Korean Journal of Polar Research
Vol.1, No.2, p.25~34, December 1990

A Study for Environmental Impacts Assessment on Natural Environment in the New Construction Area Around the Korean Antarctic Station : (1st Year)

Jae Sam Yang and Deuk San Jeon
Polar Research Center, KORDI

세종과학기지 건설에 따른 환경영향평가(Ⅰ)/1990

양재삼 • 전득산
해양연구소 극지연구센터

Abstract : As a part of construction initiated in 1987-88, the King Sejong Station is expected to build a new power-plant building and two hangars. The sites for new construction were already bulldozed in 1987-88, therefore no additional environmental destruction will be done for lichens and bryophytes colony.

Additionally, yellow-painted guard rails will guarantee the protection of the plants from traffic.

For marine birds and mammals, their major rookery is located 2km away from the construction sites and no explosives or dynamites will be used during the construction. Therefore no serious hazard will be expected to the marine mammals and birds. Every scientists and construction workers will be instructed not to destroy natural environment unnecessarily during the construction.

Therefore the impacts on the environment will be minimized. Additionally, a summer research program for the environmental impacts assessment due to the new construction will be initiated in 1990-91 seasons, and will keep on for more than 10 years. Consequently, if there are any environmental impacts, we are going to report and try to minimize them.

Key word : Antarctic, King Sejong Station, construction, environmental impacts assessment.

요약 : 남극은 인류의 마지막 남은 미개발지로 무한한 잠재력을 가지고 있으며 그 극한적 환경조건과 이에 적응한 생물군은 생물학적 정보가치가 매우 탁월하여 미래지향적 연구과제로 적합할 뿐만 아니라 이들 서식생물의 보호와 남극의 환경보전을 위한 연구가 필수적으로 수행되어야 한다.

우리나라는 1978/79년 크릴어획과 해양조사를 효시로 남극에 관심을 보인 이래 1988년 2월 17일에는 서남극 남쉐틀랜드군도 킹죠지섬에 세종과학기지를 준공했다. 세종기지가 하계조사의 전초적 기지로서의 기능을 원활하게 수행하고 월동기간중 연구지역을 넓히기 위해 투입된 설상차, 수륙양용차 등을 격납하기 위한 장비동 건축과 각종 연구 기자재의 가동에 필요한 전력사용량의 증가에 따른 발전기의 추가설치에 의해 1990년 12월부터 1991년 2월까지 기지증축 공사가 시행된다. 이에 따라 기지건설과 인간활동에 따른 환경영향을 예측하고 그 악영향의 저감방안을 수립함과 아울러 기지준공이래 수집되어 온 해양 및 육상 환경자료와 인간활동에 따른 환경변화에 민감하리라 예견되는 서식생물에 대한 조사결과를 보고하는 바이다.

남극 주변지역은 저온과 건조한 기후로 인해 물질의 순환속도가 대단히 느려 기지건설 또는 인간활동에 기인한 환경변화를 평가하기 위한 자료의 수집에는 최소한 10년 이상의 기간이 소요될 것으로 예상되며 1990/91년 기지증축에 따른 환경영향은 증축지역이 1988년 기지건설시 증축을 예상하여 이미 굴토한 지역이므로 지의류 등의 육상식물군집에 대한 추가적 환경영향은 없을 것으로 사료된다. 세계적으로 지대한 관심아래 보호되고 있는 물개와 펭귄은 그 군서지가 기지로부터 2km이상 떨어져 있으므로 기지건설에 따라 영향받을 가능성은 희박하다. 기지 주변에 서식하는 갈매기류의 보호를 위하여 공사중 다이너마이트와 같은 폭발물의 사용은 전혀 없을 것이며 공사에 동원되는 차량으로부터 육상식물들을 보호하기 위하여 공사로는 황색을 도색된 가드레일로 구분된다. 그리고 기지건설과 인간활동에 따른 환경영향의 저감을 위해 공사에 동원되는 작업인력에게는 자연환경의 보전을 위한 교육이 실시된 바 있다.

