= Troll (research station) =

Troll is a research station located at Jutulsessen , 235 kilometers (146 mi) from the coast in the eastern part of Princess Martha Coast in Queen Maud Land , Antarctica . It is Norway 's only all @-@ year research station in Antarctica , and is supplemented by the summer @-@ only station Tor . Troll is operated by the Norwegian Polar Institute and also features facilities for the Norwegian Meteorological Institute , the Norwegian Institute for Air Research .

Contrary to most other research stations on the continent , Troll is constructed on the snow @-@ free slope of solid rock breaking through the ice sheet at Jutulsessen , located 1 @,@ 275 meters (4 @,@ 183 ft) above mean sea level . The station opened as a summer @-@ only station in 1990 and was taken into use as an all @-@ year station in 2005 . It has an overwintering capacity of eight people and a summer capacity of 40 . It is served by Troll Airfield , which is the base for the Dronning Maud Land Air Network .

= = Facilities = =

Troll is located in the eastern part of Princess Martha Coast in Queen Maud Land , which Norway claims as a dependent territory . The station is located on the nunatak bare ground area Jutulsessen , at 1 @,@ 270 meters (4 @,@ 170 ft) above mean sea level . It is completely surrounded by the Antarctic ice sheet . This is unlike most other Antarctic research stations , which are located on snow . Troll is 235 kilometers (146 mi) from the coast .

The station facilities are owned by the Government of Norway through the Norwegian Directorate of Public Construction and Property . Operation of the facility is done by another government agency , the Norwegian Polar Institute . The facilities consist of a module @-@ built new section that is 300 square meters (3 @,@ 200 sq ft) , and the old section that is 100 square meters (1 @,@ 100 sq ft) . The new section consists of eight bedrooms , a gym , a sauna , a kitchen , a communication center and office space . In addition , there are several smaller buildings which are used as laboratories , provision stores , generators and garages . The old station is used partially for storage and partially as a summer station . The facility also features an emergency facility for eight people , located at a safe distance from the main base , in case of fire or other accidents . The station is dimensioned to tolerate temperatures down to ? 60 ° C (? 76 ° F) and wind speeds of 60 meters per second (200 ft / s) .

The facility attempts to minimize its environmental impact through several mechanisms , including minimizing area usage . Energy consumption is reduced by using recirculating excess heat to melt snow and ice for drinking water and heating . Waste is minimized through purchase planning and recycling ; the remaining waste is compressed and transported away from the Antarctic . Fuel is handled in such a way that even small spills are minimized . In 2016 a solar PV plant with 7 @.@ 3 kilowatt peak has been installed on one of the roof tops . It serves as a pilot installation for the declared middle term target of reducing the oil consumption of the research station significantly , by extending the solar PV plant over the next few years .

The station has a cold and dry climate , being located in a desert . The annual mean temperature is ? 25 ° C (? 13 ° F) , with the summer temperature able to reach about 0 ° C (32 ° F) and the lowest during the winter at ? 50 ° C (? 58 ° F) . Storms , which can occur throughout the year , can occasionally make outdoor activity impossible . Being located south of the Antarctic Circle , Troll has midnight sun in the summer and polar night during the winter .

= = Research = =

The Norwegian Institute for Air Research (NILU) maintains air and atmospheric measurement equipment at Troll . Combined with a similar measuring station , Zeppelin in Ny @-@ Ålesund , Svalbard , Norway . This allows the institute to collect such data from both polar regions . In particular , the facility measures aerosols , organic and inorganic pollution , ozone and ultraviolet (UV) radiation . NILU also creates air samples annually to generate data for trend analysis . The

weekly air pollution measurements are compared to equivalent measurements at Zeppelin . Ground measurements are taken of ozone and mercury , two of the greatest pollution threats in the polar regions . Stratosphere measurements are conducted to measure ozone and UV levels , in particular to gain additional information about ozone depletion and the Antarctic ozone hole .

