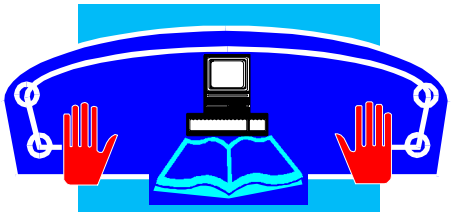




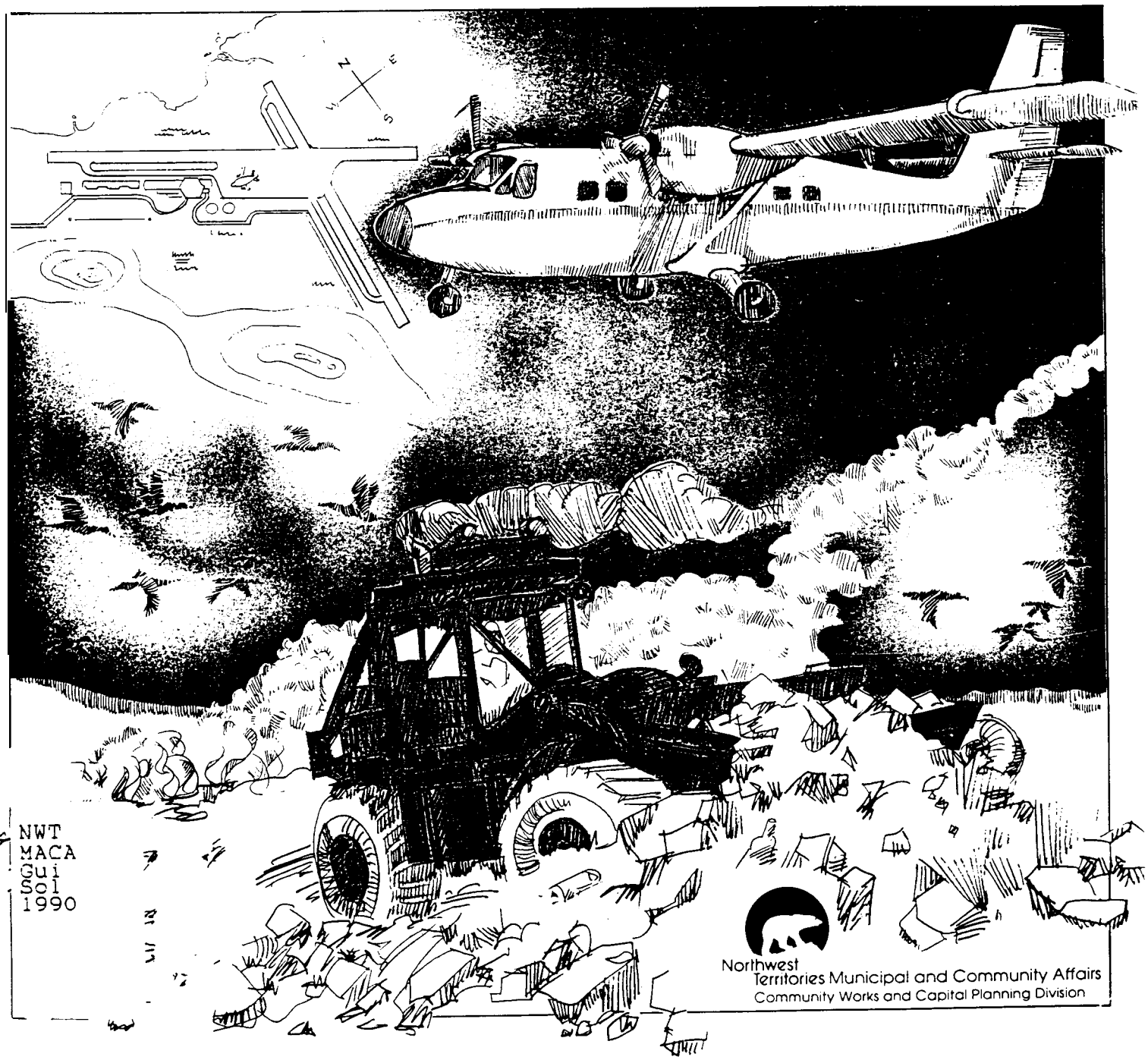
# *Guidelines For The Siting Of Solid Waste Disposal Sites In The Vicinity Of Community Airports In The Northwest Territories Catalogue Number: 9-5-390*


Financial assistance provided by Indian and Inuit Services.

# s for the Siting of Solid Waste D'sposal Sites n the Vicinity of Community Airports

*in the North west Territories*

by R.M. Soberman, M. Lovicsek and G.W. Heinke





Northwest Territories Municipal and Community Affairs
Community Works and Capital Planning Division

# Guidelines for the Separation of Solid Waste Disposal Sites and Airports in the Northwest Territories

## Final Report

prepared for

Community Works and Capital Planning
Department of Municipal and Community Affairs
Government of the Northwest Territories

by

R.M. Soberman, M. Lovicsek and G.W. Heinke

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**March 1990**

FORWARD

Over the past thirty years, the reported number of bird-aircraft collisions has increased considerably, in part due to improved reporting systems and in part due to the technological advances of higher speed, jet and turbo propelled aircraft.

Bird hazards are predominantly related to the low altitude activity of takeoffs and landings at airports. Authorities responsible for air safety are concerned with reducing the appeal of airport. sites, and their surroundings, to bird populations, thus, minimizing the potential for bird-aircraft collisions.

Various agencies, including the International Civil Aviation Organization (ICAO), Transport Canada, and the U.S. Federal Aviation Authority (FAA), have proposed zoning regulations and guidelines for the control of land use in the vicinity of airports. Some of these guidelines deal specifically with the location of solid waste disposal sites because of their appeal as a major source of food for birds.

Transport Canada's Manual of Airport Bird Hazard Control (AK-75-1-000) outlines the following standards and guidelines for dealing with the hazards of garbage dumps and airports:

i) No solid waste containing food garbage shall be dumped on airport property;

ii) Garbage dumps containing food garbage shall not be located on land owned by Transport Canada;

iii) Local municipal officials shall be made aware of the bird hazards to aircraft associated with garbage dumps on privately owned lands surrounding the airport; and

iv) Garbage dumps containing food garbage should not be located within 8 kilometres of an airport.

This study was commissioned by the Department of Municipal and Community Affairs, Government of the Northwest Territories, as the first step to address the airport-landfill separation distance as it applies to the Northwest Territories. Concern was held for the economic implications of meeting the guideline in communities with limited road networks and land suitable for solid waste disposal.

As a result of this study, Transport Canada allows a variance in the application of the8 kilometre separation guidelines (See Appendix B). Their correspondence states, "the provision in the regulation prohibiting the location of waste disposal or other land uses which may attract birds within 8 kilometres of an airport will only be included upon the expert advice of a bird hazard specialist." (December, 1988)

## INTERIM GUIDELINE

The Department of Municipal and Community Affairs has elected to use a minimum setback of 3.0 kilometres as an interim working guideline. This value is based on a consideration of the mean separation distance for existing landfills and airports (See Appendix C), and a consideration of the setback distances dictated by the U.S. Department of Transportation, Federal Aviation Administration (FAA).

The FAA guideline allows a 1.5 kilometre setback for piston driven aircraft, and a 3.0 kilometre setback for turbo-jet aircraft (See Appendix D). These same criteria are used in the State of Alaska.

Considering the predominant use of piston driven and turbo-jet aircraft in communities of the N.W.T. (See Table A-4), a value of 3.0 kilometres appears to be a reasonable interim value.

Although this value reflects upon the minimum separation criteria, the FAA guideline stipulates the criteria for the consideration of any sanitary landfill sited within 8 kilometres of an airport. This criteria relates to bird movements from feeding, water, or roosting areas into, or across the runway and/or approach and departure patterns of aircraft.

Critical to the use of these guidelines is the examination of the site specific factors which influence the behaviour of the birds in the area of the landfill site, and the airport.

Factors include: the relative position of the landfill to the airport; location and distance to the community; location and distance to water bodies; and proposed maintenance of the landfill.

PROCEDURE FOR APPROVAL OF SANITARY LANDFILL
**SITING IN THE VICINITY OF AN AIRPORT**

The approval for the siting of a sanitary landfill in the vicinity of an airport must include the submission of an information package for review and approval by the appropriate regional office of Transport Canada.

The Northwest Territories falls under the jurisdiction three different Airport Authority Groups, depending upon the geographic location. The western Arctic falls under the Western Region, the central Arctic falls under the Central Region, and the eastern Arctic falls under the Quebec Region. It is important to submit the information package to the appropriate Regional Director General for consideration.

The information package should provide the following information, and observe the outlined procedure for submission:

1. Develop the conceptual plans (in map form) for the route(s) and location of the proposed solid waste site showing its relationship to the local airport and the community.

2. Describe the proposed solid waste site:
   a) distance and bearing to the airport runway;
   b) distance perpendicular to the runway's flight path;
   c) elevation difference between proposed solid waste site and the runway;
   d) distance and bearing to the centre of the community;
   e) distance and bearing to the nearest body of freshwater;
   f) design horizon for the proposed site; and
   9) proposed schedule of site maintenance such as burning, compacting, covering, etc.

3. Obtain a copy of the local airport wind rose.

4. For each proposed solid waste site, prepare an information package including items 1, 2, and 3 above.

5. Send the information package to the appropriate Regional Director General of Transport Canada requesting their approval or rejection comments for each proposed solid waste site. The submission of this package should be concurrent with submissions to other regulatory bodies in the N.W.T. (Department of Health, N.W.T. Water Board, etc)

6. If the" proposed sites(s) is(are) endorsed by all the relevant authorities then advise Transport Canada, and the Arctic Airport Division of the Department of Transportation, G.N.W.T. of the final decision on the site location.

7. If there is not a common approval ofa site, use the rejection comments to develop new conceptual plans or modify the existing plans, and re-submit the information package.

Further information or ideas on the content of the submission maybe obtained from Appendix A-2 of the report.

## Acknowledgements

We wish to acknowledge the valuable advice received from officials of the Department of Municipal and Community Affairs throughout this study, specifically Mr. Vern Christensen, P. Eng., Assistant Deputy Minister: Mr. Moheb Michael, P. Eng., Director; Mr. Ken Johnson. P. Eng.. Planning Engineer; and Mr. Doug Howard and staff, Director (Arctic Airports ).

We are also grateful for the assistance of local officials of the five Kitikmeot communities ( Coppermine, Gjoa Haven, Holman, Pelly Bay and Spence Bay) who assisted Ms. Lovicek during her site visit.

Finally, we wish to acknowledge the assistance and advice of:

- Paul McDonald, Acting Chief. Environmental Review Services, Airports Group, Transport Canada (Ottawa )
- Alistair Pinoss, Technical Assistant. International Civil Aviation Organization
- Hugh Boyd, Chief, Migratory Bird Division, Canadian Wildlife Service. Environment Canada.

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## LIST OF EXHIBITS

## 1. Background of the Study

A study was initiated in January 1988 by the Department of Municipal and Community Affairs (MaCA), Government of the Northwest Territories, to evaluate the existing guidelines of Transport Canada for the separation of solid waste disposal sites and airports. The Government of the NWT was concerned that a strict application of the existing 8 km separation guideline would have profound cost implications. Dr. R. M. Soberman, P.Eng., and Dr. G. W. Heinke, P.Eng., were engaged, through Transmode Consultants Inc., to evaluate the appropriateness of the Transport Canada guidelines for the situation encountered in the NWT. It was desirable to have an interim report completed by June 1988 for the purpose of proceeding with the possible construction of new solid waste disposal facilities in the Kitikmeot region.

The interim report was" submitted in June 1988. It recommended that the Government of the NWT develop guidelines for the separation between solid waste disposal sites and airports that are relevant to conditions encountered in the various regions of the territories. To facilitate the development of such guidelines, the report also recommended the improvement of the data base on incidents involving bird strikes on aircraft at NWT airports, and the carrying out of special surveys 'to supplement the limited data presently available on bird-population characteristics peculiar to different regions of the NWT. Because it will take several years to obtain this data, the guidelines to be developed would be only interim, subject to revision, when the longer-term data collection has produced results.

The interim report also evaluated five specific communities in the Kitikmeot region (Coppermine, Gjoa Haven, Holman, Pelly 8ay and Spence Bay), in which work on the solid waste disposal situation was to be carried out in 1988.

Subsequent to the submission of the June 1988 interim report, informal discussions took place between Transport Canada and Government of NWT

officials. Transport Canada agreed that the 8 km separation distance may not be appropriate for general application to NWT airports. Specific approvals were given on a few communities where improvements to existing solid waste facilities or newly constructed facilities were undertaken in 1988 and 1989.

Discussions also occurred between MaCA and two departments of the NWT government, Transportation and Renewable Resources, regarding their input for the preparation of interim guidelines. Specific responses by Mr. Gordon Barber, Assistant Deputy Minister, NWT Transportation, and by Mr. P. Kraft, Acting Director, Wildlife Management, NWT Renewable Resources, have been incorporated into this report.

The consultants were recently asked to update the interim report of June 1988 by April 1990. This report is the response. It must be emphasized that little progress has been made in the intervening year and a half towards attempting to propose "Guidelines for the Siting of Solid Waste Disposal Sites in the Vicinity of Community Airports in the Northwest Territories". However, it is hoped that the completion of this study will provide the momentum to carry out the following three actions:

1. Documentation by NWT Transportation of the occurrence of bird aircraft strikes at NWT airports in the past. This effort would provide data on the magnitude of the problem at various airports, and on the lack of real problems at others. This effort would also provide guidance as to which locations to carry out bird population characteristics studies.

2. Implementation of bird population characteristics studies by NWT Renewable Resources, or its consultants, in selected locations as indicated in 1. above.

3. Discussions, initiated by MaCA with Transport Canada, on the process which will lead to the development of guidelines specific to the regions of the Northwest Territories, recognizing that in the absence of essential data, interim guidelines will have to be agreed upon.

## 2. Introduction

Hazards associated with bird strikes on aircraft have increasingly attracted worldwide' attention by those responsible for aviation safety as well as by the general public. Over the past three decades, the reported frequency of bird-aircraft collisions has risen considerably, partly as a result of improved reporting systems and partly as a result of technological change, notably a much-increased preponderance of higher speed, jet and turbo propelled aircraft. At higher speeds, both the probability of a collision and extent of damage increase, and with jet engines, ingestion of birds can lead to loss of power or engine failure and possibly disastrous results. With the anticipated increase in the number of high-speed aircraft, aviation safety related to bird-aircraft collisions is expected to be even further jeopardized in the future.

Bird hazards to aviation safety are predominantly airport-related problems occurring at relatively low altitudes associated with takeoffs and landings. Authorities responsible for aviation safety, therefore, are basically concerned with measures for reducing the attractiveness of airport sites and their surroundings to bird populations, in order to minimize the likelihood of bird-aircraft collisions on airport approaches. As a result, as one countermeasure, various agencies such as the International Civil Aviation Organization ( ICAO), Transport Canada, and the U.S. Federal Aviation Authority (FAA) have proposed zoning regulations and guidelines for the control of land use in the general vicinity of airports. Some of these guidelines deal specifically with the location of solid waste disposal sites, because of the attractiveness of such facilities as a major source of food for birds. Current Transport Canada guidelines, for example, recommend a minimum separation of 8 km between an airport and any solid waste disposal site.

The attractiveness of airport sites for birds depends upon a number of factors including local topography and vegetation surrounding the airport, the location of the airport in relation to migratory paths and bird flyways, and the proximity of bird feeding and nesting sites to the airport itself.

As a result, guidelines applicable for airports in large urban areas, where the environment of the airport itself is relatively attractive to birds in relation to the surrounding built-up areas, may not be appropriate for airports' in remote regions, where there is little difference between the environment of the airport and the surrounding land use and terrain.

This study deals specifically with minimizing bird hazards at airports in the Northwest Territories, with special emphasis on hazards associated with solid waste disposal sites near airports. The objective is to provide information and analysis that will assist in establishing guidelines for the separation distance between solid waste disposal sites and airports in the Northwest Territories which reflect climatic and topographical conditions, bird population characteristics, the nature of aviation activity, and other factors peculiar to the region. A brief investigation by Cameron(1) showed that only four communities meet the minimum recommended guideline of Transport Canada of 8 km between the solid waste disposal site and the airstrip. The mean shortest distance between the solid waste disposal site and the airstrip for all other communities for which data was available is approximately 2 km.

The report begins with a general discussion of the bird-hazard problem in terms of the consequences of bird strikes, bird-strike statistics and the vulnerability of airports to bird hazards. Legislation, guidelines and regulations respecting the location of waste disposal sites relative to airports in Canada are then summarized and compared to those adopted internationally and in the United States. Some of the key factors that generally influence bird activity near airports are treated next. Control measures which can be taken to counteract the natural attraction of birds to airport vicinities are then considered, with a view to establishing appropriate guidelines for new waste disposal sites to be located in the vicinity of an airport in the Northwest Territories. Planning implications for the siting of solid waste disposal sites near airports are then discussed. Finally, conclusions and recommendations are made on the steps necessary to be taken for the development of "Guidelines for the Siting of Solid Waste Disposal Sites in the Vicinity of Community Airports in the Northwest Territories".

The interim June 1988 report included a detailed examination of the existing situation with respect to solid-waste disposal and airport safety in five communities: Coppermine, Gjoa Haven, Holman, Pelly Bay and Spence Bay. This examination has been summarized in Appendix A. No attempt has been made to update information from the conditions existing in the spring of 1988.

## 3. Nature of the Bird Hazard

Bird strikes can damage aircraft to varying degrees, including both external damage (shattered windshields obstructing the flight crew's vision, destroyed landing lights, structural damages to airframes) and internal damage (blockage of air flow to engines, coolers, superchargers, etc.). The most serious collisions involve ingestion of birds into the engine (especially of a jet or turbo-jet), possibly resulting in temporary loss of power, damage to fan blades, total destruction of the engine, or even causing the aircraft to crash.

Forced landings due to bird strikes are fairly common. One example involved the ingestion of between twenty and thirty herring gulls into both engines of a B737 aircraft taking off from Edmonton International Airport in June, 1984. Despite an engine being completely disabled, the plane managed a safe landing. The major damages included broken turbine blades and a destroyed vortex dissipator. Other bird-stricken aircraft have not fared as well as Edmonton's B737. Aside from safety, the costs of repairing and replacing damaged aircraft, the costs of downtime for inspection and repair, and the costs and inconvenience of rescheduling passengers and air cargo as a result of bird strikes cannot be ignored.

Exhibit 1 provides details on selected worldwide bird-strike incidents with civil aircraft which resulted in a serious injury and/or loss of life. The fifteen Canadian airports which reported the greatest number of bird-strike incidents during the four-year period between 1983 and 1986 are listed in Exhibit 2. In 1986, 868 bird-strike incidents at Canadian airports were

# Exhibit 1

## Worldwide Bird Strike Incidents Involving Serious Injury or Loss of Life

| Date | Aircraft | Location | Part(. ) Struck | Bird(s) | Effects |
|---|---|---|---|---|---|
| 04-10-60 | Lockheed Electra | Boston, U.S. | Engines | Starlings (Sturnus Vulgar is) | 62 deaths, 9 serious injur I** |
| 23-11-62 | Vickers Viscount | Maryland, U.S. | Tailpl ane | Whistling Swan (Cygnus Columbianus) | 17 deaths |
| 26-02-73 | Lear 24 | Atlanta, U.S. | Engines | Cowbirds (Molothrus Ater) | deaths, one third party serious injury |
| 12-11-76 | Falcon 20 | Naples, Florida, U.S. | Engines | Ring-billed Gulls (Larus Delawarensis) | serious injuries |
| 07-04-81 | Gates Lear 23 | Lunken, U.S. | Windshield | Loon (Gaviidae) | Fatal injuries |
| 06-06-61 | Cessna 402 | Mara Bridge, Kenya | Windshield | Ruppell's Griffon (Gyps Rueppellii) | Fatal injuries |
| 06-09-81 | Military | Burke Lakefront, U.S. | Unknown | 2-10 Gulls (Larus Species) | Aircraft crashed, pilot was killed |
| 07-11-66 | Bell 206 | New York, U.S. | Windshield | Gull (Larus Species) | Precautionary landing, serious injurie - |

Source: J. Thorpe, Analysis of Bird Strikes Reported by European Airlines 1972 to 167S
International Civil Aviation Organization, Aerodromes, Air Routes and Ground Aids Section

Exhibit 2

## Reported Bird Strikes at Canadian Airports 1983-1X6

| Airport | 1983 | 1984 | 1985 | 1986 | Total | Average |
|---|---|---|---|---|---|---|
| Vancouver International | 114 | 67 | 47 | 65 | 293 | 73.3 |
| Toronto International | 68 | 32 | 52 | 57 | 209 | 52.3 |
| Halifax international | 14 | 19 | 74 | 56 | 163 | 40.8 |
| Dorval International | 42 | 34 | 33 | 53 | 162 | 40.5 |
| Winnipeg International | 24 | 22 | 9 | 41 | 96 | 24.0 |
| Ottawa International | 22 | 23 | 21 | 15 | 81 | 20.3 |
| Calgary International | 22 | 11 | 15 | 17 | 65 | 16.3 |
| St. John's (Nfld.) | 16 | 8 | 18 | 21 | 63 | 15.8 |
| Mirabel International | 15 | 15 | 11 | 21 | 62 | 15.5 |
| Edmonton International | 17 | 16 | 10 | 11 | 54 | 13.5 |
| Thunder Bay | 11 | 7 | 22 | 13 | 53 | 13.3 |
| Quebec | 4 | 16 | 11 | 14 | 45 | 11.3 |
| Yellowknife | 17 | 2 | 14 | 9 | 42 | 10.5 |
| W i ndsor | 7 | 10 | 14 | 9 | 40 | 10.0 |
| Ke I owna | 1 | 15 | 11 | 11 | 38 | 9.5 |

Source: International Civil Aviation Organization, Aerodromes, Alr Routes and Ground Aids Sect Ion

reported to the Airports Authority Group of Transport Canada. In general, about 15% of these resulted in precautionary landings. Vancouver International Airport heads the list with an average of 73.3 bird strikes per year, equivalent to a strike about every five days.

