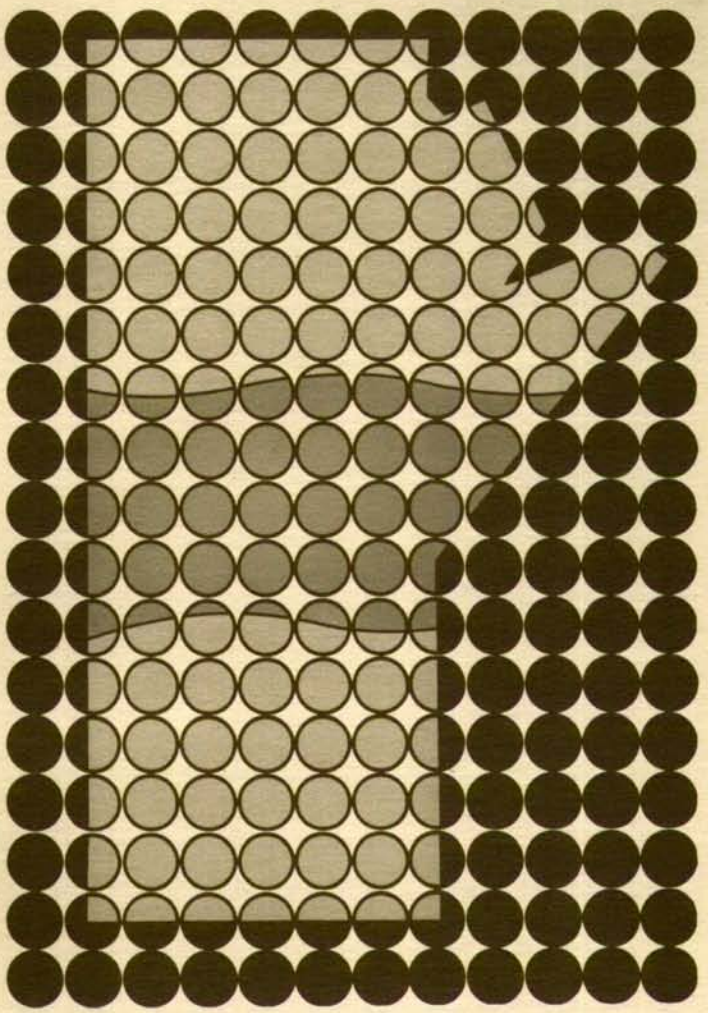

CANADA-MANITOBA Soil Survey

Soils of the Swan River Townsite Area

Report D-37

Government of Canada Gouvernement du Canada
Government of Manitoba Gouvernement du Manitoba

MG-6593-36

SOILS REPORT No. D37 1987

Soils

of the

Swan River Townsite Area

by

G.F. Mills and I. G. Podolsky

CANADA-MANITOBA SOIL SURVEY

AGRICULTURE CANADA

MANITOBA DEPARTMENT OF AGRICULTURE

DEPARTMENT OF SOIL SCIENCE, UNIVERSITY OF MANITOBA

PREFACE

This report and map of the detailed field and laboratory study of the soils of the Swan River Townsite study area is one in an ongoing series of such soil survey reports covering special interest areas in southern Manitoba. These reports are in response to a growing awareness by various government agencies that support the Canada-Manitoba Soil Survey, that a knowledge of the development and distribution of the soils of Manitoba is the key to understanding their properties, behaviour and response to management. This awareness requires that soils be described both in terms of their basic properties and the nature of the environmental setting in which they are found. Thus, in the rural community of Swan River, development for agriculture, recreation and related uses requires delineation of land of high or low suitability for such uses which in turn depends on an accurate and reliable soil map as a basic reference document.

The land resource information included in this resurvey covers approximately 7 937 hectares of land surrounding the Town of Swan River. The projected intensive use of the soils of this area has created a need for more up-to-date, more accurate and more detailed soil information. Increased examination of soils in the field, the use of current aerial photography, the use of improved methods of studying soils in the laboratory, and the accumulated knowledge of the properties and uses of soils over the years, have all contributed to the additional information contained in this new series of reports and maps.

During the course of the resurvey, a large volume of site specific data for the soils mapped in the Swan River area was generated that, for practical reasons, cannot be included in this report. These data are archived in the Canada Soil Information System (CanSIS) data bank. This computerized system of data management permits automated manipulation and statistical evaluation of large volumes of data for soil characterization and interpretations. These data are available on request. In addition, the Cartographic File of CanSis provides a capability to produce derived maps of various kinds quickly and inexpensively. The types of derived maps that can be generated from the basic soil map include the sixteen interpretations that are provided in tabular form in this report as well as a number of single feature maps such as drainage, texture of surface deposits, slope, and stoniness. A package of interpretive maps and single feature derivative maps can be made available on request from the Canada-Manitoba Soil Survey, Ellis Building, University of Manitoba, Winnipeg Manitoba, R3T 2N2.

The Canada-Manitoba Soil Survey trusts that this report and accompanying map will be of value to all individuals and agencies involved with the use of land within the map area.

ACKNOWLEDGEMENTS

This soils study was conducted as a joint project of the Canada Department of Agriculture, Manitoba Department of Agriculture and the Soil Science Department of the University of Manitoba.

The soils were mapped by G.F. Mills, and I.G. Podolsky.

The field assistants were D. Peristy and G. Smith.

Laboratory analysis were provided by R. Mirza, K.C. Yeung and J. Madden under the direction of P. Haluschak.

Cartographic Services

Mapping bases were provided by the Land Resources Research Centre, Ottawa. Map compilation and digitization in preparation for publication and addition to the CanSIS cartographic file were provided by J. Griffiths, R. DePape, and M. Black.

Manuscript review and soil correlation were provided by R.E. Smith.

Final typing of report manuscript provided by D. Sandberg.

SUMMARY

The Swan River Townsite Soil Study encompasses an area of 7 937 hectares of land immediately surrounding the Town of Swan River. Swan River is a rural agricultural service center in western Manitoba. It is located approximately 400 kilometers northwest of Winnipeg at the junction of Highways 10 north and 83 north.

