United States Antarctic Inspection February 2020

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

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Part I – Introduction

The United States conducted an inspection pursuant to Article VII of the Antarctic Treaty of 1959 and Article 14 of the Protocol on Environmental Protection to the Antarctic Treaty (the Protocol) from February 7 – 10, 2020. The U.S. Inspection Team inspected the following sites: Mario Zucchelli Station and Boulder Clay runway (Italy – ITA); Jang Bogo Station (Republic of Korea – ROK); the station under construction on Inexpressible Island (People's Republic of China – PRC); and Antarctic Specially Protected Area (ASPA) 161, Terra Nova Bay, Ross Sea. This was the fifteenth U.S. inspection since the Antarctic Treaty entered into force in 1961, and the first since December 2012.

The United States promotes Antarctica's status as a continent reserved for peace and science. The main tool to achieving this goal is the Antarctic Treaty, which places science at the heart of international cooperation on the continent by guaranteeing freedom of scientific research and mandating the exchange and free availability of scientific observations and results. It prohibits any measures of a military nature, such as the establishment of military bases and fortifications, the carrying out of military maneuvers, as well as the testing of any type of weapons. However, it does provide for the use of military personnel or equipment for scientific research or for any other peaceful purposes.

Article VII of the Antarctic Treaty and Article 14 of the Protocol grant to Antarctic Treaty Consultative Parties the right of unannounced inspection of stations, equipment, and vessels in Antarctica. Article VII states that officially designated observers shall have complete freedom of access at any time to any and all areas of Antarctica, including via aerial observation. Article 14 of the Protocol also provides that inspections should promote the protection of the Antarctic environment and dependent and associated ecosystems, and compliance with the Protocol. Article 7 of the Protocol prohibits any activity related to mineral resources, other than scientific research.

The United States conducts inspections to promote the objectives and ensure the observation of the provisions of the Antarctic Treaty. Inspections are an interagency effort led by the U.S. Department of State, the agency that coordinates Antarctic policy within the U.S. Government. It does so in close cooperation with the National Science Foundation, which operates the U.S. Antarctic Program (USAP), including three year-round stations in Antarctica.

U.S. Antarctica Inspection

February 7-10, 2020

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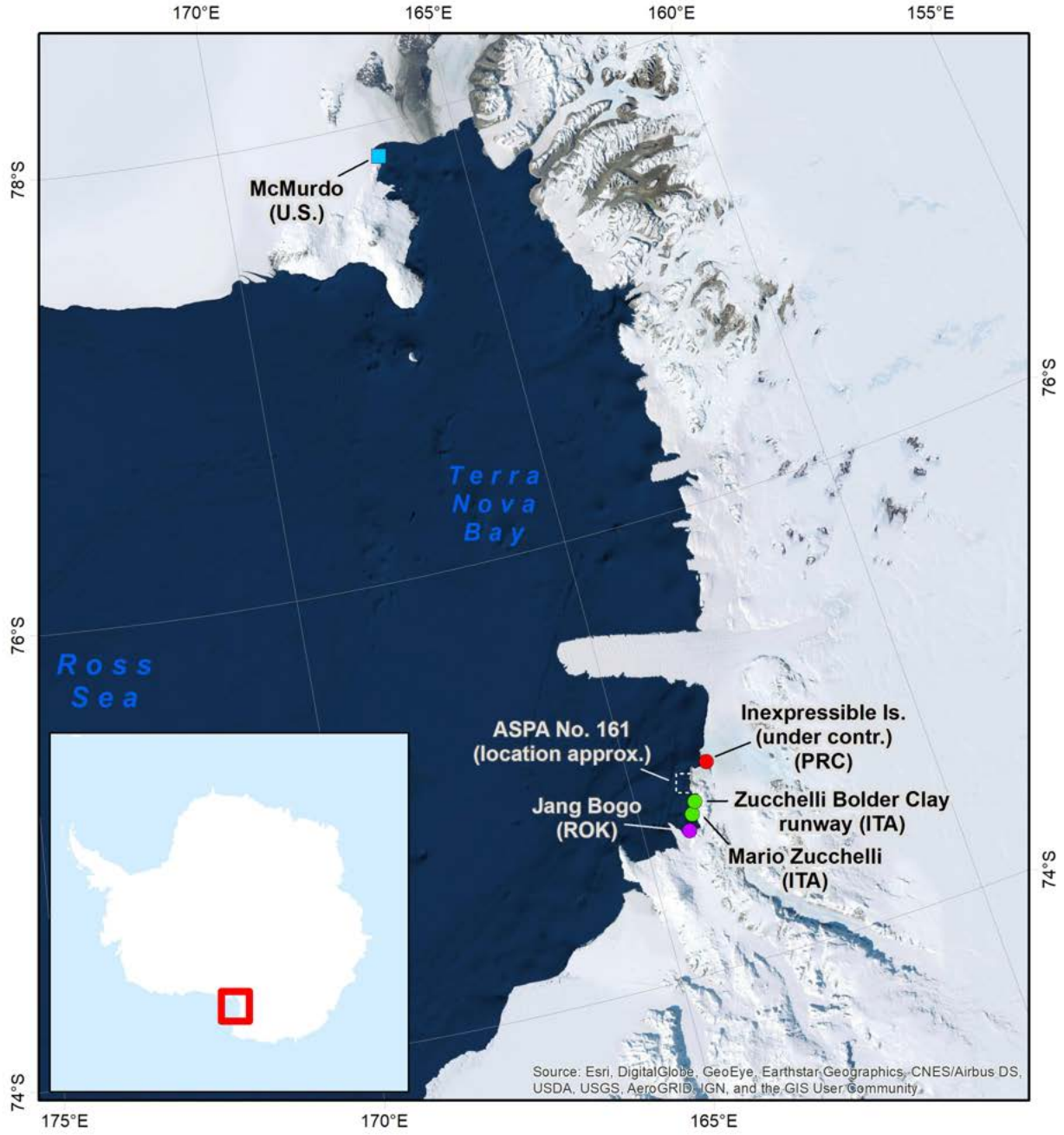
Projection: South Pole Stereographic, Datum: WGS84



U.S. Department of State, Bureau of Oceans and International Environmental and Scientific Affairs, Office of Ocean and Polar Affairs
February 19, 2020

The U.S. Inspection Team consisted of eight U.S. officials designated by the U.S. Under Secretary of State for Economic Growth, Energy, and the Environment in accordance with Article VII of the Treaty and Article 14 of the Environmental Protocol. The members of the Team, whose names were communicated to Treaty Parties on December 13, 2019, were:

Mr. William Muntean
Department of State
Team Leader

Mr. Theodore Kill
Department of State
Deputy Team Leader

Ms. Margaret Knuth
National Science Foundation

Dr. Polly Penhale
National Science Foundation

Ms. Stephanie Short
National Science Foundation

Dr. Nancy Sung
National Science Foundation

Mr. Brian Vasel
National Oceanic and Atmospheric Administration

CDR William Woityra
United States Coast Guard

Inspections are a complicated undertaking, and the Team is grateful for all the contributions made by many people in the United States and Antarctica to accomplish the task. We specifically highlight the contributions of the USAP and National Science Foundation's Office of Polar Programs under the leadership of Dr. Kelly Falkner, as well as the crew of the *USCGC Polar Star* under its Commanding Officer Captain Gregory Stanclik, all of whom provided essential support and insight for the inspection.

The Team flew on a LC-130 operated by the 109th Airlift Wing of the New York Air National Guard from Christchurch, New Zealand to McMurdo Station on February 5. They flew by helicopter operated by the USAP from McMurdo to Jang Bogo Station and back on February 7. On February 8, the Team departed for the approximately 200 nautical mile journey from McMurdo Station to Terra Nova Bay on the *USCGC Polar Star* and conducted its inspections of the station under construction on Inexpressible Island on February 9 and Mario Zucchelli Station, Boulder Clay runway, and ASPA 161 on February 10. The Team returned to McMurdo Station on the *USCGC Polar Star* and returned to Christchurch, New Zealand on February 13 on a C-17 Globemaster II operated by the 304th Expeditionary Airlift Squadron.

The following report describes the observations and conclusions of the 2020 U.S. Antarctic Treaty Inspection Team. The Team used *Checklist A: Antarctic Stations and Subsidiary Installations* annexed to Resolution 3 (2010) of Antarctic Treaty Consultative Meeting (ATCM) XXXIII for Antarctic Stations and Subsidiary Installations, and the *Checklist to assist in the inspection of Antarctic Specially Protected Areas and Antarctic Specially Managed Areas* annexed to Resolution 4 (2008) of ATCM XXXI, as guidelines for observers to carry out the on-site inspections. Prior to the inspection, the Team reviewed information from the Antarctic Treaty Secretariat website (www.ats.aq) including the Electronic Information Exchange System (EIES), the Environmental Impact Assessments database, the Inspection database, and ATCM Meeting papers and Final Reports; information from the Council of Managers of National Antarctic Programs (COMNAP) website; and information from the relevant National Antarctic Program websites.

The United States provided the opportunity to comment on a draft version of this report to the Parties whose stations were inspected. For the Boulder Clay runway that Italy is constructing and ASPA 161 that Italy takes a leading role in managing, we provided that same opportunity for comment to Italy. We appreciate the comments we received from ITA, the ROK, and the PRC on the draft report.

Part II – Observations and Recommendations

The U.S. Inspection Team was warmly welcomed and given complete freedom of access to all areas of Jang Bogo Station (ROK), the station under construction on Inexpressible Island (PRC), Mario Zucchelli Station (ITA), the Boulder Clay runway being constructed by Italy, and Antarctic Specially Protected Area (ASPA) 161. We are grateful for the time, expertise, and hospitality shown to the Team by the personnel of all three stations inspected. Each of the stations was well-managed and impressive in terms of their general facilities and professional character. The Team found no violations of Treaty provisions reserving Antarctica solely for peaceful purposes.