Bird-strike incidents in the Northwest Territories reported during the 1983-1986 time period are presented in Exhibit 3. Counts at most of the nine Northwest Territories airports shown are quite low averaging less than three bird strikes per year except for Yellowknife and Hay River. All Northwest Territories airports cited are Transport Canada airports, and four out of the nine airports are located in the southern, relatively populous Fort Smith Region of the Territories.

The statistics of Exhibits 2 and 3 were compiled by the Canadian Aviation Safety Board (CASB) which superseded the Canadian Air Transportation Administration (CATA) in 1984. Following a bird-strike incident at a Transport Canada airport, reports from pilots, airport staff and airline headquarters are mailed to the Airport Authorities Group of Transport Canada. These reports are then forwarded to CASB where they are stored in computer files (all duplicates being eliminated in the filing process). The specific data listings produced by CASB rely on four different report sources, each offering a unique perspective on a given bird-strike incident:

i. **Aircraft Operator Bird-Strike Report (Pilot Report)**

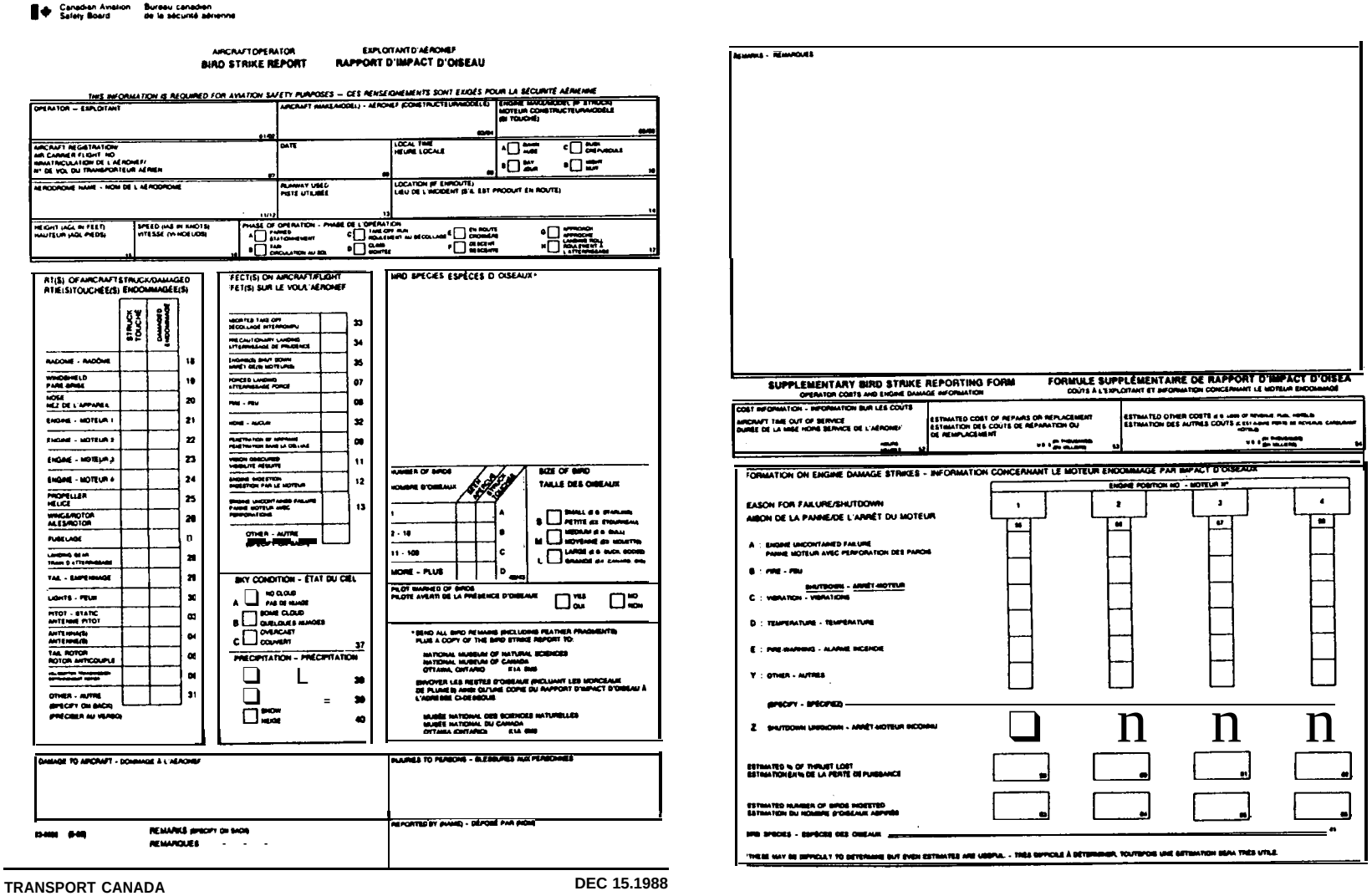
- provides accurate information on flight parameters at the time of collision
- the report form (reproduced here as Exhibit 4) is similar in format and coded to be compatible with a report form-used by the International Civil Aviation Organization (ICAO).

Exhibit 3

Reported Bird Strikes at Northwest Territories Airports
1983-1986

| Airport | 1983 | 1984 | 1985 | 1986 | Total | Average |
|---|---|---|---|---|---|---|
| Yellowknife | 17 | 2 | 14 | 9 | 42 | 10.5 |
| Hay River | 8 | 10 | 10 | 5 | 33 | 8.3 |
| Fort Smith | 1 | 3 | 4 | 1 | 9 | 2.3 |
| Norman Wells | 1 | 1 | 5 | 0 | 7 | 1.8 |
| Fort Simpson | 3 | 0 | 2 | 0 | 5 | 1.3 |
| Inuvik | 1 | 0 | 2 | 0 | 3 | 0.8 |
| Cambridge Bay | 2 | 0 | 0 | 0 | 2 | 0.5 |
| Hall Beach | 0 | 0 | 0 | 1 | 1 | 0.3 |
| Iqaluit | 0 | 0 | 1 | 0 | 1 | 0.3 |

Source: International Civil Aviation Organization, Aerodromes, Air Routes and Ground Aids Section



Canadian Aviation Safety Board / Bureau canadien de la sécurité aérienne

AIRCRAFT OPERATOR BIRD STRIKE REPORT / EXPLOITANT D'AÉRONEF RAPPORT D'IMPACT D'OISEAU

THIS INFORMATION IS REQUIRED FOR AVIATION SAFETY PURPOSES – CES RENSEIGNEMENTS SONT EXIGÉS POUR LA SÉCURITÉ AÉRIENNE

OPERATOR – EXPLOITANT

AIRCRAFT MAKE/MODEL) - AÉRONEF (CONSTRUCTEUR/MODÈLE)

ENGINE MAKE/MODEL (IF STRUCK) MOTEUR CONSTRUCTEUR/MODÈLE (SI TOUCHÉ)

AIRCRAFT REGISTRATION AIR CARRIER FLIGHT NO IMMATRICULATION DE L'AÉRONEF/ N° DE VOL DU TRANSPORTEUR AÉRIEN

DATE

LOCAL TIME HEURE LOCALE

AERODROME NAME - NOM DE L'AÉRODROME

RUNWAY USED PISTE UTILISÉE

LOCATION (IF ENROUTE) LIEU DE L'INCIDENT (SI EN ROUTE)

HEIGHT (AGL IN FEET) HAUTEUR (AGL EN PIEDS)

SPEED (IAS IN KNOTS) VITESSE (VI NOEUDS)

PHASE OF OPERATION - PHASE DE L'OPÉRATION

PART(S) OF AIRCRAFT STRUCK/DAMAGED PARTIE(S) TOUCHÉE(S) ENDOMMAGÉE(S)

STRUCK TOUCHÉ / DAMAGED ENDOMMAGÉ

RADOME - RADÔME 18
WINDSHIELD PARE-BRISE 19
NOSE NEZ DE L'APPAREIL 20
ENGINE - MOTEUR 1 21
ENGINE - MOTEUR 2 22
ENGINE - MOTEUR 3 23
ENGINE - MOTEUR 4 24
PROPELLER HÉLICE 25
WING/ROTOR AILE/ROTOR 26
FUSELAGE 27
LANDING GEAR TRAIN D'ATTERRISSAGE 28
TAIL - EMPENNAGE 29
LIGHTS - FEUX 30
PITOT - STATIC ANTENNE PITOT 03
ANTENNA(E) ANTENNE(S) 04
TAIL ROTOR ROTOR ANTICOUPLE 05
OTHER - AUTRE (SPECIFY ON BACK) (PRÉCISER AU VERSO) 31

EFFECT(S) ON AIRCRAFT/FLIGHT EFFET(S) SUR LE VOL/L'AÉRONEF

ABORTED TAKE OFF DÉCOLLAGE INTERROMPU 33
PRECAUTIONARY LANDING ATTERRISSAGE DE PRÉCAUTION 34
ENGINE(S) SHUT DOWN ARRÊT DE(S) MOTEUR(S) 35
FORCED LANDING ATTERRISSAGE FORCÉ 07
FIRE - FEU 08
NONE - AUCUN 32
PENETRATION OF AIRFRAME PÉNÉTRATION DANS LA CELLULE 09
VISION OBSCURED VISIBILITÉ RÉDUITE 11
ENGINE INGESTION INGESTION PAR LE MOTEUR 12
ENGINE UNCONTAINED MAJOR FAILURE PANNE MOTEUR AVEC PERFORATIONS 13
OTHER - AUTRE (SPECIFY - PRÉCISER) 14

SKY CONDITION - ÉTAT DU CIEL

A NO CLOUD PAS DE NUAGE
B SOME CLOUD QUELQUES NUAGES
C OVERCAST COUVERT 37

PRECIPITATION - PRÉCIPITATION

RAIN L 38
= 39
SNOW NEIGE 40

BIRD SPECIES ESPÈCES D'OISEAUX*

NUMBER OF BIRDS NOMBRE D'OISEAUX

| | STRUCK TOUCHÉ | DAMAGED ENDOMMAGÉ |
|---|---|---|
| 1 | A | |
| 2 - 10 | B | |
| 11 - 100 | C | |
| MORE - PLUS | D | |

SIZE OF BIRD TAILLE DES OISEAUX

S SMALL (E.G. STARLING) PETITE (EX. ÉTOURNEAU)
M MEDIUM (E.G. GULL) MOYENNE (EX. MOUETTE)
L LARGE (E.G. DUCK, GOOSE) GRANDE (EX. CANARD, OIE)

PILOT WARNED OF BIRDS PILOTE AVERTI DE LA PRÉSENCE D'OISEAUX YES OUI / NO NON

* SEND ALL BIRD REMAINS (INCLUDING FEATHER FRAGMENTS) PLUS A COPY OF THE BIRD STRIKE REPORT TO:
NATIONAL MUSEUM OF NATURAL SCIENCES
NATIONAL MUSEUM OF CANADA
OTTAWA, ONTARIO K1A 0M8

* ENVOYER LES RESTES D'OISEAUX (INCLUANT LES MORCEAUX DE PLUMES) AINSI QU'UNE COPIE DU RAPPORT D'IMPACT D'OISEAU À L'ADRESSE CI-DESSOUS
MUSÉE NATIONAL DES SCIENCES NATURELLES
MUSÉE NATIONAL DU CANADA
OTTAWA, ONTARIO K1A 0M8

DAMAGE TO AIRCRAFT - DOMMAGE À L'AÉRONEF

INJURIES TO PERSONS - BLESSURES AUX PERSONNES

REMARKS (SPECIFY ON BACK) REMARQUES

REPORTED BY (NAME) - DÉPOSÉ PAR (NOM)

TRANSPORT CANADA DEC 15.1988

REMARKS - REMARQUES

SUPPLEMENTARY BIRD STRIKE REPORTING FORM FORMULE SUPPLÉMENTAIRE DE RAPPORT D'IMPACT D'OISEA
OPERATOR COSTS AND ENGINE DAMAGE INFORMATION / COÛTS À L'EXPLOITANT ET INFORMATION CONCERNANT LE MOTEUR ENDOMMAGÉ

COST INFORMATION - INFORMATION SUR LES COÛTS

AIRCRAFT TAKE OUT OF SERVICE DURÉE DE LA MISE HORS SERVICE DE L'AÉRONEF

ESTIMATED COST OF REPAIRS OR REPLACEMENT ESTIMATION DES COÛTS DE RÉPARATION OU DE REMPLACEMENT

ESTIMATED OTHER COSTS ESTIMATION DES AUTRES COÛTS

FORMATION ON ENGINE DAMAGE STRIKES - INFORMATION CONCERNANT LE MOTEUR ENDOMMAGÉ PAR IMPACT D'OISEAUX

ENGINE POSITION NO - MOTEUR N°

REASON FOR FAILURE/SHUTDOWN RAISON DE LA PANNE/DE L'ARRÊT DU MOTEUR

A : ENGINE UNCONTAINED FAILURE PANNE MOTEUR AVEC PERFORATION DES PAROIS
B : FIRE - FEU
C : VIBRATION - VIBRATIONS
D : TEMPERATURE - TEMPÉRATURE
E : FIRE WARNING - ALARME INCENDIE
Y : OTHER - AUTRES
(SPECIFY - SPÉCIFIER)
Z : SHUTDOWN UNKNOWN - ARRÊT MOTEUR INCONNU

SHUTDOWN - ARRÊT MOTEUR

ESTIMATED % OF THRUST LOST ESTIMATION EN % DE LA PERTE DE PUISSANCE

ESTIMATED NUMBER OF BIRDS INGESTED ESTIMATION DU NOMBRE D'OISEAUX ABSORBÉS

BIRD SPECIES - ESPÈCES DES OISEAUX

*THESE MAY BE DIFFICULT TO DETERMINE BUT EVEN ESTIMATES ARE USEFUL. - TRÈS DIFFICILE À DÉTERMINER, TOUTEFOIS UNE ESTIMATION SERA TRÈS UTILE.

10

**Exhibit 4**

Bird Strike Report Form

ii. Airport Staff Bird-Strike Report (Site Report)

- completed by airport staff after the pilot or air traffic controller has reported a strike or, in the absence of such a report, if evidence of a strike is found on the airport property
- provides information on the species of bird(s) involved

iii. Airline Headquarters Report

- submitted by the head offices of Canada's major commercial airlines
- provides information on the nature and extent of damages to aircraft, repair costs, and operational effects

iv. Department of National Defence (DND) Report

- completed by pilots of military aircraft according to DND regulations
- similar in format to the Pilot Report used in conjunction with civil aircraft
- reviewed by the DND prior to being forwarded to CASB

The effect of bird-strike incidents at Northwest Territories airports or airstrips, which are operated by the Arctic Airports Division of NWT Transportation, is not documented. However, NWT Transportation indicated. . . "we have had no injuries as a result of strikes, but there have been extremely expensive engine replacements and structural repairs reported. The problem has cost air carriers a great deal over the years (Barber, 1989)".

## 4. Current Guidelines and Regulations

Due to the seriousness of bird hazards at airports, the Government of Canada has instituted legislation dealing primarily with zoning regulations that address this problem. In Section 3.9 of the **Aeronautics Act**[1], the Governor in Council is awarded the power to make regulations respecting:

- activities at aerodromes and the location, inspection, certification, registration, licensing and operation of aerodromes"(e);
- "the use of airspace or **aerodromes"(1);** and
- "the enforcement of such laws as may be deemed necessary for the safe and proper operation of aircraft''(n).

More specifically, the Governor in Council's authority to make zoning regulations is established in Section 4.4(2). These regulations serve the purpose of:

> "preventing lands adjacent to or in the vicinity. of an airport site from being used or developed in a manner that is, in the opinion of the Minister, incompatible with the safe operation of an airport or aircraft."

For example, zoning regulations implemented 'in June, 1987 with respect to Toronto/Buttonville Airport limit the height of new buildings, structures and objects and prohibit the disposal of any waste edible by or attractive to birds on lands adjacent to the airport. Such zoning regulations can be issued by the Governor in Council, however, only where the Minister has been unable to reach agreement with the relevant provincial government concerning compatible land use or development, or where immediate action is necessary to prevent incompatible land use. These zoning regulations are not retroactive.

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[1] Transport Canada, **Air Regulations and Aeronautics Act (October, 1987).**

Other regulations accompanying the Aeronautics Act also deal with federal control over airportts in Canada. According to Part 111 of the Regulations, airports must be licensed (300), licenses are to be issued by the Minister of Transport (301), the Minister may prescribe the conditions upon which airport licenses may be issued (303) and may cancel or suspend an airport license, at any time, for any reason that seems sufficient (304). (A 'license' is required if airports are to be used by scheduled carriers.) Licenses contain conditions relating to several factors including "the use and operation of the airport as the Minister deems necessary", and these licensing conditions are open to amendment, at any time, by the Minister. The aerodrome regulations, then, reinforce Federal control of airport operations. Control is exercised by allowing licenses to be withheld or rescinded in the event of an airport's failure to comply with any operating conditions the Minister might consider necessary, which could well include bird hazard prevention measures.

In its Manual of Bird Hazard Control[2] Transport Canada has formulated a set of standards and guidelines related to its policy to "institute effective programs and procedures to control and minimize bird-strike hazards to aircraft at Transport Canada airports". Issues covered in the manual include modifications to the airport environment, hazards associated with waste disposal sites, sewage lagoons, the disposal of sewage sludge, bird scaring, permits to scare or kill birds, and compliance with standard agricultural lease clauses.

The following four standards from the Transport Canada manual pertain specifically to the disposal of waste on or near airports:

- No solid waste containing food garbage shall be dumped on airport property.
- Garbage dumps containing food garbage shall not be-located on land owned by Transport Canada.

[2] Transport Canada, Manual of Airport Bird Hazard Control, AK-75-10-000, Airports and Construction (1983).

- Local municipal officials shall be made aware of the bird hazards to aircraft associated with garbage dumps on privately owned lands surrounding the airport.

- Garbage dumps containing food garbage should not be located within an 8 km radius of an airport.

The 8 kilometre separation distance specified above is represented diagrammatically in the Transport Canada manual and reproduced here as Exhibit 5. Note that the recommended separation along each runway centreline extends beyond 8 km by an undefined distance (about 2 kilometres, if the diagram is drawn to scale).

Another Transport Canada publication, **Land Use in the Vicinity of Airports**[3], also makes reference to the 8 kilometre separation guideline. The basic rationale for the 8 kilometre separation lies in the relationship between the flying altitude of gulls (the scavenger bird involved in most Canadian bird-aircraft collisions) and the minimum take-off/approach gradient (or glide path) of-aircraft). If the former is taken to be about 150 metres and the latter about 2%, the separation distance needed to avoid collisions is calculated to be roughly 8 kilometres, as shown in Exhibit 6.

In addition to Canadian concerns with bird hazards at airports, the issue has also been the focus of international attention. The International Civil Aviation Organization (ICAO), for example, is concerned with bird hazard problems throughout the world and has developed the ICAO Bird Strike Information System (IBIS) for the collection and analysis of international statistical data on bird strikes.