The study area consists of dominantly level to very gently sloping sandy and loamy moderately to strongly calcareous lacustrine sediments. Local areas of greater relief are associated with outcrops of loamy till and lacustrine beach sands and gravel. Stratified sandy to fine loamy alluvium occur in association with three major drainage channels traversing the area in a northeasterly direction. Natural surface drainage is to the northeast, and is provided by the Swan River, Roaring River and Tamarack Creek. Improved drainage into this river system is accomplished by a network of agricultural drains.

Climate for the Swan River area is cool, subhumid continental with distinct seasonal highs of temperature and precipitation during the growing season. The area has an estimated frost-free period of about 110 days and an estimated average of 1430 growing degree-days above 5 degrees C.

Sandy, coarse loamy and fine loamy lacustrine sediments (51.1 percent, 16.4 percent and 12.6 percent of the map area respectively) are characterized by dominantly well drained Orthic Black and imperfectly drained Rego Black soils. Minor areas of poorly drained Humic Gleysol soils are found throughout the area. Fluvial (alluvial) deposits constitute 9.9 percent of the map area. Minor areas of Orthic Black soils occur in association with dominantly imperfectly drained Regosol and poorly drained Gleysolic soils on the alluvial deposits. Loamy till deposits cover 3.5 percent of the map area and are characterized by well drained Rego Black and Dark Gray soils and imperfectly drained Rego Black soils. Organic soils constitute 0.2 percent of the area as do Black soils on sandy to gravelly beach ridges. The remainder of the area includes the Swan River townsite, lagoon and water bodies occupying 5.9 percent of the area.

The agricultural potential in the study area ranges from Class 1 for Dutton soils to 6W for Novra soils. The majority of the soils in the area are rated in Classes 1, 2 and 3, with only small areas of lower capability Class 4, 5 and 6 soils. Drainage, surface ponding, and erosion are the major soil conditions affecting capability and land management in the area. A few minor soils in the area would have a Class 1 irrigation suitability rating. However, the majority of soils in the area have been rated as Classes 3 and 4 for sprinkler irrigation because of low water holding capacity and drainage problems.

The dominant soil condition which presents problems for engineering and recreation development is excess wetness. High water tables may occur during

the early spring in about 57 percent of the soils and for longer periods through the summer in about 8 percent of the soils. Seasonally high water tables may influence construction of basements and roads. Wet subsoil conditions result in damp basements. Road maintenance costs increase from wetness and associated frost heave.

Some recreation development for camping and picnic sites has occurred within the town limits. The three rivers in the study area, particularly Swan River offer aesthetically good to excellent settings for outdoor recreational development as well.

HOW TO USE THIS SOIL REPORT

This soils report contains considerable information about the soils, their origin and formation, their classification and their potential for various uses such as dryland agriculture, irrigation, engineering and recreation. The report is divided into four parts: Part I provides a general description of the area; Part 2 describes the methodology used in the study; Part 3 discusses the development, scientific classification and morphological characteristics of the soils in the study area, and Part 4 provides an interpretation of soil properties and associated landscape features as they affect soil capability or suitability for various uses.

The soil map of the study area is compiled on an uncontrolled air photo base which is included in a pocket of the report folder. The map shows the distribution of soil types and associated landscape features that are significant for potential use as field management units. It provides a linkage from landscapes within the study area to the information contained in the report.

To assist the user in retrieving soil information quickly, the following steps are suggested:

If project consists of many individual maps, proceed with STEP 1., if only single map in pocket, proceed with STEP 2 to 6.

STEP 1 Consult the index to map sheets <u>if</u> the report contains many maps. Locate the areas of interest and note the map-sheet number(s) which identify the township and range on each map.

STEP 2 Consult the soil map in pocket of report folder. Locate the area(s) of interest on the map and identify the pertinent map unit symbols. Arabic numerals placed as superscripts following map symbols indicate the approximate proportion of each soil type within the map unit.

STEP 3 Consult the extended legend accompanying the soil map for an alphabetical listing of soil symbols giving the soil name, classification, drainage and related information concerning landforms, nature and depth of materials, and dominant vegetation.

STEP 4 For interpretive information about the soils, consult the appropriate Table in Part 4. Criteria utilized as guidelines in making these interpretations are provided in the Appendix.

STEP 5 Further information concerning the morphological properties and extent of the soils is presented in Part 3 where the soils are described alphabetically according to soil name.

STEP 6 Additional site-specific information not contained in this report is available on request from the Canada-Manitoba Soil Survey, Ellis Building, University of Manitoba.

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PART 1

GENERAL DESCRIPTION OF THE STUDY AREA

1.1 LOCATION AND EXTENT

This soil study covers approximately 7 936 hectares of land surrounding the Town of Swan River, some 400 km northwest of Winnipeg in western Manitoba. The surveyed area covers 30 sections (Sections 7 to 36) in Township 36 Range 27, West of the Prime Meridian (Figure 1).

This soil study is a resurvey of the land adjacent to the Town of Swan River initially covered by the Detailed Reconnaissance Soil Survey of the Swan River Map Sheet Area at a scale of 1:126,720[1]. The present detailed resurvey was carried out at a scale of 1:20,000.

1.2 PRESENT LAND USE

The Town of Swan River is a thriving urban center in the heart of the Swan River Valley, a prosperous farming community well suited to grain and livestock production. Swan River serves as the main communication and marketing center for the agricultural enterprises of the region.

Agriculture is the dominant land use in the study area. However, a wide range of land uses related to residential, recreational, light industrial and transportation activities are concentrated at Swan River. Growth of the town site is causing pressure for such activities centered in the town to encroach on to the surrounding agricultural land particularly along major transportation routes. Other infrastructure associated with Swan River include landfills and sewage lagoons which also require significant areas of land. In addition to the network of local roads servicing the area, two major highways from southern and northern Manitoba pass through Swan River. Railway connections from southern portions of the Province and eastern Saskatchewan pass through the town site as well. The Swan River airport utilizes a large portion of one-half section of land and a golf course consumes the better part of another half section (1 Section= 1 mi^2=2.56 km^2). Steeply sloping embankment areas along larger stream and river valleys remain largely in their native state and are of significant aesthetic value. Such areas provide wildlife habitat and the opportunity for recreation activities such as hiking, viewing, horse back riding, hunting and fishing.