1990/91 기지건설을 포함한 남극 세종과학기지의 운영으로 인한 환경영향을 향후 10년간 하계조사 기간중 지속적으로 조사할 계획이다. 이러한 조사의 대상으로는 육상생물, 해양생물이 망라되어 광범위하고 치밀한 조사가 될 것이다.

주요어 : 남극, 세종기지, 기지증축, 환경영향 평가

1. Construction Plan

For active engagement in Antarctic research, Korea has established a permanent research station, King Sejong, in the western end of King George Island, one of the South Shetland Islands in 1988(Fig. 1).

After the completion of the King Sejong Station, active Antarctic research was initiated. To study the natural environment around the station, several vehicles including snow mobiles and an amphicar were introduced to the station, which requires more space for maintenance of these vehicles Besides, two new generators became necessary to meet the increasing damand of electricity. The construction period of 3 buildings is scheduled from December 1, 1990 to February 15, 1991. The three new buildings will be allocated one for generators and two for hangars. The sites of construction are shown in Fig.2.

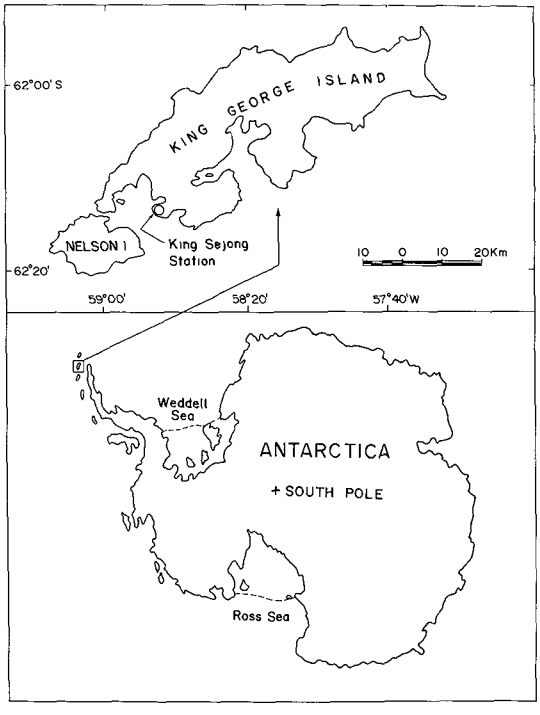

Fig. 1. Map of the Korean Antarctic Research Station, King Sejong.

The construction sites for hangars are located 800m east of the main buildings, and the building for the generators will be connected with the pre-existed Building for Generators and Storage. The total areas of construction is 568 square metres and they were already bulldozed during the construction period of 1987-88.

Approximately 30 workers will stay during the period and the pre-existing facilities provided for the stay of the workers during the period. Consequently no additional construction of facilities will be necessary for the workers.

Most construction materials is planned to be carried by two helicopters from an Argentine Navy Vessel, Almirante Irizar. The construction materials will be placed on the bulldozed area near the construction sites.

2. Facilities

The King Sejong Station is outfitted with the most modern research facilities, to accomodate the goals of Korean Antarctic Programs which otherwise be restricted to land and marine environments in and around the Bransfield Strait. The station consists of eight primary structures (six buildings and two observatories);a main building, a residential building, two laboratory buildings, a generator and food storage building and a supply building and geomagnetic and seismological observatories. Besides those main structures, there are six auxiliary structures(ac-

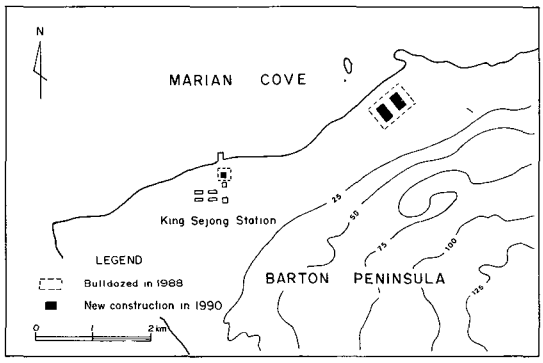

Fig. 2. Map of new construction areas.

tually containers)which are reserved for emergency shelters and storages.

Supporting facilities include fuel and water pumping stations, six fuel tanks, a 11 metre long pier. A coastal well, attached to a desalination unit, was also constructed to supply water during winter. To protect the neighboring environment the station is equipped with an incinerator and an automated sewage treatment plant whose processing capacity is 12 tons per day.