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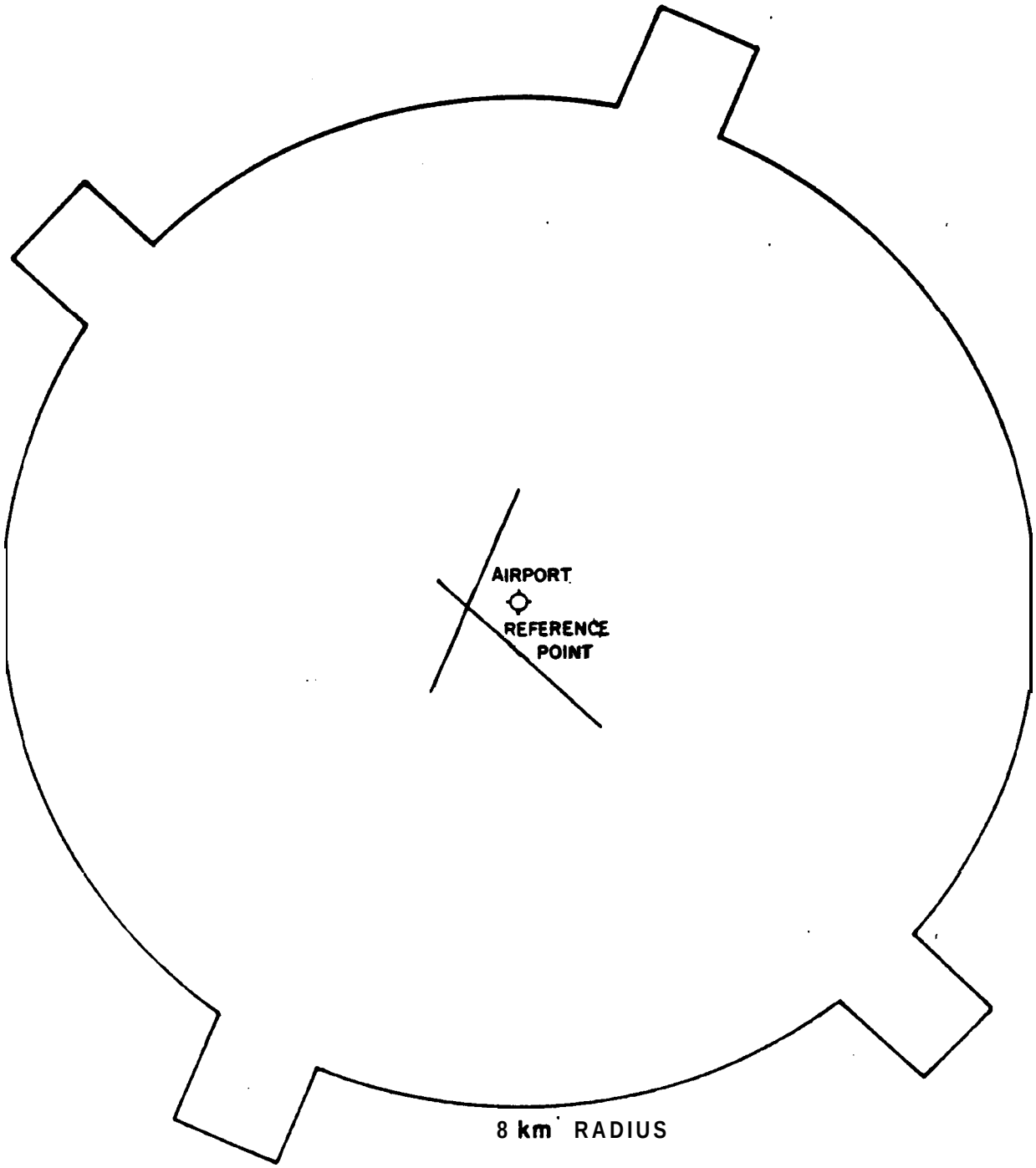
[3] Transport Canada, **Land Use in the Vicinity of Airports, TP1247E,** Air **Navigation Systems Requirements Branch (1985).**

[4] International Civil Aviation Organization, **Airport Services Manual ( 1978).**

**Exhibit 5**

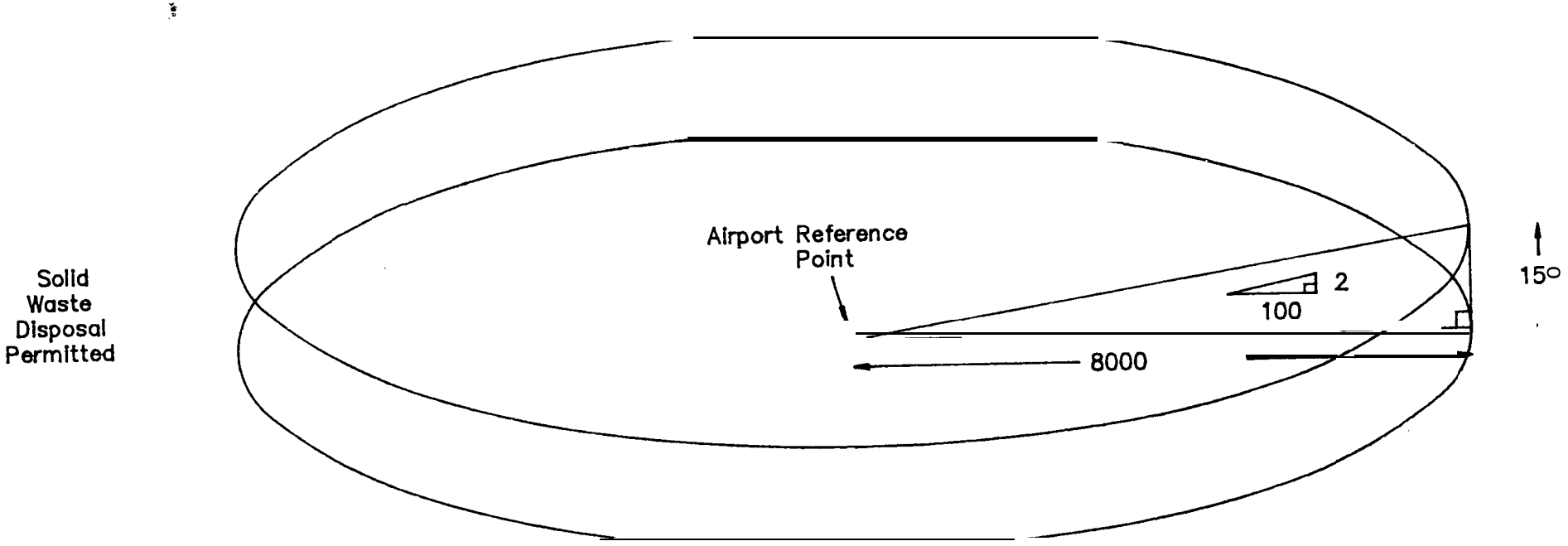
**Restricted Areas for Waste Disposal**




Source: Transport Canada, *Manual of Airport Bird Hazard Control, Ak-75-10-000, Airports* and Construction (1983)

Exhibit 6

Geometric Basis for 8.0 Kilometer Separation Standard




All Dimensions In Metres

One part of the ICAO Airport Services Manual[4] deals exclusively with bird control and reduction. Within the manual, reference is made to a 13 km separation between garbage disposal sites and airports, as recommended at the Sixth European-Mediterranean Regional Air Navigation Meeting (1971) for airports in that region. Although this suggested separation is more stringent than the Transport Canada guidelining, ICAO stresses that the 13 kilometres is only a general figure, and that if measures are taken at the site to alleviate the problem (i.e., trench burial of waste, coordination of dumping times with bird feeding habits), a waste disposal site can safely be located nearer the airport.

In contrast to the ICAO guideline, standards set out by the United States Federal Aviation Administration (FAA)[5] appear to be more lenient. Landfill sites are permitted beyond 10,000 feet (3 kilometres) of any runway used by turbo-jet aircraft and beyond 5,000 feet (1.5 kilometres) of any runway used only by piston-type aircraft. However, any landfills outside these perimeters but within a prescribed conical surface extending 4,000 feet (1.2 kilometres) beyond them, are reviewed on a case-by-case basis. In addition, in contrast to the Transport Canada guidelines, the FAA guidelines stipulate that the landfill cannot be located "such that it places the runways and/or approach and departure patterns of an airport between bird feeding, water or roosting areas". A series of "performance" guidelines also ensures that airports still experiencing bird-hazard problems (as evidenced by regular FAA inspections), even though they comply with the distance and position specifications, take corrective action; if corrective action, either in the form of terminating the landfill operation or reducing the hazard by some other means, is not taken, the airport owner could be placed in non compliance with the commitments under a grant agreement.

## 5. Factors Influencing Bird Hazards

In general terms, setting aside the specific conditions encountered in the Northwest Territories, many factors affect the vulnerability of a given

[5] U.S. Department of Transportation, FAA Guidance Concerning Sanitary Landfills on or Near Airports, Federal Aviation Administration (1974).

airport to bird hazards. Obviously, the greater the number of birds and the greater the level of airport activity, the more likely the occurrence of a bird-aircraft collision. In the Territories, of course, climatic factors result in relatively small bird populations 'and demographic factors lead to low levels of aviation activity (in absolute terms) in comparison with more developed regions of the country. In addition to the number of birds and aircraft traffic volumes, however, the types of birds and aircraft must be considered.

The degree of bird-hazard risk depends on the ethnological and physical characteristics of the bird populations in the airport vicinity. Relevant ethnological characteristics of birds include their reaction to aircraft, their familiarity with danger, their flocking habits and their flying altitude. Large flocks of birds are a problem because they increase the probability of a strike and because they are associated with the more serious multiple-ingestion type of accident in which an. aircraft can become disabled, possibly resulting in a crash.

Since bird strikes usually occur during take-offs and landings at altitudes below 150 metres, flights of local birds, generally at altitudes below 200 metres, are most critical. Although long-distance migratory flights, particularly by ducks, geese and swans, take place at much higher altitudes,migrating birds also pose a danger if their journey originates or terminates near an airport, or if they choose to rest near an airport, attracted by the favorable environment offered by the site. In addition, visiting "transients" can upset the behaviour of the "residents" already accustomed to airport traffic, by inducing them to fly while an aircraft arrives or departs. In fact, seasonal strikes mirror migratory patterns: **50% of all Canadian bird strikes occur during migratory periods.** As discussed in Appendix I, there is little bird migration in most areas of the Northwest Territories.

Physical characteristics of birds, such as size, weight and flying ability, also determine the potential for bird-aircraft conflicts. Bird mass affects the impact force and the damage inflicted in a collision. In addition, birds

such as gulls, which take off slowly and have limited flying manoeuvreability present a higher risk than quicker, more manoeuvreable birds, such as wood pigeons.

The impact force generated by a collision is proportional to the mass of the bird and the square of the impact velocity. Thus, aircraft speed has an important bearing on the extent of possible damage, with the result that airports serving high-speed aircraft are at higher risk than those serving slower planes. In addition, the likelihood of collision increases because birds are less able to avoid high-speed aircraft. Turbine-jet aircraft are particularly vulnerable to bird strikes, because of their high velocities, their large frontal areas, and because of their tremendous air suction into turbine engine intakes which are prone to bird ingestion.

The vulnerability of an airport to bird hazards is increased where the site is attractive to bird flocks. Part 3 of the International Civil Aviation Organization (ICAO) Airport Services Manual[6] suggests that birds may be attracted to airports:

- to obtain food or water
- to obtain shelter
- for safety
- because of an established migration or local movement route access to an airport
- to find nests
- for rest

In particular, the presence of a source of food and water in the airport vicinity is a major attraction for birds. Refuse containing food waste disposed of on or near the airport property encourages the congregation of

[6] International Civil Aviation Organization, Airport Services Manual (1978).

scavengers such as gulls, starlings, crows, ravens, house sparrows, magpies, jackdaws, cowbirds and black kites. The significance of problems stemming from disposing of food wastes near airports is apparent when it is considered that up to 25% of bird strikes in Canada involve gulls and 8% involve sparrows, both common native scavenger birds.

Aside from edible garbage at nearby waste-disposal sites, other factors can attract birds to airports. These include earthworms and soil invertebrates driven out of their burrows after a rainfall and collecting on paved runways, and small bodies of water such as ponds, rivers, ditches and areas of poor drainage which supply drinking water and, especially if stagnant, support a thriving population of small fish, tadpoles, frogs, insect larvae and invertebrates as well as a variety of water vegetation. Grass, which often serves as the ground cover, is welcome food to intensive grazers such as pigeons and some geese. Since many varieties of small birds enjoy feeding upon seeds, caution must also be exercised with regard to agricultural use of the land on or near the airport site; in Canada, oats, corn and sunflowers have been singled out as crops most likely to attract birds. Finally, the grassy areas frequently surrounding runways and terminal buildings provide homes for rodents and rabbits which are hunted by predators such as owls and buzzards. Again, in relation to the climate and vegetation characteristics of most airports in the Northwest Territories, such factors are of considerably less importance than in other areas of Canada.

Although the aiport site as a food source serves as the main bird attraction, other factors encourage birds to congregate near airports as well. Shelter is provided by airport buildings and by trees or shrubbery on or near the airport. While safety is related to shelter, the sense of security experienced by birds in vast open areas where they have a clear view of their surroundings and ample warning of any potential attackers, also contributes to the attractiveness of airport sites to birds. In this regard, again, most airports in the Northwest Territories do not offer such advantages in relation to surrounding areas as would generally be the case elsewhere in Canada.

The presence of birds due to migration or local movement routes across airports is simply a matter of coincidence where an airport has been constructed at a location previously used as a bird flyway. Several nesting possibilities have been exploited by birds at airports, including various parts of the terminal building, natural and excavated banks, dense grass and weeds and trees or shrubs. Finally, birds are drawn to the flat, open airport grounds as a convenient place to rest, since, apart from the aircraft itself, many of the factors that usually disturb birds (surface traffic, domestic animals, etc.) in urban environments are absent. Birds often enjoy resting on warm asphalt runways which retain heat better than the adjacent soil .

In analyzing the reasons why birds are drawn to airports, it is assumed that the attractions present in the vicinity of the airport are not available in the areas immediately outside these lands. For example, birds attracted to grassy fields at an airport located in the core of a highly developed urban area would not demonstrate the same preference for the airport if it were surrounded by similar grassy fields for miles around. The contrast - or rather lack of contrast - between an airport and its environs, is an important factor in assessing the propensity of birds to airports such as those in sparsely populated arctic communities where airport sites and their surroundings are environmentally very similar. As noted above, generally this lack of contrast is more prevalent in the Northwest Territories.

An examination of the bird hazards to aircraft in the Kitikmoet region, and in particular in five of its communities (Coppermine, Gjoa Haven, Holman, Pelly Bay and Spence Bay) is presented in Appendix A. Most of the information was obtained as part of this study. In general, it should be noted that there is little information available for NWT communities on bird population characteristics that would be of direct value to the solid waste site/airport separation requirement.

## 6. Control Measures

The most direct and effective means of reducing bird-strike hazards at airports is by eliminating or minimizing those factors which attract birds to airport sites. The presence of edible refuse is, in many cases, the main reason why the airport vicinity is so appealing to birds. Care should be taken, therefore, to locate waste disposal sites sufficiently far from runways to avoid interference with take-off and landing operations.

However, the spatial relationship between the airport, the waste disposal site and the birds' watering/roosting location is probably more important than the separation distance between the runway and the disposable site. If the waste disposal site and the watering/roosting location are situated on opposite sides of the airports, birds will fly across the airport at least twice a day, enroute from their watering/roosting site to their feeding site and then back again. A more favorable configuration occurs where the watering/roosting site is adjacent to the feeding site and both are well removed from runway activity.

In addition to spatial considerations, preventive measures can be taken at the disposal site in an effort to discourage the presence of birds. If waste is incinerated, buried and/or chemically treated, it will be of limited interest to birds. The most successful treatment programs coordinate collection, dumping and treatment with the daily schedule of the local resident bird population. For example, if gulls are accustomed to feeding on refuse during daylight hours, it is expedient to dump and bury refuse at night; when the hungry gulls arrive early the next morning, the waste is inaccessible and they must search elsewhere for food.

Other countervailing measures can be taken to diminish the desirability of the airport as a place of nourishment, shelter, protection and comfort for birds. Worms, grubs, insects, grasshoppers, crane flies and rodents consumed by birds can be controlled by chemicals. Replacing grass as a vegetable cover with a broad-leafed plant will drive away many of the insect species upon which birds thrive. Further, if the replacement vegetation does not

require the enriched soil necessary to support the growth of grass, earthworms also will not survive. If, for some reason, grass must be retained as vegetative cover, it should be grown taller than bird height, so as to block the birds' view of their surroundings and thereby discourage them from flocking to the airport grounds for security purposes.

Water in the vicinity of the airport, serving both as a drink for birds and as a medium for the aquatic life consumed by them, should be carefully controlled. Surface water should be eliminated as much as possible: ponds, pits and small depressions that tend to collect water during rainstorms and after spring thaw should be drained and filled in with a solid material. Drainage ditches should be unclogged, allowing water to flow freely and eradicating the organisms which thrive in stagnant water; also ditch banks should be mowed.

With respect to agriculture (not particularly relevant to airports in the Territories), controls can be implemented by not permitting agricultural leases on or near airport land and by distinguishing between acceptable and unacceptable crops in terms of bird attractability. Trees and brush offering food, protection, nesting sites and camouflages (also not particularly relevant in most regions of the Territories), can be removed from airport lands and fringes.

Airport buildings themselves can be designed such that they are not conducive to bird nesting: decorative holes and overhanging roofs in particular are to be avoided. Finally, in selecting sites for new airports, conflict with established migratory routes and compatibility with existing uses of adjacent land (with regard to bird hazards), should be taken into consideration.

Once all possible bird attractions have been removed from the airport and its vicinity, supplementary measures can be taken to "scare" birds and thereby disperse them or drive them off airport land. Some tactics that. have been used with varying degrees of success include:

- Activating pyrotechnic devices such as firecrackers, rockets, flares, shell crackers, etc.
- Playing back tape recorded distress calls recognizable by the offending bird species.
- 'Displaying dead or model birds in unusual positions, alongside the runways.
- Flying kites or gliders resembling predator birds.
- Training peregrine falcons to drive away other birds species.

If an intensive and exhaustive program to remove all bird attractions from the airport site is implemented and supplemented by dispersal strategies that have proven effective at a specific site, the bird-hazard problem will be eradicated in virtually every case; there is really no reason to kill, trap or otherwise harm the bird population near an airport.

## 7. Planning Implications

In selecting a waste disposal site which must be located near an airport, certain information is required in order to minimize potential bird hazards. Such information relates to:

- the nature of aircraft traffic in terms of the number of daily aircraft movements at present, the number expected in the future, and the frequency of turbo-jet aircraft;
- the density and habits of resident bird populations. Some characteristics of the resident bird population which should be studied include whether or not the birds are scavengers; the areas where they feed, water and roost; whether they are diurnal or nocturnal; the nature of their daily schedules, particularly with respect to flight paths; their ethnological characteristics (flocking habits, excitability, altitude ranges) and physical characteristics (size, weight, flying ability). The existence and utilization of any established bird migration routes in the area should also be determined;

- certain spatial relationships, namely the relative locations of the airport, population centres, water bodies, patches of vegetation, areas where birds feed, water and roost, and the proposed waste disposal sites, as well as the orientation of runways and the direction of the prevailing winds.,

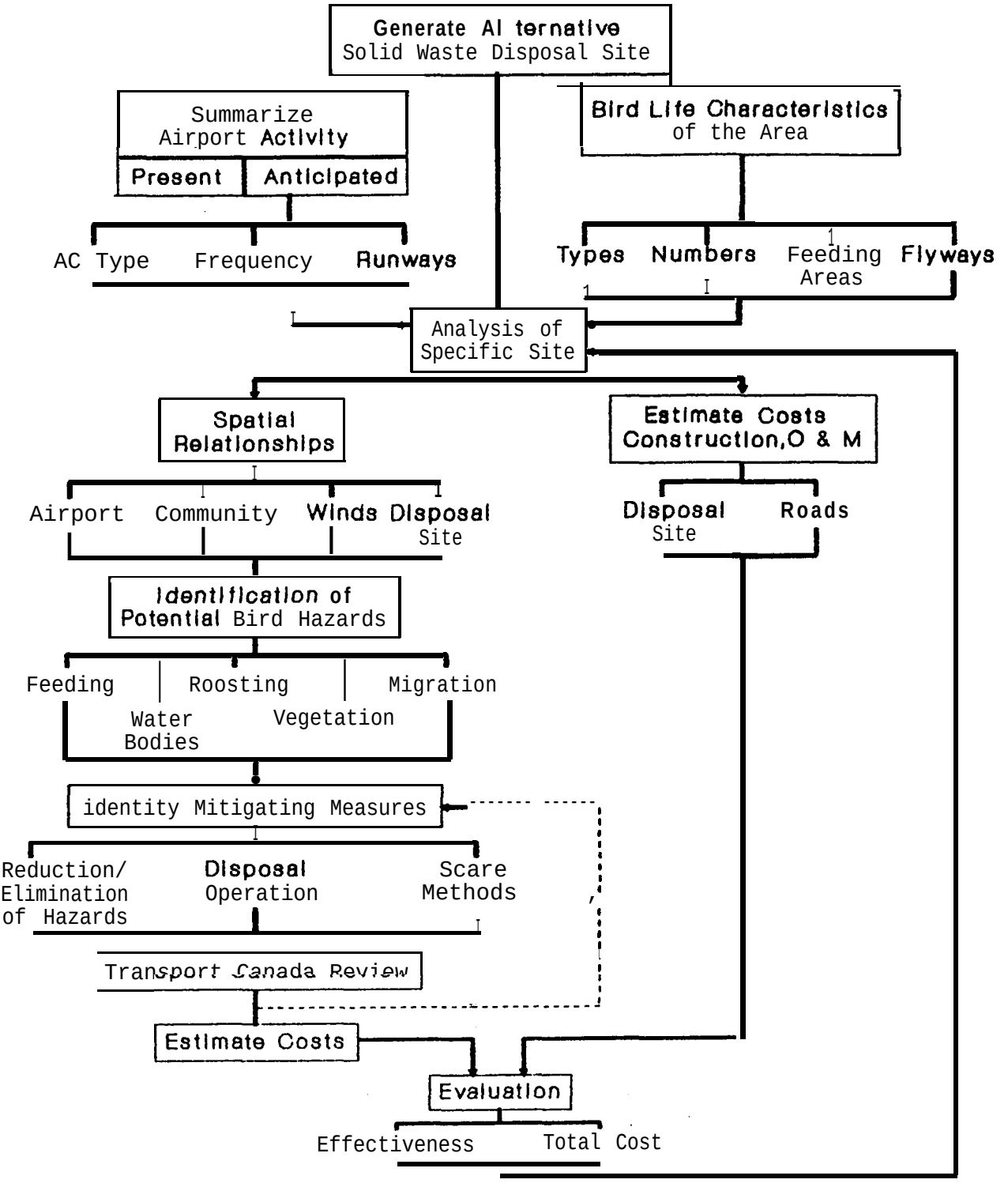
The preferred approach to waste disposal site selection involves generating a number of alternative sites for assessment before selecting the most feasible candidate. Transport Canada endorses this approach and is, in fact, willing to assist in the appraisal of alternatives. In locales where the bird density is low, where airports are infrequently used, and where few or no turbo-jet aircraft use the airport, the separation between solid waste disposal sites and airports needed to ensure safe operation should be considerably less than the current 8 km guideline, particularly if measures are implemented to render both the waste disposal site and the airport unattractive to the relatively small bird population. Such measures, as previously discussed, include drainage and fill of water bodies on or near the airport, vegetation control, incineration, burial and/or chemical treatment of waste, and the dispersal of birds by various "scaring" procedures.

A general approach for assessing potential bird hazards and possible mitigating measures can be described as in the accompanying flow diagram (Exhibit 7). The process begins by identifying potential solid waste disposal sites, summarizing activity data for the specific airport, and obtaining relevant information for birds that are characteristic to the area. For each candidate waste disposal site, spatial relationships involving the relative locations of the disposal site, the airport and the community are examined as the basis for determining potential bird hazards in relation to aircraft flight patterns. At the same time, a cost analysis of the candidate disposal site can also be carried out.

Once potential sources of bird hazards are identified for the candidate site, a variety of mitigating measures can be formulated, ranging from eliminating the potential attractiveness of certain topographical features (small bodies of water, patches of vegetation, etc.) through procedures for controlling

Exhibit 7

## Approach for Assessing Bird Hazards



disposal operations (time of day, covering) to bird scare tactics. At this point, it would be appropriate to review the effectiveness of these measures with Transport Canada and to consider any additional measures that might emerge a's a result of the review process, before proceeding to the cost estimation stage.

Finally, each candidate site is evaluated in terms of the effectiveness of mitigating measures with respect to bird-hazard reduction and all capital, maintenance and operating costs related to the mitigating measures and operation of the disposal site. A large portion of capital expense would include constructing new roads through rocky terrain, as most arctic communities do not have a pre-existing road infrastructure surrounding the community. Similarly, a large portion of annual expense would be allocated to clearing the additional roads of snow and ice during the extended arctic winter. Similar analyses are carried out for alternative sites as the basis for selecting the preferred combination of site location and mitigating measures. Ultimately, the waste disposal site selected should be superior to the other alternatives in terms of both safety and cost.

