the inspection team by the Ukrainian Antarctic program, and has been added at the end of this report.

During the interview, the inspection team was told that research that is being conducted at Vernadsky is part of a 20-year plan, currently under review, in line with the priorities set up by the Scientific Committee for Antarctic Research (SCAR). As reported to the inspection group, at the time of the visit there were 38 people

performing activities. Twelve of them were to remain during winter, six of them researchers. Four women are currently part of the staff. During winter, two women will be part of the crew, (one researcher and a physician who will arrive in late March). The scientists, in addition to developing their research activities, help in other tasks of the regular operation of the station.

The station has two biology laboratories and one ionospheric laboratory, in which marine biological studies are carried out on benthic communities and pollution, microbiological studies, seals and penguins monitoring, and studies on atmospheric sciences and geosciences.

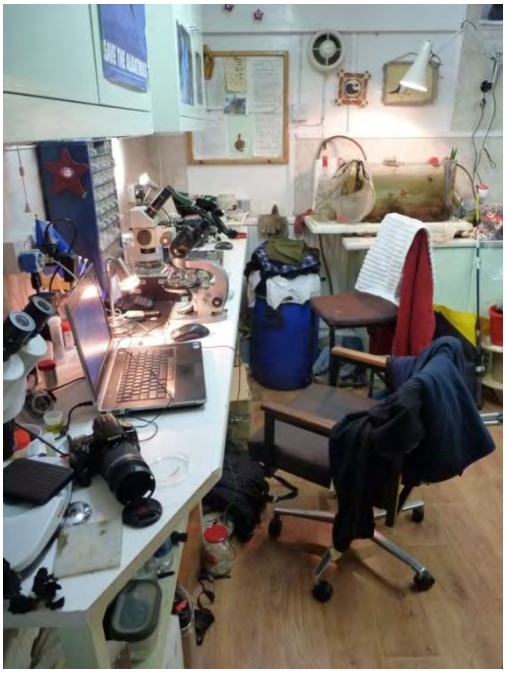
5.4.1 Geophysics Laboratory

The geo and geophysics lab has been collecting geomagnetic data since 1956, when the station was run by the United Kingdom. Observation data, after calibration and post processing, is sent to the international repository of magnetic data network for global scale analyses. The lab has plans to replace the current instruments with new ones made in Ukraine in the very near future, for the better contribution to the scientific community. For general geology, rock samples are collected from outcrops in the vicinity, and since 2002, the station continues long-term observation on ground movements under the geo-design program via GPS installations in the area Vernadsky also conducts line surveys on an irregular basis in near shore coastal waters for geomagnetic studies and bathymetry. Recently, measurement of the nearby glacier retreat has been started using photography and laser scan on a small scale. There are several scientists working on these fields of geoscience during the austral summer, but in winter, there is only one scientist for geoscience. In the past, Vernadsky had international collaboration with Russian and Latvian scientists, but such collaborations were not on a long-term basis, nor on a regular one.

5.4.2 Biology laboratory

The biology laboratory consists of a small room where a group works in the study of benthic communities and pollution, parasites in fish, and microbiology of bacteria. This laboratory has an extraction hood for microbiology work. Monitoring of penguin colonies (information that is reported to the Commission for the Conservation of Antarctic Marine Living Resources, CCAMLR) and seal surveys are conducted at the biolab and, during 2019, long-term program for monitoring of whales, which includes studies on genetics and photographic identification. This work will be developed by the Ukrainian Antarctic Scientific Center, in cooperation with the University of California at Santa Cruz (USA). Due to the increase in activities in the area of biology, the researchers of the station consider it necessary to enlarge the laboratories. There is also a biology office, for the person in charge of birds and mammals census.

Figure 24 - Partial view of the biology laboratory



5.4.3 Meteorology

The Meteorology Laboratory carries out four projects: standard meteorological observation and ozone layer observation according to the World Meteorological Organization (WMO); oceanic monitoring (collection of physical parameters of sea ice). The lab is part of the Global Network of Isotopes in Precipitation GNIP of the International Atomic Energy Agency (IAEA). In addition, the laboratory carries out the calibration of new equipment. According to the staff, it has also cooperation with the British Antarctic Survey and has previously worked with the Czech Republic.

5.5 Environmental management

According to the information provided to the inspection team, Vernadsky station does not have an environmental manager. However, one of the Ukrainian researchers and the station engineer (in charge of the fuel management) kindly provided the corresponding information. It was reported that all staff traveling for the first time to Antarctica receives training, which includes aspects of environmental protection, provided by the Environmental Officer of the Ukrainian Antarctic Program. However, the staff does not have at the station relevant information on the protection of Antarctic environment, in order to guide the development of their activities. All these important aspects are concentrated by the person in charge of environmental affairs within the Ukrainian Antarctic program, who is not at the station, but in Ukraine. Regarding the supply of drinking water, it is obtained from seawater, through a desalination system. The estimated consumption of drinking water throughout the season was not indicated.

It was reported that there are plans to change the generators, so they expect to submit the corresponding environmental impact assessments. In addition, Vernadsky is considering to use tanks of British origin for fuel storage, for which they began to undertake the corresponding studies.

Regarding sample collection from Antarctic organisms, it was indicated that the corresponding permits are given to each research project in Ukraine, and that they are kept by researchers, without no copies available at the station. Subsequently, it was not indicated if there is any kind of exotic species monitoring.

In regards to waste management, it is collected according to type, separated into organic, metal and glass, paper and cardboard, though processing of plastics was unclear to the inspection team. The station has a trash compactor that allows to reduce volume of generated wastes. All types of wastes are stored in warehouses and subsequently removed. There was no signage showing how to perform the initial classification of waste, nor a space assigned to its temporary storage. The material intended to be transported off station was kept outdoors, was accessible to local fauna, or not kept in structures that would avoid eventual spills.

Figure 25 - Part of the waste stored on platforms surrounding the main buildings

Regarding organic waste, it was reported that the staff is authorized to leave them outdoors to be eaten by birds, mainly seagulls. Organic waste is temporarily stored in open sky. This includes the remains of poultry, which implies a risk of transmitting diseases to the avian fauna. No incinerators were registered.

With regards to waste generated by scientific activity and toxic waste from operation activities, it was reported that these are mainly shipped back to Ukraine. However, the staff was not informed about how and when these elements would be removed. It was not evident to the inspectors the manner in which these wastes are collected, nor their storage site, prior to final removal from the station.

On the wooden platforms, the inspection team could see the storage of at least 60 200 liter metallic drums, in horizontal position and without any protection, and no information was provided regarding their contents.

As for gray and black waters, they are discharged directly to the marine environment and it was not evident to the inspectors whether the discharging points were monitored to establish if this method has any kind of impact. No reports about generated wastes or how this relevant information is provided to station personnel was made available for inspectors. Likewise, it was not evident whether the recommendations made during the inspection carried out in the period 2014-2015 by the United Kingdom and the Czech Republic regarding the management of generated waste were addressed, so the inspection team believes it would be advisable that the Ukrainian Antarctic Program review and consider them appropriately.

Regarding spills handling, no containment materials were observed in the event of an emergency, nor was it possible to determine if station crew receives specific training in this regard, or if there is a response plan. As briefly explained by the physician, who accompanied the inspectors, the staff has basic knowledge to mitigate spills.

The station has a new fuel storage tank, in excellent condition, and an old alternative tank, which, according to staff, has been recently inspected and is ready for use in case of need for transfers. However, leaks were observed in some of the pipes.

In regards to the Antarctic areas with some degree of protection, maps of four sites are presented at the access to the main module of the station, under the title: "Guides for visitors to Antarctica". However, it is not evident for the inspectors that personnel at the station is familiar with these site guidelines for areas in the vicinity of the station or the management plan for ASPA No. 108, Green Island, nor the manner in which this important information is given to arriving tourists.

It was reported that fauna and flora on the neighboring islands are monitored, as part of ongoing research projects.

5.6 Logistics and infrastructure

The station is annually supplied by vessels hired for such purposes. The last hired vessel was the Chilean "Betanzos", although the last supply, and the next withdrawal would be in charge of the Ukrainian ship "Marigolds".

The station consists of twelve relatively antique buildings although well preserved. There is an engine room in which the generators are kept, next to the food depot, water-pumping station and supply storage. The main building includes accommodation, kitchen, laboratories of various disciplines (meteorology, biology, geomagnetism, ionospheric and seismological studies) dining room, souvenir shop and doctor's office. There are also a recently built chapel (2012) and two modules where magnetometers are installed. As previously mentioned, at the time of the inspection there were no plans to build new buildings.

Fresh water is produced through a reverse osmosis system that extracts water from the sea, capable of generating around 3 m3 per day. In the past, fresh water was treated by UV light.

The station has an engine room building (workshop and generators) which houses the 3 three-phase Volvo Penta diesel generators with 80 kW capacity. As reported during the inspection, three new generators (D7AT Volvo Penta) would arrive at the end of the 2019 summer or at the beginning of next year. On the premises,

there are spare parts and tools for generators´ maintenance. It should be noted the general order of the premises and the space allocated for storage. There is no fixed firefighting system.

