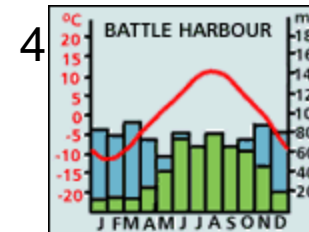
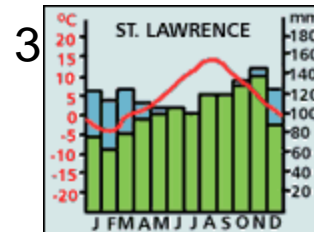
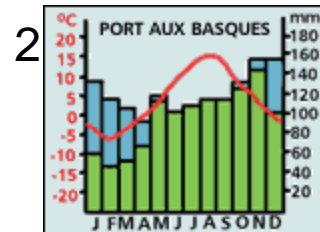
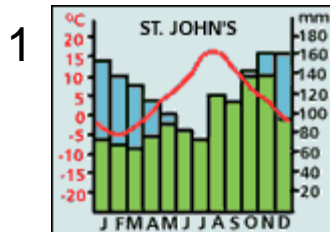
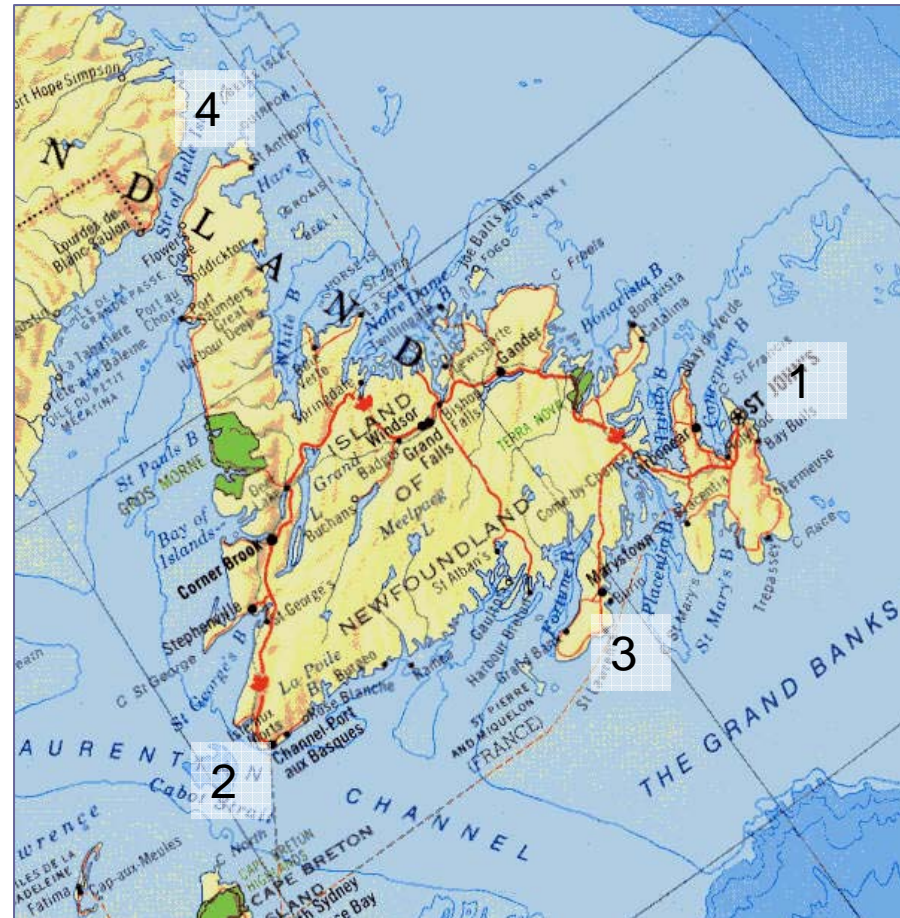
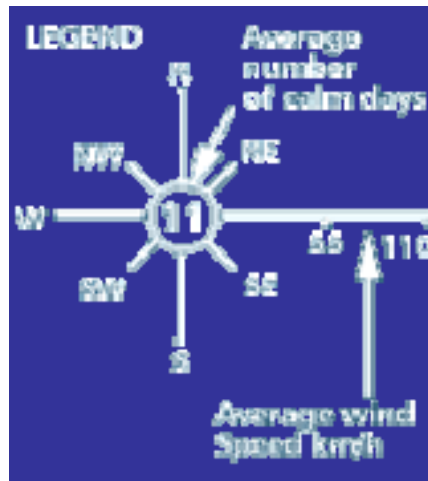
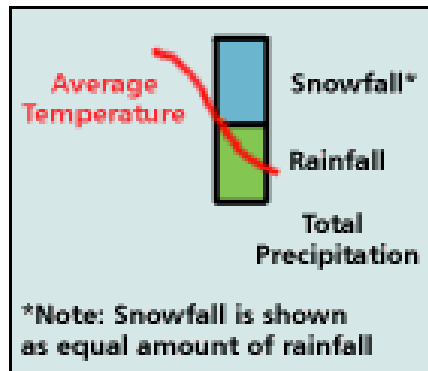


Legend/Key



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PROJECT TITLE
**WIND ENGINEERING
RESEARCH LABORATORY**

DRAWING TITLE
**N.L. WIND RESOURCES
AT A GLANCE**

CHECKS

PROJECT NO.
WER106-P1

DRAWING NO.
P1-SITE-01

DATE
FEB., 2006

DRAWN
BY **SEB**

Source: Department of Geography Memorial University of Newfoundland

St. John's Meteorology

St. John's Airport is located in the northeast corner of the Avalon Peninsula and is in close proximity to water in almost every direction. The elevation of the Airport is about 450 feet and the terrain slopes steadily downward towards Torbay, reaching sea level. To the east, cliffs rise to over 500 feet at the ocean edge. Marshland, at an elevation of 200 or 300 feet, lies beyond these cliffs.