## 8. Conclusions and Recommendations

This study presents an overview of the bird-strike problem at airports, with particular reference to the relationship between the location of solid waste disposal sites in the vicinity of airports and aviation safety. Because the available data and information are relatively scant, this overview deals generally with the problem of bird hazards at airports, extracting, wherever possible, information that is particularly relevant to the Northwest Territories. The principal findings of the study are summarized in the following paragraphs.

i. In general terms, the potential for bird strikes represents a serious hazard to aviation safety, particularly in locations characterized by large bird populations and a high preponderance of jet and turbo-jet aircraft activity. Such hazards should be reflected in controls on the use of land in the general vicinity of airports so as to minimize the attractiveness of airport sites to the bird population.

ii. In particular, because of the attractiveness of solid waste disposal sites as sources of food for bird populations, special consideration must be given to the separation between such sites and airports. In fact, a number of organizations concerned with aviation safety, including Transport Canada and the U.S. Federal Aviation Agency, have developed specific guidelines to deal with this problem.

iii. There are some notable differences in guidelines formulated by different agencies. Transport Canada guidelines, for example, place greater emphasis on separation distances, recommending a minimum separation of 8 kilometres. The FAA, by contrast, differentiates between types of aircraft, recommending minimum separations of 1.5 kilometres in the case of piston aircraft, and 3 kilometres in the case of jet aircraft. FAA guidelines also place more emphasis on the relative location of the airport, disposal site, and the community. These differences suggest some room for variation in separation distances depending upon local circumstances.

iv The potential for bird strikes on aircraft depends upon a wide variety of factors including general characteristics of the bird population, the attractiveness of the airport sites to birds relative to the surrounding environment, the orientation of airport takeoff and landing paths in relation to bird flyways, and both the type and frequency of aircraft using the airport. Clearly, land use controls, including guidelines for the separation between solid waste disposal sites and airports, should reflect differences in these factors in various regions of the country.

v. As a result, guidelines for waste disposal site/airport separations in urbanized areas, where the environment of the airport represents a significant departure from the surrounding environment in terms of attractiveness to birds, in warmer regions which support a larger bird population, and in agricultural areas that serve as a source of food for birds, may not be appropriate to the climate, vegetation, terrain, and land-use characteristics of most communities in the Northwest Territories. In all likelihood, the combination of these characteristics with the relatively small bird populations and low level of jet aircraft activity, should lead to new requirements for safe separations between airports and solid waste disposal sites in the Northwest Territories. In fact, the relative location of disposal site and the airport may be a more important factor.

vi. Some trade-offs exist between acceptable disposal site/airport separation and a wide variety of countermeasures that can be used to reduce the attractiveness of an airport site to the bird population.

vii. For the Northwest Territories, as well as other regions with similar climatic, topographical, and demographic characteristics, where bird populations are relatively small, there is a need to develop guidelines for the separation between solid waste disposal sites and airports, including related countermeasures which reflect the specific conditions encountered in these regions.

viii. In view of the Northwest Territories' unique circumstances, it would be expedient to implement a guideline which combines separation distances with spatial considerations (taking into account conflicts between bird flyways and aircraft flight paths), and with performance criteria (whereby remedial action would have to be taken if airport safety proved to be substandard as a result of bird-strike hazards associated with disposal sites). These guidelines, although different than those applying to other parts of Canada, would not necessarily be less stringent.

ix. At present, the development of such guidelines is impeded to some extent by the limited data available on site-specific bird population characteristics, as well as by statistics on bird strikes for many of the airports in the Northwest Territories that are presently not part of the Transport Canada incident-reporting system.

On the basis of these findings and other material presented in this report, and recognizing the relatively scant data available at the present time pertaining to specific airport sites in the Northwest Territories, the following **recommendations** are made:

i. The government of the Northwest Territories should develop guidelines for the separation between solid waste disposal sites and airports that are relevant to conditions encountered in various regions of the Northwest Territories.

ii. Rather than developing a single guideline for the Territories, the new guidelines should be flexible and multi-faceted, taking into account a number of different criteria, including assurances that any resultant bird hazards will be dealt with by a variety of measures such as improved waste disposal operations and bird-management procedures, reducing the local bird population.

iii. To facilitate the development of such guidelines, the data base on incidents involving bird strikes on aircraft at Northwest Territories airports should be improved. The Arctic Airports Division of NWT Transport should be asked to prepare, from their records, and in cooperation with NWT air carriers, the past experience of bird/aircraft strikes. This information yin be of great value in distinguishing between high, medium and low-risk regions/communities, taking into account any future changes in aircraft movements at communities.

iv NWT Renewable Resources - Wildlife Service should be asked to design a project to provide information for high-risk regions/communities on bird-population characteristics near airports. This information would be a valuable addition to the limited data currently available.

v. The Government of the Northwest Territories, through the Department of Municipal and Community Affairs and other departments directly involved, should negotiate now with Transport Canada for the establishment of interim guidelines for the separation of solid waste disposal sites from airports in NWT communities, on the basis of this study and information which will become available from action taken in Recommendations iii and iv above.

vi The Government of the Northwest Territories, through its Transportation Department, should develop a bird-strike reporting system for airports in the Northwest Territories, similar to the reporting system now used by the Airports Authority Group of Transport Canada, but tailored to the specific needs of the Territories. If information developed in actions on Recommendation iii so indicate, such a system may be needed only in high-risk regions/communities.

vii. After development of information resulting from action on Recommendations iii, iv, v and vi over several years, the interim guidelines should be reviewed and revised appropriately.

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# APPENDIX A

At the start of this study (January 1988); there was particular concern to investigate five communities in the Kitikmeot region because it was expected that remedial work or relocation of solid waste disposal facilities might be required. The work reported below is based on factual information available in early 1988. Changes may have occurred since, but are not reported here.

## APPENDIX A-1

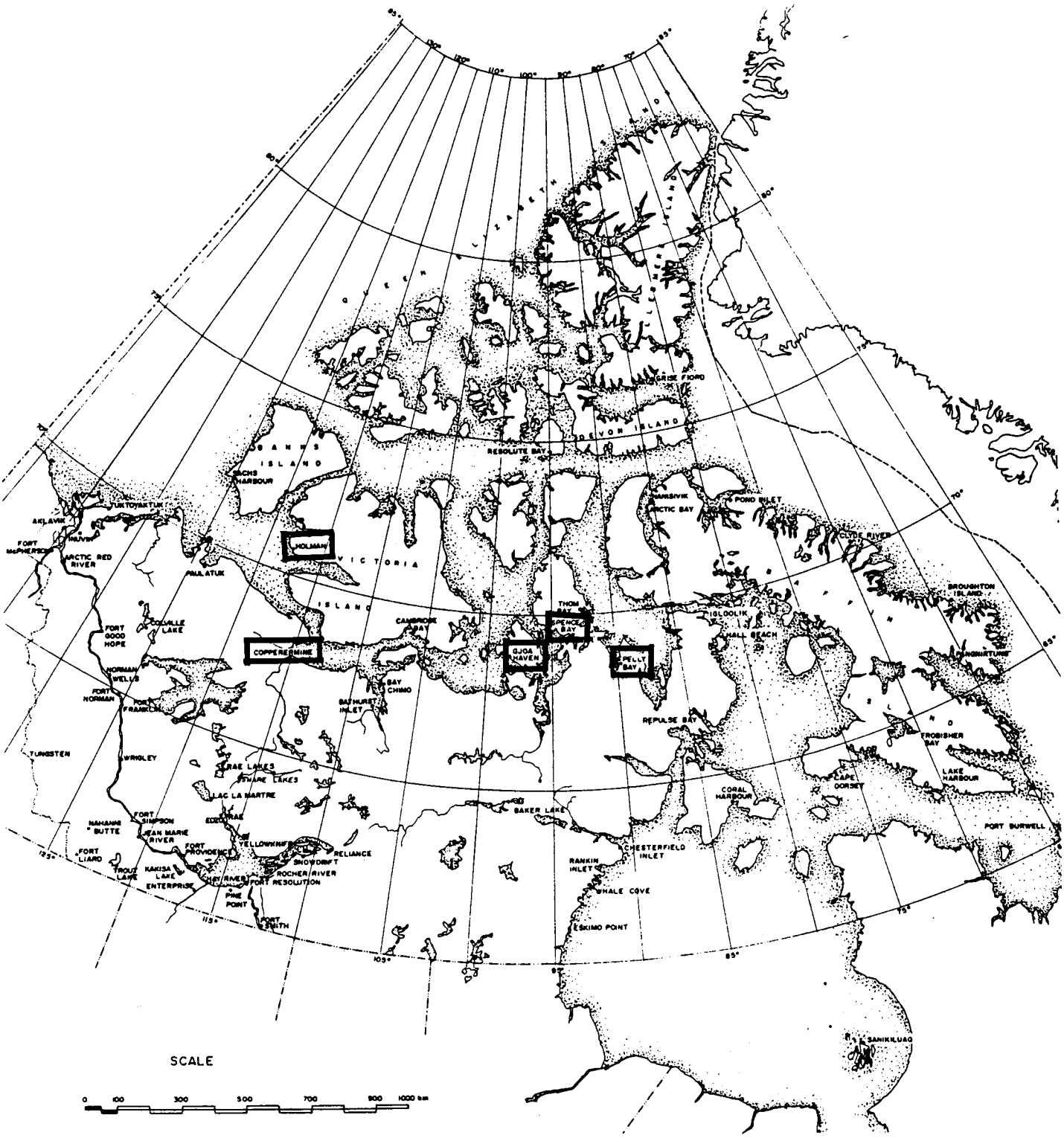
### Bird Hazards in the Kitikmeot Region

In Section 5, the general reasons that birds frequent airport lands are outlined to show what factors should be taken into account in considering locations for solid waste disposal sites. Some of these factors may be of considerably less importance in the Northwest Territories than elsewhere in Canada. This section examines these key factors in relation to the Kitikmeot region of the Northwest Territories where a number of new solid waste disposal sites have been proposed. Additional detail on five specific sites shown in Exhibit A-1, namely, Coppermine, Gjoa Haven, Holman, Pelly Bay and Spence Bay is provided in Appendix A-2. The Gjoa Haven waste disposal site has already been in operation for two years, while the disposal sites for the other four communities are in the planning stage.

In assessing the location of disposal sites in this region from the standpoint of bird hazards to aircraft, it is useful to have a basic knowledge of community demographics, geography and climate, waste disposal methods, aircraft traffic, resident and migratory bird populations as well as the spatial relationships between the airport, proposed waste disposal site and bird roosting locations. A number of conditions common to all five communities can be explored on the basis of the summary information shown in Exhibit A-2. For each community, this exhibit summarizes the general comparisons that are covered in the following paragraphs. Data is provided on community location, climate, vegetation and topography, solid waste disposal operations and airport activity. More detail on current solid waste disposal methods is provided in Appendix A-2.

Exhibit A-1

Community Locations




Source: Survey and Mapping, Department of Municipal and Community Affairs, Government of the Northwest Territories

# Exhibit A-2

## community Characteristics

| | Coppermine | Gjoa Haven | Holman | Pelly Bay | Spence Bay |
|---|---|---|---|---|---|
| **Location** | | | | | |
| Latitude | 67°50'N | 66°53'N | 70°43'N | 66°32'N | 60°32'N |
| Longitude | 115°15'W | 95°50'W | 117°46'W | 89°48'W | 98°32'W |
| **Population** | | | | | |
| 1986 | 666 | 550 | 303 | 297 | 466 |
| Anticipated Growth Rate | 3.10% | 1.60% | 2.87% | 1.96% | 3.19% |
| 2000 (Projection) | 1362 | 919 | 461 | 391 | 7S6 |
| **Climate** | | | | | |
| Coldest Month Means: | February | January | January | February | January |
| High | -27°C | -23°C | -25°C | -30°C | -30°C |
| LOW | -35°C | -49°C | -32°C | -36°C | -38°C |
| Warmest Month Means: | July | July | July | July | July |
| High | 13°C | 24°C | 11°C | loot | 12°C |
| LOW | 5°C | 7°C | 4°c | 3°c | 3°C |
| Annual Rainfall (rim) | 62 | 64 | 77 | 104 | 72 |
| Annual Snowf ● l 1 (mm) | 602 | 264 | 663 | a74 | 1161 |
| **Vegetation and Topography** | | | | | |
| Vegetation | Grasses, sedges, heather, mosses, lichens; willow and ● lder thickets in wet depressions. | Lichens on rocks ● n d outcrops; stunted ● rctfc willows in shelte red areas. | Limited vegetal cover; lichens, coarse grasses, stunted shrubs. | Rock ● nd tilleparsely covered wfth mosses ● n d lichens. | Lichens, mossess ● n d willow mats; grasses, sedges in poorly drained depressions. |
| Geological Characteristics | Steep outcrops of dolomite ● nd shale underlain by precambrian sedimentary ● nd volcanic rock. | Limestone bedrock covered wfth thfn veneer of frost - weathered in-situ canal ● n d boulders; hills to 45m. | Series of raised gravel beaches underlain by volcanic bedrock; massive gabbro escarpment and outcrops. | Huge outcrops of precam-brian rock; ● xtonslvc granular deposits in valleys between rock ridges. | Boulder glacial till underlain by precambrian granites ● nd gneisses; sandy gravel esker west of community. |

A-1 w

## Exhibit A-2 (cent'd)

## Community Characteristics

| | Coppermine | Gjoa Haven | Holman | Pony Bay | Spence Bay |
|---|---|---|---|---|---|
| Solid Waste Disposal Operations (Source: Consultants' reports as per Appendix) | | | | | |
| Proposed Disposal Method | Modified Landfill | Modified Landfill | Modified Landfill | Modified Landfill | Modified Landfill |
| Number of Annual Burials | 1 | 2 | 1 | 2 | 1 |
| Burning | On-site | None | Maybe | None | On-site |
| Per Capita Waste Product on | ($m^3$/day) | 0.0105 | 0.0100 | 0.0101 | 0.0102 0.0105 |
| Airport Activity | | | | | |
| Annual Aircraft Movements: | | | | | |
| 1982 | | 544 | 616 | 607 | 723 |
| 1983 | 2164 | 663 | 634 | 661 | 872 |
| 1984 | 1656 | 761 | 679 | 662 | 558 |
| 1985 | 1669 | 791 | 709 | 766 | 602 |
| 1986 | 1680 | 823 | 694 | 667 | 699 |
| 1986 Itinerant Movement Power Plant Types: | | | | | |
| Jet | 1 | 0 | 0 | 2 | 0 |
| Turbo-Propeller | 1091 | 180 | 432 | 376 | 247 |
| Piston | 472 | 626 | 231 | 614 | 436 |
| Helicopter | 116 | 7 | 23 | 6 | 10 |
| 1966 A/C Movements Per Capita: | | 1.6 | 1.3 | 2.3 | 3.01.4 |
| Runway Type | Gravel | Gravel | Gravel | Gravel/Clay | Gravel |
| Runway Dimensions (m lengthby m width) | 1524 X 30 | 1341 x 30 | | | |

**Population**

**All communities are Hamlets with 1986 populations ranging from approximately 300 to ,900.** Using anticipated growth rates, populations for these communities are expected to range from about 400 to 1,400 by the year 2000. With the exception of Coppermine, where oil exploration is an important means of employment, the major sources of income are from hunting, fishing and trapping, and from handicrafts such as carving and sewing. Municipal, Territorial and Federal Government employees also reside in the communities, as do those engaged in seasonal summer construction work.

**Climate**

The Kitikmeot Region of the Northwest Territories is north of the Arctic Circle within the region of continuous permafrost, where earth materials such as rock and soil are at temperatures below 0° Celcius on an uninterrupted plane beneath the surface year round. The depth of the active layer at the end of the summer ranges from about one-half metre to one metre. For those northern latitudes, temperatures are quite low. Discounting Gjoa Haven, which has a rather extreme temperature range, coldest month mean temperatures range from -30° Celsius to -25° Celsius (highs) and from -38° Celsius to -31° Celsius (lows), and warmest month mean temperatures range from 10° Celsius to 13° Celsius (highs) and from 3° Celsius to 5° Celsius (lows).

**Vegetation and Topography**

Rugged climatic conditions have an effect on the type of vegetation that can thrive. The five communities belong to the arctic tundra vegetation region. Here, soils are churned by frost action, and low temperatures inhibit the decay of organic matter. The short growing season is also limited by continuous permafrost which retards plant growth and prevents deep root penetration. Consequently, much of the vegetation tends to be low and compact in order to trap radiant energy. Lichens and mosses are common tundra plants, supplemented by grasses, sedges, and willow and alder thickets which grow in the more poorly drained depressions.

The region is characterized by rugged, rocky terrain and a relative scarcity of finer soil materials that are suitable for fill and construction. These

factors, together with the continual presence of permafrost, make road construction extremely difficult. In part, this explains the compactness of the typical arctic community where residences, community buildings, the airstrip, water resources and sewage and waste disposal sites are virtually side-by-side against the coastline.

Due to sparse vegetation and poor rocky soil characteristics of this region, certain factors which attract birds to airport vicinities further south can be ruled out. For example, food sources such as grass are not abundant in the north, and agricultural seed crops such as oats, corn and sunflowers are non-existent. Since the soil is not rich in organic matter, earthworms do not thrive. In addition, trees and shrubbery, typically providing shelter for various bird species in southern regions, are again absent in the far north.

**Airport Activity**

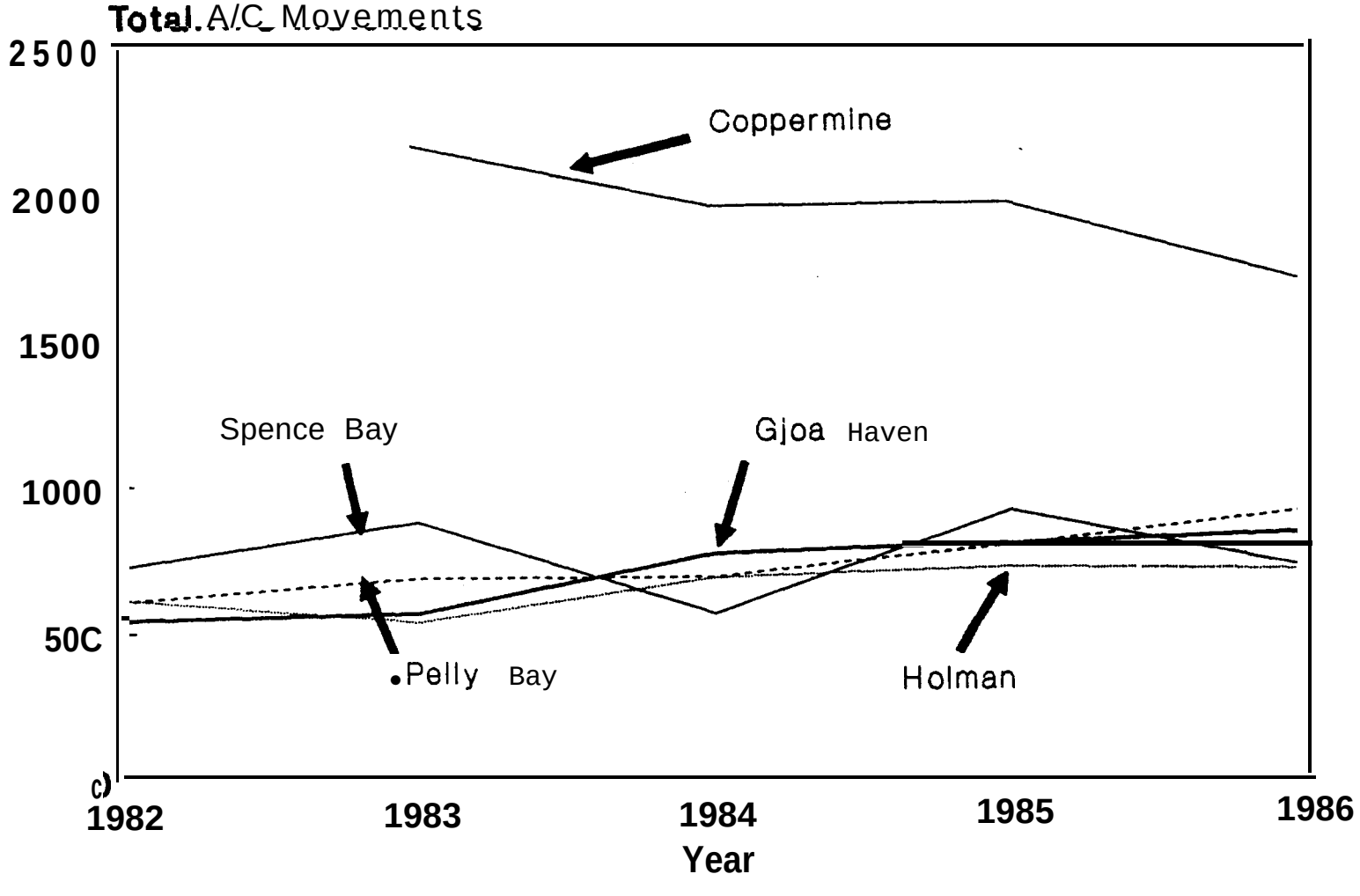
The community airports considered here are very modest in scale. Only Coppermine has a flight service station; the other four operate without air traffic control towers. Each airport has a single gravel or gravel and clay runway ranging in length from 1,100 to 1,524 metres. All are operated by the Government of the Northwest Territories. No bird strikes have been reported at any of the five airports; however, the lack of records could be more indicative of deficient strike reporting programs than the absence of bird strike incidents.

As evident from Exhibit A-3, which shows total annual aircraft movements from 1982 to 1986, volumes of air traffic are very light at all five community airports. Coppermine's aircraft movements are in the range of 2,000 per year, and those of the other communities are well under the 1,000 per year level. By comparison, Yellowknife Airport supports over 47,000 aircraft movements annually.

In general, growth rates for aircraft activity at these airports have been sporadic. Annual aircraft movements at Coppermine and Spence Bay have actually declined, while at Holman they have fluctuated within the five-year

Exhibit A-3

Total Aircraft Movements
Five Northwest Territories Airports




Source: Transport Canada, *Aircraft Movement Statistics; Annual Report (1986),*

period shown. Only Pelly Bay (which is inaccessible by sea-lift due to year-round ice flows) and Gjoa Haven have experienced steady growth in annual aircraft movements. Notably, Pelly Bay has the largest ratio of aircraft movements per capita (3.0) for 1986.