All the year round 13~15 people stay at the station. This over-wintering team is replaced with a new team after a full year stay. They consist of four scientists including a station leader and ten supporting people.

Besides year-long observational works, summer research programs are carried out every summer. The program covers geological and biological researches in the King George Island, and geological/geophysical, chemical, biological and physical oceanography in the Bransfield Strait.

3. Natural Environments

A. Terrestrial Environment

(1) Geology around the Korean Antarctic Station

Korean Antarctic Research Station, King Sejong is located near the southern shore of Marian Cove which is one of the tributary basins of Maxwell Bay(Fig. 1).

Maxwell Bay is surrounded by King George and Nelson Islands which belong to South Shetland Islands, Antarctica. It comprises a central basin and serveral tributary basins, Marian Cove, Potter Cove, Ardley Cove, Collins Bay and Edgel Bay. Cross section of the central area in Maxwell Bay is in the shape of letter "U", typical for fjords. The fjord is approximately 14km long and 6km to 14km wide, seperated from the Bransfield Strait by a 430m deep sill. Between Marian Cove and Potter Cove, Barton Peninsula spreads out to the Maxwell Bay in south-western direction, covering an area 5km by 5.5km.

Barton Peninsula is free of snow during austral summer and the exposed area is estimated to 15 square kilometers. At the coast, raised beach and morrains are developed five or seven meters above sea-level. The shoreline was elevated with two raised beaches, the vertical height difference of the first and the second raised beach is 15 to 20m. The raised beaches of Fildes Peninsula whose height is less than 20meters are known to be formed in Holocene. So all the raised beaches around King Sejong Station in Barton Peninsula are considered to be formed in Holocene(KORDI, 1988).

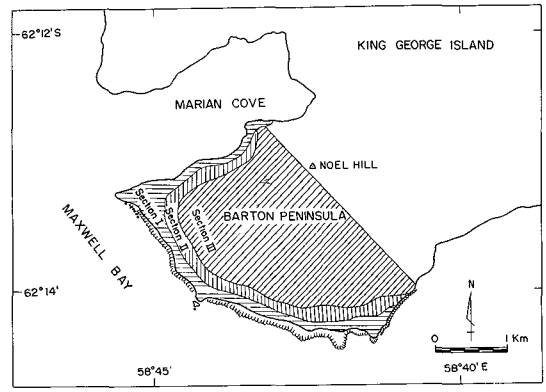

Fig. 3. Distribution of lichens and bryophytes of Barton Peninsula.

Table 1 Regional distribution of lichens and bryophytes in Barton Peninsula (KORDI, 1988)

Regions		Dominants
Section I	Lichens *Calolplaca* spp. *Rinodina* spp. *Candelariella* spp. Bryophytes *Bryum* spp. *Pottia* spp. Graminae *Deschampsia antarctica*	crustose lichens
Section II	poor development of Lichens and Bryophytes fructicose lichens *Usnea* spp. Bryophytes *Bryum* spp. *Pottia* spp.	crustose lichens
Section III	thallus foliose Lichen *Umbilicaria* spp.	fructicose lichen moss cushion subformation

The highest peak of Barton Peninsula is Noel Hill(255m). On the hillside, scree slopes are developed very steeply.

B. Biological Environments

(1) Lichens and Bryophytes

One of two flowering plants grow south of 60°S—the Antarctic hair grass—*Deschampsia antarctica* occurs in small clumps near the shore of Potter Cove.

Here, in the wetter flatten areas, are found mosses and on the drier, more exposed sites—lichens(KORDI, 1989). Details of important botanical groups and their regional distributions are shown in Fig. 3 and Table 1.

