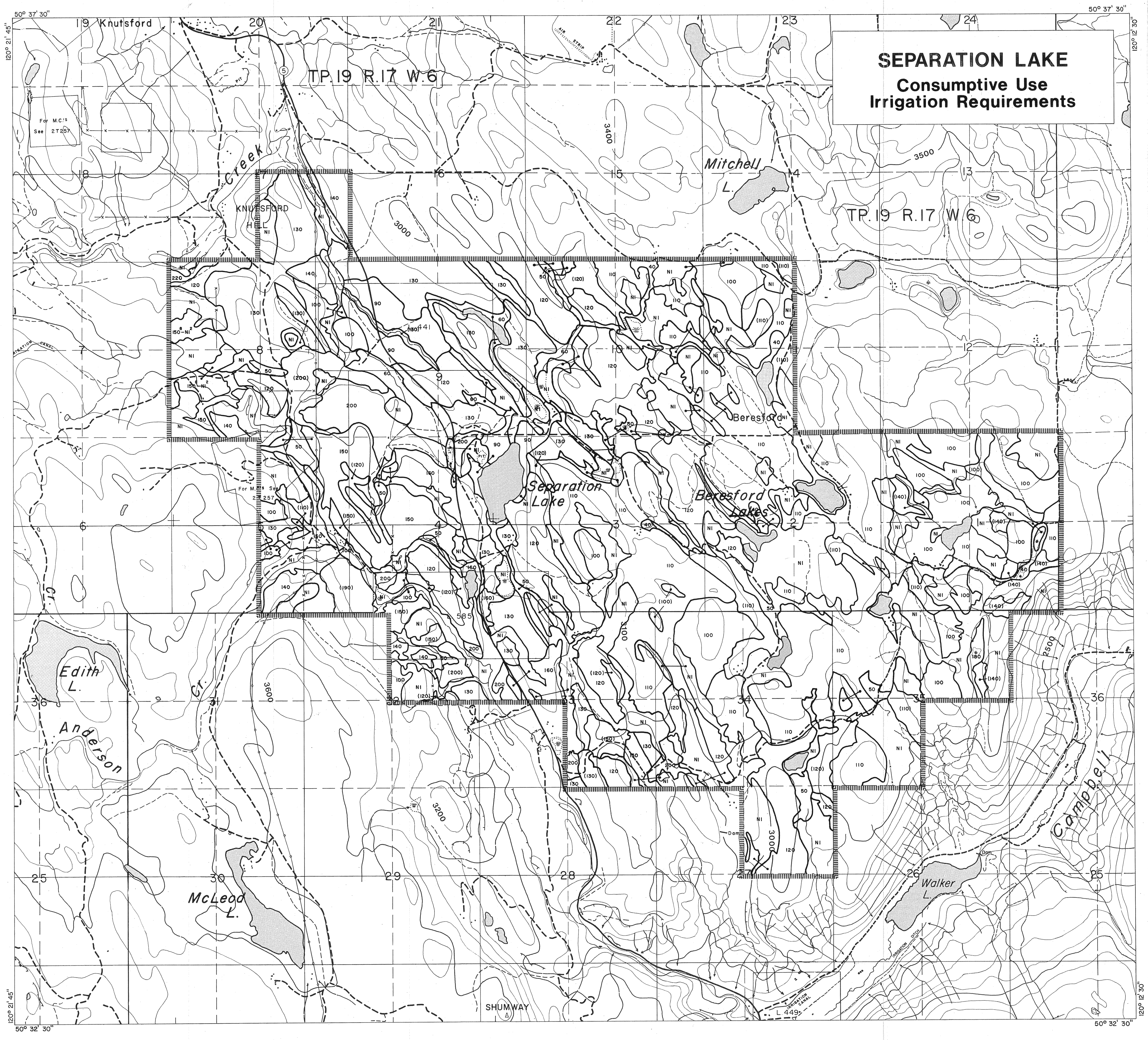

Scale 1:20 000

Ministry of Environment Region 3

Base map covers part of NTS map 92 I/9.