In addition to the volume of air traffic, the type of aircraft using an airport is an important factor in assessing vulnerability to bird hazards. As noted previously, due to their speed and the suction power of their engines, jet aircraft are most dangerous in terms of bird/plane collisions. Turbopropeller aircraft are only marginally safer. Piston-engined planes and helicopters are the least dangerous aircraft in this respect, since their. relatively slow operating speeds allow time for birds to react and steer clear of an aircraft's flight path.

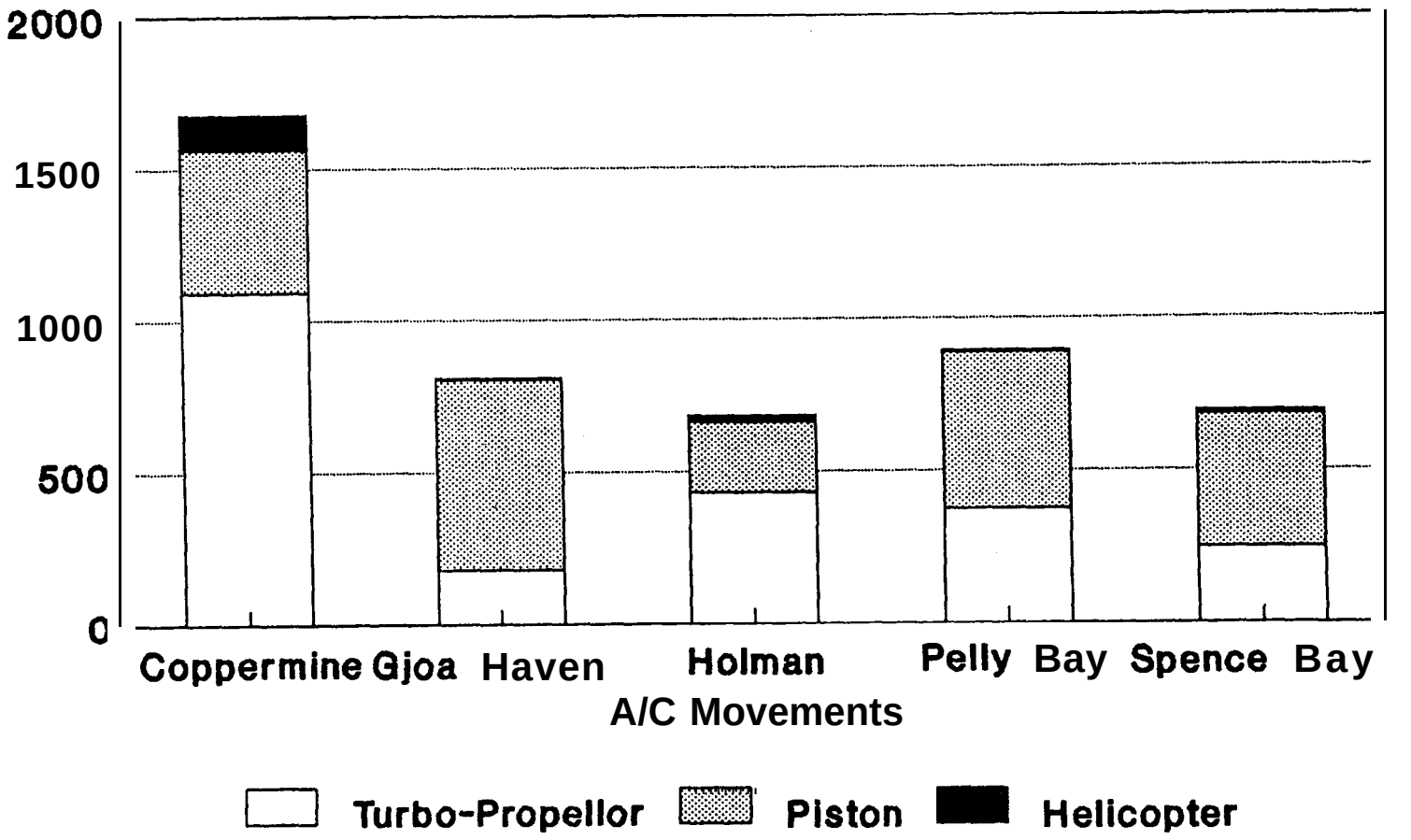
In Exhibit A-4, 1986 itinerant aircraft movements for each of the five communities are grouped according to type of power plant. Itinerant movements refer to take-offs destined to, or landings originating from, another airport, as opposed to local flights taking off and landing at the same airport without intermediate stops. There are virtually no jet movements at any of the five community airports. While the majority of itinerant aircraft movements at Gjoa Haven (77%), Pelly Bay (57%) and Spence Bay (63%) are allocated to the relatively safe piston-engined aircraft, the more dangerous turbo-propeller aircraft fly most frequently at Coppermine (65%) and Holman (63%). At Yellowknife, by comparison, over 13% of 1986 itinerant aircraft movements were made by jets, 33% by turbo-propeller aircraft, and only 48% by piston-engined aircraft. Nevertheless, over the next five to ten years, the trend "towards Short Take Off and Landing (STOL) turbo-propeller aircraft is likely to increase.

**Bird Populations**

**Data on bird populations are not available for each individual community. However,** since the five communities are similar with regard to climate, terrain and vegetation, some generalizations can be made about the "types and numbers of resident and migratory birds likely under such conditions. A rough idea of bird species and their relative densities are shown in Exhibit

**Exhibit A-4**

1986 Itinerant Movements by Type of Power Plant
Five Northwest Territories Airports




Source: Transport Canada, *Aircraft Movement Statistics; Annual Report (1986),*

**Exhibit** A-5

## Bird Species at Cambridge Bay, NWT

| Species | | I | n | Clutch sizes |
|---|---|---|---|---|
| Red-throated *Loon* | *Gavia stellata* | 3 | 1 | 1X1 |
| Arctic Loon | *Gavia arctica* | 14 | *3* | 2x2 |
| Yellow-billed Loon | *Gavia adamsii* | *5* | — | |
| Tundra Swan | *Cygnus columbianus* | *48* | 1 | 1X3 |
| Greater White-fronted Goose | *Anser albifrons* | *130* | 5 | 1X2; 2X3; 2X5 |
| (Black) Brant | *Branta bernicla* | 12 | *2* | 1X5 |
| Canada Goose | *Branta canadensis* | 170 | *19* | 7X4; 1x5; 1X6 |
| Northern Pintail | *Artas acuta* | *14* | — | |
| Common Eider | *Somateria mollissima* | *12* | — | |
| King Eider | *Somateria spectabilis* | *340* | 3 | 1X2; 1X3; 1X5 |
| Oldsquaw | *Clangula hyemalis* | *260* | 2 | 1X4*; 1X7 |
| Red-breasted Merganser | *Mergus serrator* | 14 | 1 | 1 X6 |
| Rough-legged Hawk | *Buteo lagopus* | *6* | 1 | 1X3 |
| Merlin | *Falco columbarius* | 1 | — | |
| Peregrine Falcon | *Falco peregrinus* | *1* | — | |
| Rock ptarmigan | *Lagopus mums* | *4* | — | |
| Black-bellied Plover | *Pluvialis squatarola* | *60* | 1 | 1 x4 |
| Lesser Golden-Plover | *Pluvialis dominica* | 140 | 2 | 2X4 |
| Semipalmated Plover | *Charadrius semipalmatus* | 10 | 1 | 1X4 |
| Ruddy Turnstone | *A renaria interpres* | 75 | 1 | 1x4 |
| Semipalmated Sandpiper | *Calidris pusilla* | 210 | 11 | 1X3; 10X4 |
| Baird's Sandpiper | *Calidris bairdii* | 110 | 10 | 10X4 |
| Pectoral Sandpiper | *Calidris melanotos* | 70 | 6 | 6X4 |
| Stilt Sandpiper | *Calidris himantopus* | 120 | 2 | 2x4 |
| Buff-breasted Sandpiper | *Tryngites subruficollis* | 1 | — | |
| Red-necked Phalarope | *Phalaropus lobatus* | 3 | — | |
| Red Phalarope | *Phalaropus fulicaria* | 175 | 10 | 1X3; 9x4 |
| Pomarine Jaeger | *Stercorarius pomarinus* | 6 | — | |
| Parasitic Jaeger | *Stercorarius parasiticus* | 26 | 2 | 1X2 |
| Long-tailed Jaeger | *Stercorarius longicaudus* | 72 | 3 | Ix]; 1X2 |
| Thayer's Gull | *Larus thayeri* | 9 | — | |
| Glaucous Gull | *Larus hyperboreus* | 110 | 2 | |
| Sabine's Gull | *Xema sabini* | 140 | 21 | 3x 1; 3X2; 2X3 |
| Arctic Tern | *Sterna paradisaea* | 160 | 13 | 1X1; 2x2 |
| Horned Lark | *Eremophila alpestris* | 85 | 1 | 1X3 |
| Common Raven | *Corvus corax* | 1 | — | |
| Mountain Bluebird | *Sialia currucoides* | 1 | — | |
| Water Pipit | *Anthus spinoletta* | 12 | — | |
| Lapland Longspur | *Calcarius lapponicus* | ++ | 18 | 2X4: 11X5; 4X6; 1X7 |
| Snow Bunting | *Plectrophenax nivalis* | 70 | — | |
| Redpoll | *Carduelis sp.* | *3* | — | |

I—total number of birds observed. II—number of nests found.
● —In nest Of Red-breasted Merganser,
++—very common.

**Source:** C.M. Lok and J.A.J. Vink, "Birds at Cambridge Bay, Victoria Island, Northwest Territories, in 1983", The Canadian Field-Naturalist, 100-3 (July - September 1986).

A-5, which lists, by species, the total number of birds observed near Cambridge Bay - also a coastal community in Kitikmeot Region - between June 23 and July 6, 1983. From Exhibit A-5, it is apparent that bird populations are rather modest. As a general rule, the number of birds declines as one moves further north.

The material presented in this section is based on the limited information shown in Exhibit A-5 supplemented by discussions with staff of the Canadian Wildlife Services Department. In addition, some anecdotal information on bird types, approximate numbers and flight patterns, supplied by representatives from the five communities, are included in Appendix A-2.

Most of the bird species of the arctic tundra are migratory summer residents, spending at least the worst months of the arctic winters south of their summer roosts. Migration, however, is not a problem in terms of bird strikes at the community airstrips, as most birds do not migrate to destinations north of the communities under study. Generally, the communities serve as route endpoints for their summer residents. Some ducks and geese do migrate to the large islands north of the mainland, such as Victoria Island and Ellesmere Island, but do not present a serious problem at airports: they fly at extremely high altitudes (3,000 metres to 6,700 metres) over the ocean and, further, they avoid human contact should they happen to rest close to a community in the course of their migratory journey. . There is no east-west migration, usually driven by the search for alternate food sources, by either year-round or seasonal resident species of the communities under consideration.

Certain species that reside in the arctic tundra for at least part of the year pose virtually no threat to airport safety. Canada geese and snow geese, for example, feed mainly on grass and sedge, and thereby can be independent of community activity. While in an intensive urban setting, geese would frequent grassy strips alongside runways, arctic -airports - uniform in terms of vegetation and terrain of the community and the barren lands beyond - do not represent preferred feeding sites for geese. Seabirds such as eiders and terns which are also present in relatively large numbers, also keep clear of the community, nesting dispersedly on small off-shore

islands and feeding on coastal fish. Finally, dry land pond birds like plovers and sandpipers deserve mention. While these birds may linger at ponds near airstrips, they do not present much potential for interfering with aircraft operations because of their small numbers and because they do not flock.

Two types of scavengers are possible candidates for bird-aircraft collisions: gulls and ravens. Like most arctic tundra birds, gulls are summer residents, inhabiting the communities under study from May to September. Their primary food source is domestic refuse from waste disposal sites. Because gulls tend to travel in large groups, in the event of a collision, aircraft are vulnerable to serious multiple ingestion-type accidents which often cripple their engines. In the case of gulls, flyways are created between community roosting sites and waste disposal sites and, to a lesser degree, between resting locations along the coast or in cliffs and waste disposal sites. Certainly, gull flights will cover paths other than the straight line community-disposal site and coast-disposal site connections, but the probability of finding the greatest number of birds at any time will be highest along these flyways. Care must be taken, then, that gull flyways do not intersect aircraft flight paths which, at short distances from airports, can be taken to be in alignment with the runways.

Unlike gulls, which only present a bird hazard problem in the summer, ravens are more hazardous in winter. Due to large body size (less body surface area per unit mass than for smaller birds), and thick covering of feathers and relatively high percentage of body fat, ravens are able to endure harsh arctic winters. During the summer, they disperse into the tundra fields to raise their young; however, in winter, about 100 to 200 ravens congregate back to the community in search of warmer micro-climates, protecting themselves from the elements by roosting around buildings, on elevated perches, etc. As for gulls, the waste disposal site is their primary in-community food source. Since ravens are not aquatic, only-the path connecting community roosting areas and the waste disposal feeding site is of concern "and should not interfere with airstrip flight plans.

## APPENDIX A-2

### Case Studies of Solid Waste Disposal Sites in the Kitikmeot Region of the Northwest Territories

### 1. Methods of Solid Waste Disposal

Due to the non-industrialized nature of community life in the five communities under study, most of the waste collected can be classified as domestic waste. Arctic climatic conditions and terrain dictate the types of solid waste disposal operations that are reasonable. Four main methods of waste disposal are used, namely:

i. Sanitary landfill
ii. Modified landfill
111. Incineration
iv. Comporting

Sanitary landfills, which involve dumping and burying waste on a regular (usually daily) basis, would not be feasible for the communities studied here, since the requisite daily covering of waste cannot be obtained from the minimal amount of fill material accessible via the road system. Modified landfill operations, requiring only monthly or seasonal covering, seem to best suit the needs of arctic communities. The small quantity of waste generated by 300 to 900 people (at about 0.01 cubic metres per capita per day) further justifies using the modified landfill method.

Incineration involves burning solid waste as it is deposited at the site. Due to capital and operating costs as well as requirements for on-site supervision in preventing windblown ash during covering operations, incineration is not usually suitable for small-scale disposal operations. Moreover, unless combined with a waste heat recovery project where a demand exists for the energy recovered, it is generally expensive.

Comporting, which involves the aerobic breakdown of waste by bacteria into organic matter, is also inappropriate for the communities considered here.

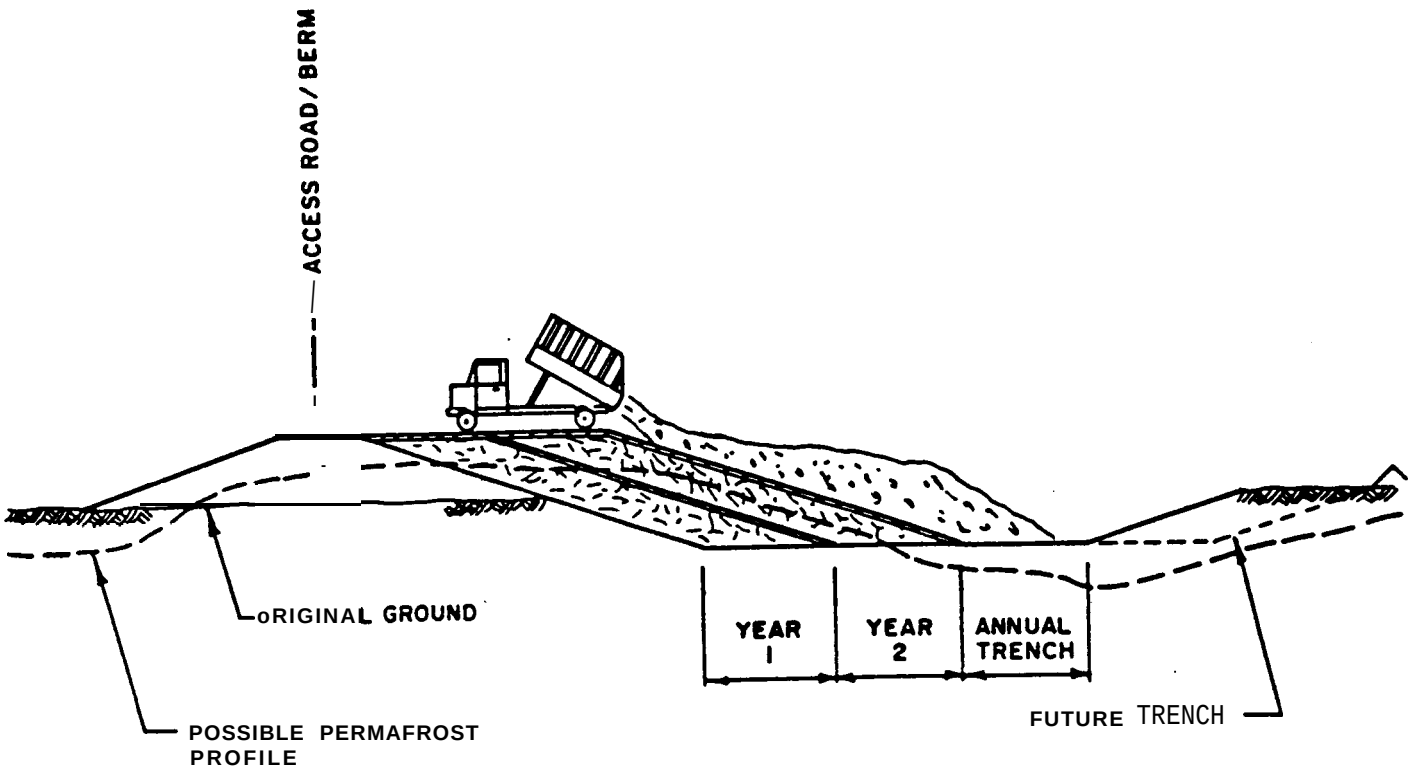
Bacteria present in composts are only active at temperatures above freezing and would require enormous amounts of heat energy throughout most of the year. Again, a high level of operator attention is required. In addition, for these locations, there would be little demand for composted refuse which is useful as a fertilizer in more temperate climates.

A typical modified landfill operation is pictured in Exhibit A-6. Refuse is unloaded from a berm (of slope 1:3 or 1:2) into a pit. Some communities prefer incinerating the waste on-site to reduce volumes by 50% to 60%, while other communities discourage waste burning due to resultant smoke, toxic fumes from plastics and explosions of aerosol cans and propane cylinders. At most modified landfill sites, however, waste is compacted; the volume of unburned refuse can be reduced by a ratio of 5:1 or more if tracked equipment for compaction is available. Compacted waste will not settle as much as uncompacted waste, so aside from reducing waste volume, compaction facilitates future site maintenance.

While traditional modified landfill operations work well under temperate climatic conditions, problems have been experienced in the Arctic. As a result of snow expansion, cold weather waste disposal trenches tend to fill up much more quickly than forecasts predict. In winter, each layer of disposed waste becomes covered with a layer of snow. Because the waste acts as protective insulation to the snow, some of the snow near the bottom does not melt during the brief summer season. In addition, the road surfaces formed after compaction tend to be rough and bumpy, due to the melting of submerged ice pockets. A variant of the modified land-fill method, whereby waste is dumped at one location within an area enclosed by berm walls, spread over the entire walled ared to drain and dry, then pushed against the wall opposite the dumping location and covered, would likely be more appropriate for Northwest Territories communities.

**Exhibit A-6**

Modified Landfill Operation




**Source:** Roland Welker, Pelly Bay, N.W.T.: Final Landfill Design and Operations Concept Report, G.C.G. Dillon Consulting Limited. (March, 1986).

## 2. Recent Studies

A number of recent studies (cited in the following section), addressing the issues of where to locate and how to operate 20-year-capacity waste disposal sites at Coppermine, Gjoa Haven, Holman, Pelly Bay and Spence Bay all recommend that modified landfill waste disposal operations be implemented. While these studies all call for an overhaul of waste disposal operations, they propose that, by and large, the present collection methods be retained. Domestic refuse is deposited in old fuel drums placed in front of each residence, full barrels are collected by trucks and emptied at the disposal site, and empty barrels are then returned. It is recommended that burning of refuse in barrels prior to collection be discontinued and replaced, in some cases (Coppermine, Spence Bay, perhaps Holman), with incineration at the disposal site. Honey bags, which are presently picked up alongside domestic refuse, will be rendered obsolete as the communities gradually convert to fully pumped sewage. In the meantime, they will be disposed of at the modified landfill site, but in separate pits from domestic solid waste.

One important factor in relocating a waste disposal site is the interaction between solid waste disposal and other services, namely sewage disposal and water supply. Studies for two communities (Holman and Pelly Bay) are concerned with spatially integrated water supply, sewage disposal and solid waste disposal systems. The other studies, while focussing only on solid waste disposal, also stress the inter-relationship between water and sanitation systems. For instance, solid waste disposal sites should be situated so as not to drain into (and contaminate) water resources. Also, it is advantageous to locate sewage and solid waste disposal sites in the same vicinity, allowing for the confinement of problematic wastes and for the reduction of access road costs.

Considerations other than interaction with water supply and sewage disposal functions and interference with airstrip operations also influence decisions on the location of solid waste disposal sites. These include:

- Economic travel distance.
- Visual concealment from community.
- Distance from community sufficient to avoid smoke and odour problems.
- Accessibility of earth cover.
- Minimal environmental impacts to land, water, birds and animals.

In addition to changing waste disposal operations, new waste disposal locations have been recommended for four of the five communities under consideration. (Only the Pelly Bay studies suggest that the present waste disposal site be retained). Because of severe constraints associated with the various location criteria, only one feasible solid waste disposal site was suggested in each study. In Holman, however, the feasibility of two additional sites was raised and discussed after the consultant's report was issued, and two new Spency Bay sites were deemed feasible in a more recent report[1]. In the consultants' studies, the economic travel distance criterion was weighted quite heavily, since the absence of an extensive road system limited the area in which a disposal site could be located. In no case was Transport Canada's 8 kilometre airport separation guideline fulfilled; in fact, the proposed sites are all less than 2 kilometres from airport runways.