(2) Marine Mammals

The marine mammal distribution around the King Sejong Station is in Fig. 4 and Table 2. The mammals were Weddell seals, southern elephant seals and Antarctic fur seals. They were found 113 cases from 13 locations during austral summer in 1988—1989(KORDI, 1989). Southern elephant seals were found to form harlems with 20~30 females with only one male. In contrast, Weddell seals and Antarctic fur seals appeared with same number of males and

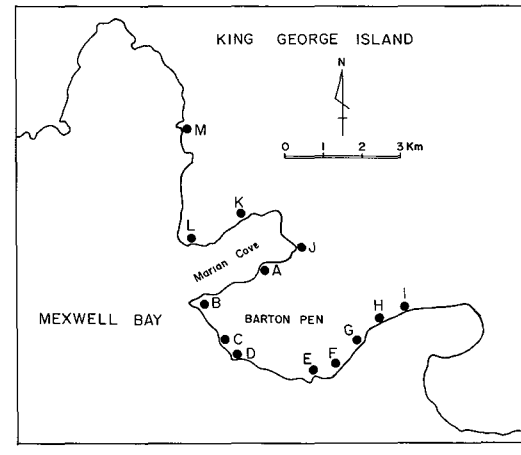

Fig. 4. Distribution of Antarctic seals around Barton Peninsula.

Table 2 Regional distribution of seals in Barton Peninsula (1988/89 summer) (KORDI, 1989)

Regions	Species	Sex	Heads Observed
A−B	Weddell Seal	Male	8
		Female	2
B−C	Weddell Seal	Female	2
	Southern Elephant Seal	Male	1
C−D	Southern Elephant Seal	Female	2
	Leopard Seal	Female	1
D−E	Weddell Seal	Female	1
	Southern Elephant Seal	Male	1
		Female	25
	Antarctic Fur Seal	Male	1
E−F	Southern Elephant Seal	Male	3
		Female	38
F−G	Southern Elephant Seal	Male	1
		Female	16
	Antarctic Fur Seal	Male	2
G−F	Antarctic Fur Seal	Male	2
J−K	——	——	——
K−L	Weddell Seal	Male	1
		Female	2
L−M	Weddell Seal	Male	4
		Female	6

females and sometimes greater number of males.

(3) Sea Birds

A mixed rookery of two species of penguin (gentoo and chinstrap penguins) was located at 2km south from the Station. Around rookery, several species of sea birds breed during austral summer.

Details of sea birds groups and density observed in January 1989 are shown in Table 3.

C. Climate Characteristics

The analysis of meteorological data collected from February 1988 to December 1989 at King Sejong Station is shown in Table 4. The mean station level pressure was recorded as 989.9mb during the period of observation. The mean air temperature was −1.5°C and the mean wind speed was 8.0m/s. Predominant wind direction was northerly and the mean relative humidity was 88%. The mean value of the cloud amount was 6.7 octas. During the period of observation, days of precipitation and fogginess were 357 and 229, respectively. This type of weather pattern is due to the latitudinal and geographical position of the Station which is under the effect of the ocean and belonging to the high latitudinal area where strong cyclones frequently generate.

Table 3 Marine birds found around King Sejong Station

groups	numbers	regions
Chinstrap Penguins	1100	penguin rookery located
Gentoo Penguin	560	at the western end of
Adelie Penguin	90	Barton Peninsula
Giant Petrel	80	around penguin rookery
Wilson Storm Petrel	20	hillside of Barton Penninsula
Sheathbill	20-30	
Antarctic Cormorant	40	around penguin rookery
Antarctic Skua	60-70	around King Sejong Station
Antarctic Tern	250	around Barton Peninsula

In 1990, a lowest temperature of −20.3°C were measured at the first of September and the greatest gust of 46.6m/s was observed in mid July.

D. Oceanographical Environment

(1) General Oceanographic Conditions

Maxwell Bay is an Antarctic fjord characterized by relatively small amount of freshwater input and a submarine sill. Hydrographic measurements in the Bay were conducted twice at an interval of a week in austral summer of 1989~90. Over this period water properties of Maxwell Bay range from −0.1°C to 1.5°C in temperature, 33.5‰ to 34.6‰ in salinity(Fig. 5). A pattern of estuarine circulation was shown in summer, which might be triggered by breakup of sea-ice and freshwater input to the bay. The freshwater input is dominated mainly by meltwater from the submerged glaciers at the northeastern part of the bay. The halocline at the head of the bay occurred within the upper 5m with steep gradient, while the halocline grew deep in seaward direction.