LEGEND

1. Explanatory Notes

This map delineates the consumptive use irrigation requirements of the soils in the Separation Lake Area, 2880 ha, and is Map No. 3 in a series of three maps of the area. The first map (Soils of the Separation Lake Area) delineates the geographic distribution and describes the soils in the area; the second map (Slope Ranges of the Separation Lake Area) indicates the actual range of slopes in each map polygon to identify areas which have slope restrictions for irrigation.

2. Irrigation Requirement Model

The irrigation requirements are derived from an irrigation model which considers precipitation and potential evapotranspiration versus elevation (Coligodo, Baier and Sly, 1968; Sly, 1970 and Baier, 1971). The model makes several assumptions. It assumes that the crop is actively growing and completely covers the soil. Consequently, the irrigation requirement is less for seedlings that are short and do not completely cover the ground surface or for mature plants which are not actively transpiring. A second assumption is that the availability coefficient is 50%, i.e. irrigation is added when 50% of the soil's available water storage capacity (AWSC) is depleted.

The model also assumes that the entire area is being irrigated. Where this is not the case, actual evapotranspiration may surpass the potential rate during some hot, dry periods. Energy from adjacent dry areas may be "advected" onto the irrigated crops causing 20% or more evapotranspiration than assumed by the model (Williams and Stout, 1981). Research discussing these conditions is incomplete and the precise contribution of advection to the total water use of the crop is unknown.

Representative irrigation requirement data for the Separation Lake area as calculated using the irrigation model are presented in the following table. These values are calculated on the basis of a 50% risk level, i.e., they represent the long term average consumptive use requirements. Drier or wetter than average growing seasons will require more or less irrigation respectively.

CONSUMPTIVE USE IRRIGATION REQUIREMENTS FOR THE SEPARATION LAKE AREA (50% RISK)

Elevation (ft)	CMD* (mm)	IRRIGATION REQUIREMENT FOR AWSC (mm) of 25	50	100	150	200	250
2500	212	280	254	210	183	157	137
2750	172	255	228	182	154	128	104
3000	132	233	205	158	129	102	78
3250	91	215	185	136	107	79	56
3500	50	199	168	117	88	59	36

*CMD - Climatic Moisture Deficit

3. Values on Map

The values presented on the map indicate the amount of water needed by a crop to meet its consumptive use requirements as calculated by the irrigation model. The above table was used to establish the value for each map polygon. The available water storage capacities (mm) are estimated from soil texture to a depth of 120 cm (rooting depth of a deep rooted crop such as alfalfa) using the procedure outlined in Spencer et al., (1981) pp. 21 and 22, and were substantiated by analyses of representative samples. The soil profile descriptions and analyses are available from the British Columbia Soil Information System.

Irrigation requirements were calculated to the nearest mm and then rounded-off to the nearest 10 mm for map presentation. Irrigation requirements are shown in brackets for map polygons with slopes ranging between 20 to 30%. This was done because although these soils were not considered to be non-irrigable, the Pollution Control Guidelines for Municipal Effluent Application to Land (Spencer et al., 1981) indicate that effluent irrigation is limited to slopes of 20% or less.

In a few map polygons, a discrete portion of that polygon was considered non-irrigable. In these cases an irrigation requirement and an NI symbol are indicated, separated by a hyphen and with superscript numbers indicating the percentage of the polygon occupied by each.

Non-irrigable areas are generally due to steep topography, bedrock, or poor soil drainage.

4. Examples of Map Symbols

110	Indicates a consumptive use irrigation requirement of 110 mm.
(110)	Indicates a consumptive use irrigation requirement of 110 mm on a slope ranging between 20 and 30%.
$110^{8}-NI^{2}$	Indicates a consumptive use irrigation requirement of 110 mm in 80% of the polygon. 20% of the map polygon is considered to be non-irrigable.
NI	Indicates that the soil is considered to be non-irrigable.

5. Actual Application Amounts

The values presented on the map are consumptive use irrigation requirements and are not adjusted for leaching requirement, application efficiency or advection. Actual irrigation applications will need to take these into account. They were not incorporated on the map because: (1) leaching requirement varies with the electrical conductivity of the irrigation water (effluent) and this varies with the source (residential vs industrial); (2) application efficiency varies with the irrigation equipment being used; and (3) the 20% increase in irrigation requirement to account for advection is approximate and not substantiated by research in this area. Procedures for adjusting the irrigation requirements follow.