The two established stations – Jang Bogo and Mario Zucchelli – conduct substantial scientific research, including long-term observational series and short-term projects that provide vital data for understanding global processes. The newly renovated laboratories at Mario Zucchelli Station and the new laboratories at Jang Bogo Station will increase the research capabilities in the region. Officials from all three stations welcomed additional international collaboration on scientific research. We encourage all stations to continue to increase scientific efficiency through international collaboration, including the submission of underlying data to relevant collaborative databases and the publication of peer-reviewed scientific findings.

The Team noted that the stations inspected currently cooperate to minimize human impact in Antarctica. For example, the stations jointly use a common annual sea ice runway, rather than each constructing a separate runway. This cooperation is expected to continue with the ITA Boulder Clay airfield under construction, which would help achieve increased environmental stewardship under the Antarctic Treaty and the Protocol.

The Team was impressed by the commitment to renewable energy at the three stations. The PRC plans to install by 2025 more renewable energy capacity than the maximum computational load for the station under construction at Inexpressible Island. The Team views this ambitious plan as a positive step. The installation of renewable energy generators at the 33-year old Italian station demonstrated that even older stations can incorporate and benefit from increased use of renewable energy. The Team encourages all Parties to share with other Parties, particularly those considering building new or upgrading existing stations, their successes and challenges in installing and using renewable energy.

Another positive example of collaboration is the proposal by the PRC, Italy, and the ROK to establish an ASPA on Inexpressible Island; see information about this proposal in the section about the station under construction at Inexpressible Island section.

The Team noted the excellent communication and collaboration that existed between some stations and encouraged greater connections. For example, the ability and willingness for the ITA and ROK station personnel to collaborate to address an urgent medical situation during the most recent austral summer demonstrated how station personnel can assist each other in the unforgiving Antarctic environment. The Team encourages the station under construction on Inexpressible Island to consider establishing a regular schedule to communicate with the nearby ITA and ROK stations to ensure connectivity in case of medical or other emergency. The Team also strongly encourages the ROK to further develop winter emergency contingency plans for its personnel at Jang Bogo Station, particularly how it would evacuate personnel in case of an emergency given the limited resources available at all Ross Sea stations during the winter months.

The Team was unable to directly contact the PRC station under construction on Inexpressible Island. The Team was able to notify the R/V *Xuelong* and understood that the station was subsequently informed of the planned inspection. The Team did not receive acknowledgement from Jang Bogo Station prior to its arrival by helicopter despite using multiple frequencies identified by the ROK in the Council of Managers of National Antarctic Programs (COMNAP) Antarctic Telecommunications Operators Manual. The Team strongly encourages the PRC station under construction on Inexpressible Island and the ROK Jang Bogo Station to provide reliable contact information to COMNAP and to other stations in the Ross Sea area, and to monitor communication equipment.

The Team encourages Parties to maintain or increase the information they share to the ATCM and public about their operations in Antarctica. In particular, the Team calls attention to the significant disparity in the use of the Electronic Information Exchange System (EIES) by the national programs. Decision 4 (2012) ATCM XXXV/ CEP XV states that the Parties will use the EIES to exchange information in accordance with the Treaty and Protocol. The Team commends ITA's consistent use of the EIES tool to provide information to the public, which assisted the Team in preparing for the inspection. Noting the importance of transparency for Antarctic endeavors, the Team encourages the ROK and the PRC to increase their use of the EIES.

Additionally, there is a significant disparity in how countries comply with our shared commitments under Annex I to the Protocol. The Team commends ITA and ROK for providing regular updates to the ATCM about the plans and progress of the construction and subsequent monitoring of the environmental impacts of their new runway and station, respectively, and encourages them to continue this practice. PRC officials confirmed that there have been two draft Comprehensive Environmental Evaluations (CEE) and no final CEE for the construction of the station at Inexpressible Island. The Team strongly encourages the PRC to submit as soon as possible a final CEE, as required under Annex I, Article 3(6) to the Protocol on Environmental Protection to the Antarctic Treaty, noting that this should have occurred before the construction activities observed by the Team had started. Additionally, the Team also encourages the PRC to regularly update the ATCM about the progress of the construction of the station on Inexpressible Island.

The Team appreciated the comprehensive briefing provided by the ROK Station Leader and the completed Checklist provided by the ITA Expedition Leader. The Team encourages all established stations to have completed up-to-date Antarctic Treaty Inspection Checklist A (Antarctic Stations and Subsidiary Installations), whenever possible, to facilitate open and productive conversations. The Team also appreciated receiving from ROK officials a copy of the Emergency Procedures booklet in a Treaty language.

Part III – Site Reports

REPUBLIC OF KOREA – Jang Bogo Station
74°37'26" S, 164°13'44" E
February 7, 2020

Jang Bogo Station (JBS) is located in Terra Nova Bay in the Ross Sea region. This year-round station is the Republic of Korea's (ROK) first station on the Antarctic continent and second station constructed south of 60°S. The station was opened in February 2014 and is operated by the Korea Polar Research Institute (KOPRI) with support from the Ministry of Oceans and Fisheries. Along with King Sejong Station on King George Island and the Korean icebreaker *Araon* (neither included in this inspection program), JBS is part of the ROK's West Antarctic observatory network that conducts global climate change research.

This was the first inspection of JBS by the United States. The U.S. Inspection Team informed the station of the inspection via email approximately 20 hours in advance of arrival. The Team arrived by helicopter at the station at approximately 13:30 local time (NZST) and departed three hours later. Station leader Dr. Tae Jin Choi represented the station in an open and friendly discussion with the Inspection Team, and provided a prepared presentation that facilitated the exchange of information and increased the ease and efficiency of the inspection.

PHYSICAL DESCRIPTION

JBS is a coastal station that is built near the shoreline and 36 meters above sea level on the Gerlache Inlet. The station has 16 buildings with a cumulative size being approximately 4,200 m^2. The main building is elevated and includes the sleeping areas, scientific laboratories, medical clinic, and common space located in three angled wings. The power generation and maintenance buildings are the next largest buildings. There are container-sized structures that house scientific research facilities in addition to other operational needs. There is a 30-meter tall metal sampling tower and atmospheric science building located approximately one kilometer from the main building. Away from the main station structure is an area where containers of various shapes and sizes, bags of debris, and other large debris are kept until removed from the Continent. The paths between the buildings were obvious and well-maintained. The entire station inside and outside was clean, well-organized, and well-cared for.

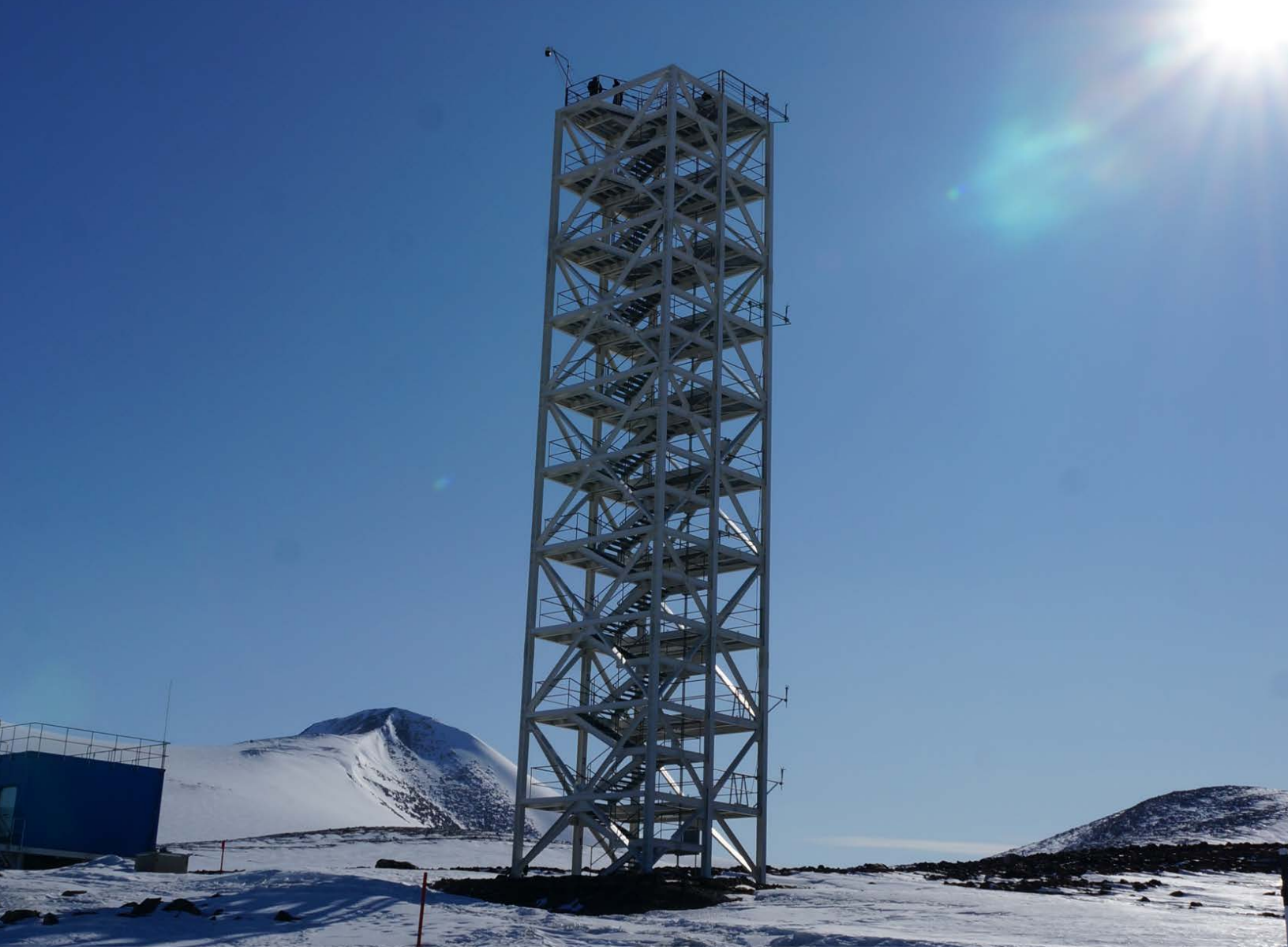
Personnel at JBS work closely with personnel at the ITA Mario Zucchelli Station, which is 10 kilometers away, and with personnel at the German Gondwana station one kilometer away, when that station is staffed. ROK officials particularly rely on the Italian weather forecasting and airfield infrastructure in the region. Please see separate sections in this report about Mario Zucchelli Station; Gondwana Station was not included in this inspection program since it was not staffed this austral summer.

