Volume III

U.S. ANTARCTIC RESEARCH PROGRAM

SCIENTIFIC SUPPORT STUDY

MARBLE POINT STATION

National Science Foundation

March 1972

Section 1

INTRODUCTION

MARBLE POINT STATION

Marble Point is on the Antarctic mainland on the west side of McMurdo Sound about 50 miles northwest of McMurdo Station (see Figure 1-1). The project area essentially consists of an ice-free strip of land along the coast between Marble Point on the south and Gneiss Point on the north, a distance of approximately 4 1/2 miles. The area is bounded on the east by McMurdo Sound, and on the west by the ice front of a lobe of the Wilson Piedmont Glacier. The strip of ice-free land is about one mile wide at its narrowest point.

The terrain is mainly gently rolling hills and valleys -- probably the result of Wilson Piedmont Glacier action in past geologic time. Rock is exposed near hill tops, and along the shores of Gneiss and Marble Points. The valleys and some of the low hills are covered with glacial debris composed of a mixture of silt, sand, gravel and boulders. Generally, this glacial debris is thin (less than 30 feet).

FUNCTION OF MARBLE POINT STATION

The facilities described below replace the McMurdo Station-Williams Field complex as the seat of functional activities in support of the United States scientific program in Antarctica.

Figure 1–1

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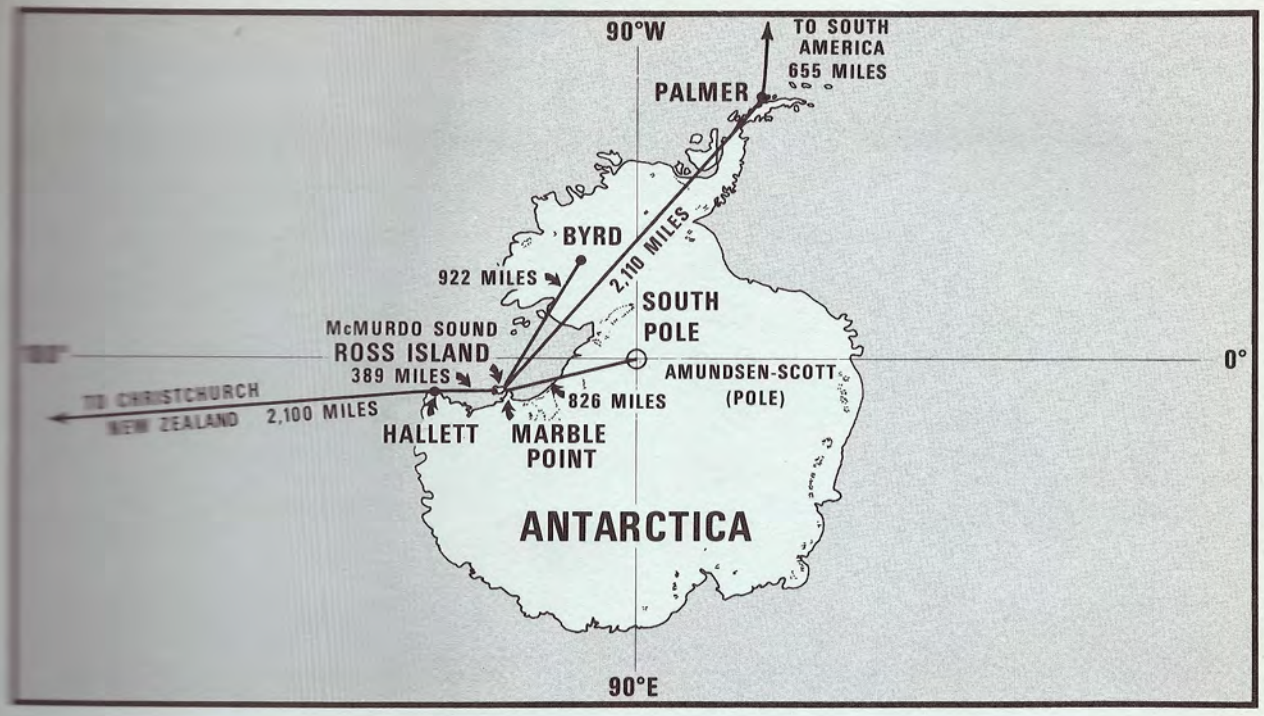
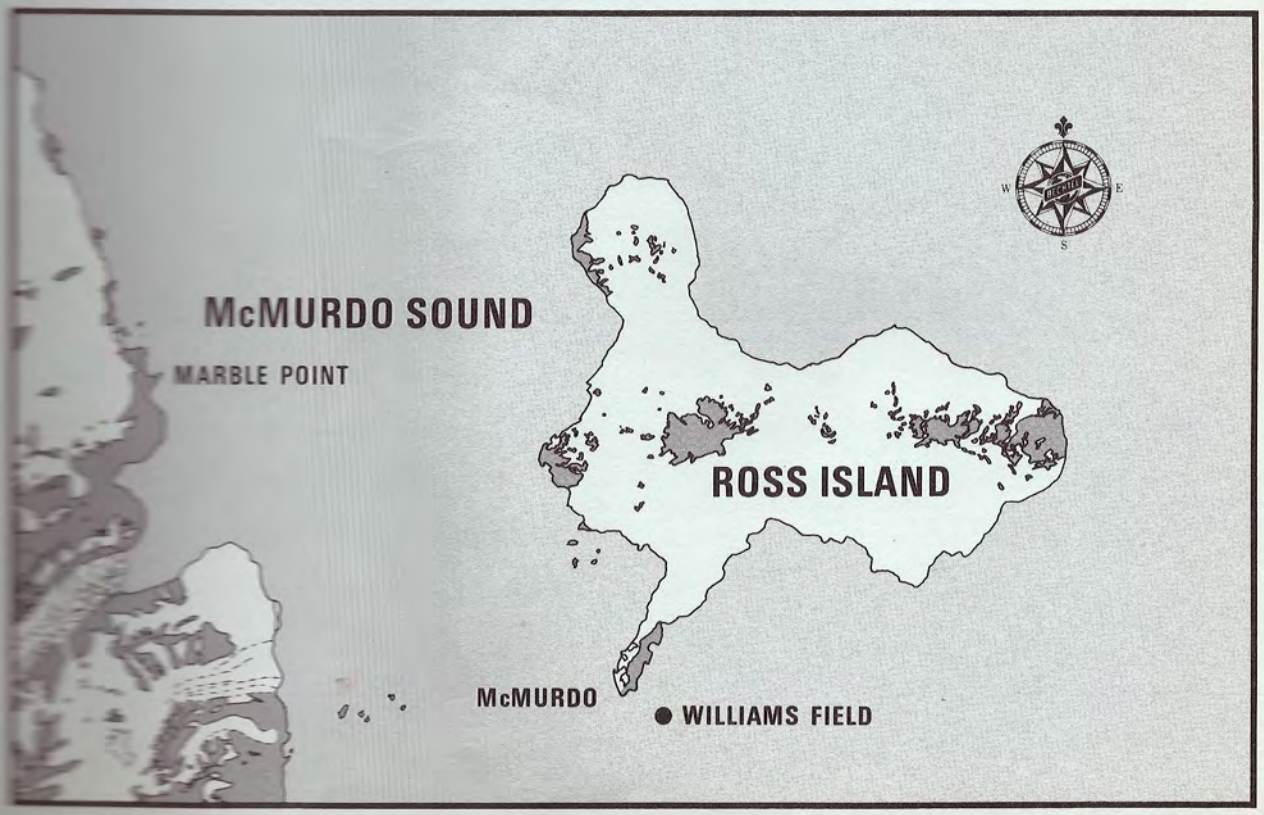
LOCATION MAP