Only one of the three generators is used at a time, for electric supply, alternating with the remaining two. No alternative means for power generation were observed.

Diesel fuel is collected in a 200 m3 double-hulled tank that supplies the internal tank of the plant, which in turn, directly feeds the generators. Vernadsky consumes between 130-140 m3 of fuel per year and is annually supplied with fuel.

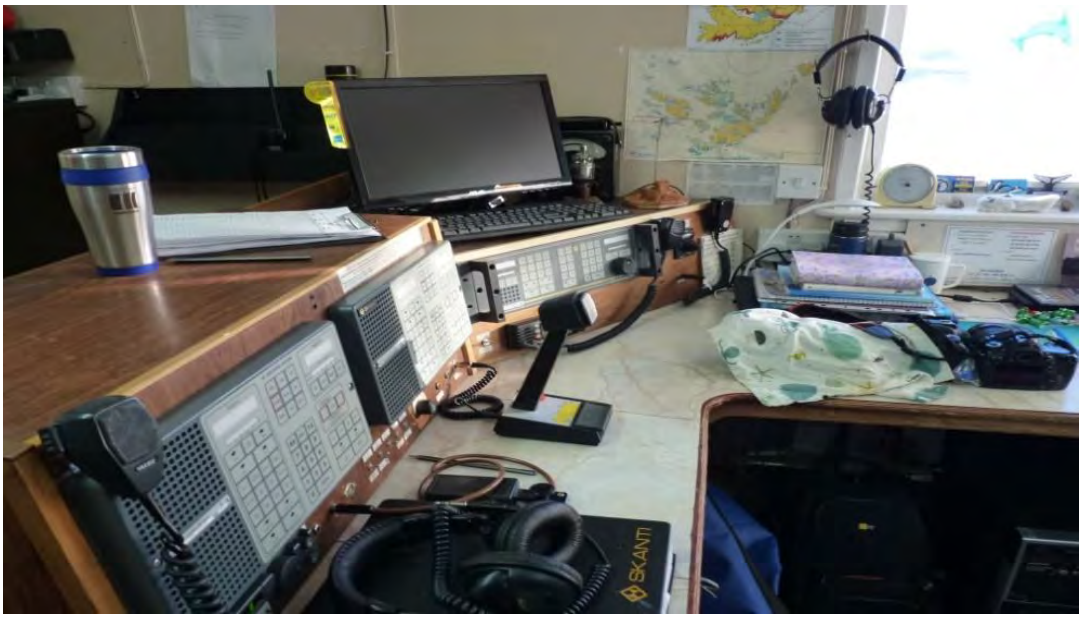
Figure 26 - View of the main fuel storage tank and part of the 205 liter drums.

Likewise, gasoline and diesel are stored in 205 liter drums arranged outside the power plant building. Two 145 m3 and 33 m3 old tanks for storage of bulk fuel are kept in the original site, although they are no longer used for fuel storage. One of them was already conditioned as a deposit and in the short run the same would be done with the second tank already empty.

Figure 27 - Generator room

Regarding **communications**, the station has VHF and HF radio equipment, satellite telephony (Iridium) and internet (30 GB per month).

Figure 28 – Radio equipment



In regards to transport system, the station does not have 4x4 vehicles or trucks. There are two snowmobiles available. For research at sea and logistical support, there are six Zodiac boats and three plastic rowing boats, but according to the information provided by the station manager, the latter ones are no longer used. For boat operations, the dock has a fixed Hiab crane, with a load capacity of up to 200 kg.

The station does not have firearms or explosives.

5.7 Emergency response capabilities

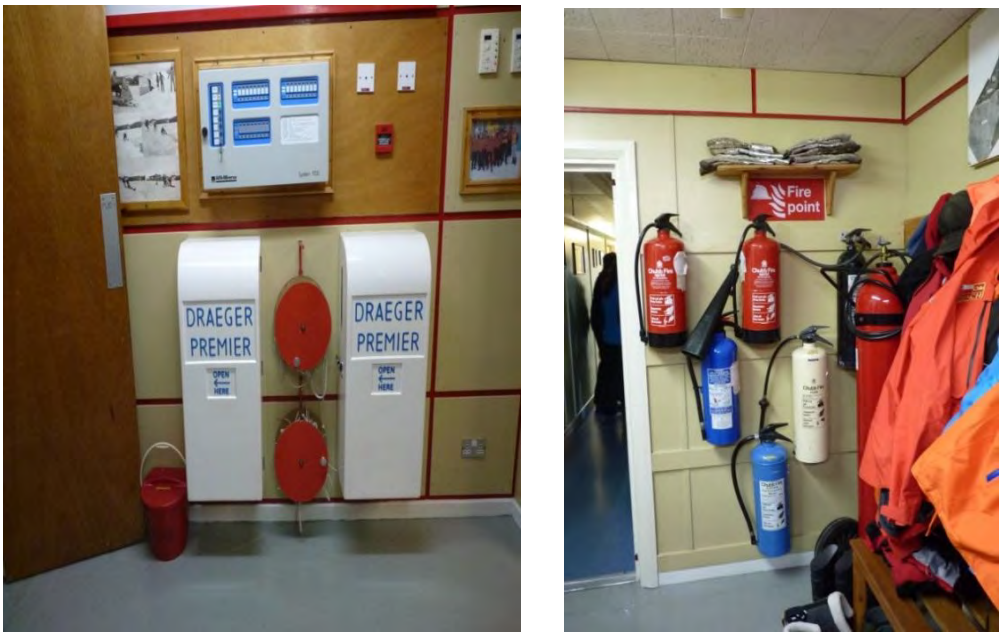
5.7.1 Safety, training and emergency procedures

According to the staff, all of them receive training related to the normal operation of the station, firefighting, and in order to provide immediate responses to oil spills. Firefighting exercises are carried out periodically. The main building has a smoke and heat detector system, centralized alarm, firefighter's equipment and manual fire extinguishers. The entire crew has basic firefighting notions, and there are firefighting roles distributed among members of the winter crew. In other buildings, only manual fire extinguishers are available, most of which were expired. A water pump in a pond near the sea would be used in case of fire, to pump water from the sea through hoses.

The training received by the staff, prior to their deployment, includes everything related to the Antarctic Treaty System and the Protocol to the Antarctic Treaty on Environmental Protection.

In the event that an emergency would exceed the crew´s capabilities, communications would be held with the Ukrainian Antarctic Program, and telephone/radio contact with SAR centers in Ushuaia and/or Punta Arenas.

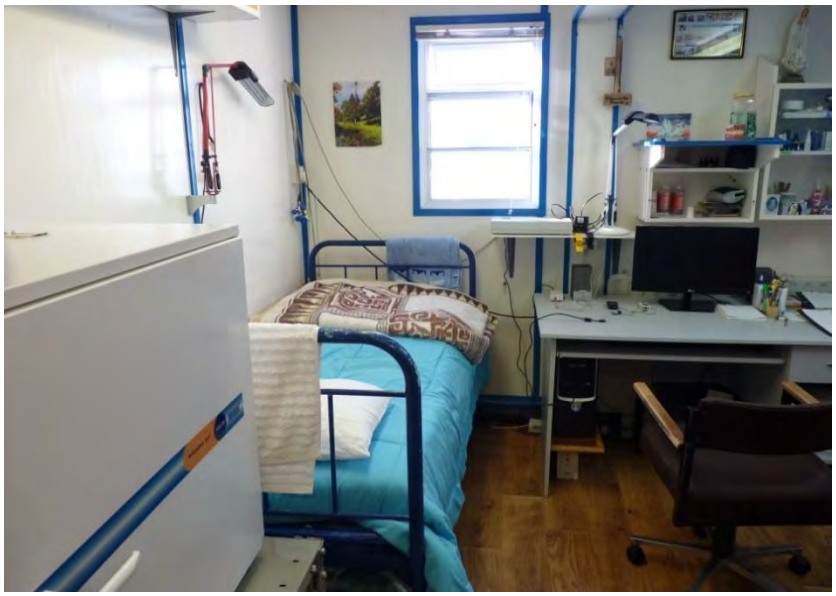
Figure 29 - Central Alarm and manual firefighting equipment arranged in the main building of the station



5.8 Medical Response

The station has a medical office with a bed suitable for hospitalization and eventual surgeries. There is a portable X-ray unit. The pharmacy has a wide range of medicines enough to cover the entire annual supply. With each change of crew, medicines are replenished and those expired are sent back to Ukraine. The station has a physician throughout the year who, in turn, conducts periodic check-ups to the staff in order to monitor their health condition.