As summer progresses, the vertical structure of water column changed as follows : The surface mixing layer became thinner with stronger salinity gradient, but the layer became thicker gradually with higher salinity.

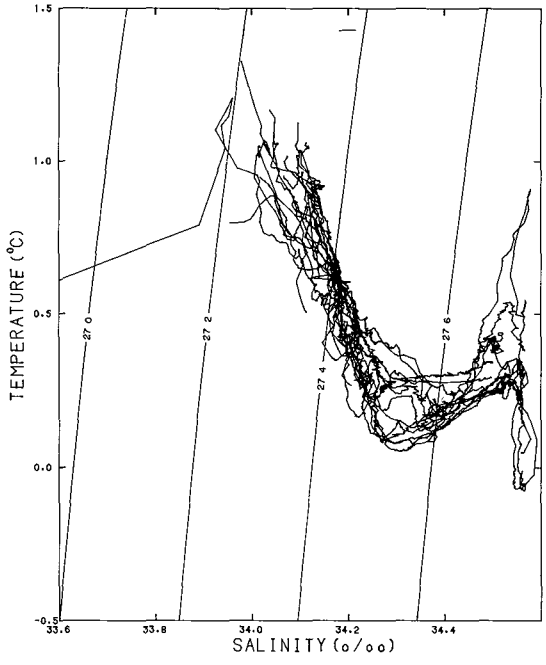

Fig. 5. Temperature and salinity on February 4-6, 1989 in the Maxwell Bay and the Bransfield Strait.

Table 4 Monthly summaries of surface observation from February 1988 to December 1989 at King Sejong Station(Lee et al, 1990)

	ELEMENT	'88FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	ANNUAL
AIR PRESSURE (mb)	MEAN STATION	990.0	986.3	991.4	997.0	994.3	990.3	999.2	911.6	999.9	982.1	982.7	991.3
	HIGHEST	1005.2	1012	1011	1018	1015	1014	1025	1016	1025	995	998	1025
	DATE	2	31	1	24	6,7	25	9	20	25	9	6	8/9,10/25
	LOWEST	973.1	968.4	957	977	966	952	976	958	974	966	963	952
	DATE	24	16	8	19	4	23	31	25	6,7	7	13,14	7/23
AIR TEMP. (°C)	MEAN	2.3	−0.1	−1.1	−1.9	−7.3	−4.8	−8.4	−3.2	−2.6	−1.1	0.5	−2.5
	MEAN MAXIMUM	4.0	1.1	0.6	−0.2	−4.2	−1.4	−5.4	0.0	0.3	1.7	3.5	0.0
	MEAN MINIMUM	1.0	−1.1	−2.8	−3.7	−9.9	−8.7	−11.2	−6.4	−4.7	−3.4	−1.4	−4.8
	HIGHEST	5.8	5.8	4.4	5.1	3.1	2.4	1.7	4.4	8.4	7.9	10.4	10.4
	DATE	21	15	17	18	15	29	10	13	19	8	12	12/12
	LOWEST	−0.9	−6.8	−7.8	−8.5	−19.0	−17.5	−19.9	−12.5	−10.4	−6.4	−5.2	−19.9
	DATE	29	26	23	9	5	7	28	20	15	13	2	8/28
WIND (m/s)	MEAN	5.7	9.2	7.3	7.0	10.3	7.4	6.9	8.0	7.9	6.6	7.0	7.6
	PREDOM. DIR.	W/NW	N	N	NNW	E	N	ESE	N	E	E	N	N
	GREATEST GUST	12.8	31.9	28.7	29.5	36.3	37.1	29.0	30.6	30.7	28.6	43.3	43.3
	DIRECTION	NNE	ESE	NNE	S	NNE	NNE	SE	ENE	NNE	SE	NNE	NNE
	DATA	20	19	18	17	24	29	23	28	5	7	30	12/30
R.H. (%)	MEAN	88	83	85	85	88	89	86	88	86	84	84	86
	LOWEST	45	67	56	33	49	58	50	50	36	39	48	33
	DATE	29	29	13	26	7	25	19	15	19	24	30	5/26
CLOUD (N*,1/8)	MEAN	6.8	7.6	6.9	6.7	7.2	6.8	6.4	6.5	6.8	7.1	7.2	6.9
NUMBER OF DAYS	CLEAR(N*≤2)	0	0	0	4	2	0	3	1	2	0	0	12
	P.CLD(2<N*<8)	23	5	11	8	9	14	19	24	19	19	27	178
	O.CAST(N*=8)	6	25	18	19	12	16	7	5	10	11	4	133
	OBSCURED	0	1	1	0	7	1	2	0	0	0	0	12
DEWPOINT TEMP.(°C)	MEAN	−	−3.2	−4.2	−5.3	−10.4	−7.5	−12.4	−6.4	−6.4	−5.1	−3.3	−5.8
TOTAL	PRECIPITATION (mm)	63.6	0.4	3.7	0.4	0.9	0.3	−	−	29.0	10.9	41.1	150.3
SNOW FALL (cm)	MAX. DEPTH	−	35.0	5.0	5.5	70.0	25.4	5.5	9.6	3.2	6.2	13.0	70.0
	DATE	−	19	5	29	26	23	27	12	10	7	11	6/26
	TOTAL	−	69.0	15.6	12.6	232.7	52.7	8.8	20.0	4.4	16.0	24.8	456.6
NUMBER OF	RAINY DAYS	16	15	16	8	13	12	6	9	6	9	14	124
	FOGGY DAYS	11	7	14	9	5	7	3	5	3	10	3	77