### 3. Specific Community Considerations

#### Coppermine

Source Document:

R. E. K. Fe lden and Norman C. Gridley, **Solid Waste Disposal Study; Coppermine, N.U.T., Associated Engineering Services Ltd. (March, 1981) .**

Coppermine is situated on a bedrock exposure on the west bank of the Coppermine River where it empties into Coronation Gulf. Exhibit A-7 is an aerial map of Coppermine, showing the community, the airstrip and the current

[1] Karu Chinniah, **Spence Bay, N.U.T-; Water and Sanitation Planning Study, Department of Municipal and Community Affairs, Government of the Northwest Territories, January, 1987.**

Exhibit A-7

# Coppermine

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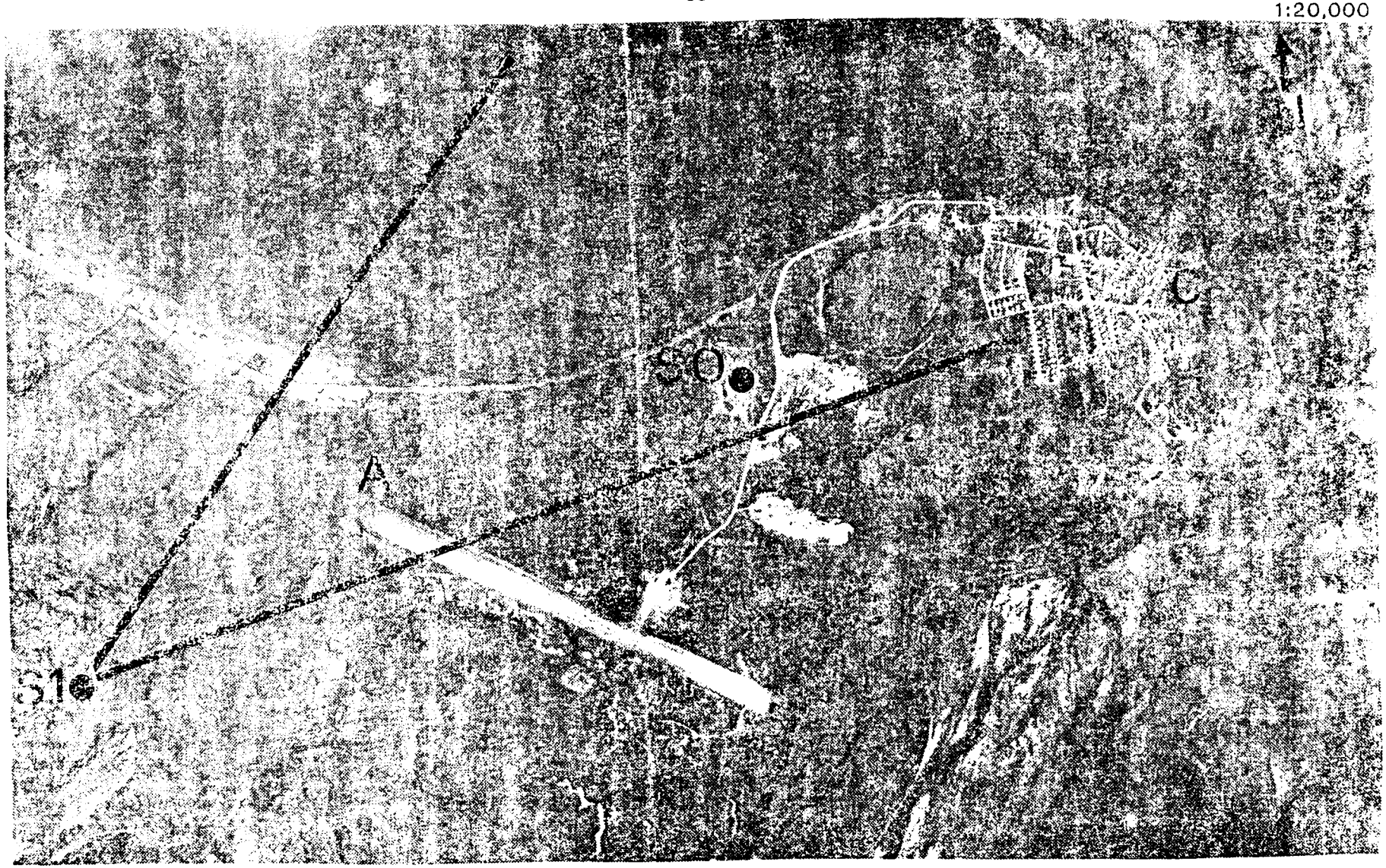



S0 - Existing Waste Disposal Site
S1 - Proposed Waste Disposal Site
A - Airstrip
C - Community

Bird Flyway

Source: Survey and Mapping Department of Municipal and Community Affairs, Government of the Northwest Territories

and proposed waste disposal sites. The present waste disposal site is considered inadequate due to its visibility from the airport road, its separation of only 1.0 kilometre from the airstrip and its drainage directly into Coronation Gulf.

In selecting an alternate location for solid waste disposal, the consultant noted that terrain was a limiting factor. Thick beds of sedimentary and volcanic bedrock, dipping to the north and exposing south facing scarps, cover the Coppermine area. Apart from the airport (which is located in a flat valley), and the town (which lies on a thick mantle of coarse river deposits), the ubiquitous bedrock tends to be weathered, rugged and difficult to penetrate with roads. Areas to the east and south of the community are rejected as sites, due to potential contamination of the Coppermine River, the community's water supply source. Coronation Gulf is immediately north of the community, with the result that only land west of the community can be used for waste disposal purposes. Lands northeast and southwest of the airport again are poorly drained, and could contaminate the Coppermine River during the spring freshet. Only sites west of the airport, then, can be reasonably considered.

The site proposed by the consultant is a 61-metre gorge with bedrock walls that could serve as control structures. The gently sloping sand base drains naturally to the sea, ensuring that no fresh water will be contaminated. Some cover and berm construction material is available on-site, and the remainder within a suitable haul distance. The site is 1.2 kilometres from the airstrip (shortest distance measurement), and 3.6 kilometres from the centre of the community; 2.6 kilometres of roadway must be constructed in order to access the site.

According to sources familiar with Coppermine and its environs, approximately 200 gulls spend the summer at the community. In addition to flying between the community and the waste disposal site, gulls often fly from tbe disposal site to their nesting area at Locker Point, approximately 60 kilometres northeast of the community. About 200 ravens frequent the waste disposal site, resting primarily in the cliffs adjacent to the community and east of

the airport. These ravens are predisposed to gliding and hovering over the waste disposal site. Unfortunately, the waste disposal site suggested in the consultant's report is situated such that flyways both between the gull-nesting area at Locker Point and the disposal site food source, and between the community and the disposal site food source, intersect aircraft flight paths. (Bird flyways are indicated on Exhibit A-7. )

In addition to the gull and raven population, sandhill cranes and birds of prey, such as peregrine falcons and deer falcons, have been observed. These birds, however, do not represent a significant threat to airport safety. In fact, the falcons help to control the number of birds inhabiting the area.. Some geese and a fair number of ducks migrate past Coppermine on their way north to Victoria Island, using the Coppermine River as a migratory guideway. A representative from Coppermine was aware of only one recent bird-strike incident at Coppermine airport: a goose was struck during the summer season, but the aircraft suffered no major damage.

**Gjoa Haven**

Source Document:

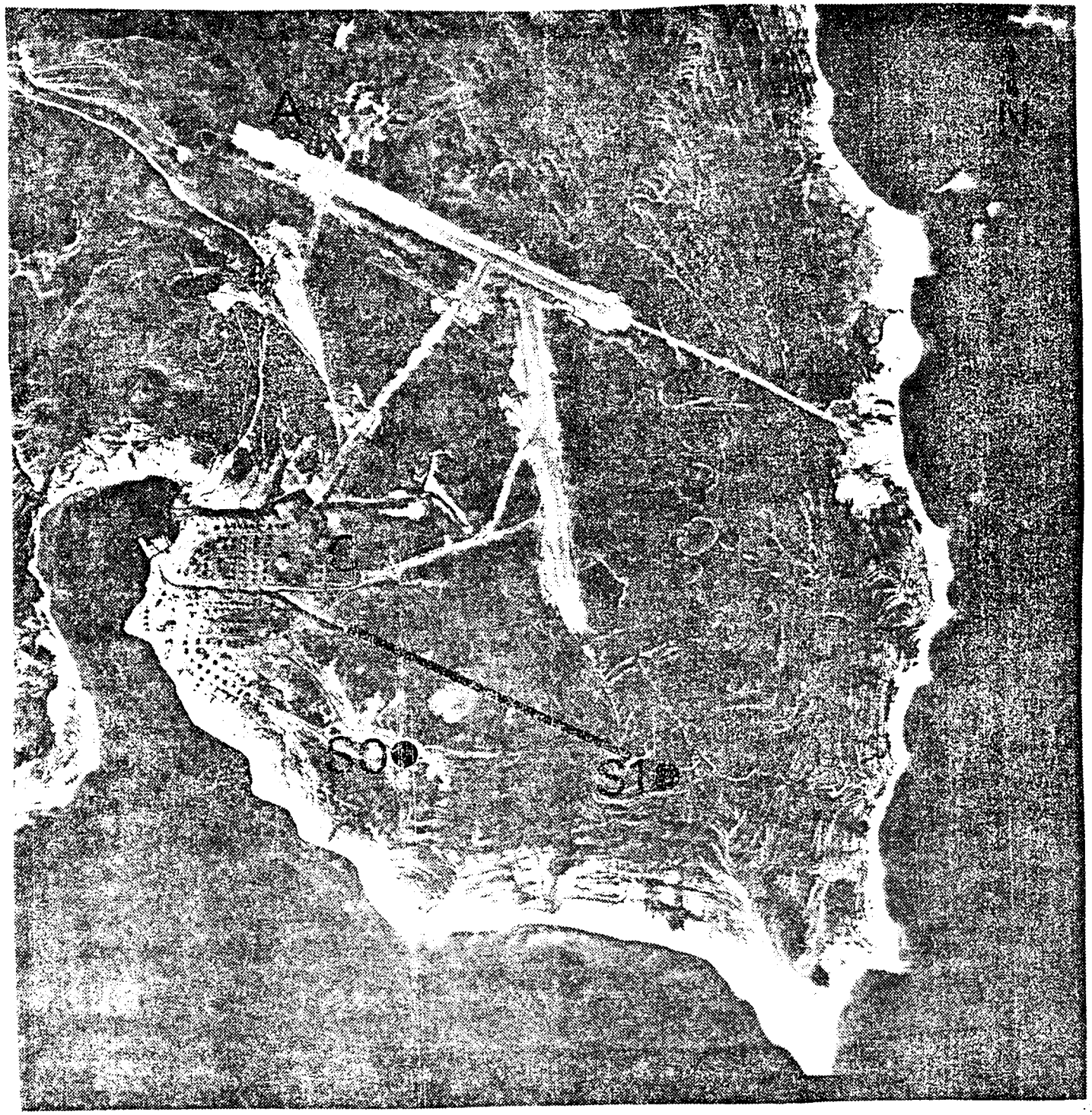
H. J. Bourque, **Design and Operations Concept Report; Gjoa Haven; Solid Haste Disposal, Stanley Associates Engineering Ltd. (January, 1985).**

Situated on the southeast coast of King William Island, Gjoa Haven (Exhibit A-8) is bordered by Peterson Bay to the south and by Rae Strait to the east. To the west, Gjoa Haven Cove penetrates partially inland. A new airstrip built by Transport Canada in 1983 severed access to a disposal site north of the community, and a temporary site southeast of the community (and adjacent to a site used prior to 1975) is presently being used. Since the temporary site is located precisely in the area earmarked for community. expansion, a new site must be selected.

**Exhibit A-8**

Gjoa Haven

1:20,000




Bird Flyway

**SO** - Previous Waste Disposal Site
S1 - New Waste Disposal Site
A - Airstrip
C - Community

Source: Survey and Mapping Department of Municipal and Community Affairs, Government of the Northwest Territories.

Regions northeast of the airport were considered by the consultant to be "too remote" from the community; the cost of constructing access roads would be prohibitive. The remaining site possibilities were confined to the jut of land south of the runway flight path and virtually surrounded by water on the east, south and west. Areas northwest of the community were ruled out due to proximity to the municipal water supply drainage area. Much of the western portion of the feasible site land was visible from the community, thus leaving only three small pockets towards the east of the peninsula in which to locate a waste disposal site.

The proposed site is located in the southernmost of the three pockets, and is separated by 1.6 kilometres from both the airstrip and the community. In order to access the disposal site, the road serving the present disposal site would have to be extended by 1.2 kilometres. The land site is fairly level and somewhat lower than the surrounding lands. Sand, which is readily available in the area, is intended to be used as the landfill cover material.

According to sources familiar with the Gjoa Haven situation, about 300 gulls frequent the waste disposal site, often simultaneously. While community-disposal site flight patterns are fairly well defined, nesting location-disposal site travel is more ambiguous and dispersed and, for this reason, is not indicated on Exhibit A-8. On occasion, gulls have had to be chased off the runway prior to an aircraft landing. Since only an estimated thirty ravens are found at Gjoa Haven, they are not deemed to be hazardous. Other birds observed include sandhill cranes which linger in the small melt water ponds created near runways early in the summer, occasional ptarmigans which have been known to loiter on the runway in search of gravel for food digestion, and Canada geese enroute to Ellesmere Island. The flyway between the community and the proposed waste disposal site is not expected to intersect aircraft flight paths.

## Holman

Source Document:

Richard E. K. Feilden, Planning Study of Water and Sanitation Alternatives; Holman, N.U.T., Associated Engineering Alberta Ltd. (March, 1985 ) .

Holman (Exhibit A-9) is located on the south shore of Victoria Island's Diamond Jenness Peninsula. It is bordered by Queen's Bay to the south, King's Bay to the east and Jack's Bay to the northwest. Within 3 kilometres of the community are a number of lakes, including Upkilluk Lake, RCAF Lake, Hidden Lake, Kunak's Lake and Mission Lake, as well as an assortment of unnamed ponds. The present waste disposal site, situated on level ground north of Airport Road and south of Limestone Hill, has been deemed unsatisfactory by the consultant for the following reasons:

- Lack of natural drainage.
- Clear visibility from Holman and much of the Airport Road.
- Tendency for snow drifting, as it is adjacent to high ground.

Although six different site possibilities are explored in the Associated Engineering planning study, all sites east of the Upkilluk River were eliminated due to topography (hilly terrain, rising up to **300 metres),** poor drainage, the need to protect the fresh water supply from RCAF Lake, and the community's desire to preserve Upkilluk Lake for recreational purposes and King's Bay for marine fisheries. The only site which was not eliminated was the "Pool Tundra Site". This site integrates with the nearby lagoon sewage disposal site recommended in the same study.

According to the consultant's report, the Pool Tundra Site is far superior to the present waste disposal site with respect to drainage; the land slopes towards Jack's Bay at grades of 1.5% to 2%, steep enough to ensure effective drainage. While the proposed site is visible from Holman and Airport Road, it is not as conspicuous as the existing site. Implementation of the Pool Tundra Site would require construction of a 1.5 kilometre access road, the cost of which would be shared with the sewage service. Gravelly sand for the

# Holman

1:18,750

Bird Flyway

SO - Existing Waste Disposal Site
S1 - Proposed Waste Disposal Site
S2 - Alternate Waste Disposal Site
A - Airstrip
C - Community

Source: Survey and Mapping Department of Municipal and Community Affairs, Government of the Northwest Territories.

road base (as well as diking and cover material) is available from a nearby source. The proposed site is 1.5 kilometres from the airstrip and 2.3 kilometres from the community.

Local authorities in Holman observe that roughly 200 gulls appear in Holman during the summer months. The primary gull flyways are between the community and the disposal site, and between the cliffs due east of the community where the gulls prefer to nest and the disposal site. Although gulls do fly to the coast, often in search of freshly caught game at fishing and sealing campsites, no definite coast-disposal site flyways can be distinguished. Again, only a few ravens are present - approximately fifty, at most. These ravens also nest in the cliffs east of the Holman settlement. " Small birds, such as snowbuntings, long spurs and grosbeaks can be found individually or in pairs, but keep well away from the community and present virtually no threat to airport safety. In addition, about twenty to fifty geese and hundreds of ducks migrate past Holman on their way to and from the northern islands. The geese, which stop over in Holman for ten days to two weeks in the fall, avoid contact with humans. Neither the community-site flyway nor the cliff-site flyway created by situating the disposal site on the location specified in the consultant's report should conflict with airstrip operations.

An element of indecision surrounds the location of the proposed waste disposal facility at Holman. At a Capital Planning Review meeting in Yellowknife in April 1988, it became known that the Hamlet of Holman was dissatisfied with the location for waste disposal suggested in the consultant's report, and had decided instead to locate the facility north of the airport (marked S2 on the map comprising Exhibit A-9). This relocated site is un- favorably situated with respect to both major flyways defined earlier. Due to the poor positioning of the relocated site in terms of airport safety, the possibility of locating the waste disposal facility somewhere north of the Pool Tundra Site but south of the airport (effectively separating aircraft flight paths from gull/raven flyways) is being considered.

## Pelly Bay

Source Documents:

Roland Welker, Pelly Bay, N.W.T.; Evaluation of Alternatives; Final Repart; Department of Local Government Water & Sanitation Planning Study, M.M.Dillon Limited. (March, 1986).

Roland Welker, Pelly Bay, N.W.T.; Final Landfill **Design and Operations Concept Report,** G.C.G.Dillon Consulting Limited. (March, 1986).

As shown in Exhibit A-10, Pelly Bay is situated south of the Kugajuk River at the point where it empties into St. Peter's Bay (a subsidiary of the much larger Pelly Bay). The hamlet lies on the western edge of Simpson Peninsula. The M. M. Dillon study on Pelly Bay (like the Associated Engineering study on Holman) covers water supply and sewage disposal services as well as solid waste disposal services. The report recommends that the existing solid waste disposal site be retained in conjunction with revised methods of operation.

Through the process of elimination, the Dillon study established that the valley used presently for waste disposal is the only feasible site, since:

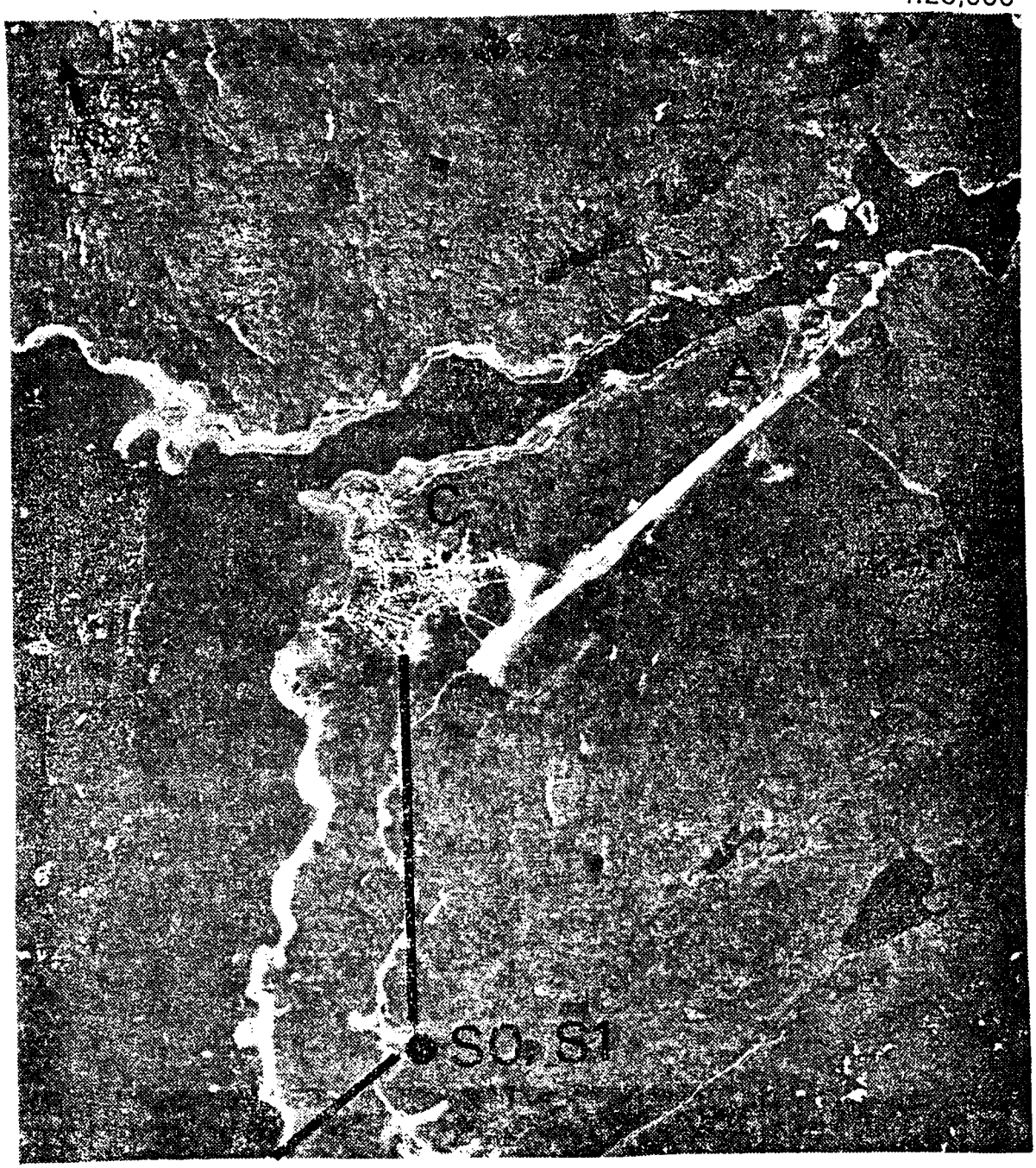
- Areas east of the valley drain into recreational bodies of water and potential potable water sources.
- Areas north of the valley are closer to the community and the airport.
- Areas north of the community would require the construction of prohibitively expensive bridges and lengthy access roads.
- Areas west of the valley are closer to the shoreline and would reduce the available buffer.
- Areas south of the valley are closer to a potable water source (gravel pit) and granular borrow area and are farther from the community.
- Areas to the extreme south of the valley would require access roads cutting through a 200-metre-high granite ridge.