Figure 30 - Medical office



Recommendations

- It is suggested that biology research laboratories follow the organizational and equipment model of the Meteorology area.
- The installation of fire and smoke alarms and control sensors in those facilities that do not have this equipment is recommended, equaling the conditions present in the main building.
- For safety reasons, food, instruments and paints should not be stored in the same place.
- Staff reported that organic waste is left as food to birds. This poses a risk to fauna, as well as waste stockpiled in plastic bags, near the coast and waiting for withdrawal to the continent. It is suggested to give proper storage to such waste, duly sealed and indoors, before removal from the Antarctic territory.
- It is advisable to consider the recommendations presented in the inspection carried out during the 2014-2015 season regarding waste management, to avoid impacts that current practices have on the environment and wildlife.

6. Inspection Report Port Lockroy (United Kingdom)

Inspected on February 22nd, 2019, 16:30-18:00.

Figure 31 – Main building

Date of previous inspection: December 8th, 2012 (Spain, the Netherlands, United Kingdom)

6.1 Introduction

Port Lockroy - Base A corresponds to Historic Site and Monument (HSM) No. 61 of the Antarctic Treaty, established in 1944 on Goudier Island, near Wiencke Island, 64°49'36" S Latitude and 63°25'01" W Longitude. The site is administered by the United Kingdom, and is operated and managed by the United Kingdom Antarctic Heritage Trust (UKAHT). The station operated continuously from 1944 until its closing in 1962. In 1994, the United Kingdom began a review of its abandoned facilities and determined the particular relevance of Port Lockroy taking into account its early contribution in terms of geology, meteorology, botany and, during the international geophysical year (1957/58), in the field of ionospheric research. In 1996 its facilities were restored to their current condition.

The British Antarctic Survey (BAS) commissioned the restoration and conservation of the site until 2006, when the UKAHT took over the operation. The main building, "Bransfield House", is a museum freely open to the public. It is a restoration with antique artifacts that aims to recreate and communicate the conditions of Base A during its peak operation in the 1950s.

During the interview, it was indicated to the team of inspectors that for the site management and conservation of the heritage store inside, international guidelines, such as those of the International Council of Monuments and Sites (ICOMOS), are followed, with ICOMOS being the organization responsible for proposing the items that are given the status of Cultural Heritage of Humanity, and is intended to promote

the theory, methodology and technology applied to the conservation, protection and enhancement of monuments and sites of cultural interest.

In the 2012/13 season, when the last inspection was carried out by Spain and the Netherlands, personnel posted at Port Lockroy carried out maintenance and conservation tasks. Tourist visits are administered by station personnel and wildlife monitoring is carried out by BAS.

At the time of inspection, Camilla Nichol, Chief Executive of the UKAHT, was visiting and received the team of inspectors. Along with staff from Port Lockroy, they kindly answered all the questions and guided the inspectors through the two site buildings: a multiple storehouse that was originally a boat house, and the lodging house for the Port Lockroy staff (6 people).

It is worth noting that of all the stations inspected, Port Lockroy is the only one that has given solution to all (two) of the recommendations made during the previous inspection, in 2012, based on the information provided by the person responsible for the site. First, limitations have been placed on tourist landings based on Guidelines No. 5 for Goudier Island, which establish that up to 350 tourists can disembark per day and, at the same time, three tourism vessels with capacity for 500 passengers each. In this regard, it should be noted that it is not clear to the team of inspectors how both restrictions are combined. The second recommendation had to do with the storage of flammable materials and, in this regard, Ms. Nichol informed that since then that type of material was no longer stored in any of the buildings of the Site. According to what was discussed with the logistics manager, the inspectors observed that, to a certain extent, Port Lockroy personnel depends on visiting vessels for all those issues for which the site does not have logistical facilities, such as personal hygiene or laundry, because, for example, the site does not have hot water or other elements to perform those tasks.

6.2 Physical description

The site is located on Goudier Island in the Antarctic Peninsula. It was established in 1944 and operated as a British research station until its closure in 1962. The abandoned facility was designated a Historic Site and Monument in 1995 under the Antarctic Treaty, and in 1996 it opened as a museum, covering an area of 0.25 hectares.

It was built in February 1944, and after World War II it continued to be operated as a scientific base, until its closure in 1962.

Three buildings and a communications tower have been erected on the islet. The place is inhabited by a colony of gentoo penguins, which move throughout the area, excluding the interior of the buildings. In addition, some Antarctic birds were observed.

Access is made by sea in a rocky area, and it is only possible to approach on small boats.

The main building is a 1000m2 wooden structure, which shelters a souvenir shop, radio room and rooms of its past occupants: mainly explorers, scientists and navigators.

6.3 Scientific Research

The Inspection Group was informed that the station performs the monitoring of the colony of gentoo penguins (Pygoscelis papua) present on Goudier Island and observations of fauna (species of penguins, birds, seals and whales). To perform this monitoring, prior to the start of the working season, BAS researchers provide training for the person in charge of the group who will work on the site to carry out censuses of penguins (nests, nests with chicks and populations at the end of the season), which data are sent back to BAS for processing and analysis. In addition, another project (linked with Oxford University) also monitors these bird colonies through a camera trap system.

Due to monitoring of the impact of tourist visits to the area of penguin colonies, whose results have been presented in a recent publication (October 2018), studies have shown a significant link between years and

visitors, where a greater number of visitors adversely affects the number of penguins (Dunn et al., 2018[1]). Therefore, UKAHT has developed a site visitor management plan, concentrating visitor access to some sectors of the island, the passage of people through other sectors and controlling the number of passengers that go ashore. The mitigation measures proposed by UKAHT (which include one of the authors of the publication) are to control the number of visitors (not to increase the current number of 350 people per day), seeking to control visiting hours (from 9 a.m. to 1 p.m. and from 2 p.m. to 6 p.m.), a measure taken with the dual purpose of allowing for staff resting times and, also, the closing of one of the landing points.

On the other hand, environmental data-loggers, measuring temperature and relative humidity, have been installed at "Bransfield House" to monitor environmental conditions and how they could affect the artefacts and building fabric.

6.4 Tourism

Port Lockroy is one of the most visited sites in the Antarctic Peninsula by cruise ships and tourist yachts. Visits are previously scheduled with the International Association of Antarctica Tour Operators (IAATO) and organized on site with personnel from the cruise ships, who could be seen guiding the tourists at the time of the inspection, with a large number of visitors. At the end of each season, UKAHT sends the statistics with the number of visitors to the Foreign & Commonwealth Office (FCO) and the IAATO.

As noted before, the site consists of a main wooden building, erected in 1944, known as "Bransfield House", which is itself a museum, and souvenir shop. Also, in early 2010, the current staff accommodation at Nissen Hut was rebuilt. A third building -"The "Boatshed"- is located not far away from the main building, and is used as an emergency shelter and as a storage depot for the operation of the station. The distance between these constructions is no more than 15 meters. Neither of these last two buildings is open to tourist visits.

Up until the inspection date -February 22- the site had received 17 thousand tourists during the season. Considering the aforementioned guidelines that stipulate a daily maximum of 350 visitors, and that the season lasts approximately 110 days, according to the information provided by the site's staff, it is estimated that a potential of 38,000 tourists could visit Port Lockroy each season. As reported by the station manager, circa 18,000 tourists is an appropriate number for each season.

It could follow that a revision of the aforementioned guidelines may be necessary in order to adjust them to scientific parameters that justify a greater restriction on the number of visitors, in order to minimize the impact. In this respect, the Guidelines No. 22 for Wordie House can be considered, which establish limitations to the number of passengers of each tourist ship visiting the site. The same applies to Guidelines No. 17 for Whalers Cove (one cruise per day).

According to what was discussed with the station manager, the inspectors observed that Port Lockroy personnel depends to a certain extent on visiting vessels, for specific issues for which the site lacks logistics facilities, such as personal hygiene or laundry. Reliance on basic services provided by interested external private parties might not be convenient for staff that must, at times, implement restrictions to those parties.

At the beginning of the season, Port Lockroy sends out a document with updated information to the crew of all cruise-ships that intend to visit the site. Additionally, the station staff offers pre-disembarkation lectures on board the vessels, as a way to reinforce the implementation of the guidelines, and assist the groups during the visit if necessary. The inspection team was also able to observe the presence of "expedition leaders" from the vessel accompanying the tourists who visit the site. This could be a good opportunity, for example, to verify -*in situ*- and through surveys agreed between the Consultative Parties, the effective implementation of environmental protection guidelines implemented by IAATO, and also to obtain information on the potential impact of tourism in the surrounding areas. As already mentioned, documents prepared by BAS scientists have shown a correlation between an increase in the number of tourists and a decrease in penguin populations in neighboring colonies.

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[1] *Dunn, M. J., Forcada, J., Jackson, J. A., Waluda, C. M., Nichol, C., & Trathan, P. N. (2018). A long-term study of gentoo penguin (Pygoscelis papua) population trends at a major Antarctic tourist site, Goudier Island, Port Lockroy. Biodiversity and Conservation, 28(1), 37-53.*

As a conclusion and because Port Lockroy is one of the most visited sites in the Antarctic territory, the site offers a unique opportunity to monitor the impact of tourism and improve its management, with new indicators that can generate best practices for application at this or other sites in the region (for example, in surrounding colonies of penguins, in museological values, their relationship with private tour operators of smaller scale). From the interviews held with Port Lockroy personnel, it is estimated that the impact of visitors to their facilities may extend beyond Goudier Island and the landing points established for passenger ships, with possible impacts in the vicinity.