The winds at St. John's are, for the most part, determined by large-scale weather systems. The prevailing wind direction is from the western quadrant but does vary slightly from season to season. Winds during the winter are predominantly from the west, whereas summer winds exhibit a shift to a more southwesterly direction due to the strengthening of the Bermuda High over the Atlantic Ocean. The stronger winds generally occur in the winter and are always associated with storms moving north-eastward near Newfoundland. Gusts of up to 35 knots occur frequently at St. John's and often persist for prolonged periods of time. Winds with gusts to 35 knots or more occur most frequently from the southwest. Very strong winds with gusts to 60 knots or more occur mostly with very deep, low pressure systems that pass to the west of the Avalon Peninsula. Calm winds, on the other hand, only occur about 2% of the time.

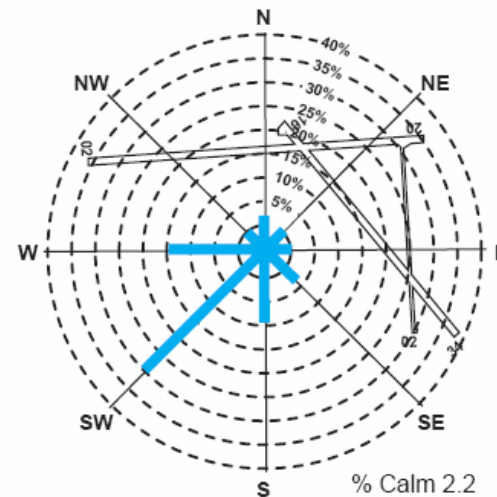
Although sea breeze activity does occur at St. John's, its overall effect on the prevailing wind direction is small. Even if the water temperatures are favourable for the development of sea breezes, the prevailing wind speed and direction are often such that any sea breeze formation will be suppressed. When they do develop, sea breezes at St. John's tend to be between 120 and 150 degrees or between 40 and 60 degrees.

St. John's Airport has a reputation for being one of the foggiest airports in Canada. The worst cases by far occur during the spring. Low ceilings and visibility are extremely common when winds are from the northeast to southeast. This is due to the upslope nature of the terrain and the air's prolonged exposure to the ocean when winds are from these directions. As seen from the winter diagram, when IFR conditions are present, there is very little diurnal variation. In the summer time, sea fog may move inland at night, however, it often burns off during the day accounting for the more pronounced improvement after about 1000 UTC on the summer diagram.

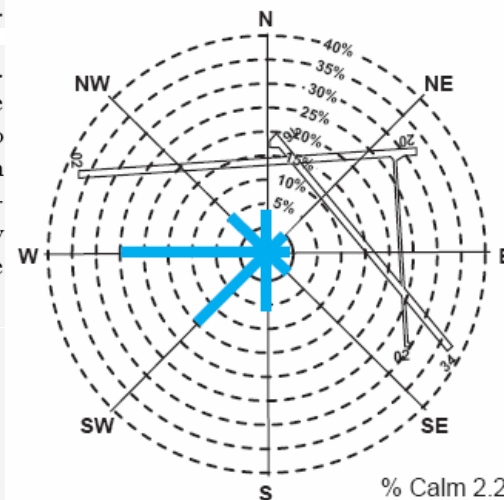
The fall is more stable at St. John's in that IFR conditions are generally less frequent during this time than during all other seasons. Although very low conditions sometimes exist in mild flow, particularly if fog blankets the water south of the Avalon Peninsula, operational ceilings usually exist in the winter especially when winds are from the western quadrant. IFR conditions in this season are often due to snow and blowing now and can be quite variable. A particular hazard to aviation that develops frequently at St. John's is freezing precipitation, which occurs an average of 175 hours each year.

Source: NavCanada at: www.navcanada.ca/ContentDefinitionFiles/publications/lak/atlantic/5-AE34.PDF

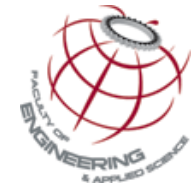
St John's (Torbay)
Wind Frequency by Direction
Summer



St John's (Torbay)
Wind Frequency by Direction
Winter



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PROJECT TITLE
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ST. JOHN'S METEOR.
DATA

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WER106-P1

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BY SEB

St. John's Wind Statistics

Wind

The majority of wind measurements are made by anemometers installed at ten metres above the ground. A substantial minority of sites have instruments installed at other heights, usually greater than ten metres. Wind in the first ten's of metres above the ground tends to increase in speed and veer with height.

Winds are normally measured at level, open sites removed as much as possible from obstacles to wind flow such as trees, buildings, or hills.

At the majority of principal stations, wind is measured by taking a one- or (since 1985) two-minute mean at each observation, from a U2A anemometer. At other wind-measuring sites, values are usually obtained from autographic records of U2A or 45B anemometers. Averaging periods may vary from one minute to an hour. Winds measured by U2A's are recorded to the nearest ten degrees, while those from the 45B provide them to eight points of the compass. The extreme gust speed is the instantaneous peak wind observed from the anemometer dials, or abstracted from a continuous chart recording.