PERSONNEL

The maximum number of people at JBS is 80. The maximum number of people during the winter season is 23. There is generally a 2:1 ratio of scientists to staff in the summer and the opposite ratio during winter. At the time of the inspection, only the 18-person winter staff was in place. Six were research scientists, 10 were support staff, and two were management. The station leader reported that the ROK military did not provide support at JBS, but did report one military member on station, employed as an engineer for the power generators. Prior to departing the ROK, all individuals working at JBS attend a two-week training program and undergo a medical screening. The training includes one week of familiarization with the Antarctic Treaty and Environmental Protocol and environmental management practices, and one week of safety and first aid, firefighting, and life on station.

The station has a medical clinic staffed by one doctor (year-round) who is responsible for all types of medical ailments including dental procedures. The doctor is augmented by an emergency medical technician in the austral summer when staffing is at its highest. The clinic is well-equipped for minor surgery, anesthesia, X-rays, ultrasounds, electrocardiogram, and physical therapy. There are three patient beds, plus an operating room and physical exam table. There is also a modern tele-medicine capability that could allow for remote monitoring of patient condition (vitals), if necessary. Personnel needing more advanced care could be flown to ITA Mario Zucchelli Station, U.S. McMurdo Station, or to New Zealand. The Team was informed that collaboration with staff from the ITA Mario Zucchelli station took place this season when there was sufficient time to coordinate medical care as well as an urgent need to address the medical issue. Staff reported only minor cases in the past year, with the exception of a medical evacuation in December 2019 for appendicitis, accomplished in collaboration with Italy and the United States. Medical supplies including medicine were found stored in a room labeled “Linen Room” behind an unlocked door.

The Station Leader informed the Team that JBS personnel would contact other stations in the Ross Sea area for emergency assistance, if needed. The Team strongly encourages the ROK to further develop these emergency contingency plans for its personnel at Jang Bogo Station, particularly for winter months when all Ross Sea stations have reduced resources and confront significant logistical challenges due to the weather.



SCIENTIFIC RESEARCH

The station focuses its scientific research on atmospheric science; upper atmospheric and space science; geophysics; geology and meteorite science; life sciences; and oceanography. There are five small observatory buildings which support atmospheric science (Atmospheric Chemistry Observatory, Atmospheric Boundary Layer Observatory, and Radiosonde Observatory); upper atmospheric and space science (Space Weather Observatory); and geophysics (Geophysical Observatory). Other science is supported in the station laboratory and at field sites in the region.

The well-equipped scientific laboratory inside the main building was approximately 900 m^2. Field samples are prepared and/or analyzed in this space with glassware, scales, microscopes, a deep freezer unit (-80 C), and fume hoods. Chemicals for these scientific activities, including ethanol and acetone, were visibly in use on lab benches and appeared to be stored under the benches on the floor. A -40°C cold room is located in the power plant/logistics building.

The atmospheric sampling building located at the base of the metal sampling tower, labeled as the air chemistry building, was well equipped with instrumentation to measure in situ: ozone (O_3), sulfur dioxide (SO_2), nitrogen oxides (NO, NOx, NOy), nitrous oxide (N_2O), carbon monoxide (CO), carbon dioxide (CO_2), methane (CH_4), water vapor (H_2O), and black carbon (BC). The Team observed the exterior of the facilities where weather balloons (automated radiosondes) and monthly ozonesondes were launched and observed numerous locations for

meteorological measurements around the station, including on the distant metal sampling tower and the World Meteorological Organization recognized automatic synoptic observation system.

The station leader reported that scientists from Italy, Japan, New Zealand, Republic of China (Taiwan), and the United States had collaborated with Korean scientists, and that JBS would welcome additional scientific collaboration, when possible.

TOURIST AND NON-GOVERNMENTAL ACTIVITIES

The station leader reported that there had been no tourist or non-governmental visitors to the station during the season. The station does not have a gift shop, other facilities, or staff dedicated to tourists.

LOGISTICS AND OPERATIONS

Communications

The communications room in JBS is modern and well-equipped. The communication links include VHF and HF radio and Iridium satellite telephone. The station has 2 Mbps internet speed and WiFi within the main building. KOPRI headquarters can remotely view activities in JBS via 75 closed-circuit television cameras located throughout the main building and at several external locations. In addition to live views, recordings from the cameras were reported to be kept for one month.

On the Team's helicopter approach to the station, the pilots attempted to hail the communications room on channels published in the Antarctic Telecommunications Operators Manual, including HF 5390 and VHF 16. Eventually, the Mario Zucchelli communications operators directed us to try other frequencies (HF 8245 and 5371), as did the contracted helicopter pilots working at JBS, but no answer was received from the station prior to landing. The Team strongly encourages JBS to provide reliable contact information to COMNAP and to other stations in the Ross Sea area, and to monitor communication equipment.

Transportation and Equipment

The station had four helicopters on-site during October and November, with two on station the rest of the year, including over winter. The helicopters are utilized for science support as well as to move personnel to and from other stations in the Ross Sea region. It was reported that two Zodiac inflatable boats are onsite, but they were not seen by the Team. There was also a small barge located nearer the shoreline that appeared to be used for cargo movement to and from visiting vessels.

The Station Leader reported that the ROK *Araon* arrives twice per year (December and March) in odd years and three times per year in even years to provide supplies. The station was expecting the *Araon* to return to the station one more time late this season (March). ROK personnel utilize the air facilities at the nearby Italian Mario Zucchelli Station to transit personnel and equipment to and from Christchurch, New Zealand and through the U.S. McMurdo Station.

There was a variety of equipment and trucks at the station including two cranes, two loaders, two backhoes, three forklifts, seven PistenBullys, one truck, two all-terrain vehicles, and several trailers. JBS also has five skied sleds and two fuel tanks which are necessary equipment for inland traversing. The primary purpose of the inland exploration would be for subglacial lake access work and other possible future projects.

Fuel Storage and Use

According to the Station Leader, JBS has capacity to store up to 900 tons of JP-5 fuel in nine double-walled tanks surrounded by a concrete berm. Six of these tanks are near the main station and power plant and the

other three are located closer to the water's edge, presumably to reduce the amount of pumping required when offloading from the delivery vessel. During refueling operations, a short length of flexible hose is used to connect to the hard lines that extend to the water's edge. The station's average annual consumption is 500 tons. There is an extensive network of pipelines that connect the tanks and the power plant. The pipelines appear to be appropriately protected, being placed underground where people or vehicles transit, or slightly raised in other locations.

Tanks (25,000 liters) with JP-5 fuel are used for helicopters and vehicle fueling. Two tanks were staged on trailers located next to the helicopter pads, another was located near the garage, and thirteen more were staged around the station (based on storage location, potentially for retrograde). These tanks were also reported to be dual shell construction; however, there was no catchment or berm visible beneath the tanks.

Various fluid totes and drums (oil, hydraulic fluid, etc.) were found around the station. While not in secondary containment they appeared to be in specific, orderly locations in good condition. A fuel pump is also located within the garage shop and reduces the risk for spills during refueling by being inside the building.

Power Generation and Management

The station has three 275-kW Caterpillar power generators, one of which is used at any given time. The generator in use is rotated every ten days. The generators use JP-5 fuel. JBS has installed capacity of 45-kW solar power, which the Station leader reported works well. It also has six wind turbines of 1.5-kW each. JBS also utilizes a heat recovery system from the generator(s) for station heating. There is currently no power storage for the renewable energy sources. The average daily power consumption is less than 4,320 kWh during summer seasons and no more than 5,280 kWh in the Austral winter. Approximately 28 percent or 1,200 kWh of the daily electricity consumption in summertime is collected from renewable energy sources. The Team was impressed by the significant commitment to using renewable energy sources, and encourages the ROK to share its experiences with the successes and challenges in installing and using solar and wind generators with its Ross Sea neighbors and the wider Antarctic community.

Water Systems

The station included a desalination unit capable of producing 20 tons per day of water. Water is pulled from a single intake located near the fuel tanks furthest from the main building. The line is electrically heat traced from the intake to the power plant to prevent freezing. The pipelines appear to be appropriately protected, being placed underground where people or vehicles transit, or slightly raised in other locations.

MANAGEMENT OF DANGEROUS ELEMENTS

The Station Leader reported that JBS maintains explosives and detonators for scientific research on the subglacial lake that is reached by traverse. He stated that they were held in separate storage containers more than 100 meters from the main building, and personnel were certified in their use. The station leader reported no radioisotopes were present at the station, and none were observed by the Team.

The Team noted that various chemicals were stored in proximity to each other in the scientific laboratory and potentially hazardous waste products were commingled in the heavy equipment garage. The Team encourages JBS personnel to consider appropriate procedures and equipment, such as a cabinet for hazardous materials for maintaining accessibility to the chemicals while decreasing potential risks. Similarly, the team encourages JBS personnel to consider appropriate procedures and equipment for handling hazardous waste products and reducing the risk for accidental spills both indoors and outdoors.