* : TOTAL OF CLOUD AMOUNT

− : MISSING DATA OR NO OCCURRENCE

CONTINUED

	ELEMENT	'89JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	ANNUAL	TWO YEARS('88~'89)
AIR PRESS-URE (mb)	MEAN STATION	991.1	986.4	987.5	991.2	985.4	983.1	994.8	997.7	990.2	982.7	983.3	990.5	988.7	989.9
	HIGHEST	1003	1005	1010	1003	1014	1024	1015	1017	1017	1010	1006	1004	1024	1025
	DATE	26,27	6,7	24,25	14	14	12	26	8	26	23	5	7	6/12	8/9,10/25('88)
	LOWEST	970	966	959	976	954	952	965	977	963	957	946	962	946	946
	DATE	13	26	14	22,28	27	26	2	5,6	12	15	2	20	11/2	11/2('89)
AIR TEMP. (°C)	MEAN	1.5	2.4	2.3	−4.8	−0.9	−2.0	−0.7	−2.1	−3.0	−0.6	0.2	1.4	−0.5	−1.5
	MEAN MAXIMUM	3.7	4.4	4.3	−1.5	1.0	0.4	−0.7	−0.3	−1.2	1.1	2.7	3.2	1.5	0.8
	MEAN MINIMUM	−0.4	0.6	0.6	−7.5	−2.8	−4.1	−2.1	−4.0	−4.9	−2.2	−1.8	−0.1	−2.4	−3.5
	HIGHEST	8.1	7.5	8.9	5.4	4.9	4.4	3.6	4.2	6.1	2.8	5.6	6.6	8.9	10.4
	DATE	15	25	18	21	16	15	27	14	17	10	28	31	3/18	12/12('88)
	LOWEST	−3.3	−2.1	−3.6	−13.8	−15.4	−8.4	−5.5	−9.3	−11.2	−6.3	−7.4	−2.7	−15.4	−19.9
	DATE	29	2	21,22	29	11	30	4	19	6,7	21	4	11	5/11	8/28('88)
WIND (m/s)	MEAN	6.3	7.1	9.1	8.5	8.8	8.9	9.6	8.2	10.0	10.9	6.4	6.2	8.3	8.0
	PREDOM. DIR.	N	N/NNW	N	E	NNW	NNW	NNW	E	N/NNW	NW	NW	NNW	NNW	N
	GREATEST GUST	38.0	33.7	38.9	29.4	32.5	33.3	33.4	33.9	27.9	36.0	25.6	28.9	38.9	43.3
	DIRECTION	NNE	NNE	N	E	N	E	N	E	NNE	SSE	NNE	SE	N	NNE
	DATE	1	25	26	20	28	29	15	31	20	27	29	11	3/26	12/30('88)
R.H. (%)	MEAN	85	89	91	86	91	89	92	91	92	90	92	90	90	88
	LOWEST	53	62	69	57	40	50	68	64	57	61	61	64	40	33
	DATE	24	6	20	8	4	12	20	14	23	17	25	15	5/4	5/26('88)
CLOUD (N*,1/8)	MEAN	6.4	6.5	6.4	6.8	6.4	6.2	6.2	6.5	6.6	6.4	6.9	6.8	6.5	6.7
NUM-BER OF DAYS	CLEAR(N*≤2)	2	2	0	0	0	2	2	2	3	2	1	0	16	28
	P.CLD(2<N*<8)	28	18	26	23	21	19	21	21	15	21	21	24	258	436
	O.CAST(N*=8)	1	8	5	7	10	9	8	7	10	8	8	7	88	221
	OBSCURED	0	0	0	0	0	0	0	1	2	0	0	0	3	15
DEWPOINT TEMP.(°C)	MEAN	−2.4	−0.9	−1.1	−8.5	−4.6	−6.2	−4.6	−6.7	−7.6	−5.7	−4.4	−3.6	4.7	−5.2
TOTAL	PRECIPITATION (mm)	16.1	68.8	49.2	18.9	15.2	9.1	16.5	11.0	12.0	17.2	25.3	13.93	273.2	423.5
SNOW FALL (cm)	MAX. DEPTH	0.0	4.4	18.0	70.0	2.0	48.0	8.0	65.0	14.0	30.0	10.0	50.0	70.0	70.0
	DATE	−	1	9	19	27	30	3	31	6	26	3	11	4/19	6/26('88), 4/19('88)
	TOTAL	0.0	4.4	38.0	218.0	11.5	94.0	15.5	90.0	197.5	44.0	26.5	61.0	800.4	257.0
NUMBER OF	RAINY DAYS	9	18	20	19	24	21	24	20	22	20	15	21	233	357
	FOGGY DAYS	5	15	22	10	20	9	16	14	5	16	11	9	152	229