6.5 Logistics

The station has a VHF radio for internal communications and for short-range maritime links. It has an Iridium satellite phone, with two more backup units, plus an HF radio that would only be used in case of emergency. It also has a satellite email system and a computer with SATphone connection with GPS location capability. It was noted that all communication elements are powered by solar panels. In case of failure of such system, there is the possibility of using one of the portable power generators. The telecommunications equipment is entirely kept at the "Nissen Hut", with a backup set in the Boatshed for emergency use.

Figure 32 – General view of the access to the HSM N° 61, Port Lockroy. You can see the "Boatshed" (left) and the main house, "Bransfield House" (right), where the museum is located.

Figure 33 – Staff accommodation house of Port Lockroy, "Nissen Hut"

Figure 34 – Table with telecommunications equipment

6.5.1 Transport

Port Lockroy does not have maritime or land transport means for the transport of cargo for the regular supply and maintenance of the station. As a result, the logistics support operations of the station are carried out in coordination with the tourism operators, members of IAATO, especially with regard to the transportation of the station staff and associated cargo for the operation of the site during each season. Logistical support is also provided by the Royal Navy and BAS.

6.5.2 Power generation

The museum building, "Bransfield House", has a small generator of 0.9 kW for power generation during tourism reception hours, mainly for the operation of the cash register, computer and payment with credit cards. The gasoline consumption for this generator is seven 20 liter drums for the whole season, which is 140 liters for four months of operation. In relation to the accommodation house "Nissen Hut", as previously mentioned, it has a set of solar panels that provides all the energy consumed, mainly to cover the supply required by the electronic communications equipment to be operational all 24 hours a day. Likewise, this building also has gas cylinders for heating and kitchen/oven, with a station consumption of five 20-Kg gas cylinders per season.

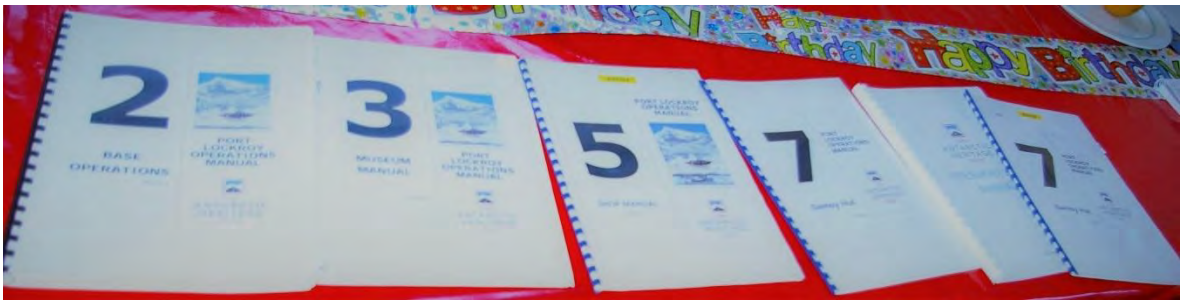
Figure 35 – Gas supply system for kitchen and heating.

There are five manual fire extinguishers distributed in the different buildings, with the Station Leader being responsible for the administration of fuel safety and management. No hazardous chemicals are used or kept at the station. In the main house, smoke detection system was observed.

Prior to their deployment, all personnel receive training on the following disciplines: first aid, fire safety, risk assessment, environmental issues, communications, and operational aspects related to the station.

Seven procedural manuals of the "UK Antarctic Heritage Trust" were observed, which specify the normal operation of the site, issues relating to safety and contingency plans in case of fire or emergency. These manuals are available in the accommodation house, and are accessible to the entire staff.

Figure 36 – Training manuals and operating procedures at Port Lockroy.



In case of emergency, or if staff requires medical assistance and/or evacuation, the procedure involves contacting the nearest vessel via VHF channel 16, mainly IAATO tourist vessels that visit the area on a daily basis. The site has several first aid kits.

6.6 Explosive elements and firearms

The site does not have firearms or explosives.

6.7 Environmental management

In the station, classification and handling of wastes according to type is carried out, and then collected in the storage building, the “Boatshed”. Hazardous waste is picked by Royal Navy vessels and removed from the Antarctic territory.

The site does not have systems for generating fresh water for consumption nor a system for use of sanitary water. For this reason, toilet facilities similar to those used in camps or shelters are used; that is, buckets with sea water which are then discharged into, according to the station staff, an agreed and permitted tidal zone off the west side of the island. There was no presence of equipment for melting of snow or ice to obtain fresh water. Fresh water for human consumption and basic cleaning is provided by tourism vessels on a regular basis in Jerry cans. Likewise, there is no sewage or gray water treatment system on site.

Recommendations

- Aware of the complexities that a tourist visit can bring to the site, it would nevertheless be desirable that regular attention to tourists in Port Lockroy facilities be put on hold during an inspection, giving priority to the team of inspectors and their task. The necessary revision of the check-list was frequently interrupted by tourists who, for example, wanted to visit the space where the inspectors were working or to ask them questions. Perhaps the temporary suspension of tourist visits or a private meeting at any other of the facilities would benefit the task of the inspectors, site personnel and of the tourists themselves.
- It would be important to analyze the effect of the visits on the surrounding sites (mainly Jougla Point, Wiencke Island), resulting from the restriction of visitors established for Port Lockroy.
- It is recommended to submit a report on a regular basis to assess whether the mitigation steps proposed by Port Lockroy personnel are effective, and also that this information be provided to tourist vessels and posted on the website of UKAHT.
- Because tourist access to some sectors of the island has been restricted, it seems appropriate to introduce amendments to the Guidelines for Visitors to Goudier Island, so that the out of bounds areas are clearly marked and the currently allowed trails for trekking are updated. In the same way, the map available in the guidelines should also update the information with the new existing housing module, to accommodate the personnel attending visitors.

7. Inspection Report St. Kliment Ohridski (Bulgaria)

Inspected on February 26th, 2019, 12:30hs-14:15hs

Figure 37 – Main building

7.1 Introduction

St. Kliment Ohridski is a Bulgarian station, operated by the Bulgarian Antarctic Institute (BAI). Located in South Bay, Livingston Island (62° 38' 29,90´´S; 60° 21' 53,01´´W), it is a medium-sized facility that works in the summer season (November-February/March). It was constructed in 1988, later refurbished and inaugurated in December 1993.

At the time of the inspection, the person in charge was Dragomir Mateev, responsible for environmental and scientific affairs of the station, and with experience at the Committee for Environmental Protection (CEP). Mr. Mateev, along with other members of the crew, very kindly welcomed the inspection team, answering their questions and guiding the observers through the different areas of the station. There were nine men and three women at the station at the time of the inspection: four were scientists: one Bulgarian, one Turkish, and two Portuguese.

The last station inspection was carried out on December 31st, 2014, by the United Kingdom and the Czech Republic. At the time four recommendations were made. In respect to the storage of fuel tanks and the equipment to prevent spills, the inspectors were informed that due to the melting of the ice, the tanks had been removed from their original location only this season, and stored on the beach -outdoors- installing platforms to avoid spills. Secondly, regarding waste management, monitoring began at specific points to measure the impact on water and land, although waste treatment would not be monitored.

As to the recommendation regarding the previous environmental impact assessment, the inspection team was informed that the structure erected on the beach to house the generator is a removable construction, received from the neighboring Spanish station Juan Carlos I and has been authorized by the Ministry of Environment and Water of Bulgaria. Finally, in respect to the need of implementation of a scientific plan developed for the station, Mr. Mateev informed that, indeed, a five-year science program is being implemented until 2022, contained in a document Bulgarian language.

Reportedly, it is not a site that receives tourists and it is not an objective of the Bulgarian operation to promote tourism.

7.2 Physical description

The station consists of a main building, two triangular shaped buildings, a small cabin dating back to April 1988 ("Lame dog"), a destroyed container shelter, a chapel and a module to shelter the generators on the beach.

The main building is located on a rock 20 meters above sea level. It consists of a 12x5 meter construction, which houses the kitchen, dining room, bedrooms and clinic area.

The two containers described in the joint United Kingdom-Czech Republic inspection in 2014 were now free from snow, and according to the Station leader, they have received historical status from the National Museum of Bulgarian History.

Access by sea can be done on small boats about a hundred meters from the main building, accessible through a stony beach. There is no dock infrastructure of any kind, and a Manitou crane facilitates boarding/disembarking maneuvers.

Figure 38 – General view of the installations from the chapel

7.3 Scientific Research

At the time of the inspection, the station was anticipating shutdown in two weeks, and the scientists were wrapping up their projects. During the season, the station welcomed Chilean, Turkish and Portuguese researchers, who developed their activities there.