EMERGENCY RESPONSE CAPABILITY

A *Jang Bogo Station Emergency Procedures* booklet in Korean and English was reported to be available in every room in the main station. A copy was provided to the Team and is a thorough summary of the appropriate response to any number of potential incidents.

The Team was impressed by the commitment to fire safety. The design of the station, the training and equipment available, and the procedures all demonstrate that KOPRI and station personnel are committed to addressing this threatening issue. The Team noted an abundance of well-placed and well-labeled fire extinguishers throughout the main building, which is also served by an all-station nitrogen fire extinguishing system. The station leader reported that firefighting and first aid drills are done every two months. Additionally, the station has a two-person fire watch every night (one person placed in the communications center and another at the power plant) throughout the winter.

The station leader indicated that fuel spills are cleaned up and contaminated soil removed to Korea but that there had been no spills in five years. No spill kits were visible on the exterior of the facilities or near high risk areas (helicopter pads or the heavy equipment garage, for example); however, a barrel to place contaminated soil was found near the garage shop.

A nearby building was identified as being an emergency berthing location; however, it was also used for overflow housing in the summer and it was not evident that any extra food or materials were stored here for emergencies. A trailer of runway lights was also observed near the garage shop and it was indicated these could be used in the winter for an emergency evacuation, but it was not clear how or where they would be used. The station leader reported that the station has a decompression chamber, but the Team did not see the chamber.

ENVIRONMENTAL PROTOCOL

Environmental Impact Assessment

The Team was pleased to easily find information about the station on the Antarctic Treaty Secretariat's website, particularly in the section with papers from previous Antarctic Treaty Consultative Meetings (ATCM). The Team commends the ROK for providing regular updates to the ATCM about the plans and progress of the construction and subsequent monitoring of the environmental impacts of JBS. However, we noticed that some of the html links to KOPRI webpages reported to the Secretariat no longer worked, such as to the final CEE. We encourage the ROK to submit to the Secretariat not just a link to a government web page but the actual document to ensure that Parties can access that information in the future, particularly for important documents.

Station leaders were fully aware of the Protocol's requirement to follow the environmental assessment procedures set out in Annex I to the Protocol in the planning processes leading to decisions about activities undertaken in the Antarctic Treaty area. Since the submission of the final Comprehensive Environmental Evaluation (CEE) for the construction of the JBS, three additional Initial Environmental Evaluations (IEE) that assessed research activities and research in the region have been submitted. The station leader reported that station personnel continue to conduct environmental monitoring of impacts from station operation and that results are reported annually and made available on the KOPRI website.

It appears that the ROK has made no submissions to the Electronic Information Exchange System (EIES). We strongly encourage the ROK to submit information to EIES to meet our shared transparency responsibilities.

Conservation of Flora and Fauna

There is an absence of conspicuous local flora and fauna at JBS. Lichen and mosses are the predominant flora in the region. Occasionally, sightings of Adélie penguins (*Pygoscelis adeliae*) and Weddell seals (*Leptonychotes weddellii*) have been reported. The Station leader confirmed that station personnel rarely observed marine mammals. With the exception of skuas (*Stercorarius maccormicki*) at a breeding ground located approximately two kilometers from the main building, the Team saw no fauna during its time on station.

The Team was impressed by the cleanliness and orderliness of the station, both inside and outside of the buildings. The Team was also impressed by the size of the indoor greenhouse and the obvious care and joy that it brings to the station personnel. The plants were being grown in soil and it was reported that they were being grown from seeds. The Team observed some seedlings being grown in the clinic and was concerned that these plants were not being grown under controlled use conditions as specified in Annex II of the Protocol. The Team encourages JBS personnel to consider potential invasive species risks when growing plants outside the greenhouse and when using seeds and soil inside the greenhouse.

Waste Management

The station has a sewage treatment plant with a 20 ton per day capacity. The plant has nine stages of physical, biological and chemical treatment. JBS produces approximately 20 tons of wastewater per day. The station returns approximately 2 tons of sludge from the treatment plant to Korea each year.

The Team noticed clearly marked receptacles for different types of solid trash inside the building. Outside the main building, waste containers appeared to be well-secured from wind and fauna. In the power plant building, we observed the processing/compaction of some solid waste for recycling (aluminum cans) and where food waste is ground and dried.

Area Management

JBS is approximately 16 kilometers from Antarctic Specially Protected Area (ASPA) 161 located in Terra Nova Bay, between the Campbell Glacier Tongue and Drygalski Ice Tongue. See separate entry for the Team's inspection of ASPA 161. Other sites designated under Annex V of the Environmental Protocol within a 50-kilometer radius of the station are the existing Historic Sites and Monuments (HSM) 14 and 68 on Inexpressible Island, which is approximately 35 kilometers from JBS. The ROK, along with the PRC and ITA, has proposed the establishment of an ASPA, also on Inexpressible Island; see information about this proposal in the Inexpressible Island section. Additionally, JBS is located approximately 9 kilometers west of the western boundary of ASPA 173, Cape Washington and Silverfish Bay, Ross Sea. This 286 km^2 ASPA is almost entirely marine and was designated to protect one of the largest Emperor penguin colonies in Antarctica and the nearby marine area which is a "nursery" and hatching area for the Antarctic silverfish. ASPA 165, Edmonson Point, Wood Bay, Ross Sea, at the foot of Mount Melbourne, is approximately 45 kilometers north of JBS. This 5.5 km^2 ASPA was designated to protect the diversity of the freshwater system and rich vegetation, as well as an important Adélie penguin colony. ASPA 175, High Altitude Geothermal sites of the Ross Sea Region, was designated to protect the unique biological communities that thrive in areas warmed by geothermal activities. Nearby Mount Melbourne is one of the three sites protected by this ASPA and is the site of Korean seismic and glaciological research. HSMs 14 and 68 as well as ASPAs 165, 173, and 175 were not included in this inspection program.

The station leader reported on the significant ROK research on population dynamics and ecosystem dynamics at the penguin colony at ASPA 106, Cape Hallett, Northern Victoria Land, Ross Sea. This site was designated originally for its rich vegetation and was later expanded in size to include additional vegetation areas and the Adélie penguin colony on Seabee Hook.

Entry permits for ASPAs are issued in advance by the Minister of Foreign Affairs of the Republic of Korea. This season, four entry permits were issued for entry into ASPA 161 only, and an additional six permits were issued for access to ASPAs 105, 106, 118, 121, 124, 155, 159, 161, 165, 172, 173, and 175. Those entering the ASPA have a copy of the permit and submit end of season reports of their activities within the ASPA. The Team did not observe posted information about the ASPAs at JBS but confirmed that station personnel were familiar with the nearby ASPAs and were aware that access to the ASPAs was only allowed with a permit.

ARMS AND MILITARY SUPPORT

There were no weapons or military equipment reported at JBS and none were observed. One military member was reported to be on station, employed as an engineer for the power generators.

PEOPLE'S REPUBLIC OF CHINA –Station Under Construction on Inexpressible Island
74°55' S, 163°42' E
February 7 and 9, 2020

The People's Republic of China's (PRC) fifth Antarctic research station is under construction on the southern edge of Inexpressible Island in Terra Nova Bay, in the Ross Sea. Like all PRC stations in Antarctica, it is operated by the Polar Research Institute of China (PRIC). The most recent official PRC submission about this project is the 2018 Draft Comprehensive Environmental Evaluation (CEE) submitted as ATCM XLI, WP 13, *The Draft Comprehensive Environmental Evaluation for the proposed construction and operation of a New Chinese Research Station, Victoria Land, Antarctica,* Attachment, and *ATCM XLI, IP 25, The Updated Draft Comprehensive Environmental Evaluation for the construction and operation of the New Chinese Research Station, Victoria Land, Antarctica.* According to the Draft CEE, the construction was planned to be initiated in the austral summer of 2018/2019 and completed in the austral summer of 2021/2022. According to the Draft CEE's timeline, the wharf and main road would be constructed in 2018/2019; the temporary buildings, the structures of the main buildings, and the modules preassembled in the PRC would be constructed in 2019/2020; the on-site connection and set up of all the buildings and facilities and system test would be completed in 2020/2021; a final test of all the buildings and affiliated facilities and initiation of opening for the summer season would take place in 2021/2022; and year-round operations would start in 2022/2023.

This was the first inspection of the PRC's station under construction on Inexpressible Island by the United States. The U.S. Inspection Team informed the PRIC and the icebreaker R/V *Xuelong* of its intentions via email on February 6 and carried out aerial observation of the station on February 7 prior to its in-person inspection on February 9. The Team arrived by a light landing craft launched by the *USCGC Polar Star* at approximately 11:00 local time (NZST) on February 9 and departed 90 minutes later. Station leader Wang Zhechao represented the station in an open and friendly discussion with the Team.

PHYSICAL DESCRIPTION

The station is being built near the shoreline. The one-story main building, constructed of containers, includes living quarters with sleeping rooms, a kitchen, and dining/gathering area. The station housed 21 people during the 2020 summer season. Other smaller buildings include an emergency shelter, water desalination plant, power generation, additional berthing modules, toilet module, and storage for food and general supplies. According to PRIC officials, the structures are temporary in nature and will be demolished or relocated to become emergency shelters, if necessary, when the station building is completed.

Approximately 500 meters from the main building is a single wind turbine site that includes battery storage. The station site includes a timber helipad and two partial stone jetties for small boat or barge access; the water depth at the face of the jetties were less than one meter. The insides of the buildings were clean, and the station site was well maintained. There was one large area on the site where the ground had been leveled and rocks removed. The paths between the buildings at the station were obvious.

PERSONNEL

During the construction period, the station is seasonal with the capacity to accommodate up to 25 people. At the time of the inspection, the station leader reported there were 21 people present at the site and they had been onsite approximately 40 days. In addition to the station leader, there were six scientific staff plus fourteen other staff that included one medical doctor and various other support and construction workers.