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[1] Ehrlich W.A., L.E. Pratt and F.P. Leclaire. 1962. Report of Detailed Reconnaissance Soil Survey of Swan River Map Sheet Area. Soils Report No. 13, Manitoba Soil Survey, Manitoba Department of Agriculture, Queens Printer, Winnipeg, Manitoba.

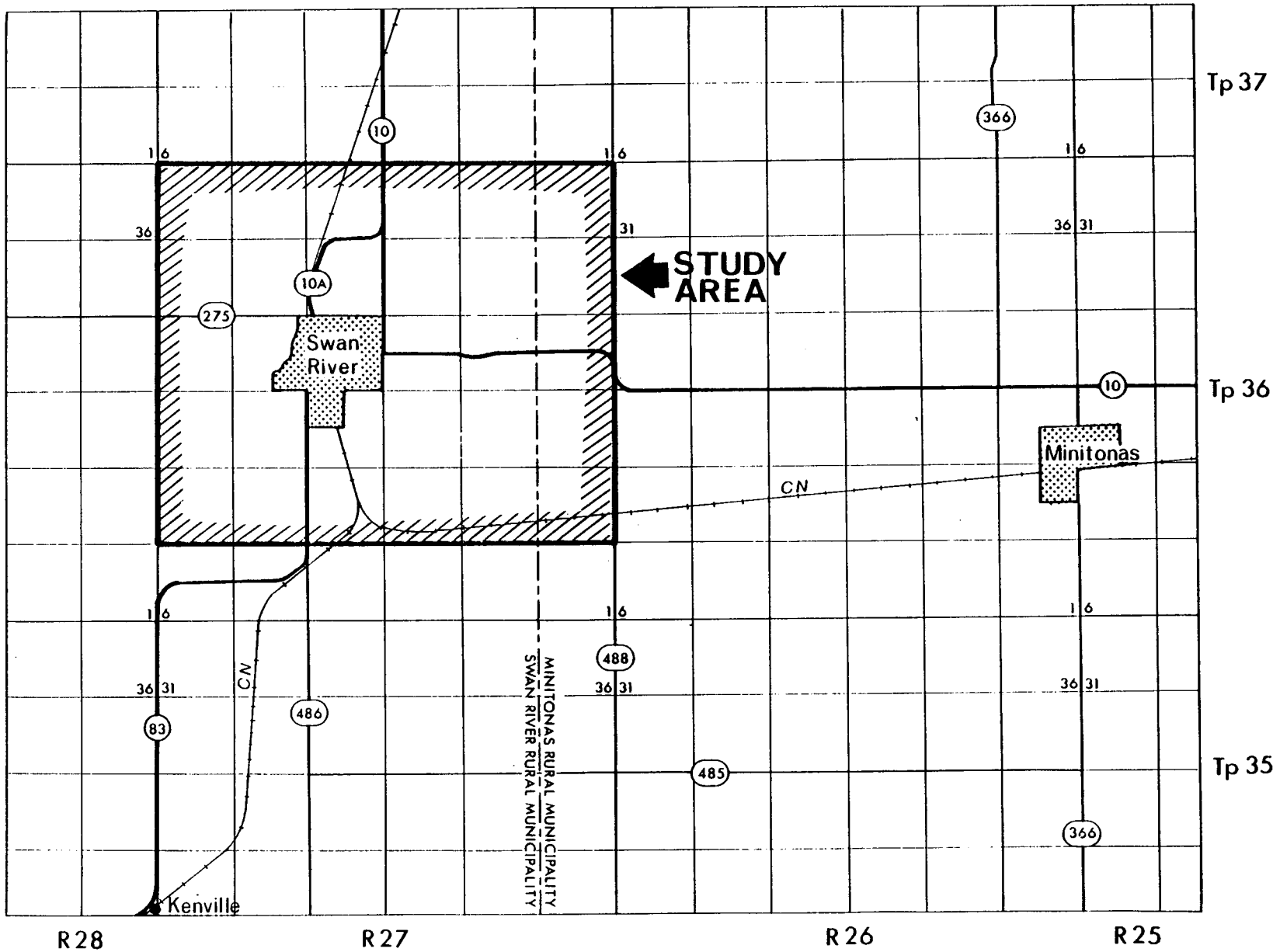

Figure 1: Location of the Swan River Townsite Study Area.

1.3 PHYSIOGRAPHY

The study area is situated in a level to very gently sloping lacustrine and fluvial plain containing lacustrine, fluvial and morainal deposits. The area is referred to as the Armit River-Swan Lake Plain, a physiographic subsection of the Westlake Plain Section of the Manitoba Plain (Figure 2).

1.4 GEOLOGY

The bedrock formations underlying the Swan River study area belong to the Cretaceous Period of the Mesozoic Era (Figure 3). Dark gray carbonaceous shales of the Ashville Formation are dominant in the study area. Sandstone and minor kaolinitic shales of the Swan River formation are of lesser extent trending across the study area in a narrow projection from the north east to the west and south west.

1.5 SURFACE DEPOSITS

Pleistocene glaciation and subsequent inundation by waters of Glacial Lake Agassiz resulted in deposition of variable depths of glacial till and lacustrine sediments (drift) on the bedrock surface. Thickness of the drift ranges from 20 m to in excess of 45 m (Little, 1973)[2].

Lacustrine sediments ranging from sandy to fine loamy particle size occupy the largest portion of the study area in contrast to smaller areas of loamy glacial till, lacustrine beach sands and gravels and sandy to fine loamy stratified fluvial deposits (Figure 4). The lacustrine sediments may be underlain by morainal till, fine loamy to clayey lacustrine sediments or fluvial gravels within 1 m of the surface. Three vertical cross-sections of these materials are shown in Figures 5, 6 and 7. Soil Samples were collected from various depths at drill sites to determine the chemical and physical properties of the surface deposits. These data are presented in Table 1.