SCIENTIFIC STATIONS OF THE UNITED STATES IN ANTARCTICA



MARBLE POINT STATION/McMURDO STATION/WILLIAMS FIELD COMPLEX



February 1972

Specific Marble Point functions are:

1. Entry point into Antarctica for personnel, materials, equipment and supplies for all United States stations except Palmer
2. Distribution point for transfer of personnel and resupply of materials, equipment, and supplies for all United States stations except Palmer
3. Administrative center for activities performed in Antarctica except Palmer
4. Communications center for the United States program in Antarctica
5. Staging center for deployment of scientific parties and investigations
6. Scientific station.

The level of activity in performance of these functions varies seasonally. More specifically, support activities are controlled by:

1. Climate
2. Hours of sunlight
3. Annual sea ice
4. Transportation

During the austral summer of approximately five months, personnel having wintered-over will be rotated, and resupply activities will be conducted in preparation for the following winter. The air support facilities will be staffed and activated for air transport operations.

During the austral winter of approximately seven months, activities performed at Marble Point Station will be confined to operating the station facility, maintaining equipment, and performing scientific investigations. The airport will be closed and personnel required only for the austral summer activities will be redeployed to the United States, leaving a minimum station complement to winter-over.

Air transportation is the means used to convey personnel and to resupply outlying stations. Sea transportation is available in January and February to deliver fuels, bulk cargo, construction materials and equipment. Cargo items required at outlying stations can be stored in the airport warehouse until air transportation is available.

Fuels will be transported in specially designed tanks that will be loaded into C-130 (Hercules) aircraft.

BASIS OF STUDY

This report presents a theoretical revised Marble Point facility study based on U.S. and international science support and commercial logistics support needs projected over the period 1972 to 1991. It is based on the findings of a field team that visited the Marble Point site and studied the operations at the existing McMurdo Station-Williams Field facility during October and November of 1971.