According to the 2018 Draft CEE, there would be no more than 40 people including scientists, engineers and construction workers for 60 days during austral summer of 2018/2019, and no more than 80 people including scientists, engineers and construction workers for 60 days during subsequent austral summer construction

years. The station once constructed is designed to host up to 80 personnel in the summer and 30 personnel in the winter when completed. The expected ratio of scientists to staff would be 1:1 in summer and 1:2 in winter.

The station leader reported that all personnel received 3½ days of training and underwent medical screening prior to departing the PRC. The training includes familiarization with the Antarctic Treaty and Protocol, fire response, safety, first aid, and environmental management practices. The station leader reported that information about the Antarctic Treaty system was maintained on the R/V *Xuelong*.

A medical doctor was present among the personnel at the time of the inspection. A limited amount of medical supplies was kept in unlocked cabinets within the living quarters; the station does not yet include a dedicated clinic space. Medical equipment includes an automated external defibrillator. The station leader informed the Team that safe construction practices and injury prevention were key components of training before personnel were deployed to the station. Station personnel reported that they were prepared to respond to minor injuries but would require international assistance (no country was specified) for more serious cases.

The Team encourages the station to consider establishing a schedule to communicate with the nearby ITA and ROK stations to ensure connectivity in case of medical or other emergency. While the training of personnel prior to deployment about how to prevent injury and accident is necessary, the Team strongly recommends establishing an executable reliable backup plan for all possibilities as construction of the station continues on the Island.

SCIENTIFIC RESEARCH

According to the 2018 Draft CEE, scientific research at the station once complete will focus on physical and biological oceanography; glaciology; marine ecology; zoology; atmospheric and space physics; and geology. At the time of the inspection and while the station is still under construction, the primary scientific activity include surveys of local penguin and skua populations, as well as paleontology. The station does not yet have a laboratory or dedicated indoor scientific space; scientific activities take place outdoors.

Over the small ridge above the station and approximately one kilometer from the buildings, the Team observed four to six holes that had been excavated with heavy equipment. These holes were each filled with varying depths of what is presumed to be melt water and were each approximately 2 meters deep, 2 meters wide, and 2 meters long. The reported purpose of these holes is to take surface exposure measurement against the deep geological conditions of the bedrock to determine the vertical distribution of the soil on the site and the depth of freeze-thawing. The information gained from these holes is intended to assist the construction and maintenance of the permanent station. Additionally, behind the main building was a small structure described as “metal testing,” presumably to assess viable materials for continued station construction.

Currently, seasonal personnel at the station do not collaborate or interact directly with personnel at the nearby stations operated by the Republic of Korea and Italy. Station personnel indicated that once their facilities are complete, scientists from other countries would be encouraged to collaborate since the goal of the station was to become a platform for scientific studies.

TOURIST AND NON-GOVERNMENTAL ACTIVITIES

The station leader reported that there had been no tourist or non-governmental visitors to the station during the season. The station does not have a gift shop, other facilities, or staff dedicated to tourists.

LOGISTICS AND OPERATIONS

Communications

In addition to VHF radio, the primary links are an Iridium satellite phone as well as satellite data links with email capabilities for two to three hours per day. Bandwidth is 128 kBps. All station personnel carry a transmitter with which they can contact each other. There was no dedicated communications room; instead, the portable communications equipment was kept in or near the dining area.

The Team was unable to directly contact the station via various means (VHF, email, telephone). The Team was able to notify the R/V *Xuelong* and understood that the station was subsequently informed of the planned inspection. We strongly encourage the station on Inexpressible Island to provide reliable contact information to COMNAP and other stations, particularly in the Ross Sea area.

Transportation and Equipment

Cargo is brought to and from the station via helicopter and barge from the icebreakers R/V *Xuelong* or R/V *Xuelong* 2. The timber helicopter pad and the larger of the two stone jetties was built during the 2019-2020 austral summer. Construction of the new jetty suggests the possibility of easier transport of bulky items by barge in the future. However, it was unclear to the Team whether either of the jetties are considered completed or if additional improvements would take place in future seasons to secure them against the weather and make them more usable for cargo operations. The new stone jetty was observed to lack stability and would likely have to be further reinforced in order to support any significant cargo operations.

Vehicles present during the inspection included two ATVs, two excavators, one crane, one large wheeled-loader, one all-terrain loader, and a small drill rig on tracks. One excavator was reportedly new this season, while the rest of the equipment had been brought onsite in previous years' expeditions. Station personnel reported the vehicles are left outside during the winter. No aircraft were present at the station at the time of inspection and no hanger had been constructed. The movement of personnel was done by helicopter from the icebreakers. Other equipment observed included a rock crushing machine that has reportedly been tested but not yet used and a small tub mixer that had been used during the first construction season to make small amounts of concrete. In the same area, several bags of sand and small grade stone that had been imported were stored. The Team understands the fuel and other fluids would not be drained from the vehicles or heavy equipment during the long winter period in which the equipment is not being used. We encourage the station to consider how best to protect the equipment and environment from potential degradation and leaks during this period.

Fuel Storage and Use

The Team observed two double-walled 20,000-liter tanks of jet fuel for use by the power plant and for the equipment. Additionally, multiple 200-liter drums of gasoline and aviation kerosene were located in a storage area directly behind the main buildings. The tanks were not raised off the ground or in a berm. Small, well-maintained spill kits were easily accessible near the generator. The station leader confirmed that the protocol in case of a spill would be to halt the spill, clean up the spill, and remove the resulting waste from the Continent. The station leader reported that there had been no spills at the station.

Power Generation and Management

The station has two 100-kW diesel generators, with alternating use every 15 days. Main station power requires approximately 150-liters of fuel per day, which is stored near the generator. Heat generated from the plant is currently released and there were no reported plans for capture and use. One 10-kW wind turbine and battery storage system is located on a hill adjacent to the station. They are currently undergoing testing and provide heat to the co-located hut, but the station does not yet depend on the wind turbine for power. In addition, two solar panels were observed at a temporary location on the hillside above the wind turbine, however, these were also a test project and not in operation. The 2018 Draft CEE for the station has ambitious plans to install significant solar and wind power.

Water Systems

The station has a containerized desalination plant with a small on-site storage tank that can produce approximately 1.5 tons of water per day. Additional freshwater storage was available in the main facility. The machinery was installed in 2018 and first used in 2019. It draws water from the sea through a hard pipe that is wrapped with an electrical heat-trace to avoid freezing. Water is then piped under the road to the main building to a holding tank where it is stored for use.

MANAGEMENT OF DANGEROUS ELEMENTS

The station leader reported that no radioisotopes were present at the station, and none were observed by the Team. Given the absence of indoor scientific laboratories, the Team did not observe any potentially hazardous chemicals used for scientific purposes.

EMERGENCY RESPONSE CAPABILITY

The station under construction relies on handheld fire extinguishers for their firefighting capabilities. The Team observed well-maintained small spill kits in appropriate places, such as near fuel tanks. Station personnel primarily rely on email communication with the R/V *Xuelong* and the PRIC as needed to consult on situations that cannot be resolved at the station. The station had not yet established communications contact with the nearby Italian and Korean stations. Therefore, in the event of an emergency requiring evacuation of personnel, assistance from the nearby Italian and/or Korean stations would be requested via the R/V *Xuelong*. There was no apparent coordination between the station under construction and their neighbors for emergency response.

ENVIRONMENTAL PROTOCOL

The station leader reported that draft legislation called the "Antarctic Activities and Environmental Protection Law" was pending consideration by the National People's Congress. This legislation would reportedly clarify internal responsibilities related to Antarctic issues, establish guidelines on China's activities in the Antarctic, and promote domestic capacity-building for Antarctic exploration.

The 2018 draft CEE stated that the PRIC would formulate the Environmental Management Plan for the station, which would cover the protection measures for penguins and skuas; refueling and fuel transportation; waste collection and disposal; sewage treatment and gray water recycling; equipment; field operations; and other operational activities. The Team did not receive information about this Plan during the inspection.

Environmental Impact Assessment

PRC officials confirmed that there have been two CEEs and no final CEE for the construction of the station at Inexpressible Island. The Team notes that in ATCM XLI, IP 23 rev 1. *The Initial Responses to the Comments on the second Draft CEE for the construction and operation of the New Chinese Research Station, Victoria Land, Antarctica*, the PRC indicated that it had conducted an assessment on the transportation of materials for construction of the station. Additionally, the Team was informed that CAA conducted an assessment of the environmental impact of the preparatory work for the construction of the station. During its inspection, the Team observed significant construction activities which resulted in structures that are planned to be used once the main building is finalized. These activities would appear to go beyond transportation of materials or preparatory work, and would have more than a minor or transitory impact. Moreover, the Team reminds the PRC that under the Guidelines for Environmental Impact Assessment in Antarctica annexed to Resolution 1 (2016), "temporary constructions," are considered a "principal characteristic" of the planned permanent station that "should be clearly identified" in the CEE for the permanent station and not in a separate document or through a separate process. The Team strongly encourages the PRC to submit as soon as possible a final CEE, as required under Annex I, Article 3(6) to the Protocol on Environmental Protection to the Antarctic Treaty, noting that this should have occurred before the construction activities observed by the Team had started. Additionally, the Team encourages the PRC to regularly update the ATCM about the progress of the construction of the station on Inexpressible Island.

Conservation of Flora and Fauna

Terra Nova Bay is home to a large variety of Antarctic flora and fauna, including marine life, lichens, and mosses. Adélie penguins and seals were present near the new stone jetty. All station personnel are trained on the Protocol prior to deploying to the station under construction, and their movements into proposed protected areas outside the station is restricted. For example, the Team observed one dead Adélie penguin near the gravel path from the jetty to the station; the station leader reported the penguin had died of natural causes and that station personnel had deliberately not disturbed it. Station personnel reported that they are conducting surveys of penguin and skua populations in the vicinity of the station.