Deep (in excess of one meter), weakly to moderately calcareous sandy deposits occur to the east and southeast of the Town of Swan River. Other areas of deep sand occur adjacent to outcrops of loamy moraine to the west and northwest of the townsite. Extensive areas of deep (in excess of 1 meter) moderately to very strongly calcareous, coarse loamy to fine loamy lacustrine sediments occur both north and south of the townsite. Shallow (<1 m) veneers of these sediments are underlain by loamy till, fine loamy to clayey sediments or fluvial gravels. Deep deposits (>1 m) of weakly to moderately calcareous sandy and fine gravelly materials occur as lacustrine beach ridges on the side of moraine ridges in the northwest and southwest portions of the study area.

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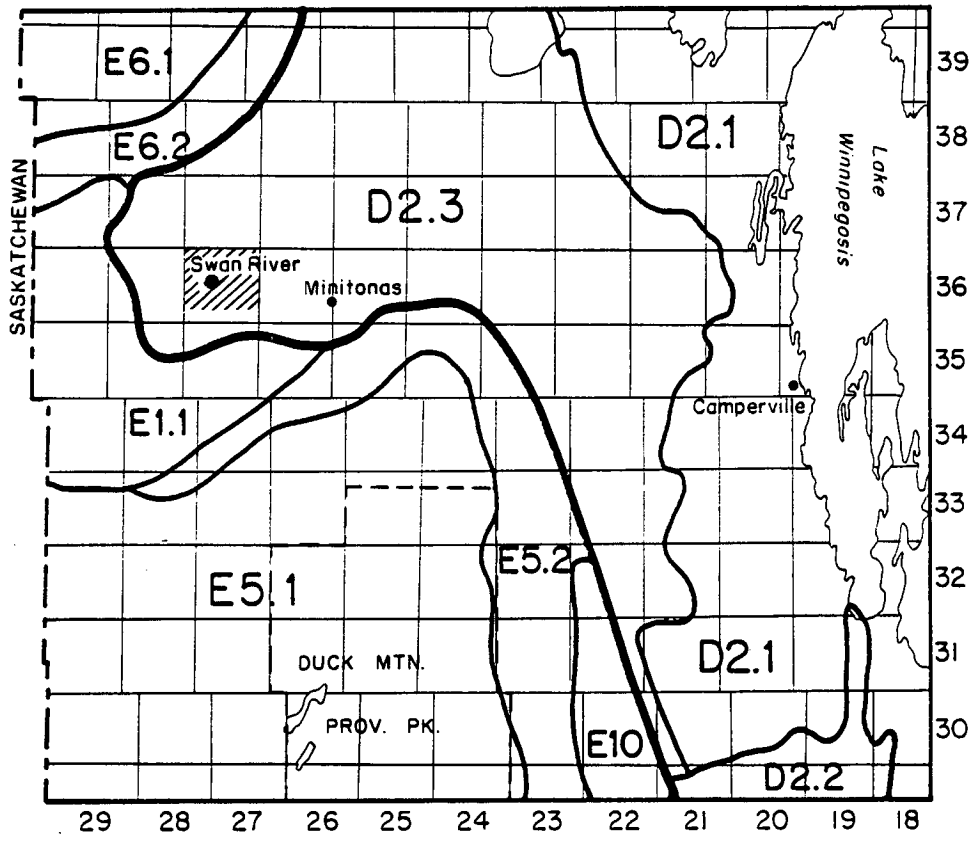
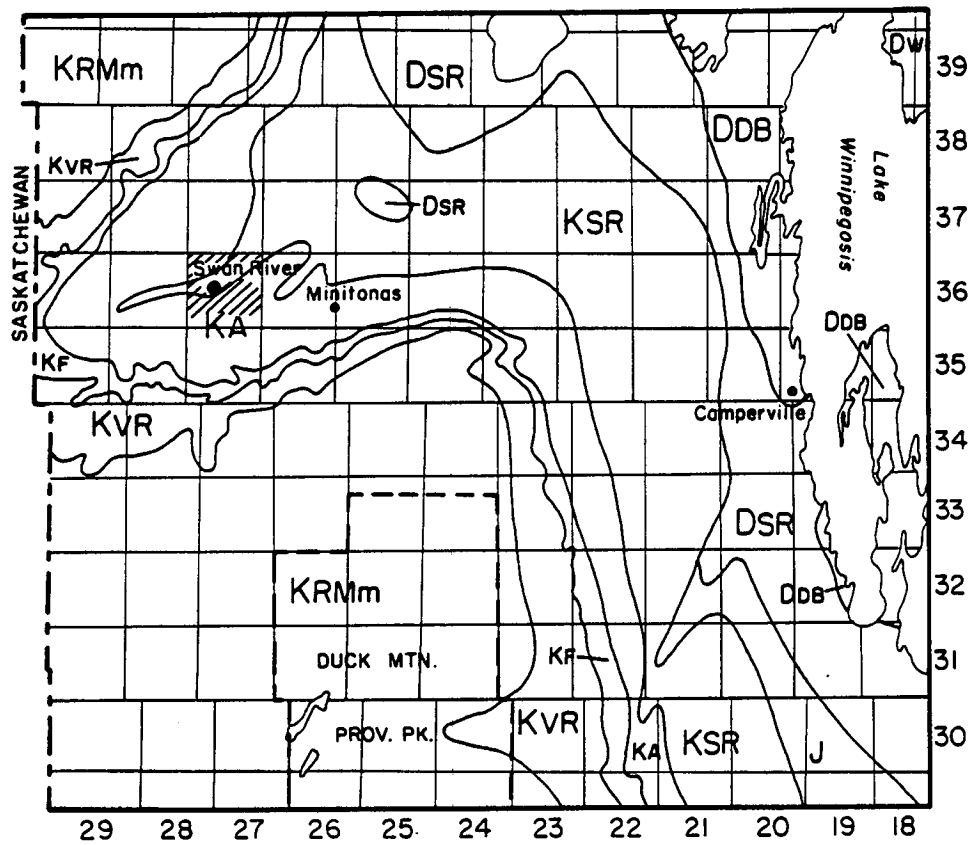
[2] Little J., 1973. Ground-Water Availability Study Report No. 12, Swan Lake Map Sheet, 63 C. Water Resources Branch, Manitoba Dept. of Mines, Resources and Environmental Management.