Costs to develop and operate the theoretical station were developed for two cases:

1. Military complements
2. Civilian complements.

A construction program was developed for these cases, and the schedule for construction and delivery of materials provides the basis for the cost estimates.

RMC Report UR-169 was used as the primary source for operating cost data utilizing military station complements. Cost data for construction were developed on the basis of construction by civilians and material purchases from the United States.

APPROACH

The method of approach is set forth in the logistics requirements of USARP and is comparable to that employed for McMurdo Station. Facilities and staffing were developed to accomplish the desired objectives and these form the basis of the estimates of capital costs and operating expenses for both military and civilian type operations. The designed facilities, both modern and efficient, will provide the required services, with requisite comfort for personnel at an acceptable cost.

CONCEPT ALTERNATIVES

Two concept alternatives are presented for Marble Point: military operation and civilian operation of the Station.

Basically, the facility layout for either operation is the same. However, the civilian housing requirement would be less due to the reduced number of personnel assigned. Manpower requirements therefore become a determining factor in deciding station layout and building needs. These requirements are shown for both concepts in Figure 1-2.

Section 2

SUMMARY

The proposed Marble Point Station plan permits a concise site and consolidates the living area, work laboratory, and airfield locations. The [illegible] is designed to meet both functional and aesthetic demands. Construc- [illegible] is provided by civilians. The use of modular buildings is intended, thus providing for ease of maintenance and operation.

The 20-year costs, in millions of dollars, for the two cases studied, including cost of construction, operation and support, are:

20-Year Costs

Military Complement	Civilian Complement
$1,257	$1,099

Section 3

PROPOSED MARBLE POINT STATION - MILITARY

FACILITIES

The proposed general facilities plan for Marble Point Station is shown in Figure 3-1.

Townsite

The townsite (Figure 3-2) was selected on the basis of natural ground slope and proximity to airport facilities. Contour maps indicate that existing ground slopes do not exceed 7 percent. For the greater part, development of the slope will not exceed 5 percent. The townsite can be greatly enlarged but without exceeding the 5 percent slope criteria.

Air Field

The runway for Marble Point Station (see Figure 3-3) is designed to be 10,000 feet long with 1,000-foot overruns at either end. The runway strip will be 500 feet wide with the center 150 feet paved. A taxiway has not been provided because the anticipated level of air traffic does not justify the installation. However, the apron is located 500 feet from the runway, providing space for the future installation of a taxiway without relocating any of the initial installation.

The facilities are designed to enable future expansion, as required, to handle the following aircraft types and sizes:

[illegible]	Lockheed 1011
[illegible]	McDonnell Douglas DC-8
Boeing 707	McDonnell Douglas DC-9
Boeing 747	McDonnell Douglas DC-10
Lockheed C5	Helicopters

[illegible]

Buildings. In general the buildings at the Marble Point townsite will service the same functions as listed under McMurdo Station. The air-[illegible] buildings will service the same function as those at Williams Field. The [illegible] estimates are based on prefabricated metal construction for all buildings. [illegible] metal buildings have been proved in similar conditions on the [illegible] with satisfactory results.

Building requirements to meet military standards for operation of [illegible] Station are shown in Table 3-1.

Foundations and Substructures. With the exception of container-[illegible] storage and equipment shelters, all buildings at Marble Point will be [illegible] above ground. The depth of air space required under the buildings will meet building plant area and dimension plans. This proposed air space [illegible] to render the area under and around the building virtually [illegible].

Buildings will be anchored only if required for stability needs. [illegible] and sub-floor beams supporting the buildings will be of the type [illegible] for the new buildings at McMurdo Station. Timber will be used for the [illegible]. The pedestals and support beams will be either timber or steel.

Drainage of the areas under and around the buildings will be de-[illegible] to prevent ponding of melt water.

Fire rating and resistance in buildings will be designed to conform to recognized codes and standards (for example, the Uniform Building Code).

The fire station will be a two-story building covering a total of [illegible] square feet. Two fire engines will be provided.

Water Production and Distribution System

Fresh water will be obtained by flash evaporation of seawater.

The quantity of fresh water to be produced is based on an estimated per capita design consumption of 50 gallons per man day.

A seawater intake and pump house will be constructed near sea level and a seawater pipe constructed to the water production plant. A branch of the seawater line will be constructed to the laboratory for use in scientific research.

Waste heat, recovered from the power plant, will be used to produce water. A standby boiler will be installed in the water plant for emergencies.

A 100,000-gallon water storage building and tankage will be constructed on Reigle Hill to provide sufficient gravity head to feed the distribution system by gravity.

Water produced will be treated to reduce its corrosivity and improve its taste. Fresh water will also be chlorinated. Standards of the [illegible] or other recognized authorities will be met.

The brine line leaving the water plant will be laid on the same supports as the seawater supply line.

Sanitary and Solid Waste Disposal System

Sewage Disposal. Town and airport area sewage will flow by gravity to the sewage treatment plant, which is located near sea level. The