Waste Management

The Team observed clearly marked receptacles for different types of solid trash inside the building and in other areas around the station. The station leader reported that wastes are returned to China and noted that the incident with the R/V *Xuelong* reported in ATCM XLII, IP 85, 2019 R/V *Xuelong Collision with Iceberg during Marine Investigation in the Amundsen Sea, the Southern Ocean*, had slightly delayed the return of some wastes. Outside the main building, waste containers appeared to be well-secured from wind and fauna. During the inspection, greywater was being collected, treated, and returned to China. Returned samples of the treated greywater will be evaluated for possible local release in future years. Solid human waste also was collected in barrels for shipment back to China. A hard-piped outfall was observed and was reported to have been finished during the previous season but is not yet being utilized.

Area Management

The PRC, ITA, and the ROK proposed in ATCM XLII, WP 47, *Proposal for a new Antarctic Specially Protected Area at Inexpressible Island and Seaview Bay, Ross Sea*, to establish an Antarctic Specially Protected Area (ASPA) on Inexpressible Island at 74° 54.2' S, 143° 43.5' E, approximately three kilometers from the station being constructed by the PRC. The ASPA would have an approximate area of 3.31 km^2, of which 0.99 km^2 would be marine and 2.32 km^2 would be terrestrial. The primary reasons for the proposed designation are that the area hosts one of the oldest Adélie penguin colonies and is an important breeding site of South Polar Skua. Additionally, due to the polynya created by strong katabatic winds from the Nansen Ice Shelf, the ASPA would be a reference site to compare with other areas where sea ice coverage is more persistent for studies on the marine food-web structure and the effect of sea ice dynamics on the ecosystem. While the ASPA designation has not been approved by the ATCM, the proponents of the ASPA have developed a Management Plan for the ASPA with the goal to protect penguin and skua colonies; the draft management plan is currently undergoing intersessional review. The station has constructed two small huts adjacent to the proposed ASPA for the purpose of temporary shelter for scientists and storage of scientific equipment. It was reported that one of the huts would be removed at the end of the summer season for storage. Station staff reported that travel to/from the huts was accomplished on foot and no motorized transportation was used.

There are two Historic Sites and Monuments (HSMs) in the vicinity of Inexpressible Island. These are HSM 14, an ice cave located on Inexpressible Island, and HSM 68, the location of storage on the Hells Gate moraine just north of Inexpressible Island. HSM 14 is just outside the borders of the proposed ASPA and four kilometers from the station under construction. HSM 14 is the cave site where the Northern Party, led by Victor Campbell, of Robert Falcon Scott's Terra Nova Expedition was forced to overwinter in 1912. This party is given credit for having named the Island in recognition of the significant hardships faced by that overwinter. HSM 68 is the

location of an emergency depot of supplies and equipment from the 1910-1913 British Antarctic Expedition. The items were removed in 1994 by New Zealand, which undertakes management of HSM 68, in order to stabilize their deteriorating condition.

The Team did not visit the proposed ASPA or existing HSMs. The Team did not observe posted information about the proposed ASPA but confirmed that station personnel were familiar with the guidance not to access the nearby proposed ASPA and HSMs. The station leader reported that information about the ASPA and HSM was maintained on the R/V *Xuelong*.

There are two additional managed areas within 50 kilometers of the station. ASPA 161, Terra Nova Bay, Ross Sea, is located 16 kilometers to the north; see separate section for the Team's report on this ASPA. Additionally, ASPA 173, Cape Washington and Silverfish Bay, Ross Sea, is 48 kilometers to the northwest. This 286 km^2 ASPA is almost entirely marine and was designated due to its outstanding ecological and scientific values, including having a significant Emperor penguin colony and the first documented 'nursery' and hatching area for Antarctic silverfish. ASPA 173 was not included in this inspection program.

ARMS AND MILITARY SUPPORT

There were no weapons, military equipment, or explosives reported at the station and none were observed. No military support personnel were reported onsite and none were observed at the time of the inspection.

ITALY – Mario Zucchelli Station
74° 41' 42" S, 164° 7' 23" E
February 10, 2020

The Mario Zucchelli Station (MZS) is located on a granite promontory in the Ross Sea that overlooks the Gerlache Inlet in Terra Nova Bay between Cape Washington and the Drygalski Ice Tongue. MZS, a seasonal station operating during austral summer, conducts a wide range of scientific research as well as provides significant logistical support to the joint Italy/France Concordia Station (not included in this inspection program). MZS was built in 1986 by the National Program of Research in Antarctica (PNRA), which continues to operate the station. The Ministry of University and Research (MUR) finances scientific proposals and all government activities related to research in Antarctica and monitors implementation and compliance with Antarctic Treaty obligations. The National Scientific Commission for Antarctica (CNSA) proposes to MUR the strategic guidelines and calls for scientific proposals. The National Research Council (CNR) coordinates scientific activity. The National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) is responsible for logistics. The station's principal goals are to provide shelter and support for scientific personnel working at the station and in remote field sites; provide logistics and operational support for cargo and oceanographic ships; support personnel and material in transit to the Concordia Station; and support Italian and foreign air operations in the area.

The United States previously inspected MZS in February 1989, when it was called Terra Nova Bay Station, and in January 2012 in a joint inspection with the Russian Federation. The U.S. Inspection Team informed MZS of the inspection via email approximately three days in advance of arrival. The Team arrived by light landing craft near the station local time (NZST) at 13:30 and departed at 17:30. Italian Expedition Leader Alberto Della Rovere represented the station in an open and friendly discussion with the Team. He also provided a completed Inspection Checklist which helped in the exchange of information and increased the ease and efficiency of the inspection.

PHYSICAL DESCRIPTION

MZS is a coastal station that is built approximately 20 meters from the shoreline and 15 meters above sea level. The station has one 2,000-m^2 main building constructed from 120 6-meter containers that provides the main sleeping area, cafeteria, laboratories, offices, communications room, and related rooms. Other buildings include a 750-m^2 building for generators and a 2,500-m^2 high-ceilinged building for storage, workshop, and hangar. There are additional small buildings for recreation and temporary housing. The paths between the buildings were obvious and well-maintained.

As is to be expected given its role in supporting Concordia Station and other nearby stations as well as its own operations, MZS has a well-developed logistical network. It currently has three helicopter pads and up to three airstrips available, depending on the time of season. A fourth runway, a 2,200-meter gravel runway plus service support structures, is under construction at nearby Boulder Clay, six kilometers south of MZS; see separate entry below for the Team's report on Boulder Clay runway. MZS has a dock with a crane that is used for annual resupply as well as for arrival/departures for scientific research.

Italy remains strongly committed to the 33-year old MZS and its mission as demonstrated by its investment in refurbishing the sleeping quarters and laboratories. Most of the scientists and support staff had departed the station before the start of the inspection, so the Team saw the initiation of the modernization of the sleeping quarters in the main building. The Team also viewed some of the refurbished laboratories, including the impressive new aquarium that will be used starting next season, and the new solar panels and wind turbine.

Personnel at MZS work closely with personnel at the ROK Jang Bogo Station, which is 10 kilometers away, and with personnel at the German Gondwana Station 1 kilometer away, when that station is staffed. Please see separate sections in this report about Jang Bogo Station; Gondwana Station was not included in this inspection program since it was not staffed this austral summer.

PERSONNEL

The maximum number of people at MZS at any time is 120, with 44 personnel present at the station during the inspection. There is generally a 1:1 ratio of staff to scientists. This is a seasonal station, so it is only occupied from mid-October through mid-February. This was the first year the station would be open into March, with 14 people staying to conduct internal renovations. However, even after the renovations, there are no plans to have the station accommodate people year-round. Seventeen four-person berthing rooms were undergoing significant renovations at the time of the inspection.

All Italian civilians going to Antarctica for the first time attend a two-week training program and undergo a medical screening prior to departing Italy. The training includes familiarization with the Antarctic Treaty and Environmental Protocol, survival training, safety and first aid, fire-fighting, and environmental management practices. Divers and firefighters go through additional specialized training. Civilians who have previously traveled to Antarctica receive a refresher briefing upon arrival at MZS. All personnel going to Antarctica undergo medical screening appropriate for their role and activity prior to departing Italy.

MZS has a medical center staffed by two doctors and one nurse. The center is equipped for surgery, anesthesia, X-rays, and ultrasound. Telemedicine assistance is provided by Gemelli Polyclinic in Italy. Personnel needing more advanced care are flown to the U.S. McMurdo Station or to New Zealand for care. The medical professionals at MZS and Jang Bogo collaborated during the past season to provide medical care when needed.

SCIENTIFIC RESEARCH

The station supports a number of major research projects, including hosting facilities for geomagnetic observations since 1986/87, geodetic, ionospheric, seismological, and weather-climate research. Researchers also investigate the ecosystem structure, nano-climatic parameters, volcano-ice dynamics, aerosol chemical composition, precipitation, bio-mineralizers, ocean-atmosphere interaction, and the area proximate to MZS. There are 17 laboratories and two aquariums at the station, as well as facilities for astronomical, atmospheric, and meteorological observations. Four of the laboratories were undergoing extensive modernization during the time of the inspection. Measurements of the size of Adélie penguin colonies of the southern Ross Sea since 1984 are among the longest biologic time series in Antarctica. Personnel at MZS and nearby Jang Bogo Station collaborate on marine biology and astronomy, in particular.

MZS supports scientific camps at different locations depending on the type of approved scientific activity being conducted. This season, it supported camps at Starr Nunatak, Litell Rocks, Edmonson Point, and Redcastle Ridge. Italian officials said they welcomed international scientific cooperation, noting that scientists from France, Japan, Korea, New Zealand, and Poland conducted research at MZS this season as collaborators of approved Italian scientific projects. Italian scientists participated in projects organized by other programs, such as one managed by New Zealand in the Dry Valleys.