DIVISION	SECTION	SUBSECTION
D Manitoba Plain	2. Westlake Plain	.1 Westlake Till Plain .2 Dauphin Lake Plain .3 Armit River - Swan Lake Plain
E Saskatchewan Plain	1. Turtle Mountain Upland	.1 Turtle Mountain
	5. Duck Mountain Upland	.1 Duck Mountain .2 Duck Mountain Escarpment
	6. Porcupine Hills	.1 Porcupine Mountain .2 Porcupine Escarpment
	10 Valley River Plain	

Canada-Manitoba Soil Survey, unpublished data

Figure 2: Physiographic Regions in the Vicinity of the Swan River Townsite Study Area.



MESOZOIC - CRETACEOUS - UPPER CRETACEOUS

KRMm — RIDING MOUNTAIN FORMATION (285-340m): Millwood Member (m) - soft green bentonitic shale

KVR — VERMILLION RIVER FORMATION (50-190m): Morden Member - black carbonaceous shale. Boyne Member - grey calcareous speckled shale and carbonaceous shale. Pembina Member - thinly interbedded carbonaceous shale, bentonite and bentonitic shale.

KF — FAVEL FORMATION (15-45m): calcareous speckled shale ("Second Specks"); minor limestone, bentonite and "oil shales"

- UPPER AND LOWER CRETACEOUS

KA — ASHVILLE FORMATION (55-115m): dark grey carbonaceous shale, in part bituminous; minor sand, silt and bentonite (Local occurrence of thick bar-type sandstone in subsurface - Ashville or Viking Sand)

- LOWER CRETACEOUS

KSR — SWAN RIVER FORMATION (0-105m): sandstone, in places glauconitic; kaolinitic shale, minor lignite. May include some non-marine Jurassic beds in the north. Also includes channel and/or karst fill within Paleozoic outcrop belt. Locally missing from outcrop sequence due to non-deposition.

JURASSIC

J — ARMANTH FORMATION: red argillaceous dolomitic siltstone and sandstone overlain by gypsum or anhydrite. RESTON FORMATION: limestone and dolomite, shale interbeds. MELITA FORMATION: fine-grained sandstone, variegated shale, minor limestone. Total Jurassic thickness 0 - 280m.

PALEOZOIC - DEVONIAN - UPPER AND MIDDLE DEVONIAN

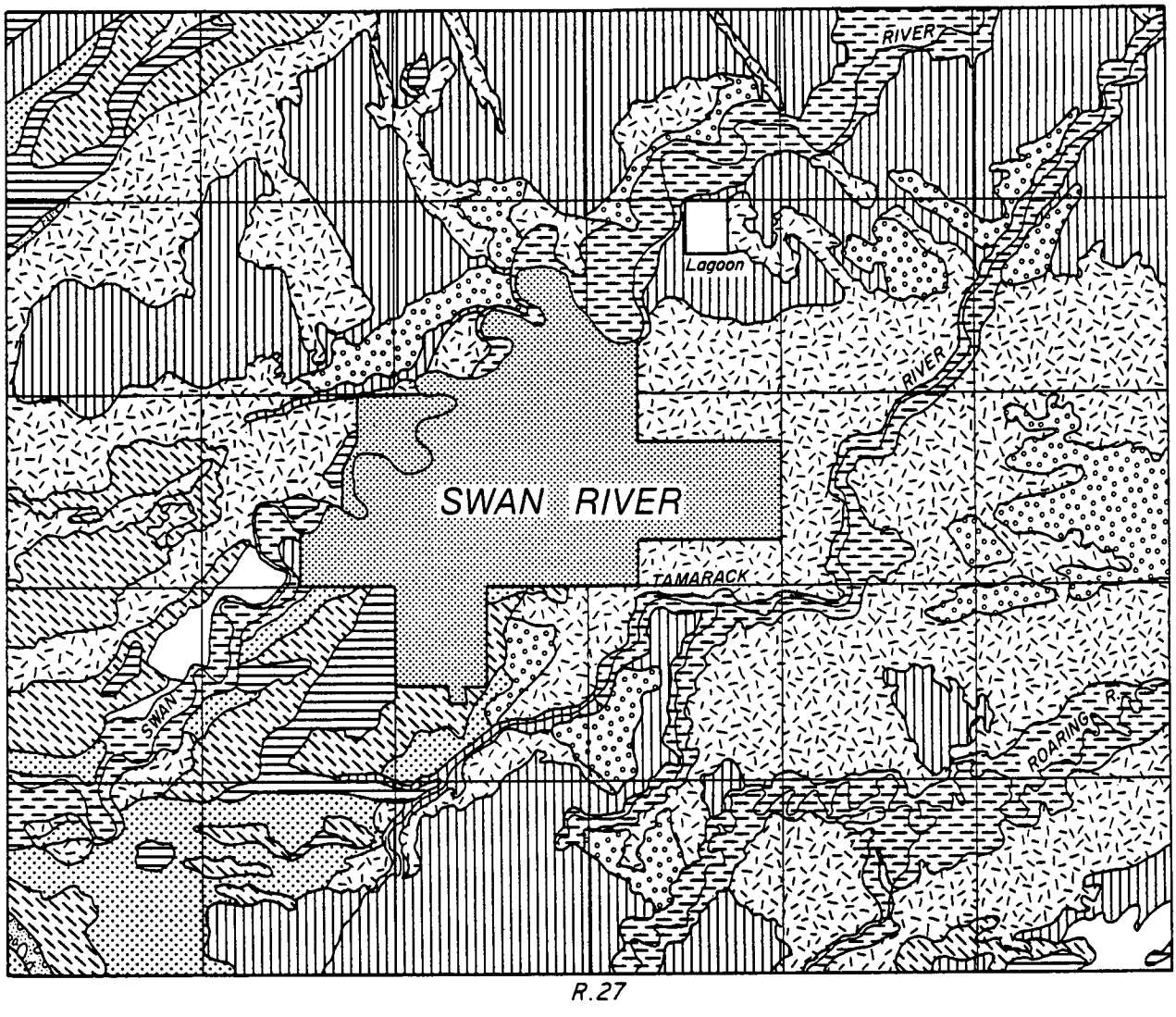
DSR — SOURIS RIVER FORMATION (65-95m): sequence of basal red shale (First Red Beds), argillaceous micrite, high-calcium micritic limestone and upper dolomite in northern area; complex facies of limestone and dolomite to the south.