The station leader provided the inspection team with a compilation of scientific information produced by researchers of the Bulgarian Program over the past 25 years of operation of St. Kliment Ohridski. Mainly, such information corresponds to projects on earth sciences, studies in geology, geomorphology, geophysics and glaciology, and in life sciences, with studies mainly in terrestrial biology and ecology.

Additionally, considering the observations made during the last inspection (2014), the team of inspectors welcomed the current development of seven research projects directly funded by the Ministry of Education and Science of Bulgaria, in compliance with the provisions of the Environmental Protocol, which include geological, glaciological, global change and environmental monitoring studies:

- Digital modeling and monitoring of the ice cover around the Bulgarian Antarctic Base "St. Kliment Ohridski" and development of an integrated information system for polar research
- Geological and geochemical researches on Hannah Point, Livingston Island, Antarctica
- Characterization of sediment transfer in the area of the Bulgarian Antarctic base (BAB) in the context of climate change
- Study of toxic elements and nematode diversity in soils of different habitats on Livingston Island, Antarctica
- Study of epilithic marine diatoms from the South Bay of Livingston Island (Antarctica)
- Hydrobiological monitoring of coastal marine waters from the littoral zone in South Bay of Livingston Island
- Biomonitoring of polar ecosystems on Livingston Island in the context of global change

One of the Bulgarian projects consists of geophysics research via sub-terrestrial temperature monitoring by deployment of thermo-sensors in the station area. According to the station leader, this study contributes to the global collection of the geodetic data by sending the information to the network of participants. Since 1999, the scientists at the Station carry out long-term monitoring on glacier retreat and geographic changes via photography. On another note, the Turkish scientist collected rocks from the area in order to study volcanic records via X-ray analysis of the samples, which are later shipped back to Bulgaria.

The ground floor of one of the triangular houses is used as a working area for biology projects. On these premises, the Bulgarian station provides support to two activities developed by the Polytechnic Institute of Beja, Portugal. One Portuguese project was about the use of sewage waters for hydroponic cultivation of vegetables. The experiment was successful, and specimen samples of the aqua-culture are supposed to be analyzed at the headquarters institute, in order to see if the produced vegetables satisfy food standards for human consumption with respect to health and hygiene. The inspector team considered this project as a positive way to use and treat sewage waters at the station. The other Portuguese project consists of the test operation of a remote-controlled robotic vehicle, which is composed of a blocked structure and modules (like Lego), and equipped with diverse sensors and a gyroscope, designed to maneuver on rough terrain. The vehicle seems already fully functional and in its final version (it came with a user manual), and available on the market. The science project at this stage aimed to the successful installation of the control software, which was produced in Portugal and to be transmitted via satellite to the vehicle on Antarctica. The person in charge of the project claimed that the objective is the outreach and educational aspects of robotics, in order to strengthen the public awareness on Antarctic issues, particularly the new generations.

7.4 Matters related to the Madrid Protocol

7.4.1 Environmental management

At the time of the inspection, the station leader was the person in charge of environmental management, as well as the administration of the research projects. Therefore, to facilitate the inspection, one of the

Bulgarian researchers together with the person in charge of the main kitchen, kindly accompanied the inspectors.

With regard to the preparation of the staff on the management of environmental aspects, it was not clear if the crew received any training before traveling to Antarctica. However, environmental guidelines were observed in the central area of the main module (dining room and meeting room) under the title "Guidelines for safeguarding the Antarctic environment", available in Bulgarian and English.

7.4.2 Environmental Impact Assessments

As mentioned before, upon arrival at the site, the presence of a new aluminum module was noticed, located at the beach, which houses two generators, has a storage area for boat safety clothing and work elements. At the end of the season, the "Manitou" front loader and the snowmobiles are also stored there. Although the shed did not require the construction of a cement floor and is mounted directly on the ground, no environmental impact assessment was submitted prior to its deployment, even though two generators are kept there, critical for the operation of the station. Therefore, it would be advisable to submit an Initial Environmental Evaluation for such structure.

On the other hand, it was reported that, in the disembarking area, there is a boat house: an aluminum module that at the time of the inspection was completely covered by snow and glacial ice, its location only being recognizable thanks to an antenna. Similarly, it was not evident for the inspection team whether the construction of such boat house had any environmental impact assessment and the condition in which it will be found once the ice retreats

7.4.3 Waste management

Upon arrival at the site, the inspection team observed that a considerable amount of waste material was stored on the beach: mainly remains of 200 liter fuel drums together with newer drums, metal waste and plastic drums arranged nearby the generators module. When the station leader was asked about those elements, he informed that they corresponded to material that had appeared this season in the area of the old engine house, which had been covered by glacial ice during previous seasons. Destroyed by the effect of ice, part of the old engine house started to be removed this season thanks to the ice retreat, and all the resulting waste has been stored at the beach. It was also reported that the fuel contained in the old metal drums at the beach has been transferred to new drums and previously filtered, in order to use it for the operation of the station. The inspectors were not informed as to when the waste material would be removed from the shore, although the station leader said they expected the removal to be carried out during the following season, after the necessary arrangements with countries working in the area, that have available space in vessels for such removal.

Although it was not evident to the inspectors whether waste was classified by type, some bins for waste separation with their corresponding labels were observed inside the main module. The station leader indicated that waste is classified into glass, metals, paper and cardboard, plastics and organic matter; the latter one being burnt at the end of the season. Reportedly, the rest of the waste is compacted or broken and removed from the station at the end of the season. As informed to the inspection team, the incinerator is operated at the end of the season. However, it did not seem to be in operating conditions since it was kept in a shed, where food and other tools were stored. It should be noted that such incinerator could only work provided the rest of the stored items be removed. When walking around the facilities of the station, it was possible to observe the storage of different elements underneath the houses, without being clear whether they were actually in use or which were plain waste. It would seem advisable to organize such elements in a better way to avoid wind dispersion. It was also noted that in several open areas of the station, batteries are stored not properly protected, and it was not clear for the inspection team whether they correspond to waste material or if they are still in operation.

At the back of the main building, the generated waste is organized in an orderly manner and covered with a tarpaulin to prevent dispersion. Station staff estimates that around 3 m3 of waste are generated over the season.

As for sewage waters, those corresponding to each module are conducted through pipes to the main building, where they are connected to a small treatment plant, from where they are subsequently discharged into the sea by means of hoses that run underground. It was not indicated, however, if the station performs water quality monitoring.

General dispersion of stored elements was observed with unclear distinction between materials in use and waste, like for example, batteries. It is possible to find the same type of materials stored in different places throughout the Station.

7.4.4 Spill management

It was observed that in several areas of the station area there are stains caused by fuel spills. It was not evident to the inspectors whether the station has spill treatment material easily available or if there is a contingency plan in case of emergency, or previous training for spill management. Regarding the generators, it should be noted that they are stored directly on the ground, with no platform to contain fuel spills.

7.4.5 Management of protected areas

Opposite to the station is Hannah Point, site for which there are guidelines for visitors. It was not evident to the inspection team whether there is information available for the staff about the site guidelines. Similarly, there was no information on Deception Island, ASMA No. 4, and ASPA No. 140 and 145, present on that island, which is located south of the station. Likewise, no information was available on ASPA No. 126, Byers Peninsula, located west, and ASPA No. 149, Cabo Alvarado/Cape Shirreff in the San Telmo islets, located north of the station.

The station leader reminded the inspectors that during the XXXVIII ATCM held in Sofia, Bulgaria, in 2015, the Bulgarian delegation presented a proposal to the CEP in order to designate as Historic Site and Monument (HSM) the original modules of the station. Ultimately, the “Lame Dog” house –one of the old buildings- has been designated HSM N°91, by the ATCM. However, it was not clear to the inspectors if such HSM includes the destroyed nearby containers. For such constructions, no information was provided regarding future measures to be taken for its final removal. Likewise, it is noted that the historical module requires repairs and adequate signaling and handling of the elements that are inside it.

Figure 39 – Serious deterioration and damages to the first facilities

7.5 Logistics and operations

7.5.1 Communications

The station has VHF communication equipment and satellite equipment (BGAN and Inmarsat), plus two repeaters that allow communications via Internet with the nearest station, Juan Carlos I of Spain, located in the same bay (30-minute navigation).

7.5.2 Transportation

It has two snowmobile vehicles and two Zodiacs, which allow short sea trips in the area of the South Bay.

Figure 40 – Nautical means located on the beach of South Bay.

There is also a wheeled "Manitou crane", which performs different tasks with great efficiency and flexibility in support of land and sea maneuvers.

Figure 41 – Operation with Manitou crane and Zodiac boat for inspectors redeployment.

There are no aerial operations at the Station without any dedicated area for helicopter use.

7.5.3 Fuel storage

The station normally operates between November and February/March of each year; therefore, diesel consumption ranges between 2000 and 5000 liters per season. Reportedly, fuel is supplied by other countries cooperating in logistics with the Station, such as Chile, Spain, Argentina or Brazil. All types of fuel, both diesel and gasoline, are stored in the same shelter that houses the generator, at the beach. The 50 kW power generator is operated twice a day, allowing electricity supply once in the morning and once in the afternoon.