Where directions were measured more precisely than eight points, they have been converted to this format. The direction is defined as that from which the wind blows.

Statistics listed below are provided as a guide to determine the validity of normals and extremes calculations. For example, a station with 30 years of record between 1971 and 2000 with no missing years would be a more reliable normal than a station with 15 years of record and 2 missing years. Less than 100% possible observations indicates that out of the total number of observations used, some records were missing.
Calculation Information for 1971 to 2000 Canadian Normals Data

Station Name: ST JOHN'S A

Province: NFLD

Latitude (dd mm): 47 37 N

Country: CAN

Longitude (ddd mm): 52 44 W

Time Zone: NTZ

Latitude (decimal degrees): 47.62

Climate Id: 8403506

Longitude (decimal degrees): -52.74

WMO Id: 71801

Elevation (m): 140.5

TC Id: YYT

Station Status: Active

<i>WIND for St. John's Area</i>	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Daily Average (°C)	-4.8	-5.4	-2.5	1.6	6.2	10.9	15.4	15.5	11.8	6.9	2.6	-2.2	4.7
Speed (km/h)	27.6	26.5	26.1	22.5	21.1	21.2	20.7	19.8	20.7	22.7	24.5	26.6	23.3
Most Frequent Direction	W	W	SW	SW	SW	SW	SW	SW	SW	SW	W	W	SW
Maximum Hourly Speed	120	137	121	93	101	74	67	84	97	103	105	97	
Date (yyyy/dd)	1977/20	1959/16	1956/15	1960/10	1975/02	1976/13	1979/06	1953/06	1955/21	1955/24	1955/27	1954/10+	
Maximum Gust Speed	167	193	193	159	146	108	107	113	153	153	161	153	
Date (yyyy/dd)	1977/20	1964/09	1956/15	1960/10	1975/01	1959/11	1977/23	1955/22+	1955/21	1955/15	1955/27	1963/20	
Direction of Maximum Gust	SW	SW	NW	SW	N	NE	SE	SW	S	NW	SW	S	NW
Days with Winds >= 52 km/hr	10.3	7.4	7.5	3.7	1.9	1.6	1.1	0.8	2.4	4.3	6.2	9.6	56.7
Days with Winds >= 63 km/hr	5.2	3.2	3.6	1.1	0.4	0.2	0.1	0.1	0.7	1.2	1.9	4.2	22.1

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DETAILED METEOR DATA

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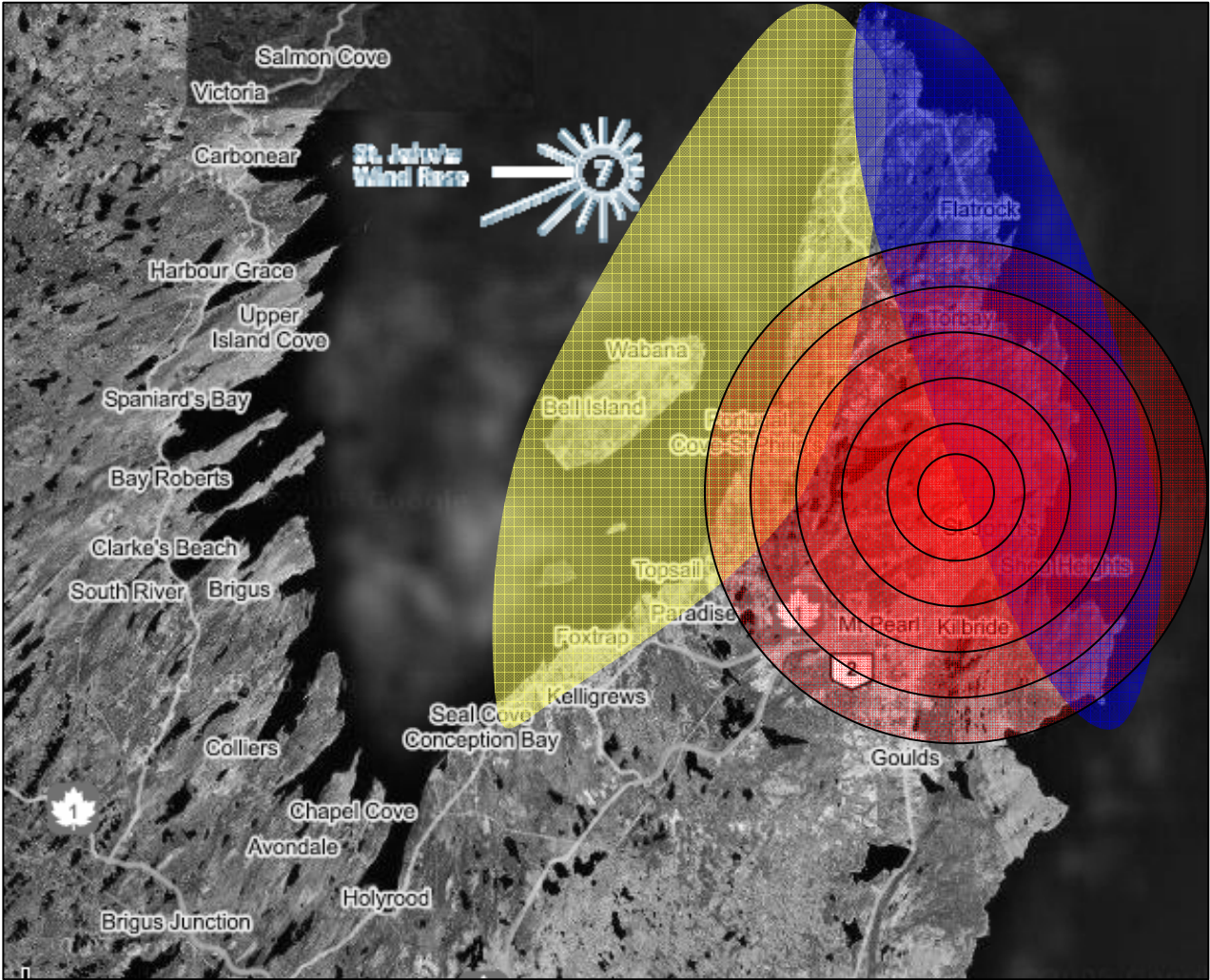
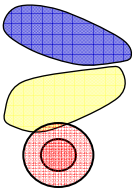
St. John's Region Exposure Profiles