- MIDDLE DEVONIAN

DDB — DAWSON BAY FORMATION (45-60m): sequence of basal red shale (Second Red Beds); bituminous dolomite grading upward to micritic limestone to brachiopod biomicrite (high-calcium); red to grey fossilferous calcareous shale; highly fossiliferous coral stromatoporoid limestone (high calcium), locally dolomitized.

Dw — ELM POINT FORMATION: high-calcium limestone biomicrite (platform facies) WINNIPEGOSIS FORMATION: lower member - dolomitized platform facies (grades laterally to DEP); upper member - thin inter-reef bituminous laminates or thick reefal carbonates (Dw/r). Total thickness 12 - 105m.

Figure 3: Bedrock Formations Underlying the Swan River Townsite Study Area.



GLACIAL DEPOSITS

Very Strongly Calcareous Loamy Glacial Till.

LACUSTRINE SEDIMENTS

Coarse Loamy to Sandy Sediments.

Thin (1m) Coarse Loamy to Sandy Sediments Underlain by Loamy Till.

Thin (1m) Coarse Loamy to Sandy Sediments Underlain by Clayey Sediments.

Fine Loamy to Coarse Loamy Sediments.

Thin (1m) Fine Loamy to Coarse Loamy Sediments Underlain by Till.

Sandy to Gravelly Lacustrine Beach Deposits.

FLUVIAL (Alluvial) SEDIMENTS

Fine Loamy to Coarse Loamy Stratified Alluvial Deposits.

Figure 4: Distribution of Surface Deposits in the Swan River Townsite Study Area.

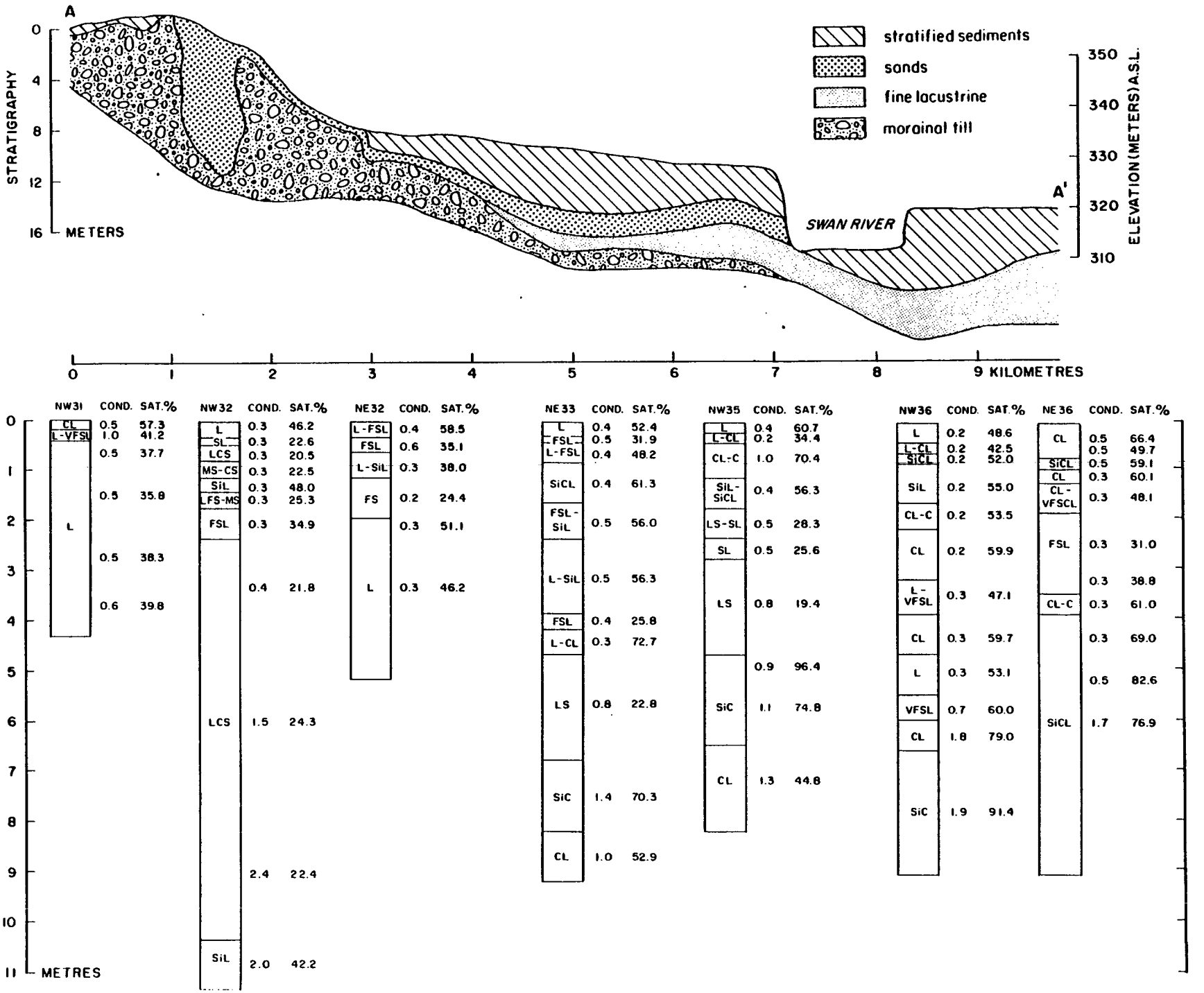


Figure 5: Cross-section A-A1 Showing Near Surface Stratigraphy in Northern Portion of Study Area. Transect Location Shown on Figure 8.