Figure 42 – Shelter on the beach with power generator inside.

During the rest of the day the basic energy is supplied by a renewable energy systems, placed on the roofs of the rest rooms and main building. To this end, the station has small wind turbines for the generation of renewable energy that are complemented with power generation through solar panels, providing minimum electrical supply, enough for the operation of Internet during the day.

Figure 43 – Renewable energy generation system.

Waste material is also stored near the generator shelter, at the beach. Reportedly, removal should be done by sea. The inspectors noted that this activity should be prioritized and implemented through a short-term removal plan. In this way, a greater impact on the environment could be avoided, considering the high corrosion observed in the waste stored outdoors without any protection.

Figure 44 – Beach location for storing waste material and fuel drums

7.5.4 Water system

Fresh water for the station is pumped from the glacier seen immediately behind the main building and is conducted through hoses, which allow fresh water supply for the three main facilities. In addition, there is a 4000 liter water tank attached to the main building. Sewage waters are removed through a pond and by gravity, through hoses for discharge at the sea.

7.6 Medical facilities

The station has a physician and first aid equipment in one of the facilities. Complete emergency equipment (mobile) contained in briefcases and backpacks was observed ready for use in the rest of the premises. The station leader mentioned that there is high coordination with the neighboring Juan Carlos I station (Spain), in order to exchange medical specialties.

According to information reported, the staff received previous training in firefighting measures; however, the inspectors noted that both passive means for fire control (smoke detectors) and firefighting material (extinguishers) should be stored in a more visible place, clearly indicated and labeled. This would ensure quick action in case of emergency. Likewise, rare signaling has been observed to prevent labor accidents

The station does not have any weapons or explosives.

Recommendations:

- It is recommended to promptly remove waste material from the beach, in order to avoid contamination in those areas, providing order and cleanliness to the logistics operation regarding the entire waste cycle. Moreover, and as a result of the strong winds in the area where the station is located, the existence of scattered metal and wood remains poses additional risks to the staff safety.
- It is suggested to reduce the fire load (equipment and material that has incendiary characteristics/low ignition point) of inhabited spaces and increase passive measures (detectors) for accident prevention. Although the main accommodation and the other buildings of the station have manual fire extinguishers, at the time of inspection they were not arranged in an orderly manner. Likewise, as mentioned, it is advisable to put in place signs relating to fire prevention and work-related accidents.
- In respect to the structured housing the generators, it is suggested to increase oil spill prevention measures considering both the proximity to the sea, and the lack of a platform to prevent soil pollution. Likewise, it should be reminded that spill mitigation elements must be available permanently and clearly identified.

Figure 45 – Condition of the floor in the module where electric generators are located

Figure 46 – Location of fire extinguisher in the main accommodation of the station.

- Consideration should be given to additional risks caused by changes in weather conditions. Particularly, the evolution of the glacier is reportedly the main obstacle to remove historic waste and, in fact, the glacier is very close to the main facilities of the Station.
- The inspection team recommends establishment of an integral environmental management plan, feasible in the short term with monitored deadlines, prioritizing waste removal, considering the necessary allocation of resources.
- The inspection team wishes to recall that the declaration of a historic site requires responsibilities and, particularly but not exclusively the presentation of a conservation and management plan. Such plan will strengthen the historic value of Lame Dog house, as well as raising awareness about it among the scientific community working at the station.
- It is recommended to use trays or platforms for fuel transfer, to avoid oil spills, minimizing the risks of pollution.
- It is advisable to have information available on management plans of the ASPAS and ASMAS in the vicinity of the station, as well as the site guidelines for Hannah Point.
- It is suggested to consider submission of an environmental impact assessment for the latest aluminum module installed on the beach.
- It is recommended to make available an appropriate storage area for the waste material prior to removal.

Annex A. Background provided by the US April 2nd

---------- Forwarded message ---------
De: **Farrell, Robert (Contractor)** <Robert.Farrell.Contractor@usap.gov>
Date: mar., 2 abr. 2019 a las 11:54
Subject: RE: Request of information from Chilean-Argentinian inspection
To: Carlos Gajardo <cgajardo@minrel.gob.cl>

Good morning Carlos,

My apologies for the delay in getting this information back to you. We are in the process of turning over to the winter crew.

I'm attaching 4 documents for your reference:

1. Palmer Master Plan phasing diagram – this is what we discussed for future plans for the station. The pier project is first and is planned for the 2021-22 season. Please let me know if you have any questions on this.

2. Polar Code of Conduct and USAP Alcohol Policy – these are the documents that outline our expectations for behavior through the Program – there were some questions from the team related to how we manage alcohol and disruptive behavior at the US stations

3. Overhead photo of Palmer Station from January of this year

A few highlights of changes since the last inspection…

- Firearms were destroyed on site in October 2016

- 2 new Rigid Hull Inflatable Boats (RHIBs) were added to our science support fleet

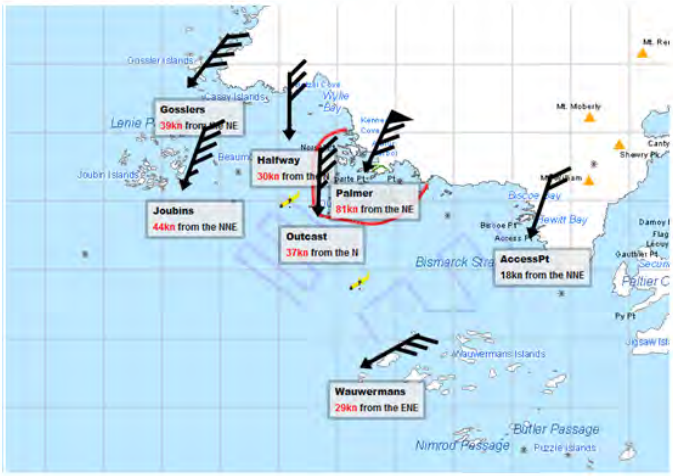
- Launching and recovering boats is now done via trailers on a boat ramp

- The station has added remote weather stations in the area to better plan boating operations (see map below)

- We now have AIS tracking on our boats to improve safety

- A sprinkler system was installed in the Trades Shop building

Here is a map showing our weather station locations:



Please let me know if there are any other details I can provide.

Best regards,

Annex B. Comments received from Ukraine May 24th

"From: "Evgen Dykyi" <evgendykyi@gmail.com>
To: csanhueza@minrel.gob.cl
CC: cgajardo@minrel.gob.cl, gme@mrecic.gov.ar, fedchuk@uac.gov.ua
Sent: Friday, May 24th 2019 12:20:02
Subject: Ukrainian comments to the inspection report

Dear Camilo Sanhueza,

Many thanks for a inspection report prepared by Chile and Argentina at Vernadsky station, in the framework of article VII of AT and article 14 of the Madrid Protocol.

Please find attached Ukrainian official comments to the recommendations highlighted in the inspection report (to include in the printed report to be delivered at 42 ATCM), as well as the report itself with our factual corrections to avoid some misrepresentation. (*both documents, attached below)

First of all, I would like to pay your attention, that there are some contradictory representations about the old fuel tank in different parts of the report. The description of the current situation in the chapter "Logistics and infrastructure" is correct. Indeed, as it was highlighted on page 10 "Two 145 m3 and 33 m3 old tanks for storage of bulk fuel are kept in the original site, although they are no longer used for fuel storage. One of them was already conditioned as a deposit and in the short run the same would be done with the second tank already empty".

However, in the chapter "Environmental management" it is twice indicate that station personnel tends to use it again as a fuel storage. Unfortunately, the staff member, who was interviewed on environmental matters, was not fully aware about the situation, and provided inspectors with incorrect information.

To this end, I would like to make a clear statement, that all corresponding operations with the old fuel tanks (its cleaning, fuel wasting, sludge removing and further modification of the empty tanks) are carrying out for the purpose to use them only as a storage facility for dry solid materials.

Hope, our corrections would be acceptable or you could propose another alternative text to the report. It will help us to avoid objectionable statements at the ATCM.

Hope on your consideration and understanding.

Kind regards,

Evgen

Dr Evgen Dykyi, Director, National Antarctic Scientific Center, Tarasa Shevchenka blvd., 1601601 Kiev

Ukraine,Tel/fax: +38 044 246 38 80www.uac.gov.ua"

"*Opportunities of international research at Vernadsky station*

B.1 The legislative base of Ukraine and directions of the State Antarctica Research Program

Ukraine has acceded to the Antarctic Treaty by the Resolution of Verkhovna Rada (the Supreme Council) of Ukraine No2609-XII as of September 17, 1992. On May 27, 2004 Ukraine has acquired the status of Consultative Party and has received the right to vote in making decisions that are approved by consensus. On February 22, 2001Ukraine has acceded to the Environmental Protocol to the Antarctic Treaty (Law of Ukraine No2284-III as of February 22, 2001).