Key

Severe Storm/Icing Exposure – N, NE, E

Prevailing Coastal Exposure – W, SW

Proximity to Memorial Laboratory



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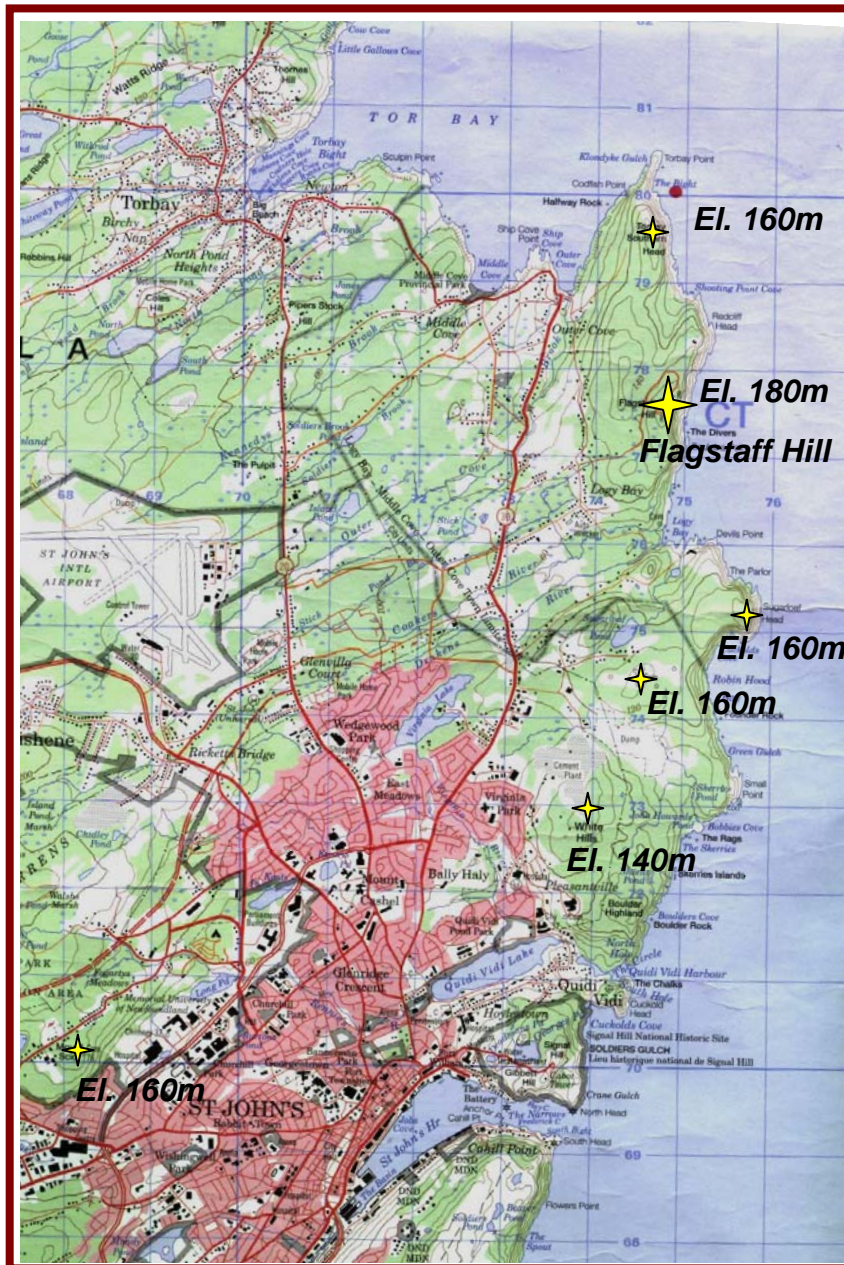
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St. John's East Storm Exposure Sites



Criteria

- Exposure to harsh wind environment
- Ease of Access
- Existing support Infrastructure
- Security
- Permitability
- Proximity to Memorial
- Representative of typical conditions