TOURIST AND NON-GOVERNMENTAL ACTIVITIES

The Expedition Leader reported that a visit by a tourists had recently been concluded. He said that tourism was not a significant distraction since there was usually only one visit every season, although this season there were three visits. The station does not have a gift shop or other facilities dedicated to tourists. The station does not allow tourists to roam freely on the station or in the vicinity of the station.

LOGISTICS AND OPERATIONS

Communications

MZS uses HF and VHF radio, with its main antennas located at Campo Antenne located between the station and Boulder Clay runway. Satellite telephone connections are provided via two Inmarsat and two Iridium systems. The internet connection has a download bandwidth of 1.5 Mbps and upload of 1 Mbps. Personnel can access VOIP, Skype, and WhatsApp at the station. The Team found the MZS communications room to be very responsive, making coordination of the visit very easy.

Transportation and Equipment

Italy maintains four runways at MZS: a 3,000-meter seasonal fast-ice runway for wheel and ski airplanes from mid-October to late-November, a 1,000-meter ice-runway for ski only from November to mid-February at Enigma Lake, a 1,200-meter snow-runway for ski only from November to mid-February at Browning Pass, and a gravel runway under construction at Boulder Clay. See separate section below for more information about the Boulder Clay runway; the other runways were not included in this inspection. MZS received 14 intercontinental flights using the fast-ice runway this season. Intracontinental flights during the season use the other runways. MZS has three helipads for the three helicopters based there for logistical and scientific operations.

MZS also has a dock with a crane that can hoist up to 45 tons. The dock is used to load/unload materials via pontoon with the Italian icebreaking research vessel, *Laura Bassi*. One small research vessel that is not currently operational, and two Zodiac inflatable boats are also based at MZS. The Expedition Leader also reported that a second research vessel is currently in Lyttelton, New Zealand for recertification.

MZS maintains many vehicles for operations, including pickup trucks, snowmobiles, excavators, dump trucks, and fire trucks. MZS has also recently acquired a screening plant (rock sorter) for their runway construction. There are several roads made of compacted gravel that connect the main facilities at MZS, including the runways, wind turbines, and dock.

Fuel Storage and Use

Aviation fuel Jet A1 is used for all flying operations. Jet A1 is mixed with additives to power vehicles and power generators. Fuel is stored in three welded steel, double-walled 600,000 liter tanks. For safety, the tanks are located more than 500 meters from the main buildings at MZS. These three tanks are refueled from tanks brought ashore from the icebreaker. There are also two steel tanks of 26,000-liters of helicopter fuel, four double-walled steel 12,000-liter tanks for power station refueling, and two double-walled steel 30,000-liter tanks for over-winter power generator. Fuel consumption this season was 726,500 liters, including 202,000 liters for power generation, 165,500 for intercontinental flights, and 131,000 liters for Boulder Clay runway construction.

The Expedition Leader reported that there were "Control and Management of Fuel" and "Oil Spill Contingency" plans in Italian at the station. Personnel conduct daily inspections of the fuel storage and pumping system, and purge, sample, and analyze fuel in the pumping system every two weeks. Fixed-wing aircraft refueling is done by truck with a fuel tank attached. Spill response materials were not readily identified around the station. The Expedition Leader reported that there have been no spills greater than 200 liters in the past five years and that logistics and fuel-management personnel know the location of spill response materials and how to use them.

Power Generation and Management

MZS uses two 375-kVA diesel-electric generators and has two emergency 175-kVA generators. A glycol heat recovery system is also utilized. Solar could provide up to 62.5 kVA and wind turbines up to 11.5 kVA. The average daily electrical generation is 200-kW. Electrical energy consumption for the season was 455,200 kWh, with solar providing 25,300 kWh, 3,500 kWh coming from wind, and the balance from diesel. Italy is planning to increase its use of renewables at MZS in the coming years. Three experimental wind energy generators were installed in 2018 and will be tested through 2021 to power the operation of all-season instruments.

Water Systems

Water is produced through a sea-water desalination plant with a capacity of 38,000 liters per day. Processed water is stored in three tanks of 20,000 liters, 19,000 liters, and 4,000 liters. Average daily consumption is 120 liters per person. The station began using unprocessed seawater in toilets this season and indicated this was significantly reducing their freshwater usage.

MANAGEMENT OF DANGEROUS ELEMENTS

The station maintains approximately 200 liters of organic and 40 liters of acidic chemicals. The chemicals are labeled and stored in a container outside of the main station building. The Expedition Leader reported that no radioisotopes were present and none were observed by the Team.

EMERGENCY RESPONSE CAPABILITY

MZS has four fire trucks, an ambulance, and a helicopter capable of carrying a stretcher. The station is equipped with a fire and smoke detection system and has hand-held fire extinguishers distributed throughout the station. Some of the renovation work being conducted includes upgrades to the fire alarm system. Two professional firefighters are employed each season and lead a brigade of thirteen personnel more that are trained for fire response. There is emergency training weekly and station personnel conduct firefighting exercises twice per season. These exercises include a simulated medical emergency component.

ENVIRONMENTAL PROTOCOL

The Expedition Leader reported that there has been no change in Italy's legal regime for the implementation of the Environmental Protocol. This issue was identified in the 2012 inspection conducted by the Russian Federation and the United States, ATCM XXXVI, IP 45, *Report of Russia – US joint Antarctic Inspection, November 29 – December 6, 2012*. Italy's response to the U.S./Russian inspection report can be found at ATCM XXXVI, IP77, *Italy answer to the US / Russian Inspection at Mario Zucchelli Station in 2012*, of the same meeting.

Environmental Impact Assessment

The station has conducted an environmental monitoring program for more than 20 years. Italy has presented the results of this program in papers submitted at ATCMs.

Conservation of Flora and Fauna

There is little obvious flora or fauna at the station, although skuas are present. There are penguin colonies five kilometers to the south at Adélie Point just outside of ASPA 161 and about 40 kilometers to the north at Edmonson Point. The Expedition Leader described monitoring and plans to eradicate invasive species if any were found in the vicinity of the station.

Waste Management

The general policy is to minimize waste and for all wastes to be removed from Antarctica except waste that can be incinerated or treated as effluent. Four separate categories of waste are collected, stored, transported, and disposed of separately according to Italian domestic regulations: biodegradable (e.g., sewage, greywater, food waste), non-hazardous (e.g., glass, metal, wood), petroleum products (e.g., fuel, fluids), and hazardous (e.g. chemicals, radioactive materials, paint). Waste produced in field camps is returned to MZS for appropriate handling.

The Expedition Leader reported that the station produces approximately 200 kilograms of waste per day that can be incinerated. Most of this is kitchen waste and paper, but other sources include waste from the wastewater screening process, wastewater treatment sludge, cardboard, and wood. The ashes from the incinerator are collected and sent to Italy for disposal as hazardous waste. The Expedition Leader also indicated that they were looking to invest in a new system for drying food waste.

Area Management

MZS is approximately 1.6 kilometers north of ASPA 161 located in Terra Nova Bay, between the Campbell Glacier Tongue and Drygalski Ice Tongue. Italy proposed and the ATCM approved the designation of the ASPA in 2003 and has since reviewed ad updated the Management Plan for the ASPA consistent with the requirements of Annex V. See separate entry for the Team's report on ASPA 161.

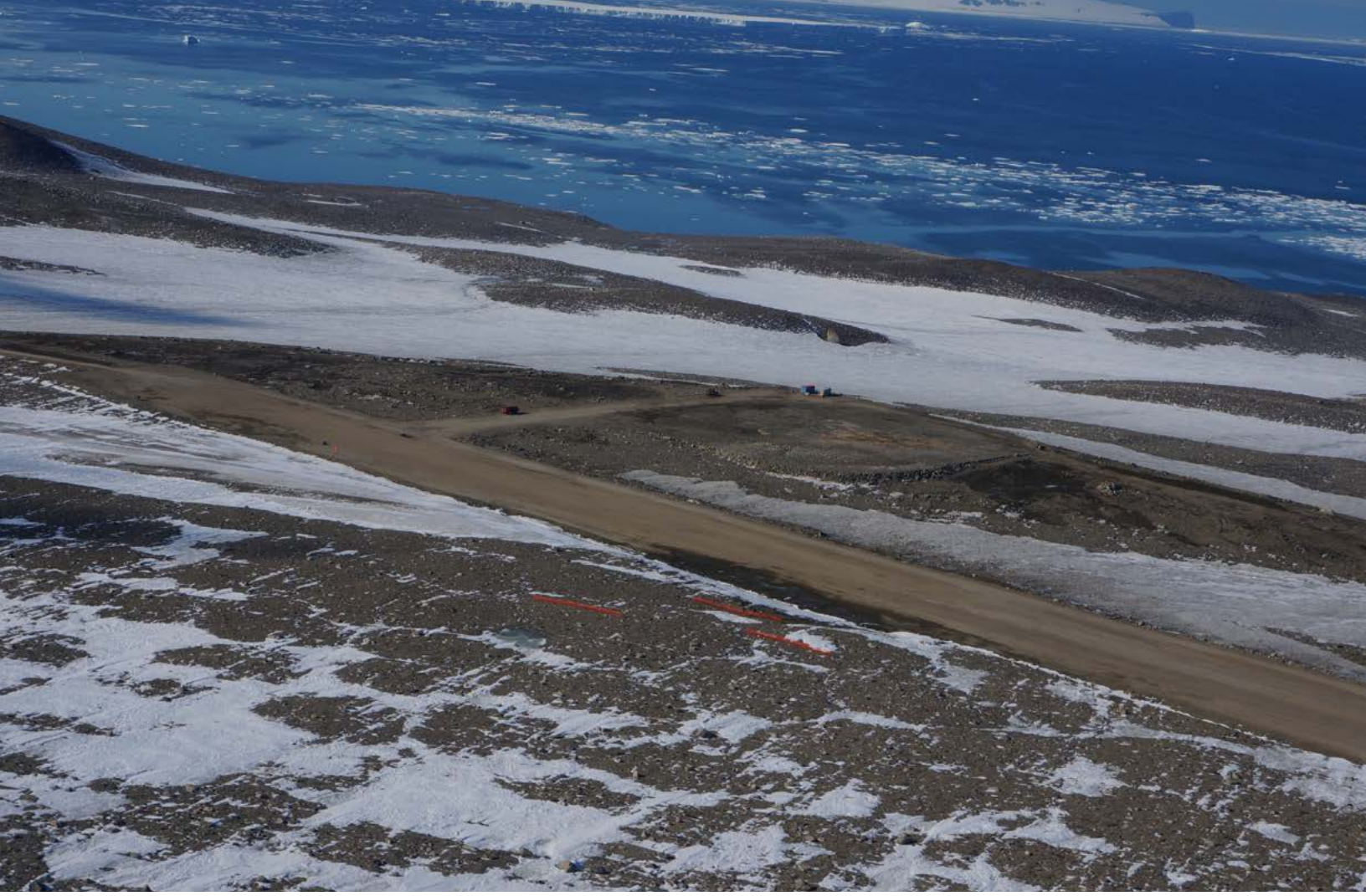
Additional area management plans within a 50-kilometer radius of the station are the existing Historic Sites and Monuments (HSM) 14 and 68, and ASPA 173; these sites were not included in this inspection program. HSM 14 is an ice cave located on Inexpressible Island where the Northern Party, led by Victor Campbell, of Robert Falcon Scott's Terra Nova Expedition was forced to overwinter in 1912. HSM 68 is the location of an emergency depot of supplies and equipment from the 1910-1913 British Antarctic Expedition; the items were removed in 1994 by New Zealand, which undertakes management of HSM 68, in order to stabilize their deteriorating condition. ASPA 173, Cape Washington and Silverfish Bay, Terra Nova Bay, Ross Sea, is 40 kilometers west of MZS. This 286-km^2 ASPA is almost entirely marine and was designated for its outstanding ecological and scientific values, including having a significant Emperor penguin colony and the first documented 'nursery' and hatching area for Antarctic silverfish.