The solid waste disposal site is adjacent to the current sewage disposal site which, according to the recommendations in the report, should also not be relocated. Because former sites are being used in both **cases, new access**

**Exhibit A-10**

**Pelly Bay**

1:20,000




S0 - Existing Waste Disposal Site
S1 - Proposed Waste Disposal Site
A - Airstrip
C - Community

Bird Flyway

Source: Survey and Mapping Department of Municipal and Community Affairs, Government of the Northwest Territories.

roads need not be constructed, and any access road improvement costs can be covered jointly by sewage and solid waste disposal services. The solid waste disposal site is situated 1.6 kilometres from the airstrip and 1.8 kilometres from the Pelly Bay community.

In Pelly Bay, local authorities have confirmed the presence of about 100 seagulls and an unknown number of ravens. Flyways between the community and the disposal site are predominant. Gulls, however, have been observed flying back and forth to their nesting location about 25 kilometres south of the Pelly Bay coast. While flyways between the nesting location south of the community and the proposed solid waste disposal site steer clear of aircraft flight paths, the route between the community and the disposal site could possibly interfere with airstrip operations.

## Spence Bay

Source Document:

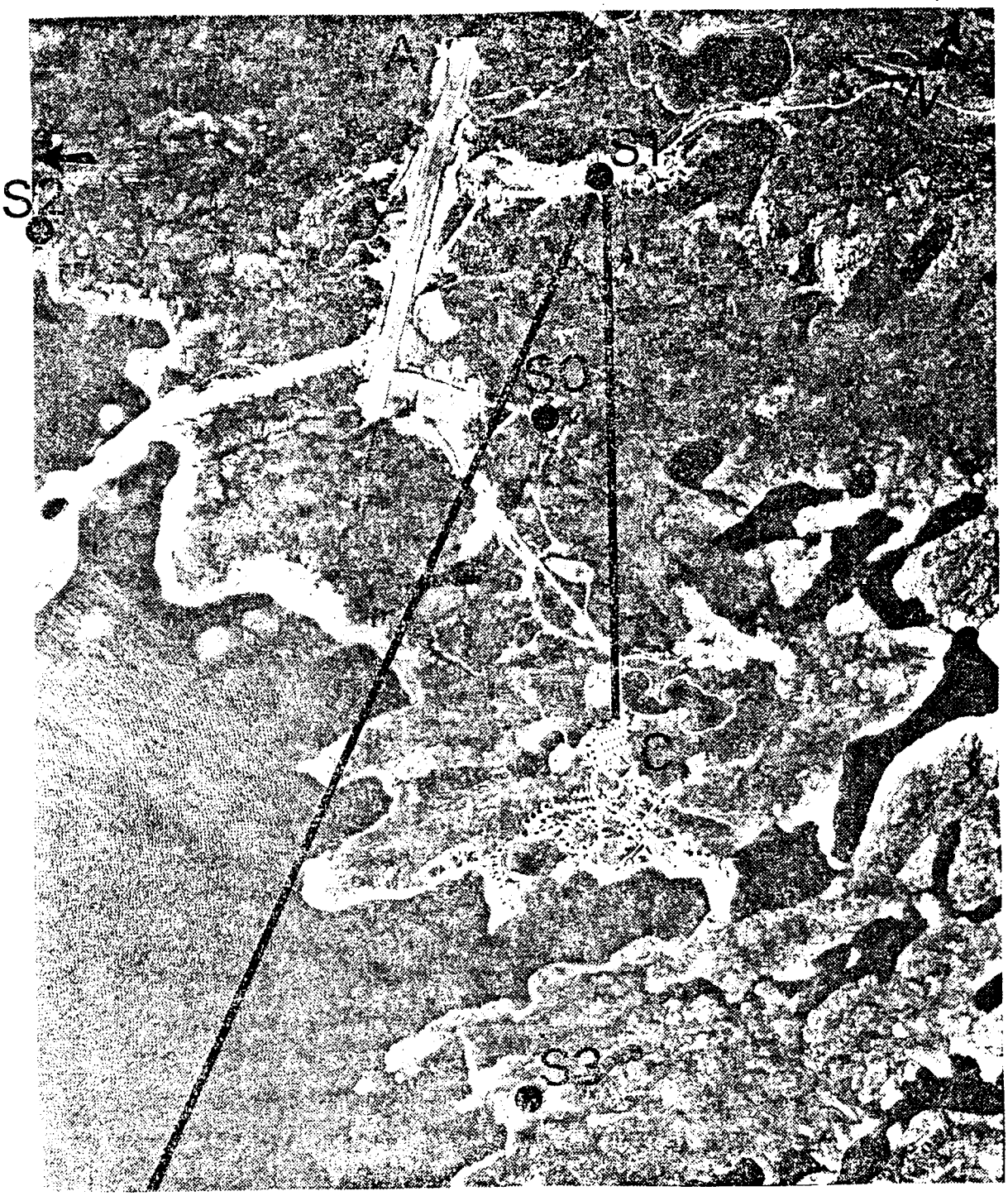
R.E.K. Feilden and Norman C. Gridley, **Solid Waste Disposal Study; Spency Bay, N.W.T.,** Associated Engineering Service Ltd. (March, 1981) .

Spence Bay (Exhibit A-11) is located on the west coast of Boothia Peninsula. The settlement is situated in a narrow inlet projecting northeastward from the head of Spence Bay. The construction of a new airstrip and terminal building within 360 metres of the present waste disposal site is the primary motive for relocating the site. In addition, residents have complained of the proximity of the present disposal site to the community.

In deciding upon a new waste disposal site, terrain was a limiting factor. Although the terrain is low in relief, it is very rugged, with much of the land surface composed of irregular weathered bedrock hills and outcrops. Road construction among the rock outcrops is costly and difficult with the result that potential new sites would have to be fairly close to the existing road infrastructure in order to be economically feasible. Sites south of the airport road were deemed to be too close to and too visible by the community,

Spence Bay

1:20,000




Bird Flyway

S0 - Existing Waste Disposal Site
S1 - Proposed Waste Disposal Site
S2 - Alternate Waste Disposal Site
S3 - Alternate Waste Disposal Site
A - Airstrip
C - Community

Source: Survey and Mapping Department of Municipal and Community Affairs, Government of the Northwest Territories.

while those immediately north of this road were hampered by high rock bluffs and the potential for contaminating water supply and fishing lakes. Ultimately, an area close to a large gravel deposit presently being mined for reconstruction and extension of the airstrip, was selected by the consultant as the most workable future waste disposal site.

The proposed site is advantageous since the gravel deposit provides a ready source of berm and cover material. Only 1.4 kilometres of newly constructed access road is required. However, the site is only 0.6 kilometres from the runway (by shortest distance measurements). Spence Bay, therefore, most severely violates Transport Canada's 8 kilometre separation guideline of the five communities being studied.

About 150 to 175 gulls inhabit Spence Bay during the summer according to sources from that area. Because the current waste disposal site - airport separation is so small (600 metres), gulls flocking to meet the waste collection truck are visible (and their screeching audible) from the airport runway. In addition to flying between the disposal site and the community, Spence Bay gulls have been known to fly to and from nesting locations off the coast about 40 kilometres south of the community. Ravens, too, are present in Spence Bay and frequently fly between the community and the waste disposal site. While flyways between the community and the waste disposal site are roughly parallel to runway alignment (and therefore should not pose serious problems with respect to air traffic), gulls nesting south of Spence Bay could interfere with airport operations enroute to their feeding grounds at the proposed disposal site.

In the study by Chinniah referred to previously, one objective was to determine alternative locations for waste disposal, expressly for the reason that the proposed landfill site would be far too close to the airpcrt. Two sites were deemed feasible for further consideration, one west of the airport (marked S2 on Exhibit A-11) and one southeast of the community-across a narrow portion of Spence Bay (marked S3 on Exhibit A-11). Although the southeastern site fared better than the western site in an economic analysis, the report recommended that the western site be selected since the community

would be subject to adverse environmental effects (noise, odour, smoke, dust, etc.) if the southeastern site were implemented. Both sites are approximately 2.5 kilometres from the airport. While the southeastern site poses no problem with respect to conflicts between bird flyways and aircraft flight paths, the western site advocated by the study is contentious in terms of the community disposal site flyway.

### 4. Summary Comparison

In certain respects, these five airports are relatively safe from the standpoint of potential bird strikes. Bird populations are small and migratory flyways are of minor relevance. The lands surrounding all the air strips have weathered, rocky terrain and limited vegetative cover. As such, they are all environmentally similar to the airport lands; birds then would not be attracted specifically to the airports for the purposes of feeding on grass, worms or insects which live in grass, or resting in an open area with good visibility. Air traffic is light: even Coppermine averages less than five take-offs or landings per day. Furthermore, in Gjoa Haven, Pelly Bay and Spence Bay, piston-engined aircraft constitute the majority of traffic.

As summarized in Exhibit A-12, all proposed disposal sites are within 1.6 kilometres of the airstrips, well short of the Transport Canada guideline. In addition, flyways between the site and the community and between the site and gull cliff/coast nesting locations intersecting with aircraft flight paths, could present problems in three of the five cases (Coppermine, Pelly Bay and Spence Bay).

Gjoa Haven's and Holman's waste disposal sites appear to be favorably located with respect to potential bird problems. Given the low bird populations and low air traffic volumes, separations between disposal sites and airports are probably adequate. Holman, however, is characterized by relatively heavy use of turbo-propeller aircraft (63% of 1986- itinerant aircraft movements. )

Exhibit A-12

Comparison of Solid Waste Disposal Sites

| | Coppermine | Gjoa | Haven | Holman | Pelly Bay | Spence |
|---|---|---|---|---|---|---|
| Shortest distance fran site to airstrip (km) | 1.2 | 1.6 | 1.5 | 1.6 | 0.6 | |
| Distance fran site to center of community (km) | 3.6 | 1.6 | 2.3 | 1.8 | 2.0 | |
| Potential conflicts with aircraft flight paths: | | | | | | |
| Coast-Site Flyway | Yes | No | No | No | Yes | |
| Community-Site Flyway | Yes | No | No | Yes | No | |
| 1986 Aircraft movements | 1680 | 823 | 694 | 897 | 699 | |
| % Turbo-propellor aircraft in 1986 | 65% | 22% | 63% | 42% | 36% | |
| New road requirements (km) | 2.6 | 1.2 | 1.5 | 0 | 1.4 | |

In the case of Coppermine, both coast-disposal site and community-disposal site flyways may interfere with airport operations. Even though Coppermine is hardly comparable in terms of annual aircraft movements to a major centre like Yellowknife, it does receive sufficient traffic to warrant a flight service station. Presently, Coppermine has roughly twice as much air traffic as the other four communities studied. In addition, about 65% of itinerant aircraft movements involve turbo-propeller aircraft, and this percentage is expected to increase in the future. Given these air traffic conditions and the possibly conflicting paths of birds and aircraft, location of the waste disposal site for Coppermine probably requires more detailed consideration, including the possibility of using various mitigating measures.

Pelly Bay's proposed waste disposal site may also be problematic. At Pelly Bay, only the community-site flyway would potentially interfere with airport operations; the coast-site flyway seems to present no difficulty. Of the two types of flyways, however, the former (community-site) is more critical, since it is used by both ravens and gulls and because it is a more established flight pattern. The growth rate in annual aircraft movements has been rapid and consistent in Pelly Bay and, since all provisioning must be done by airlift, annual aircraft movements are not likely to decrease unless population declines.

Finally, in the case of Spence Bay, while only the coast-site flyway intersects with aircraft flight paths, the site is at such close proximity to the runway (600 metres) that the limited number of birds hovering around the site may conflict with aircraft movements. In addition, the Spence Bay airport serves as a "hub" from which connecting flights or "spokes" to Kitikmeot and Baffin communities are based. As air traffic to these "spoke" communities increases, traffic at Spence Bay will also increase.

# APPENDIX B

## CORRESPONDENCE RELATED TO THE SEPARATION OF SANITARY LANDFILLS IN THE VICINITY OF COMMUNITY AIRPORTS

Northwest Territories Municipal and Community Affairs

26 200 013

October 25, 1988

Distribution List

**Separation of Solid Waste Disposal Sites and Airports in the Northwest Territories**

As you are probably aware, over the past thirty years, the reported number of bird-aircraft collisions has increased considerably, in part due to improved reporting systems and in part due to the technological advances of higher speed, jet and turbo propelled aircraft. Bird hazards are predominantly related to the low altitude activity of takeoffs and landings at airports. We understand that authorities responsible for air safety are concerned with ways of reducing the appeal of airport sites and their surroundings to bird populations, thus minimizing the likelihood of bird-aircraft collisions on airport approaches.

Various agencies such as the International Civil Aviation Organization (ICAO), Transport Canada, and the U.S. Federal Aviation Authority (FAA) have proposed zoning regulations and guidelines for the control of land use in the vicinity of airports. Some of these guidelines deal specifically with the location of solid waste disposal sites because of their appeal as a major source of food for birds. Current Transport Canada guidelines recommend a minimum separation of eight kilometers between an airport and any solid waste disposal site. A study was commissioned by the Department of Municipal and Community Affairs, Government of the Northwest Territories, as the first phase in an effort to address the airport-landfill separation distance as it applies specifically to the Northwest Territories.

The purpose of the enclosed study was to address the scientific basis for the eight kilometre separation guideline presently used by Transport Canada. We do question the application of this guideline in the Northwest Territories. The economic implications of requiring an eight kilometre separation between every landfill site and airport in the Northwest Territories are tremendous. In the report a number of conclusions and recommendations were made which we would like YOU to consider for discussion.

Phase two of the program will focus on formulating guidelines that will be specific to different regions of the Northwest Territories, taking into account a number of criteria other than those related solely to the separation distance between airports and solid waste disposal sites.

. ../2

We would like to organize a meeting between Transport Canada officials, our consultant, and representatives from the Department of Municipal and Community Affairs. If possible, we would like to schedule this meeting before the end of the year. If you have any questions please do not hesitate to contact my office at (403) 873-7644. We look forward to your comments and a subsequent meeting to discuss the comments.

Vern Christensen
Director
Community Works and
Capital Planning

Enclosure

Cc. Doug Howard
Arctic Airport Division
MACA

Richard Soberman
Transmode Consultants Inc.

Les Devorak
President
Northern Air Transport Association

JOHNSON/rs

Transports Canada / Transport Canada

Aviation / Aviation

Ottawa, Ontario
KIA 0N8

DEC 13 1988


Your file Votre référence

Our File Notre référence
AAND5154-1 (AANDD)

Mr. Vern Christensen
Director
Community Works and
Capital Planning
Northwest Territories
Municipal and Community Affairs
Government of the Northwest Territories
Yellowknife, N.W.T.
X1A 2L9

Dear Mr. Christensen:

Your letter of October 25, 1988, concerning waste disposal sites in the vicinity of airports addressed to my colleague Mr. Swanston has been referred to me for reply.

I have reviewed your letter and the report of the study commissioned by your government.

I am pleased to inform you that as a result of several enquiries of this nature, we have clarified our position with respect to the provisions regarding disposal sites in the enactment of federal zoning regulations.

Effective immediately, the provision in the regulations prohibiting the location of waste disposal or other land uses which may attract birds within 8 kilometers of an airport will only be included upon the expert advice of a bird hazard specialism.

Related planning guidelines and manuals will be amended accordingly.

Yours truly,

M. D. Broadfoot
Chief
Air Navigation Policies
and Standards Division

Highways and Transportation
Marine Operations
215 Garry Street
Winnipeg, Manitoba
R3C 3Z1
(204) 945-3421



April 26, 1990

*Mr.* Glenn **Shortlif fe .**
**Deputy Minister**
**Transport Canada**
**Tower "C"**
**Ottawa, Ontario**
**KIA 0N8**

Dear **Mr. Shortliffe:**

**The Roads and Transportation Association (RTAC) Aviation Committee passed, at its spring meeting April 3-4, 1990 in Ottawa, a motion to bring to your attention an issue that is of concern to the Provinces and Territories. This being the planning guidelines for the use of land outside the airport boundary and specifically the Part II, Bird Hazards section of the document - Land Use in Vicinity of Airport, TP 1247, dated May 1981. The wording of these guidelines has presented problems for airport planners.**

**Of major concern is the guideline identifying that there** should be no food garbage disposal within 8 **km** of **an airport.** This guideline. is difficult **to** *adhere* **to in northern Canada remote communities where the airports are usually less than 8 km from a community. Also in the built-up areas of Canada, where there is intense competition for land, similar difficulties occur. The opponents to airport sites** *are* **using this document to support** their arguments and similarly opponents **to garbage dumps are using this provision to their advantage.**

. . ../2

ALIVE
A Safety Initiative of the Manitoba Government

To this end, we request Transport Canada undertake and update to the TP 1247 publication to take into consideration:

the differences in potential hazards when operating a piston powered and a turbine powered aircraft at an airport.

the recent developments and new techniques of waste disposal to reduce bird attraction (daily covering).

the need to undertake a site specific bird hazard evaluation if the landfill site is within 8 km of an airport.

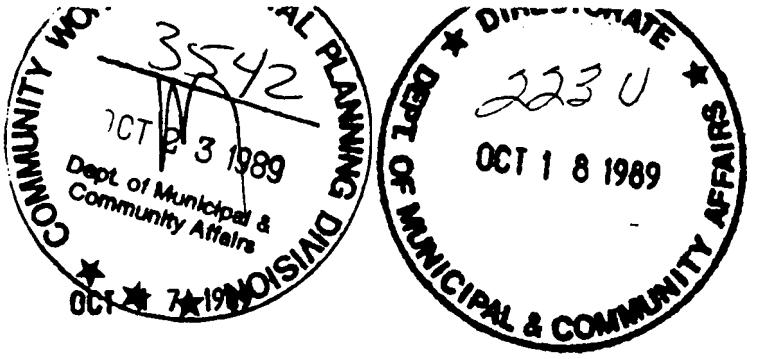
Your immediate attention to this matter is requested as the issue of landfill and airport sites is being actively debated, especially in southern *Ontario.*

Sincerely,

David O. Selby, Chairman
RTAC Aviation Committee

bcc : RTAC Aviation Committee Members

Northwest Territories Transportation




VERN CHRISTENSEN,
ASSISTANT DEPUTY MINISTER,
MUNICIPAL AND COMMUNITY AFFAIRS.

Interim **Guidelines for the Separation Of Solid Waste Site and Airports**

your letter of September 28, 1989 has been passed to me for action . Please accept this as the written statement you have requested.

The situation with regard to bird strikes is not as simple as may have been stated. We do agree the 8 km separation may be excessive for NWT conditions and sheer cost considerations. Bird strikes are a hazard and can produce very expensive problems. We have had no injuries as a result of strikes but there have been extremely expensive engine replacements and structural repairs reported. The problem has cost air carriers a 9reat deal over the years .

Nevertheless, we have had no injuries nor crashes because the odds are limited due to traffic volumes. The risk is low but the hazard is still real.

Birds are not a problem at most airports but some do, in fact, have this problem. With limited options available, we must treat this subject on a site specific basis and look closely at bird populations and locations of dumps with respect to water bodies, the community, and centreline of runway. We have to consider ways to mitigate the risk and not simply revamp the guidelines. Otherwise, we may jeopardize airport certification.

We will be pleased to work closely with YOU in this important issue.

L

Gordon Barber,
Assistant Deputy Minister.

cc: Director,
Arctic Airports.

Northwest Territories Renewable Resources


145 000

16 October 1989

Director
Community Works and
Capital Planning
Department of Municipal
Community Affairs

**Interim Guidelines for the Separation of Solid Waste Disposal Sites and Airports in the Northwest Territories**

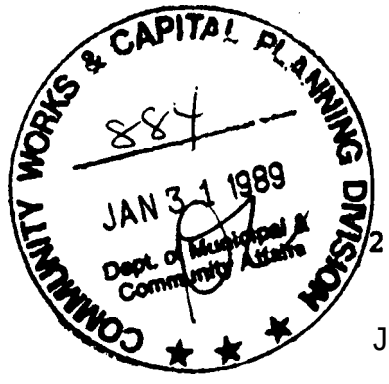
Thank you for your recent letter regarding the above mentioned guidelines. As you are aware, Dr. Robert Bromley has provided some assistance to this project by meeting with your staff and providing them with relevant information.

In response to your request for additional information in the form of a new study on bird population characteristics, I am afraid that we do not have the time or resources to devote to this field project. Dr. Bromley has informed me that the field work could easily be carried out by the consultants over a very short period of time in the spring and fall. Although we cannot undertake this study, we would be happy to assist you in designing such a project.

P. Kraft
A\Director
Wildlife Management Division

c.c. Dr. R. Bromley

Northwest Territories Kitikmeot Region




22 501 06

January 24, 1989

Mr. Ernie Frioult
Transport Canada
12th Floor
1100-9700 Jasper Avenue
Edmonton, Alberta
T5J 4El

SOLID WASTE DISPOSAL SITES/AIRPORTS, SEPARATION DISTANCES

I would like to confirm the decision regarding the proposed solidwaste site in relation to the airport in **Coppermine.**

It is my understanding that Transport Canada is dropping the traditional regulation of 8 kilometers separation distance between solidwaste sites and airports for arctic communities. Each arctic community will be examined on an individual basis.

From your review of the proposed solid waste site in Coppermine you give your general approval provided there is at least 300 feet between the side of the airport runway and any access road, and at least 800 feet between the end of the airport runway and any access road.

If you would like I will forward as-built information to you for your records.

If I can provide you any further information please contact me at (403) 983-7269.

Terry Brookes
Municipal Engineer
Municipal and Community Affairs
Kitikmeot Region

cc : Ken Johnson,
**Municipal and Community Affairs**
**Yellowknife, NWT**

Aviation Aviation

Your file Votre référence

Our File Notre référence
1675-4 (SANDDA)

Western Region
12th Floor
9700 Jasper Avenue
EDMONTON, Alberta
T5K 4E6



January 23, 1989

Mr. Terry Brookes
Municipal Engineer
Municipal and Community Affairs
CAMBRIDGE BAY, N.W.T.
XOE OCO

Dear Mr. Brookes:

YOUR 22 501 06 DATED JANUARY 9, 1989
PROPOSED SOLID WASTE SITE, COPPERMINE, N.W.T.