★ Prospective Wind Research Site

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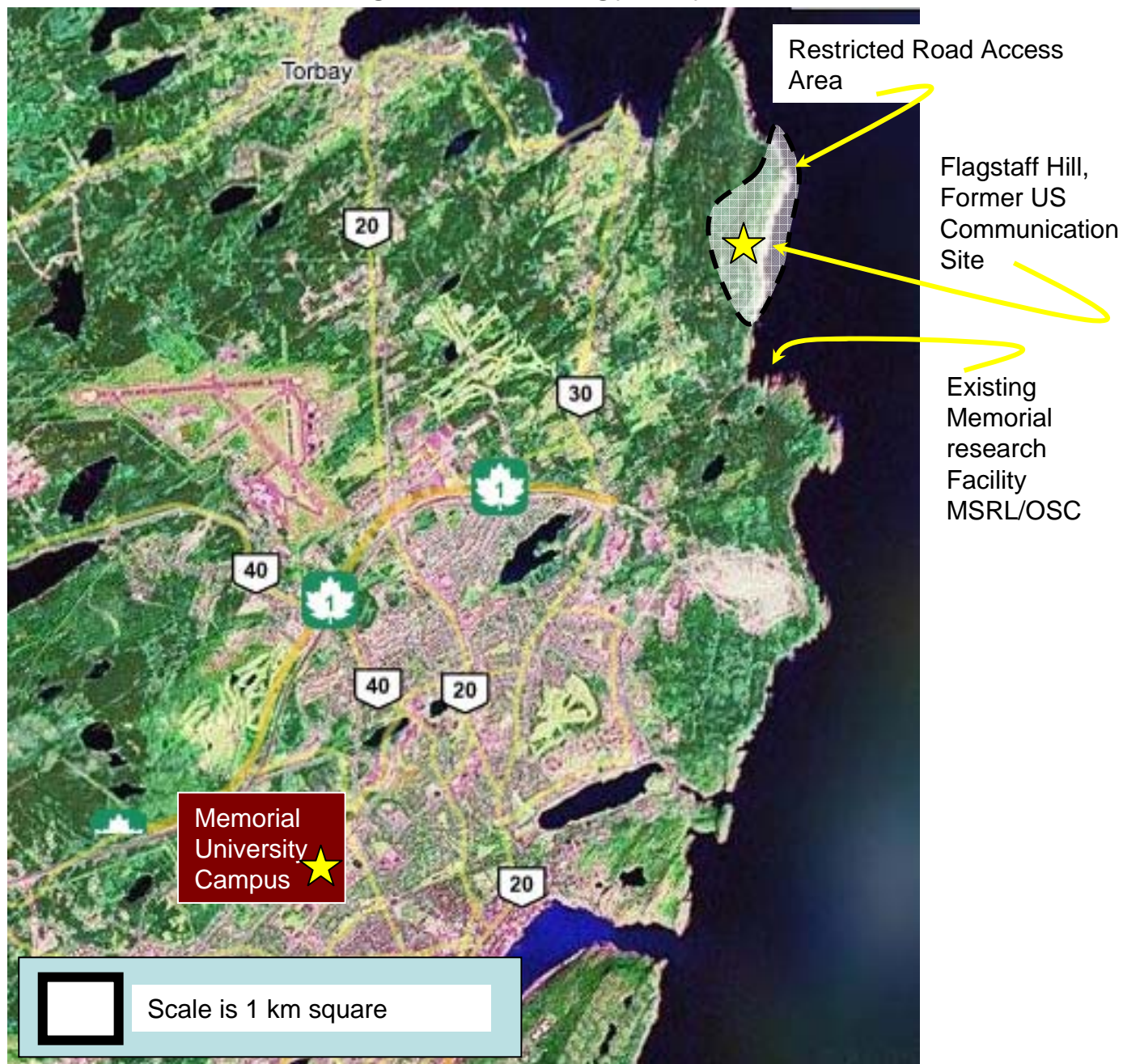
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Preferred Site – Flagstaff Hill, Logy Bay