* : TOTAL OF CLOUD AMOUNT

− : MISSING DATA OR NO OCCURRENCE

Vertical and horizontal distributions of water density were almost identical to those of salinity, but not to those of temperature, which implies that the water density was controlled mainly by salinity. At the head of the bay, the surface water showed lower temperature than those of 5m−10m depth, which probably due to the thawing of sea ice. The inflow water was characterized by subsurface temperature minumum or maximum layers which were found in the western and northern boundary of the Bransfield Strait. It is believed that watermass of the Bellingshausen Sea spreads to the Bransfield Strait during summer. Therefore subsurface water found in Maxwell Bay during this period is probably originated from the Bellingshausen Sea(KORDI, 1988;1989;1990).

Vertical temperature distribution clearly indicated that the inflow tended to hug the left side (facing downstream) of the fjord due to the earth's rotational effect.

(2) Marine Geology

Maxwell Bay shows a typical U-shaped fjord topography formed by glacial erosion. The area can be divided into four zones(Fig. 6) according to geologic patterns recognized in 3.5kHz seismic profiles as follows, (1) very rugged and acoustically opaque in the shelf, suggesting exposure of crystalline basement with probable thin or intermittent sediment cover, (2) unsorted glacial deposits represented by discontinuous and chaotic facies or reflection-free facies in the small basins, (3) slide/mass flow deposits characterized by hyperbolic echo with indiscernible layers in the sediment along the steep slope and (4) turbidites deposits characterized by conformable well-stratified reflecters in the central basin(KORDI, 1988).

E. Glaciers and Sea-Ice

In King George Island, 95% of land surface is covered by glaciers and snow all the year round. The thickness of the glaciers is estimated 100 meters. They move slowly and creep over their own bed. The flow rate of glaciers in King George Island is estimated less than 100 meters a year. The local difference of the flow rate in the glaciers creates stresses in the glaciers resulting in vast cracks or crevasses. At the steep slopes of inner sides of Marian Cove, Collins Cove and Potter Cove, ice split and fall into the sea sporadically.