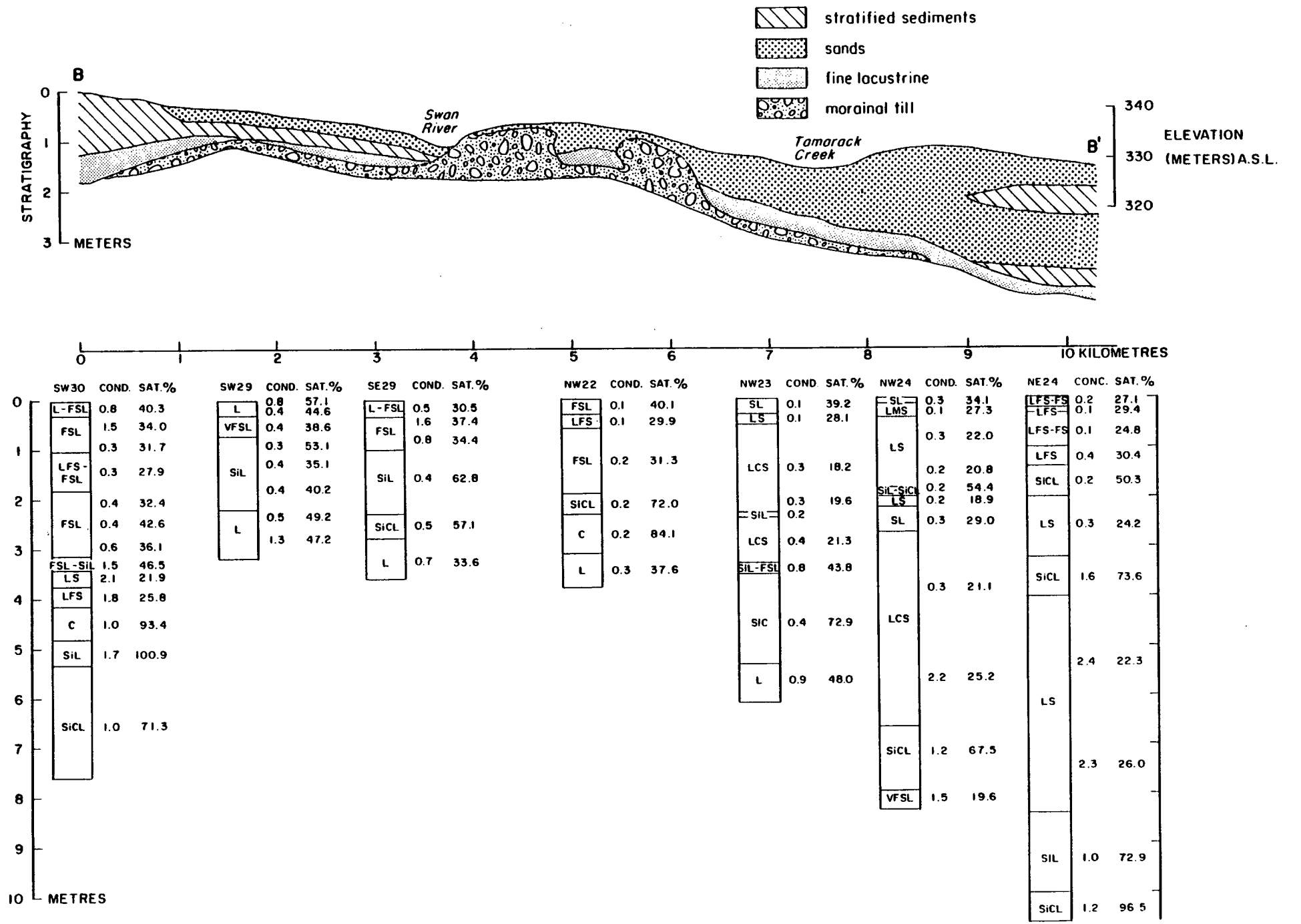


Figure 6: Cross-section B-B1 Showing Near Surface Stratigraphy in Central Portion of Study Area. Transect Location Shown on Figure 8.