Taking into account the nationwide and international importance of comprehensive scientific research in Antarctica, the State institution Ukrainian Antarctic Center was given the status of a National Scientific Center by the Decree of the President (Decree of the President No1524/2004 as of December 23, 2004).

The international achievement of Ukraine was the preparation and holding of the XXXI Consultative Meeting of the Antarctic Treaty in Kyiv in June 2008.

In November 2010, a new State Special-purpose Scientific and Technical Program of Research in Antarctica for 2011-2020 has been approved. (Decree of the Cabinet of Ministers of Ukraine as of November 03, 2010, No 1002). The State Program objectives are to provide fundamental and applied research in Antarctica, to maintain effectively Akademik Vernadsky Antarctic station, to fulfill commitments of Ukraine in accordance with the Antarctic Treaty, and to evaluate biological and mineral resources in Antarctica based on scientific approach.

The Program includes subject studies in the following areas: geological and geophysical, meteorological, oceanographic, geospatial, biological, medical and physiological research, and the development and introduction of new technologies.

B.2 Advantages of Ukrainian Antarctic Vernadsky station

As provided by the Intergovernmental Agreement of July 20, 1995, the United Kingdom has transferred one of its permanent stations – Faraday base (starting from February 6, 1996 the station is renamed to Akademik Vernadsky).

Vernadsky Station is located on Galindez Island of the Argentine Islands archipelago, the west coast of the Antarctic Peninsula (geographical coordinates: 65°15´ S, 64°16´ W). Today, the station consists of ten buildings of residential and technical purpose, a complex of laboratories with a total area of about 1600 m2, and has a reliable life-support system. Provision the station with fuel, necessary materials and food products is carried out by chartered supply ship once a year during the rotation of members of the expedition, which takes place each year at the end of March.

Work at the station is conducted throughout the year by scientists in key areas of research and experts to ensure the life-support system. The number of personnel at the station is determined by the amount of works planned, and now averages 12, while the station is designed for permanent residence of up to 24 people.

With a year-round cycle of work, the station is well equipped to carry out interdisciplinary research in the field of ionospheric sensing, meteorological and magnetometric observations, studying the ozone layer and the electromagnetic processes in the environment, seismic acoustic observations.

Compared to other Antarctic stations, Akademik Vernadsky station has two significant advantages.

First, the state-of-the-art research equipment can solve the fundamental problems of modern science at five research grounds – electromagnetic, tectonomagnetic, paleomagnetic, geodynamic and glaciological. This allows monitoring of environmental parameters in Antarctica at all levels of Geosphere - from tectonosphere to Geospace.

In particular, the station has accumulated the longest continuous series of meteorological data in Antarctica starting from 1947; and in the 1980s, after discovery of effect ozone "hole" on the station; its unique research has been launched, making the station one of the ten most important reference ozone stations in Antarctica. In addition, scientific station equipment enables the development of algorithmic and methodological support for monitoring and early warning of natural hazards such as earthquakes and tsunamis.

Such scope of interdisciplinary research provides a holistic understanding of the planetary laws with access to the forecasting of global changes in the environment and their appearance in the polar and tropical latitudes.

Secondly, the station has a unique geographical location on the west coast of the Antarctic Peninsula – in the zone of formation of the ozone "hole" in the immediate vicinity of the Drake Passage, one of the key meteorological active regions of the Earth; as well as in one of the climate "hot spots" of the Southern

hemisphere, where there is a long-term warming of the troposphere, the melting of glaciers and, as a consequence, a change in the basic types of Antarctic ecosystems.

The island archipelagos around the station are the natural border of reproductive habitat of many species. In particular, the revealed extreme southern penguin breeding colony is one of the main indicators of population size of Antarctic krill shrimp, which in turn is the basis of the Antarctic ecosystem food chain and a key element of forecasting of fishing capacity of the Southern Ocean.

Around the station within a radius of its accessibility, there is a network of representative scientific ground, where for 15 years monitoring of organisms populations is carried out. Taking all this into consideration, the position of the station is a unique natural laboratory for the study of climate change impacts on ecosystem processes and biological diversity of the region.

Thus, the station research complex makes it a unique geophysical observatory and an important reference point of the long-term research in the Antarctic region, and also special location allows the station to study the complex environmental processes and to thoroughly monitor their changes.

B.3 Opportunities of international research at Vernadsky station

Taking into account the growing scientific interest in Antarctica, Ukraine in the spirit of the existing international cooperation, is ready to provide foreign partners with possibilities to carry out their research at Vernadsky Station both during the whole year and during the summer season (from December to March), providing accommodation services up to 12 people simultaneously.

Furthermore, the Ukrainian side is ready to provide at Vernadsky Station training courses and summer field camps to improve the skills of scientists. In case of a long-term use of the station the Ukraine is ready to consider different kind of cooperation, including the creation of a joint lab on a mutually beneficial basis.

Evgen Dykyi, Director, National Antarctic Scientific Center, Ministry of Education and Science of Ukraine."

UKRAINE
MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
STATE INSTITUTION
NATIONAL ANTARCTIC SCIENTIFIC CENTER
01601, Kyiv, Tarasa Shevchenko boulevard, 16, Tel / Fax: (380 44) 246 38 80 E-mail: uac@uac.gov.ua

24.05.2019 № 161

To: Mr Camilo Sanhueza
Directorate of Antarctica
Ministry of Foreign Affairs
Teatinos 180, 5th floor
Santiago
Chile

Dear Carlos Gajardo,

Many thanks for the report of the inspection at Vernadsky station on February 22, 2019. We would like to provide bellow some comments in response to observations and recommendations stated in the inspection report.

1. In accordance with point 1, Article 5 of the Annex III "Waste disposal and waste management" to the Environmental Protocol "sewage and domestic liquid wastes may be discharged directly into the sea, taking into account the assimilative capacity of the receiving marine environment". Moreover, in accordance with para (b) of this point, such wastes, generated in a station where the average weekly occupancy over the austral summer is approximately no more than 30 individuals, shall not be treated by maceration.

At Vernadsky station the average occupancy over the austral summer is approximately no more than 20-24 individuals, and really this amount can be exceeded only for a short period of time depending on the enabled scheme of the planned field works as well as rotation of expedition teams. Thus, Ukraine, in general, meets the commitments of the Environmental Protocol concerning disposal of waste in the sea.

Nevertheless, taking into consideration general commitment to reduce as far as practicable the amount of wastes produced or disposed of in the Antarctic Treaty area to minimize impact on the Antarctic environment (Article 2 of the Annex III to the Environmental Protocol), Ukrainian Antarctic Program's leadership considers a possibility to install an additional equipment for sewage treatment within the technical improvement plan for Vernadsky station.

2. The inspection team noted, that no containment materials regarding spills handling were observed. However, there are basic oil spill kits available at the station, including inflatable booms for the control of oil spills in the sea, and absorbent material as well. Such materials were observed by the previous inspection carried out during the 2014-2015 season, and for some obscure reason the station staff did not demonstrate it to the inspectors.

3. The fire and smoke control sensors are installed not only in the main building, but also in the joinery, compactor workshop, and shed. The reasonability of installation of such equipment in other facilities is under consideration.

4. The State Institution National Antarctic Scientific Centre developed a plan of Vernadsky station modernization, which carry out repairs of existing and creation of new infrastructure at the station until 2020 in accordance with the requirements of the State Special-Purpose Scientific and Technical Program of Research in Antarctica for 2011-2020. The document referred to planned technical improvements of both engineering systems and communications, and scientific equipment, including enlarging the laboratories.

Taking into account the inspection observations, in particular, it is planned installation of a compact incinerator for solid waste, production of closed wooden storage for bags with compacted food waste in order to prevent access to the local fauna, production of metal pallets for barrels of gasoline and diesel fuel waste.

However, the difficult political and economic situation in Ukraine since 2014 did not allow to realize the plan of modernization in full yet. But the State Institution National Antarctic Scientific Center constantly takes steps to modernize the station as far as possible, depending on the available financial opportunities.

5. We agree with inspection's recommendation to design for the station a clear plan in order to follow-up the recommendations indicated by the previous inspections. To this end, as the first step, Ukraine will prepare a separate information paper regarding the follow-up of past recommendations made by each inspection team since 1998/1999 season.

And again we emphasize that are very grateful for the excellent work of inspection team. The recommendations received are very useful for us, especially for resource allocation at the domestic level, and will facilitate the maintaining of Vernadsky station, as well as its further modernization.

With kind regards,

Director Evgen Dykyi

State Institution National Antarctic Scientific Centre,
Ministry of Education and Science of Ukraine

Annex C. Comments received from Bulgaria May 24th

De: "prof. Christo Pimpirev" <polar@gea.uni-sofia.bg>
Para: "Juan Antonio Barreto" <bat@mrecic.gov.ar>
CC: "danail chakarov" <danail.chakarov@mfa.bg>; cgajardo@minrel.gob.cl; csanhueza@minrel.gob.cl; gme@mrecic.gov.ar; "sasha raycheva" <sasha.raycheva@mfa.bg>; "Dragomir Mateev" dragomir.mateev@gmail.com

Dear Juan Antonio and all,

We would like to thank you again for the detailed report. We believe the inspections are very important and improve the productivity of the programs and the protection of Antarctica.