As discussed in our telephone conversation this morning, we have no objection to the proposed solid waste site as described in the above referenced letter and attachments. However, the access road to the new site must be at least 300 feet from the side of the runway and at the point where it crosses the extended runway centre-line it must be at least 800 feet from the runway.

Yours truly,

H. R. Kuszmaniuk
Inspector
Aeronautical Environment Officer

Canada

# APPENDIX C

## EXISTING RELATIONSHIP BETWEEN SOLID WASTE SITES AND AIRPORTS IN THE NUT

**JAMES J. CAMERON,** M.Sc., P.Eng.

NORTHERN CIVIL AND ENVIRONMENTAL ENGINEERING CONSULTANT

1675 - West 11'• Avenue
Vancouver, B.C.
V6J 2B8

(604)738-1327



March 4, 1986

**Moheb Michael, M. Sc.**
Planning Engineer,
**Community Works** and Capital Planning,
Department of **Local Government,**
**Government of the NUT,**
**Yellovknife, NUT**
XIA 2L9

**Re: Relationship Between Solid Waste Sites and Airports in the NWT**

Attached please find a Table with the **information** I assembled on the relationship between solid **vaste** sites and **airstrips** in co-unities **in** the NW?.

**Please** note that the distances **in** the Table are only **estimates.** Most *of* the distances were scaled **from** the **airphotos** in the report 'Community Water and Sanitation **Services'** (1981). In **some** cases the airstrip and/or the solid **vaste** site **vere** not indicated on the ● irphoto but distances **vere** estimated *from* other data provided **in** the report.

The Table provides the following **distances:**

1. The perpendicular distance from the **centre** line of the airstrip to the community **solid vaste** site. Note that the perpendicular distance can be **small** even though the separation **is** large.
2. The **shortest** distance between the airstrip **runvay** surface and the solid **vaste site.**
3. The distance between the **centre** of the **airstrip** (approximately the airport reference **point)** and the **solid vaste** site.

For comparative purposes the Table **also includes** the distance between the **airstrip** and the **nearest** residential area of the community, the community population, and the annual number of flights at the airstrip.

According to the data collected, of the 61 communities only 53 have ● local airstrip, In only 4 communities is there the ● lniaum separation recommended by Tranport Canada of 8 km between solid vaste sites and an ● irstrip. The mean shortest distance between the solid vaste site and the airstrip for the communities with data is 2034 ● or ● pprcxiaatly 2 km. For comparison the mean distance between the solid vaste site and the airstrip vas calculated as only 866 m.

There are many factors to consider vhen assessing the hazards of land use near ● irports ● nd in particular the relationship between solid vaste sites, communities, airstrips ● nd flight paths. The spacial relationship is an important *one* and I hope this data ● tid ● nalysis is useful to you in reviewing the relationships between solid vaste sites and airstrips.

Yours sincerely,

Jim Cameron

**TABLE 1 RELATIONSHIP BETWEEN SOLID WASTE SITES AND AIRPORTS**

**KEEWATIN REGION**

| COMMUNITY | POP[1] | FLIGHTS[2] | DISTANCES[3] FROM SOLID WASTE SITE TO AIRSTRIP (M) | | | AIRSTRIP TO TOWN[4] (M) |
|---|---|---|---|---|---|---|
| | | | PERP | SHORTEST | CENTRE | |
| BAKER LAKE | 1014 | 2707 | | | | |
| -Existing | | | 4500 | 4700 | 4900 | 1400 |
| -Proposed | | | 3000 | 1800 | 1800 | 900 |
| CHESTERFIELD | 251 | 424 | 1800 | 1800 | MOO / | 900 |
| CORAL HARBOUR | 432 | 874 | greater than 8 km | | | |
| ESKIMO POINT | 1138 | 1091 | 600 | 700 | 1200 | 1000 |
| RANKIN INLET | 1239 | 5518 | 0 | 1000 | 2000 | 700 |
| REPULSE BAY | 382 | 429 | 250 | 250 | 600 | 200 |
| WHALE COVE | 206 | 905 | greater than 8 km | | | |

**NOTES:**

1. Community population estimates December 1984 from Bureau of Statistics, GNWT.
2. Total aircraft movements in 1984 from 'Aircraft Movement Statistics: Annual Report 1984' Transport Canada TP577.
3. All distances were estimated from data on air photos in 'Community Water and Sanitation Servies' Dept. of Local Government GNWT.
   'PERP' is the perpendicular distance from the solid waste site to the centre line of the airstrip
   'SHORTEST' is the straight line distance from the solid waste site to the runway surface.
   'CENTRE' is the straight line distance from the solid waste site to the centre of the runway surface.
4. Distance from the airstrip to the nearest residential area of the community.

n/a Information not available or not applicable.

KITIKMEOT REGION

| COMMUNITY | POP | FLIGHTS | DISTANCES FROM SOLID WASTE SITE TO AIRSTRIP (M) PERP | SHORTEST | CENTRE | AIRSTRIP TO TOWN CENTRE (M) |
|---|---|---|---|---|---|---|
| BATHURST INLET | 21 | n/a | n/a | | | |
| CAMBRIDGE BAY | 887 | 3876 | 4080 | 4300 | 4400 | 2650 |
| COPPERMINE | 077 | 19ss | | | | 2500 |
| - Existing | | | 1100 | 1100 | 11s0 | |
| - Proposed | | | 1200 | 1300 | 1700 | |
| GJOA HAVEN | 647 | 761 | | | | n/a |
| - Existing | | | 1800 | 1800 | 2000 | |
| - Proposed | | | 1600 | 1900 | 2300 | |
| HOLMAN ISLAND | 347 | 679 | | | | |
| - Existing | | | 1900 | 1900 | 2000 | |
| - Proposed | | | 1000 | 1s00 | 1800 | |
| PELLY BAY | 278 | 682 | 900 | 1300 | 1900 | 200 |
| SPENCE BAY | 454 | 562 | 600 | 600 | 800 | |

INUVIK REGION

| COMMUNITY | POP | FLIGHTS | DISTANCES FROM SOLID WASTE SITE TO AIRSTRIP (M) PERP | SHORTEST; | CENTRE | AIRSTRIP TO TOWN (M) |
|---|---|---|---|---|---|---|
| AKLAVIK | 774 | 2%8 | | | | 100 |
| - Old | | | 570 | 970 | 1750 | |
| - New | | | 4000 | 4000 | 4000 | |
| ARCTIC RED RIVER | 121 | 200 | | | | |
| COLVILLE LAKE | 59 | n/a | 20 | 20 | 20 | 300 |
| FT. FRANKLIN | 578 | n/a | 1000 | 1000 | 1000 | 250 |
| FT. GOOD HOPE | 539 | 2077 | 2440 | 2600 | 2600 | 300 |
| FT. McPHERSON | 67S | 1048 | n/a (greater than 8 km.) | | | |
| FT. NORMAN | 292 | 36% | 375 | 600 | 97s | 67S |
| INUVIK | 3714 | 26417 | n/a (greater than 8 km.) | | | |
| NORMAN WELLS | 555 | 36208 | 3800 | 4100 | 4200 | 300 |
| SACHS HARBOUR | 165 | 508 | 490 | 670 | 1050 | 800 |
| TUKTOYAKTUK | 858 | 17641 | 1100 | 1100 | 1450 | 700 |

**BAFFIN REGION**

| COMMUNITY | POP | FLIGHTS | DISTANCES FROM SOLID WASTE SITE TO AIRSTRIP (M) PERP | SHORTEST | CENTRE | AIRSTRIP TO TOWN (M) |
|---|---|---|---|---|---|---|
| ARCTIC BAY | 417 | n/a | 2s00 | 2500 | 2500 | 600 |
| BROUGHTON ISLAND | 415 | 764 | 600 | 3800 | 5000 | 900 |
| CAPE DORSET | 861 | 763 | 1500 | 1900 | 2300 | 100 |
| CLYDE RIVER | 50s | n/a | 4000 | 4000 | 4000 | 3000 |
| FROBISHER BAY | 2684 | 8489 | 1000 | 2200 | 3s00 | 4s0 |
| GRISE FIORD | 135 | 207 | n/a (not on airphoto) | | | |
| HALL BEACH | 399 | n/a | 6000 | 6000 | 6000 | 3200 |
| IGLOOLIK | 780 | 749 | >2500 | >2s00 | >2500 | >1000 |
| LAKE HARBOUR | 266 | 663 | >1000 | >1000 | >1000 | >1000 |
| NANISIVIK | 277 | 644 | n/a (not air photo) | | | |
| PANGNIRTUNG | 920 | 1075 | 700 | 1200 | 1700 | 50 |
| POND INLET | 818 | 1146 | 7s0 | 1200 | 1600 | 100 |
| RESOLUTE BAY | 142 | 6655 | 0 | 3600 | 4400 | 2900 |
| SANIKILUAQ | 41s | 967 | n/a (not on airphoto) | | | |

## FORT SMITH REGION

| COMMUNITY | POP | FLIGHTS | DISTANCES FROM SOLID WASTE SITE TO AIRSTRIP (H) PERP | SHORTEST | CENTRE | AIRSTRIP TO TOWN (n) |
|---|---|---|---|---|---|---|
| DETAH | 150 | n/a (No local airstrip) | | | | |
| ENTERPRISE | 46 | n/a (No local airstrip) | | | | |
| FT. LIARD | 420 | 2395 | 2500 | 2s00 | 2s00 | 200 |
| FT. PROVIDENCE | 662 | n/a | 4000 | 4000 | 4000 | 3000 |
| FT. RESOLUTION | 498 | 73a | n/a (not on airphoto) | | | |
| FT. SIMPSON | 1068 | 7210 | n/a | 10000 | 10000 | 100 |
| FT. SMITH | 2436 | 10004 | S/W site 9. km from town | | | n/a |
| HAY RIVER | 3200 | 10301 | n/a | 12000 | 12000 | 500 |
| HAY RIVER RESERVE | | n/a (same as HAY RIVER) | | | | |
| JEAN MARIE RIVER | 74 | n/a | n/a | 3000 | 3000 | 150 |
| KAKISA LAKE | 34 | n/a (no local airstrip) | | | | |
| LAC LA MARTRE | 300 | n/a | 2200 | 2200 | 2200 | 300 |
| NAHANI BUTE | 92 | n/a | | < 200 | | 800 |
| PINE POINT | 1604 | n/a | n/a | | | n/a |
| RAE LAKES | 209 | n/a | 200 | 600 | 800 | 100 |
| RAE | 1541 | n/a | n/a | 3500 | 3500 | 500 |
| EDZO | n/a | same as RAE) | | | | |
| SNARE LAKE | 79 | n/a (No airstrip) | | | | |
| SNOWDRIFT | 264 | n/a | n/a (not on airphoto) | | | |
| TROUT LAKE | 63 | n/a | 100 | 200 | 400 | 7s |
| WRIGLEY | 147 | 1520 | n/a (not on airphoto) | | | |
| YELLOWKNIFE | 10751 | 53117 | 1800 | 2600 | 3200 | 1400 |

HEAH VALUES'

| COMMUNITY | POP | FLIGHTS | DISTANCES FROM SOLID WASTE SITE TO AIRSTRIP (M) PERP | SHORTESTI | CENTRE | AIRSTRIP TO TOWN (M) |
|---|---|---|---|---|---|---|
| MEAN VALUES | | | 1723 | 2034 | 2338 | 866 |

NOTE: Mean values are calculated using only the available data for existing facilities. Mean values are calculated for communities where the separation between airstrip and solid waste site is less than 8 km.

# APPENDIX D

## US DEPARTMENT OF TRANSPORTATION
## FEDERAL AVIATION AUTHORITY

## WASTE DISPOSAL SITES
## ON OR NEAR AIRPORTS

**ORDER**

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

5200.5A

1/31/90

SUBJ: WASTE DISPOSAL SITES ON OR NEAR AIRPORTS

1. PURPOSE This order provides guidance concerning the establishment, elimination or monitoring of landfills, open dumps, waste disposal sites or similarly titled facilities on or in the vicinity of airports.

2 DISTRIBUTION. This crder is distributed to the division level in the Offices of Airport Planning and Programming, Airport Safety and Standards, Air Traffic Evaluations and Analysis, Aviation Safety Oversight, Air Traffic operations Service, and Flight Standards Service; to the division level in the regional Airports, Air Traffic, and Flight Standards Divisions; to the director level at the Aeronautical Center and the FM Technical Center; and a limited distribution to all Airport District Offices, Flight Standards Field Offices, and Air Traffic Facilities.

3. CANCELLATION. Order 5200.5, FAA Guidance Concerning Sanitary Landfills On Or Near" Airports, dated October 16, 1974, is canceled.

4. BACKGROUND. Landfills, garbage dumps, sewer of fish waste outfalls and other similarly licensed or titled facilities used for operations to process, bury, store or otherwise dispose of waste, trash and refuse will attract rodents and birds. Where the dump is ignited and produces smoke, an additional attractant is created. M of the above ate undesirable and potential hazards to aviation since they erode the safety of the airport environment. The FAA neither approves nor disapproves locations of the facilities above. Such action is the responsibility of the Environmental Protection Agency and/or the appropriate state and local agencies. The role of the FAA is to ensure that airport owners and operators meet their contractual obligations to the United States government regarding compatible land uses in the vicinity of the airport. While the chance of an unforeseeabk, random bird strike in flight will always exist, it is nevertheless possible to define conditions within fairly narrow limits where the risk is increased. Those high-risk conditions exist in the approach and departure patterns and landing areas on and in the vicinity of airports. The number of bird strikes reported on aircraft is a matter of continuing concern to the FAA and to airport management. Various observations support the conclusion that waste disposal sites are artificial attractants to birds. Accordingly, disposal sites located in the vicinity of an airport are potentially incompatible with safe flight operations. Those sites that are not compatible need to be eliminated. Airport owners need guidance in making those decisions and the FAA must be in a position to assist. Some airports are not under the jurisdiction of the community or local gowning body having control of land usage in the vicinity of the airport. In these cases, the airport owner should use its resources and exert its best efforts to close or control waste disposal operations within the general vicinity of the airport.

5. EXPLANATION OF CHANGES. The following list outlines the major changes to Order 5200.5:

● . Recent developments and new techniques of waste disposal warranted updating and clarification of what constitutes a sanitary landfill. This listing of new titles for waste disposal were outlined in paragraph 4.

b. Due to a reorganization which placed the Animal Damage Control branch of the U.S. Department of Interior Fish and Wildlife Service under the jurisdiction of the U.S. Department of Agriculture, an address addition was necessary.

c. A zone of notification was added to the criteria which should provide the appropriate FAA Airports office an opportunity to comment on the proposed disposal site during the selection process.

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Initiated By: AAS-300

6. ACTION.

a. Waste disposal sites located or proposed to be located within the areas established for an airport by the guidelines set forth in paragraph 7a, b, and c of this order should not be allowed to operate. If a waste disposal site is incompatible with an airport in accordance with guidelines of paragraph 7 and cannot be closed within a reasonable time, it should be operated in accordance with the criteria and instructions issued by Federal agencies such as the Environmental Protection Agency and the Department of Health and Human Services, and other such regulatory bodies that may have applicable requirements. The appropriate FAA airports office should advise airport owners, operators and waste disposal proponents against locating, permitting or concurring in the location of a landfill or similar facility on or in the vicinity of airports.

(1) Additionally, any operator proposing a new or expanded waste disposal site within 5 miles of a runway end should notify the airport and the appropriate FAA Airports office so as to provide an opportunity to review and comment on the site in accordance with guidance contained in this order. FAA field offices may wish to contact the appropriate State director of the United States Department of Agriculture to assist in this review. Also, any Air Traffic control tower manager or Flight Standards District Office manager and their staffs that become aware of a proposal to develop or expand a disposal site should notify the appropriate FAA Airports office.

b. The operation of a disposal site located beyond the areas described in paragraph 7 must be properly supervised to insure compatibility with the airport.

c. If at arty time the disposal site, by virtue of its location or operation, presents a potential hazard to aircraft operations, the owner should take action to correct the situation of terminate operation of the facility. If the owner of the airport also owns or controls the disposal facility and is subject to Federal obligations to protect compatibility of land uses around the airport, failure to take corrective action could place the airport owner in noncompliance with its commitments to the Federal government. The appropriate FAA office should immediately evaluate the situation to determine compliance with federal agreements and take such action as may be warranted under the guidelines as prescribed in Order 5190.6, Airports Compliance Requirements, current edition.

(1) Airport owners should be encouraged to make periodic inspections of current operations of existing , ., disposal sites near a federally obligated airport where potential bird hazard problems have been reported.

d. 'his order is not intended to resolve all related problems, but is specifically directed toward eliminating waste disposal sites, landfills and similarly titled facilities in the proximity of airports, thus providing a safer environment for aircraft operations.

e. At airports certificated under Federal Aviation Regulations Part 139, the airport certification manual/specifications should require disposal site inspections at appropriate intervals for those operations meeting the criteria of paragraph 7 that cannot be closed. These inspections are necessary to assure that bird populations are not increasing and that appropriate control procedures are being established and followed. The appropriate FAA Airports offices should develop working relationships with state aviation agencies and state agencies that have authority over waste disposal and landfills to stay abreast of proposed developments and expansions and apprise them of the hazards to aviation that these sites present.

f. When proposing a disposal site, operators should make their plans available to the appropriate state regulatory agencies. Many states have criteria concerning siting requirements specific to their jurisdictions.

g. Additional information on waste disposal, bird hazard and related problems may be obtained from the following agencies:

U.S. Department of Interior Fish and Wildlife Service
18th arid C Streets, NW
washingtort, DC 20240

U.S. Department of Agriculture
Animal Plant Health Inspection Service
P.O. Box 96464
Animal Damage Control Program
Room 1624 South Agriculture Building
Washington, DC 20090-6464

Environmental Protection Agency
401 M Street, SW
Washington, DC 20406

U.S. Department of Health and Human Services
200 Independence Avenue, SW
Washington, DC 20201

7. CRITERIA. Disposal sites will be considered as incompatible if located within areas established for the airport through the application of the following criteria:

a. Waste disposal sites located within 10,000 feet of any runway end used or planned to be used by turbine powered aircraft.

b. Waste disposal sites located within 5,000 feel of any runway end used only by piston powered aircraft.

c. Any waste disposal site located within a 5 mile radius of a runway end that attracts or sustains hazardous bird movements from feeding, water or roosting areas into, or across the runways and/or approach and departure patterns of aircraft

Leonard E. Mudd
Director, Office of Airport Safety and Standards

U.S. Department of Transportation
Federal Aviation Administration

# Memorandum

Subject: INFORMATION: Order 5200.5A, Waste Disposal Sites On or Near Airports

Date: JUN 20 1990

Reply to Attn. 01:

From: Assistant Administrator for Airports, ARP-1

To: All Regions and AAC-960
Attn: Manager, Airports Division

Recently, there have been many questions raised concerning the location of waste disposal sites on or near airports. This correspondence is intended to provide guidance on these issues.

*Order* 5200.5A, Waste Disposal Sites On or Near Airports, was revised and signed on January 31, 1990. This revision was necessary to update the earlier document and to identify modern terminology used to describe waste disposal operations.

In accordance with the order, regional offices should categorically object to all "open processing" waste disposal operations that are proposed to be located within the 5,000- and 10,000-foot limits outlined in the *order.* This would also apply to proposals to expand existing "open processing" waste disposal sites within these distance criteria. Waste transfer stations that are completely enclosed will have to be reviewed on a case-by-case basis.

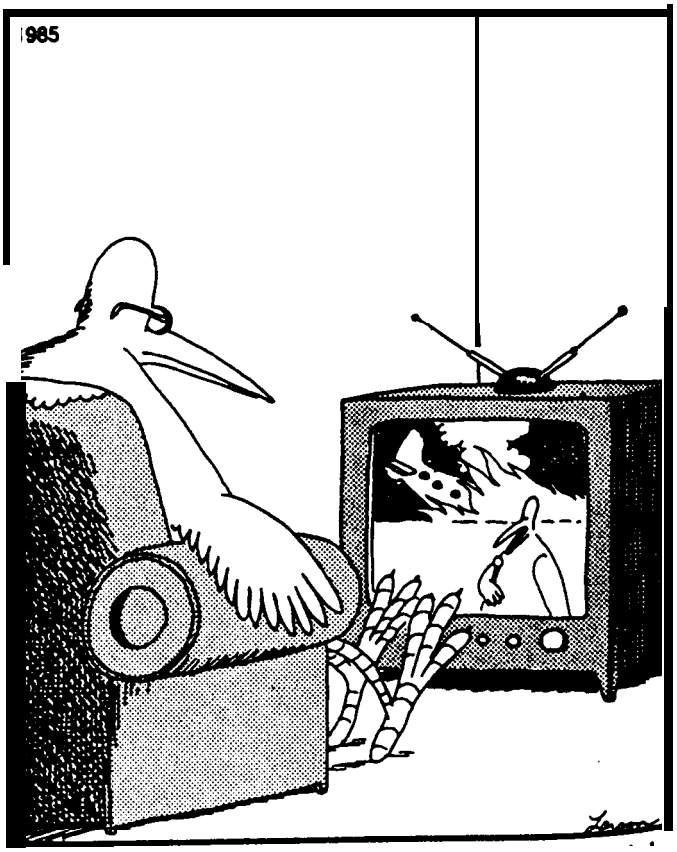
Regional or district offices should remain alert to *any waste* disposal operation that is proposed within 5 miles of an airport. The appropriate office should review the proposal to make certain the location does not jeopardize the traffic pattern *of* the associated airport in accordance with criteria contained in Order 5200.5A, Paragraph 7c. Moving a preposed landfill outside of the 5,000-foot or 10,000-foot criteria

for incompatibility does not automatically remove our objections to the proposal.

If there is any doubt about a specific operation, please, contact Eugene LeBoeuf, FTS 267-8792.

Leonard L. Griggs, Jr.

# THE BIRD'S PERSPECTIVE




"Details are still sketchy, but we think the name of **the bird sucked** into the **jet's engines was** Harold Meeker."