5.1 Leaching Requirement

Irrigation system design must include a net leaching of water through the soil profile, known as the leaching requirement, to prevent salt accumulation in the soil. The leaching requirement (LR) is expressed as a fraction of the irrigation requirement and is calculated as:

$$LR = \frac{EC_{irr}}{4}$$

where EC_{irr} is the electrical conductivity of the irrigation water expressed in mS/cm. A twenty percent leaching requirement is usually adequate if the electrical conductivity of the effluent is less than 1 mS/cm. The amount of water needed for irrigation, including the leaching requirement (IR_o) is calculated using the following formula:

$$IR_o = \frac{IR}{1-LR}$$

where IR is the irrigation requirement from the table above.

The following sample calculation (which should be typical for the Separation Lake area) assumes a hypothetical electrical conductivity of 0.8 mS/cm and an irrigation requirement of 110 mm. Hence, the leaching requirement is:

$$LR = \frac{0.8}{4} = 0.2$$

The irrigation requirement including the leaching requirement is calculated as:

$$IR_o = \frac{110}{1-0.2} = 137.5 \text{ mm. } (5.4 \text{ in})$$

5.2 Application Efficiency

Application efficiency (A.E.) calculates the additional water required due to losses resulting from irregular water distribution patterns from sprinklers. The amount of loss varies depending upon sprinkler type, nozzle size and operating pressures, prevalent wind, temperature and humidity conditions. The minimum allowable application efficiency for conventional low volume sprinklers is 72% (Spencer et al., 1981). The irrigation requirement, including application efficiency (IR_{Tot}) is calculated using the following formula:

$$IR_{Tot} = \frac{IR_o}{AE}$$

Continuing the sample calculation and using a 72% irrigation application efficiency, the irrigation requirement is:

$$IR_{Tot} = \frac{137.5}{0.72} = 190.9 \text{ mm } (7.5 \text{ in})$$

5.3 Dry Air Advection

During dry, hot periods, energy from adjacent non-irrigated dry areas may be "advected" onto the irrigated area. This may cause a 20% or more increase in actual evapotranspiration and a corresponding increase in the irrigation requirement. Therefore, continuing the above sample calculattion, the actual application amount will be:

$$IR_{Actual} = 190.9 + (190 \times .20) = 229 \text{ mm } (9 \text{ in})$$

6. References

Coligodo, M. C., W. Baier and W. K. Sly, 1968: Risk Analysis of Weekly Climatic Data for Agricultural and Irrigation Planning. Agriculture Canada. Ottawa.

Sly, W. K. and W. Baier, 1971: Growing Seasons and the Climatic Moisture Index. Can. J. Soil Sci. 51: 329-337.

Sly, W. K., 1970: A Climatic Moisture Index for Land and Soil Classification in Canada. Can. J. Soil Sci. 50: 291-301.

Spencer, J. G., W. K. Oldham and E. Schulz, 1981: Pollution Control Guidelines for Municipal Effluent Application to Land. British Columbia Ministry of Environment.

Williams, R. J. and D.G. Stuart, 1981: Evapotranspiration and Leaf Water Status of Alfalfa Growing Under Advective Conditions. Can. J. Plant Sci. 61: 601-607.

7. Credits

Climatic information: supplied by:	R. Williams Air Studies Branch British Columbia Ministry of Environment Kelowna, British Columbia
Irrigation requirements by:	P. Epp Surveys and Resource Mapping Branch British Columbia Ministry of Environment Kelowna, British Columbia and R. Williams Air Studies Branch British Columbia Ministry of Environment Kelowna, British Columbia
Map drafted by:	Drafting Unit Surveys and Resource Mapping Branch British Columbia Ministry of Environment Kelowna, British Columbia
Base map provided by:	Surveys and Resource Mapping Branch British Columbia Ministry of Environment Victoria, British Columbia.

8. Other Maps in Study

Map No. 1 - Soils of the Separation Lake Area
Map No. 2 - Slope Ranges of the Separation Lake Area

All maps and information stored in the British Columbia Soil Information System are available upon request from:

Map Library,
Planning and Resource Manangement Division
British Columbia Ministry of Environment
Parliament Buildings
Victoria, British Columbia
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MAP NO. 3