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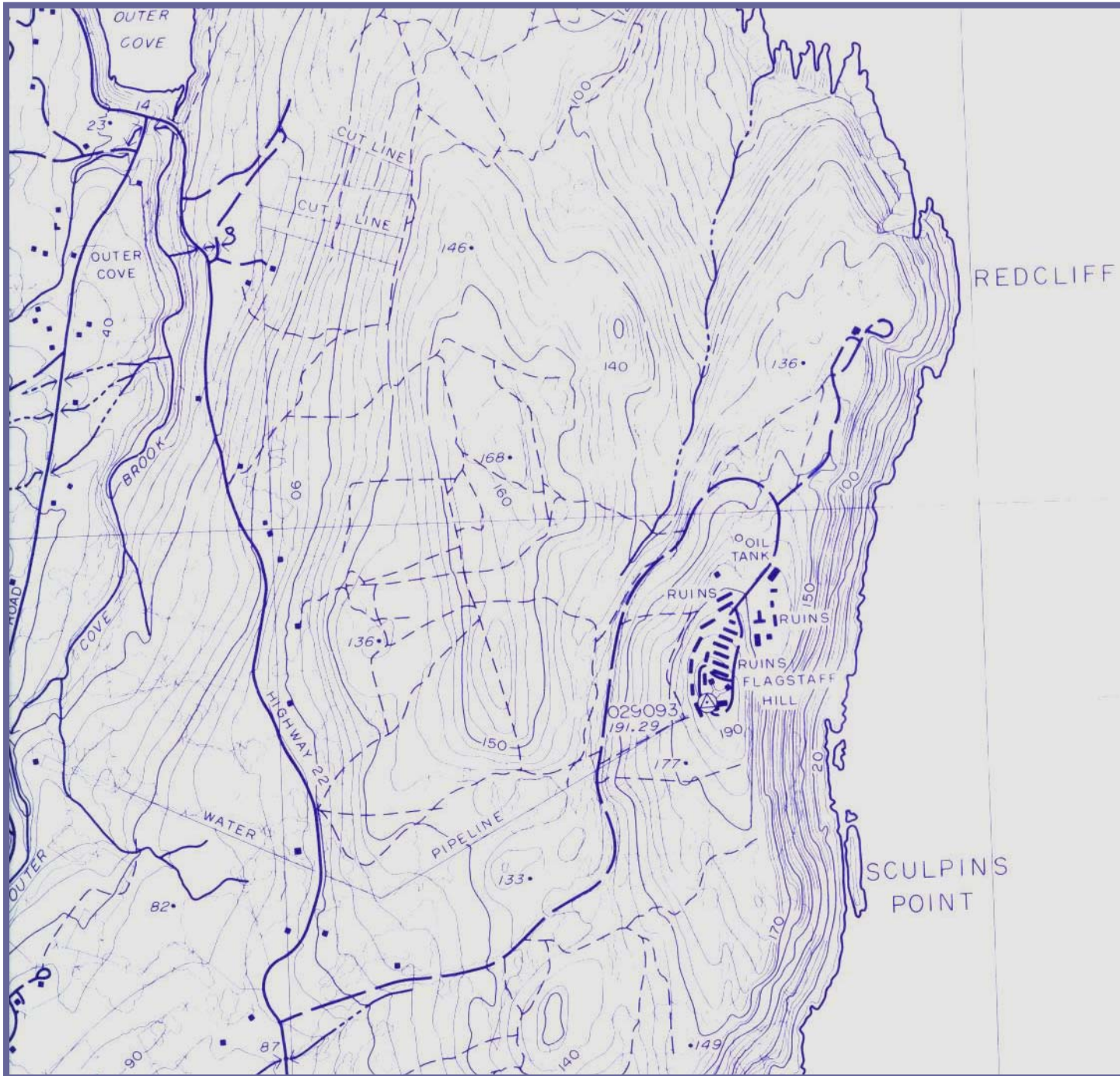
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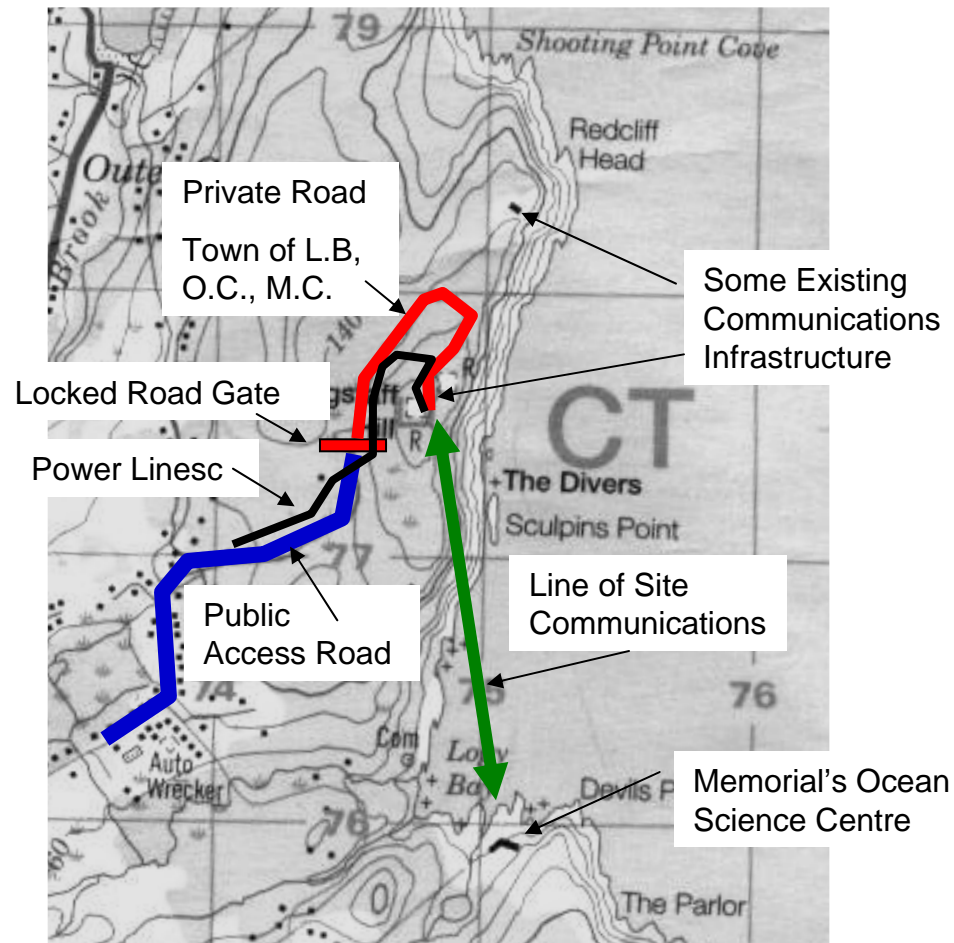
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Flagstaff Hill, Access and Power