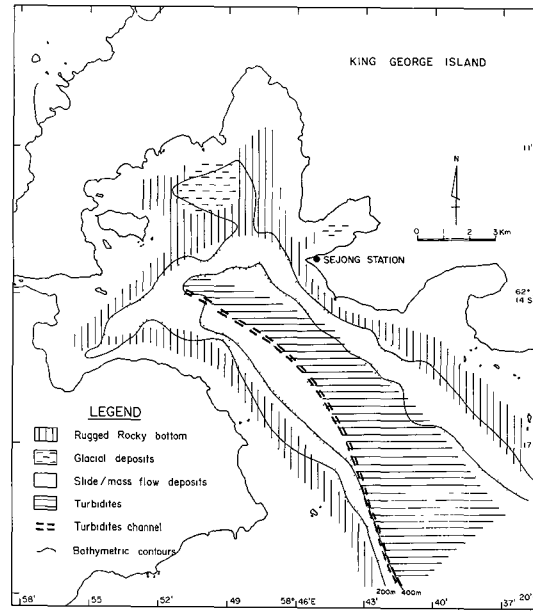

Fig. 6. Areal distribution map of typical geologic feature by acoustic characteristics.

Besides of these broken pieces of glaciers, ice bergs and pack ice which drifted from the Antarctic Peninsula drift into Maxwell Bay. When the westly wind prevails, Marian Cove is covered entirely by these drifting ice.

The amount of these floating ice increases in winter. In general, sea surface is frogen frequently in the coldest season, August or September. Midwinter of 1988 and 1990, Marian Cove was frozen entirely. The thickness of sea-ice reaches 25~30cm in August 1988 and 15~20cm in September 1990.

4. Environmental Impacts and Their Controls

The sites of construction during 1990-91 are mostly covered with pebbles. Most of the area were bulldozed during the first construction period of 1987−1988. Consequently, no additional hazard due to the new construction will be done for the lichens and bryophytes. There already exists a bulldozed road for the traffic of the new construction, and the roads will be guard-railed with yellow-painted stones. The guard rails can guarantee the protection of lichens and bryophytes from traffic.

Most seals were generally found in southern and western coasts of Barton Peninsula from the previous study in 1988−89. Therefore, the new construction in the northern coast of the peninsula minimize the impacts to the seals habitat.

Most penguins and other marine birds were found in the penguin rookery about 2km south from the new construction area. Only a few Antarctic skuas were found around the stations. There will be no explosives or dynamites will be used. Consequently, no serious damages will be given to the habitat of marine birds.

5. Conclusions

As a part of construction initiated in 1987−88, the King Sejong Station is expected to build a new power-plant building and two hangars. The sites for new construction were already bulldozed in 1987−88, therefore no additional environmental destruction will be done for lichens and bryophytes colony.

Additionally, yellow-painted guard rails will guarantee the protection of the plants from traffic.

For marine birds and mammals, their major rookery is located 2km away from the construction sites and no explosives or dynamites will be used during the construction. Therefore no serious hazard will be expected to the marine mammals and birds. Every scientists and construction workers will be instructed not to destroy natural environment unnecessarily during the construction.

Therefore the impacts on the environment will be minimized. Additionally, a summer research program for the environmental impacts assessment due to the new construction will be initiated in 1990−91 seasons, and will keep on for more than 10 years. Consequently, if there are any environmental impacts, we are going to report and try to minimize them.

6. References

Korea Ocean Research and Development Institute, 1988. A study on natural environment in the area around the Korean Antarctic Station, Barton Peninsula, King George Island (Preliminary Study). KORDI Technical Report BSPG00069−190−7, 382p.(in Korean with English abstract).

Korea Ocean Research and Development Institute, 1989. A study on natural environment in the area around the Korean Antarctic Station, King George Island(Ⅱ). KORDI Technical Report BSPG00081−246−7. 485p.(in Korean with English abstract).

Korea Ocean Research and Development Institute, 1990. A study on natural environment in the area around the Korean Antarctic Station, King George Island(Ⅲ), KORDI Technical Report BSPG00111−317−7, 513p.(in Korean with English abstract).

Lee, Bang Yong, Dong Ho Kim and Yeadong Kim, 1990. A study on the climate characteristics over King Sejong Station, Antarctica(1988−1989), Korean Journal of Polar Research, 1 : 47−57.(in Korean with English abstract).