Additionally, Italy, along with the PRC and the ROK, has proposed the establishment of an ASPA on Inexpressible Island; see information about this proposal in the section on the Station under Construction on Inexpressible Island.

The Team noted several posters in the station that identified the nearby protected areas and that gave appropriate advice about interacting with wildlife.

ARMS AND MILITARY SUPPORT

Italy's 2019/2020 Pre-Season report in the Antarctic Treaty Secretariat Electronic Information Exchange System (EIES) stated that 22 military officials would be located at MZS, and an additional four military personnel would be at or traversing to Concordia Station on the icebreaker *Laura Bassi*. At the time of the inspection, there were nine Air Force, four Army, and two Navy personnel to conduct weather forecasting, vehicle use and maintenance, diving, and staff the communications room. Military equipment at MZS consisted of four dump trucks and two excavators. No weapons, military equipment, or explosives were reported or observed.



ITALY – Boulder Clay Runway
74° 44' 00" S, 164° 03' 00" E
February 10, 2020

The Boulder Clay runway is located approximately 6 kilometers from Mario Zucchelli Station (MZS) and two kilometers from Antarctic Specially Protected Area (ASPA) 161. The U.S. Inspection Team inspected the runway and MZS at the same time, and ASPA 161 on the same day; see separate sections for the Team's reports on MZS and ASPA 161.

Currently, access to the Boulder Clay runway is via roads that connect MZS with Enigma Lake runway, although MZS officials did indicate that the roads would need to be re-routed before completing the project. At the time of the inspection, a 1,700 meter long and 30 meter wide gravel runway had been constructed, of which 1,100 meters had been completed to final finish/grade. The Expedition Leader reported that a Basler aircraft had successfully used this section of the runway this season. The apron had been roughly defined (rough grade) and was anticipated to be complete next season.

The construction season at Boulder Clay is from December 10 to February 10. A portable 10-kW generator, a living module, and a toilet module are installed at Boulder Clay each austral summer. These structures had been removed for the winter season the day before the inspection. The construction team has 20 dedicated personnel from ENEA, the Italian Air Force, Italian Fire Department, and contractors. The construction team uses three excavators, four dump trucks, a steamroller, and a grader; this equipment was listed in the MZS portion of this report. The machinery is removed from the site and stored in buildings at MZS for the winter. Construction materials are all locally sourced, but specifically not taken from the glacial moraine.

The plan is for the runway to be a total of 2,200 meters in length and 60 meters wide. The Expedition Leader reported that additional work to be completed include constructing a 120 meter by 120 meter apron for aircraft parking and refueling, a 15 by 40 meter terminal building to hold passengers and luggage for a short time, and two double-walled, stainless steel 44,000-liter fuel tanks. Fuel will be trucked from MZS to the fuel tank for storage and subsequent use by airplanes and generators. A helipad will also be constructed east of the runway (downhill) for emergency use only. Navigational aids and airfield markings are still under review. The Expedition Leader anticipated 30 airplane flights (including both continental and intercontinental) per year once the Boulder Clay runway and supporting infrastructure are completed. Local geography demanded that the runway be constructed perpendicular to prevailing winds although MZS personnel were confident the winds would not unduly impact the arrival/departure of flights.

Italy submitted a Final Comprehensive Environmental Evaluation (CEE) as ATCM XL, IP 70, *Final Comprehensive Environmental Evaluation for the construction and operation of a gravel runway in the area of Mario Zucchelli Station, Terra Nova Bay, Victoria Land, Antarctica*, and provided a progress report on its construction in ATCM XLII, IP 109, *Progress update in the construction of the gravel runway in the area of Mario Zucchelli Station, Terra Nova Bay, Victoria Land, Antarctica.* MZS personnel maintain an Environmental Monitoring Plan to evaluate the impacts of the runway and infrastructure on the surrounding environment to include CO_2 emissions assessments of the construction and ground temperature measurements every 500 meters along the length of the runway. The Team commends Italy for keeping the ATCM well-informed about the progress of the runway construction and encourages MZS officials to keep officials at the other Ross Sea stations apprised of progress on constructing the runway and the support facilities.

There is very limited flora and fauna in the vicinity of the runway, with only skuas conspicuously present. Boulder Clay runway is approximately 200 meters higher than the largely maritime ASPA 161.

Since there were no structures at Boulder Clay, the Team did not observe any posters about the ASPA. However, the Team confirmed that Italian personnel were well-informed about the ASPA and took appropriate measures to prevent personnel from harming it.

ANTARCTIC SPECIALLY PROTECTED AREA 161, TERRA NOVA BAY, ROSS SEA
74 45' S, 164 01'E
February 10, 2020

Antarctic Specially Protected Area (ASPA) 161 is located in Terra Nova Bay, between the Campbell Glacier Tongue and Drygalski Ice Tongue, approximately 1.6 kilometers south of Mario Zucchelli Station (MZS) and 1.8 kilometers east of Boulder Clay runway; see earlier entries for the U.S. Inspection Team's reports on MZS and Boulder Clay. ASPA 161 is a narrow strip of coastal waters, approximately 9.4 kilometers in length and generally within 1.5 – 7 kilometers of the shore, with a total area of 29.4 km^2.

Italy proposed and the ATCM adopted the designation of Terra Nova Bay as ASPA 161 through Measure 2 (2003). Italy's revisions to the management plan were adopted via Measure 14 (2008), Measure 15 (2013), and Measure 7 (2019). The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) considered and approved the designation of this ASPA during CCAMLR XXI, Hobart 2002.

The central value to be protected in the designation of this coastal area as an ASPA is its importance for ongoing and future research. Long term studies conducted over the past 30 years have revealed a complex array of species assemblages. The ASPA contains several vulnerable marine ecosystems, characterized by the Antarctic scallop *(Adamussium colbecki)* and pterobranchs. Italian scientists have conducted studies of near-shore benthic communities in the ASPA since 1986/87; this research has contributed substantially to understanding the marine communities in this area, and the effect of katabatic winds on the physical, chemical, and biological processes occurring in the water column. Adjacent to the ASPA is an Adélie penguin colony with a 2013 population of approximately 13,000 breeding pairs and 30 skua breeding pairs. No marine resource harvesting has been, is currently, or is planned to be, conducted within the ASPA, nor in the immediate surrounding vicinity.

The 2019 Management Plan and permit information is available at MZS. The Plan stated that there shall be a map of the ASPA at all scientific stations located within 50 kilometers of the ASPA; the Team confirmed the presence of such a map at MZS but did not see any such maps at the ROK's Jang Bogo Station or at the PRC's station under construction on Inexpressible Island, both located within 50 kilometers of the ASPA.

Access to the ASPA is generally by ship, but could be accessed by air and over sea ice, when conditions allow. Routes are not defined. Inspectors saw numerous posters at MZS that provided information about the location and rules related to the ASPA and guidance on interacting with wildlife. The MZS station leader stated that Italian personnel working at the station are briefed about environmental procedures related to the ASPA and other nearby protected areas prior to departing Italy. He said that access to the ASPA is allowed only by permit and that tourists are not permitted to visit.

The Team observed some wildlife in and near the ASPA, including one seal in the water and numerous skuas. The Boulder Clay runway under construction is significantly uphill – approximately 200 meters – and inland from the coastline of the ASPA. The Team did not observe any evidence of human presence in the ASPA. The Italian vessel *Laura Bassi* was observed in Terra Nova Bay at the time of the inspection in a position outside of the ASPA boundary.

Based on the visual observations of the Team, the ASPA continues to protect the values that were the basis for the original designation. The team encourages Parties to continue to monitor the ASPA, particularly for impacts related to ongoing climatic and ecological changes in Antarctica, and that all Terra Nova Bay stations ensure that their staff is aware of the location and regulations related to the ASPA through briefings and posters.

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