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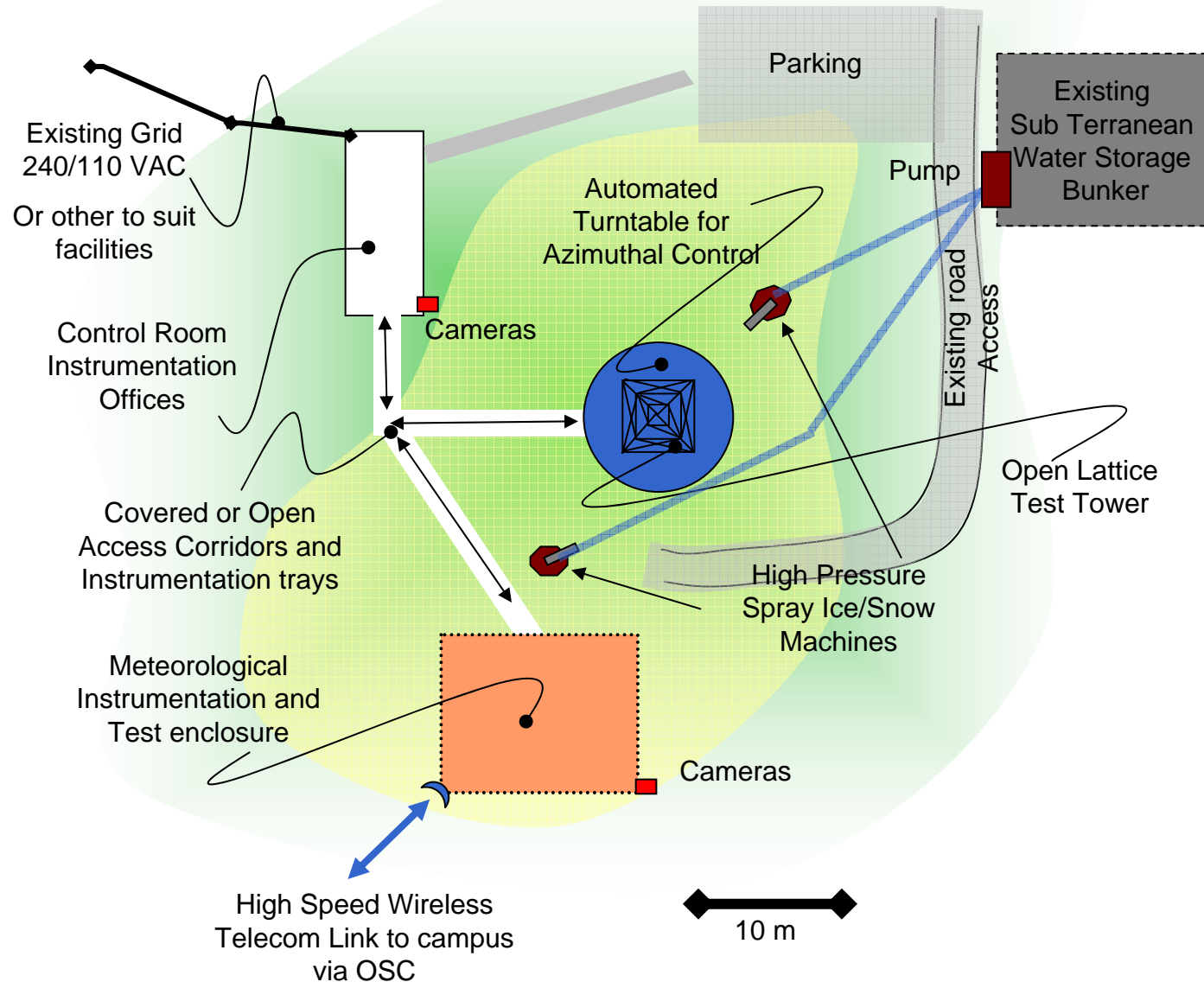
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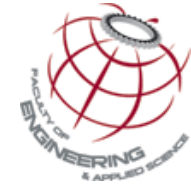
Conceptual Layout for Flagstaff Hill Field Test Facility