Please find attached St. Kliment Ohridski Inspection Report with our comments. Also, we attach the chemical and microbiological analysis report form this year.

We are available for any further information if you needed it.

Kind regards,

Christo and Dragomir

Prof. D.Sc. CHRISTO PIMPIREV

Director, Bulgarian Antarctic Institute

- About fuel tanks removal: "*The main job was to relocate the fuel tanks away from the main building and incinerator and was done 3 years ago. The removal from the old generator building was completed this last season. The process took so long due to heavy snow and ice conditions.*"
- *About foreign scientists working at the station this season: "There were also two Colombian, one Mongolian and one Cypriot scientists at the base at the beginning of the season.*"
- About one of the Bulgarian scientific projects: "*This is a long-term project in collaboration with Portugal and it is a part of the network of permafrost observatories on Western Antarctic Peninsula.*"
- About the "Guidelines for safeguarding the Antarctic environment": "*Official communication is running between the Bulgarian Antarctic Institute and the Ministry of Environment and Water. The Minister advised the preparation of a Waste Management Plan for the Base, corresponding to national and AT regulations. A minister's special advisor is in charge to coordinate the project. Prior to the last 2 expeditions all participants have been instructed on major waste management and biodiversity issues by the advisor to the Minister of Environment at the preparative field camp.*"
- About the module installed at the beach: *"We would like to stress once more that this is a completely removable module and erected due the severe weather conditions in the last few years which caused the complete cover and destructed the generators shed.*"
- About the module where the generator is stored, along with lots of other items: "*This is the reason why the incinerator is used once per season. The rest the litter is stored in a depot*."
- About waste material stored at the Station: "*At the period of the Inspection, at the base there was reorganizing of the battery park and before closing the base they were stored under cover.*"
- About water quality monitoring: "*Collection of waste water samples and water quality monitoring is foreseen it the draft Waste Management Plan. Depending on the abilities of the Base lab, they may be processed on site, or in the mainland. Drinking water quality monitoring – chemical and microbiological analysis is executed during the expedition. The results from this year`s analysis is attached.*"*(Protocol on Drinking Water Analysis attached below)
- About fuel spill management: "*The spill treatment material (absorbent pads for oil spillage) is stored near the generators and near all equipment using diesel. When using diesel orange plastic trays are used to prevent spills. All participants have been instructed on spill, waste and emergency management prior their visit to the Station during preparative field camp.*"

- About ASPAs in the vicinity: "*Information on the protected areas in proximity to the Base and on the regulations, as well as instructions for appropriate treatment and behavior is available in the Guideline document. When the work of a project is planned on ASPA, all participants are informed and trained on the specific requirements and rules of the ASPA*".
- About Historic Site and Monument N° 91: "*The Lame Dog Hut at the Bulgarian base St. Kliment Ohridski was added to the List of Historic Sites and Monuments (HSM 91) in 2015. It is the oldest preserved building on Livingston Island, hosting a museum exposition of associated artefacts from the early Bulgarian science and logistic operations in Antarctica. The hut itself has a particular technical and architectural value in its materials, design and method of construction. At the time of its HSM listing, the hut was covered by a thick layer of snow that had failed to melt for several summers, something unusual in the preceding decades. It was only in 2017/18 season that the hut reemerged from under the snow. An assessment of the hut`s present condition, including possible structural or material damage and initial restauration work, as well as an inventarization and assessment of the museum exposition items will be carried out during the forthcoming 2019/20 season.*"
- About seasonal fuel consumption at the Station: "*It ranges between 2000 and 5000 liters per season*."

Sofia University "St. Kliment Ohridski
Faculty of Biology
Department of General and Applied Hydrobiology

Protocol on drinking water analysis

Water source: Drinking water from Bulgarian Antarctic Base, Livingston Island.

Legislation: Ordinance № 9 (O) 30/2001, last changes 16.01.2019) about the water quality, intended for drinking and household needs.

Laboratory standards: Sampling procedure - EN ISO 19458:2006 and ISO 5667-5:2013; Total colonies (colony count) - EN ISO 6222; E-coli and Coli-forms - ENISO9308-1 and ENISO9308-2; Active reaction - ISO 10523; Total phosphorus - ISO 6878; Nitrates – BNS 3758:1985.

Laboratory analysis:	Results	Acceptable scopes	Comments
Escherichia coli bacteries	No	No presence allowed	Water is safe
Colony count (at 22 °C)	2	100 / 1ml	Water is safe
Colony count (at 37 °C)	0	20 / 1ml	Water is safe
Active reaction (pH)	pH = 7.51	between pH 6,5 and pH 9,5	concentration is below the scope
Electro conductivity ($\mu S.cm^{-1}$)	237	up to 2000	concentration is below the scope
Salinity (‰)	0.00	---	acceptable
Turbidity	Not found	acceptable for the consumers	acceptable
Smell	Not found	acceptable for the consumers	acceptable
Coloration	Not found	acceptable for the consumers	acceptable

Laboratory analyses:

Hydro-chemical parameters:
Associate Professor Lyubomir Kenderov

Microbiological control:
Associate Professor Yovana Todorova

Date of analysis: 02/04/2019

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Annex D. Comments received from the United Kingdom May 16th

Port Lockroy Report

Stuart Doubleday (Sensitive) <Stuart.Doubleday@fco.gov.uk> 16 de mayo de 2019, 9:15
Para: "Máximo E. Gowland" <gme@mrecic.gov.ar>, "Jane Rumble (Sensitive)" <Jane.Rumble@fco.gov.uk>
Cc: Camilo Sanhueza <csanhueza@minrel.gob.cl>, "cgajardo@minrel.gob.cl" <cgajardo@minrel.gob.cl>

Dear Máximo

Many thanks for sharing the observer report on Port Lockroy. It is a very thorough and fair report. Camilla Nichol from the UKAHT and I have made a number of suggested changes to the attached in tracked. Some of these are factual corrections, some drafting and some are more subjective changes. There are also a few comments relating to the recommendations for your information. We'd be grateful if the factual corrections could be made and for your consideration of the remaining suggestions.

Many thanks Stuart

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To paragraph	Comment
First, limitations have been placed on tourist landings based on Guidelines No. 5 for Goudier Island, which establish that up to 350 tourists can disembark per day and, at the same time, three tourism vessels with capacity for 500 passengers each. In this regard, it should be noted that it is not clear to the team of inspectors how both restrictions are combined.	*"The site guideleines follow the standard for visitor landings at Peninsula sites for vessels with a maximun capacity of 500 being able to visit at up to three per day. However, greater restrictions are in place at Port Lockroy where a maximum of 350 passengers are able to land in any 24hr period. This specific restriction supercedes the general 3x 500 pax ship guideline".*
Up until the inspection date -February 22- the site had received 17 thousand tourists during the season. Considering the aforementioned guidelines that stipulate a daily maximum of 350 visitors, and that the season lasts approximately 110 days, according to the information provided by the site's staff, it is estimated that a potential of 38,000 tourists could visit Port Lockroy each season.	*"However, whilst it is a hypothetical maximum it is unlikely to ever be reached due to scheduled rest days, weather conditions preventing landings and the nature of the visitor season (few vessels in the early and latter parts of the season)".*
There are five manual fire extinguishers distributed in the different buildings, with the Base Leader being responsible for the administration of fuel safety and management. No hazardous chemicals are used or kept at the station. In the main house, smoke detection system was observed.	*"There is also fire fighting equipment on base".*
Aware of the complexities that a tourist visit can bring to the site, it would nevertheless be desirable that attention to tourists in Port Lockroy facilities be suspended during an	*"We wouldn't necessarily disagree with this. Although it might be helpful to inspectors to see the site when empty and when being visited. In this instance I understand the inspection team*

inspection, giving priority to the team of inspectors and their task. The necessary revision of the check-list was frequently interrupted by tourists who, for example, wanted to visit the space where the inspectors were working or to ask them questions. The temporary suspension of tourist visits would benefit the task of the inspectors, site personnel and of the tourists themselves, especially considering the inspection was announced in advance.	*had arranged in advance to arrive at 7am when there was no tourist landing, but actually arrived at 3pm, when there was".*
It is recommended to submit a report every five years to assess whether the mitigation steps proposed by Port Lockroy personnel are effective, and also that this information be provided to tourist vessels and posted on the website of UKAHT.	*"We will happily commit to report regularly to the ATCM/CEP on this matter. We wouldn't want to be as a prescriptive as every five years".*
Because tourist access to some sectors of the island has been restricted, it seems appropriate to introduce amendments to the Guidelines for Visitors to Goudier Island, so that the vetoed areas are clearly marked and the currently allowed trails for trekking are updated. In the same way, the map available in the guidelines should also update the information with the new existing housing module, to accommodate the personnel attending visitors.	*"We are considering a revision to the site guidelines".*