Kongsberg Satellite Services , a joint venture between Kongsberg Group and the Norwegian Space Center , operates TrollSat , a satellite ground station which allows downloading of data . In conjunction with SvalSat , located in Longyearbyen , Svalbard , TrollSat targets satellites in a polar orbit . TrollSat consists of a single radome with an 7 @.@ 3 @-@ meter (24 ft) low Earth orbit antenna capable of S band and X band reception . To relay the information , TrollSat has a 4 @.@ 8 @-@ meter (16 ft) and a 7 @.@ 6 @-@ meter (25 ft) C band uplink to provide broadband connection to Europe and North America . TrollSat will be one of 30 ground stations for the European satellite navigation system Galileo , and is Norway 's main contribution to the project .

The Norwegian Meteorological Institute operates a manned weather station at Troll . It measures air pressure , temperature , humidity and wind , both at the station itself and at the airfield .

= = History = =

During the 1980s , it became increasingly important for the Government of Norway to have a permanent base in Queen Maud Land . The area had been annexed as a dependency on 14 January 1939 , at the time mainly based on Norwegian whaling interests in the Antarctic . From 1956 , Norway operated the research station Norway Station , but this was given to South Africa in 1959 . From the 1960s through the 1980s , Norway 's research activities in Antarctica were sporadic and without a fixed base . This gave the advantage that the research was not bound geographically , but it weakened the Norwegian claim for Queen Maud Land and the right to participate as a consultative member of the Antarctic Treaty . In 1989 , any party to the Treaty could ask for it to be renegotiated , and Norwegian authorities saw the need for a permanent base to strengthen Norway 's claim to Queen Maud Land .

The Norwegian Polar Institute decided to establish a summer station . This was built during the summer of 1989 and 1990 , resulting in a 100 @-@ square @-@ meter (1 @,@ 100 sq ft) building with room for eight people . Construction required 300 tonnes (300 long tons ; 330 short tons) of materials to be hauled from the coast and the station was officially opened on 17 February 1990 . The station took its name from the surrounding jagged mountains , which resemble trolls of Norse mythology . The first overwintering occurred in 2000 , when a South Pole expedition used the camp as a base .

To ease logistics , Norway took the initiative to establish Dronning Maud Land Air Network (DROMLAN) , a cooperation between the countries with bases in Queen Maud Land to streamline transport costs . Having an airfield at Troll allows quicker transport to the research stations in western Queen Maud Land , which are located further away from the incumbent airfields at Henriksenskjera and Novolazarevskaya . The first flight that was a preliminary to DROMLAN was made in 2000 from Cape Town , South Africa , to Henriksenskjera , where a Twin Otter was used onwards to Troll .

In 2003 , it was decided that Norway was to extend its operations in Antarctica by establishing an all @-@ year research station . By then , Norway was the only country with a territorial claim to Antarctica to not have an all @-@ year research station on the continent . The government stated that the investment was motivated to improve climate research , to strengthen Norway as a bi @-@ polar research nation and to strengthen Norway 's role as a premise @-@ maker in the environmental policy of the Antarctic .

Construction of the expansion was done from December 2004 through February 2005 by the Norwegian Directorate of Public Construction and Property , who contracted the job to AF Gruppen . About 700 tonnes (690 long tons ; 770 short tons) of equipment was hauled to the base from the ice shelf . The base was prefabricated and only required the modules to be connected at site . New infrastructure included a new generator , emergency station , garage , provision stores , container ramps for equipment and fuel , and more laboratories . At the same time , the Norwegian

Meteorological Institute established a meteorological station at Troll .

The construction of the runway itself required the filling of crevasses and the removal of stones . Troll Airfield was opened on 11 February 2005 by Queen Sonja of Norway and the new research station the following day . After the opening , another power station was built in 2005 . In 2006 , a satellite base station was built by Kongsberg Satellite Services . This resulted in the need for a broadband connection for the base . During the winter season of 2006 , there was no overwintering due to lack of funding , but from 2007 this has been re @-@ instated . In 2008 , a windmill was taken into use to provide some of the power .

Norwegian Prime Minister Jens Stoltenberg visited Troll in January 2008 , when he among other things opened TrollSat . At the same time , as part of the International Polar Year , a Norwegian ? United States expedition traveled from Troll to the Amundsen ? Scott South Pole Station and back . On 23 February 2009 , Norwegian Minister of the Environment Erik Solheim hosted a meeting for environment ministers from 15 countries to discuss climate change and learn about recent research in the field .