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CONCEPTUAL LAYOUT

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PREFERRED SITE PHOTOS

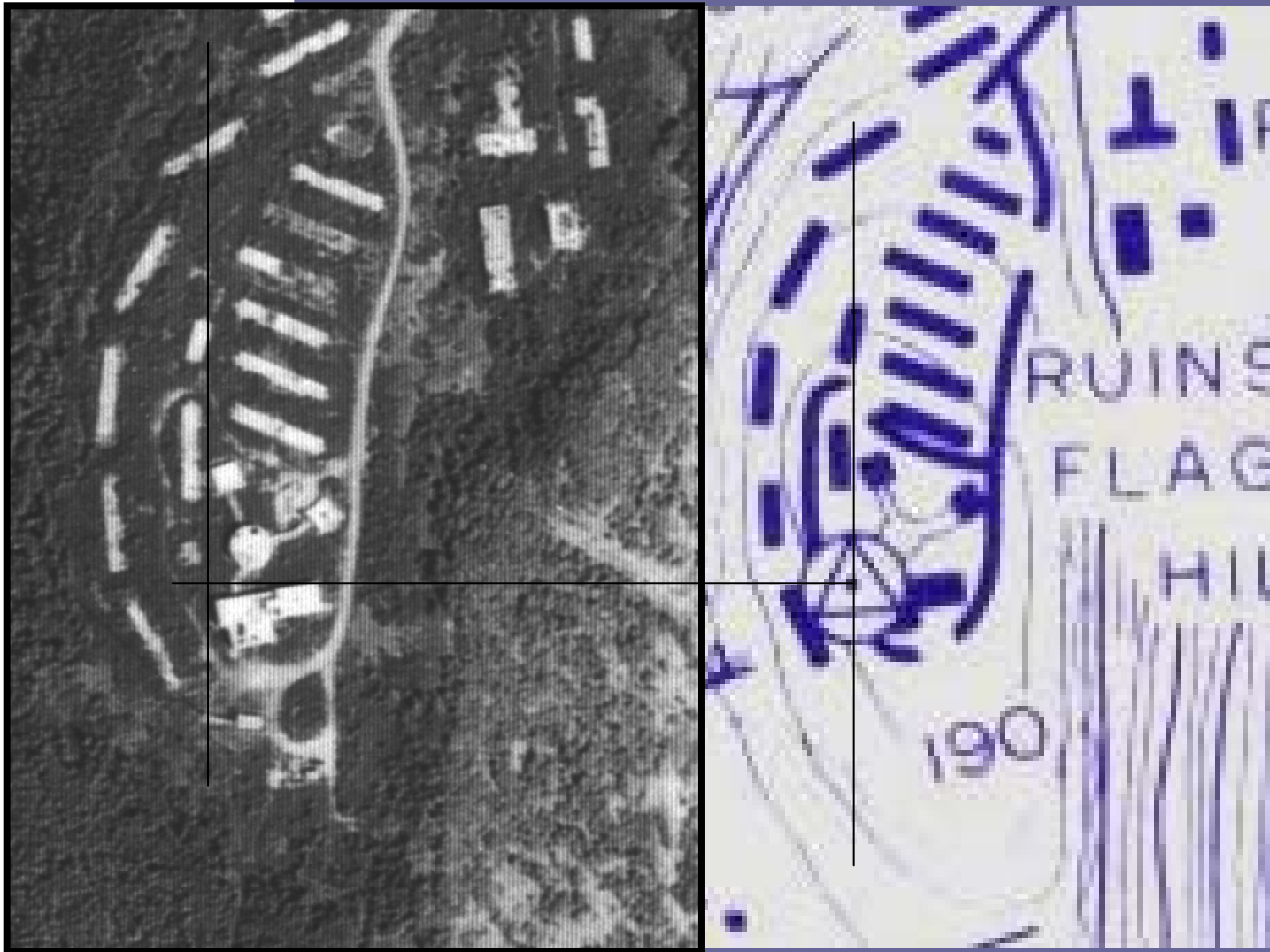
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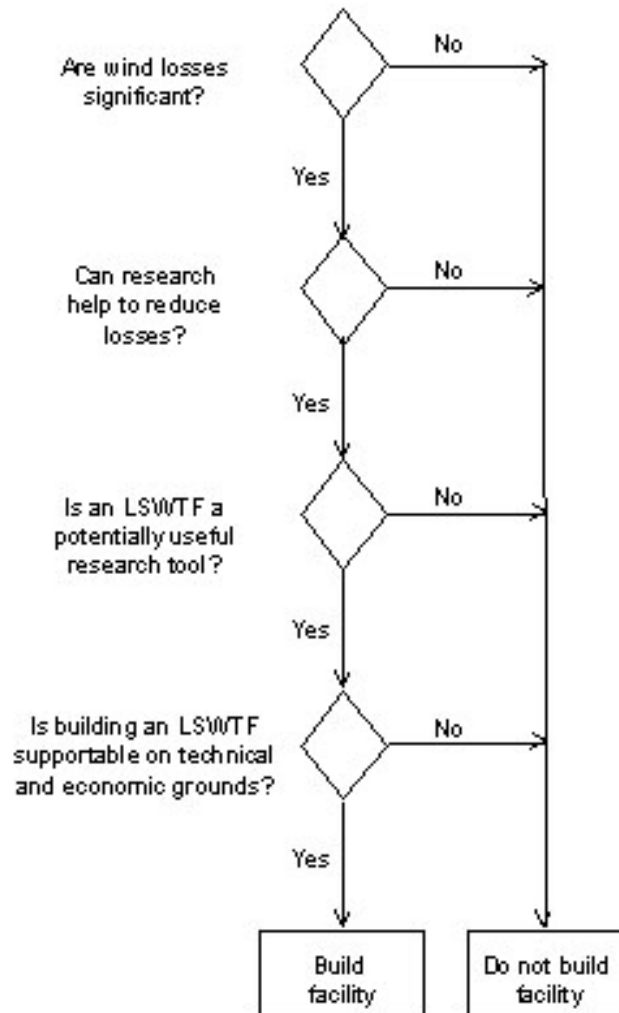
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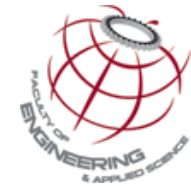
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About the Program	Working with Industry	Facilities Tour	For Consumers	NWTC Library
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Building 251 & High Bay
Dynamometer Test Facility
Hybrid Test Facility
Advanced Research Turbine
Turbine Test Pads

Facilities Tour

Turbine Test Pads

In addition to the two advanced research turbines permanently installed on the site, the NWTC provides test pads for manufacturers that need to test their prototype machines. Companies that have had turbines tested at the NWTC include the Atlantic Orient Corporation, Bergey, Northern Power Systems, and the Wind Turbine Company.



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PROJECT TITLE
WIND ENGINEERING
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SAMPLE TEST SITE

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