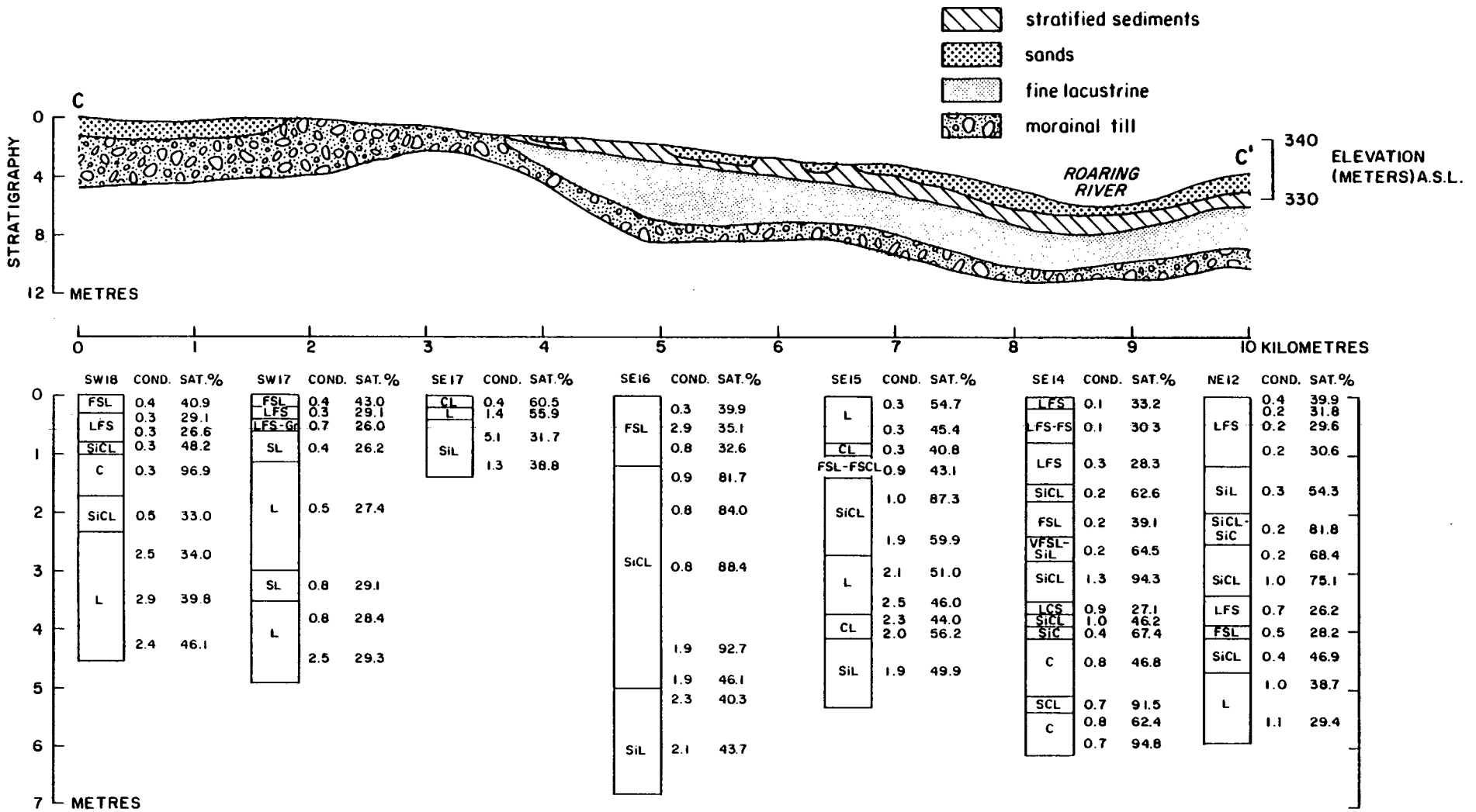


Figure 7: Cross-section C-C1 Showing Near Surface Stratigraphy in Southern Portion of Study Area. Transect Location Shown on Figure 8.

TABLE 1

Selected Soil Properties of Surficial Deposits in the Swan River Townsite Study Area

Soil Type and Location	Depth m	EC mS/cm	Saturation %	$CaCO_3$ Equiv. %	Calsite %	Dolomite %	Particle Size Analysis								Textural Class	Drill Log No.	Remarks
							VCS %	CS %	MS %	FS %	VFS %	Total Sand %	Silt %	Clay %			
Oaknook (ONK)	0.4-0.8	0.5	37.7	33.0	15.2	16.4	1	3	5	13	18	40	40	20	L	1	Lacustrine
NW 31-36-27W	2.4-3.1	0.5	38.3	28.0	10.5	16.1	1	2	5	13	16	37	46	17	L		Morainal
Gilbert, clayey	0.4-0.8	1.5	24.3												S	2	Lacustrine
substrate (GBT2)	0.8-1.1	2.4	22.4												S		Lacustrine
NW 32-36-27W	10.0-11.3	2.0	42.2	36.4	9.8	24.6				1	12	13	76	11	SiL		Lacustrine
Valley (VLY)	0.6-1.1	0.3	38.0												L	3	Lacustrine
NE 32-36-27W	2.2-5.1	0.3	46.2	31.7	8.7	21.2	1	2	4	10	10	27	48	25	L		Lacustrine
Valley (VLY)	6.7-8.1	1.4	70.3	24.0	3.4	19.0						9	48	43	SiC	4	Lacustrine
NE 33-36-27W	8.1-9.1	1.0	52.9	41.9	20.4	19.8	2	3	4	8	9	26	42	32	CL		Lacustrine
Swanford (SWF)	5.1-7.4	1.1	74.8	23.6	6.9	15.4						10	45	45	SiC	5	Lacustrine
NW 35-36-27W	7.4-8.1	1.3	44.8	40.8	14.7	24.0	2	3	5	10	8	28	40	32	CL		Lacustrine
Dutton (DTT)	0.8-1.6	0.2	55.0	19.4	5.6	12.6			1	4	21	26	51	23	SiL	6	Lacustrine
NW 36-36-27W	6.5-10.2	1.9	91.4	15.3	3.3	11.0							53	47	SiC		Lacustrine
Dutton (DTT)	4.5-5.3	0.5	82.6	17.3	4.7	11.6				1	11	12	61	27	SiL	7	Lacustrine
NE 36-36-27W	5.3-9.1	1.7	76.9														Lacustrine
Ethelbert (ETT)	1.0-1.7	0.3	96.9	37.3	25.4	10.9						5	31	64	C	8	Lacustrine
SW 18-36-27W	2.3-3.6	2.5	34.0	31.2	6.2	23.0	3	4	6	17	16	46	37	17	L		Morainal
Sevick (SVC)	1.1-3.0	0.5	27.4	29.6	10.4	17.7	3	4	6	19	20	52	34	14	L	9	Lacustrine
SW 17-36-27W	4.0-4.9	2.5	29.3	31.7	12.4	17.7	2	3	6	18	18	47	35	18	L		Morainal

Table 1. Cont'd

Soil Type and Location	Depth m	EC mS/cm	Saturation %	$CaCO_3$ Equiv. %	Calsite %	Dolomite %	Particle Size Analysis								Textural Class	Drill Log No.	Remarks
							VCS %	CS %	MS %	FS %	VFS %	Total Sand %	Silt %	Clay %			
Swanford (SWF)	2.3-3.9	0.8	88.4	14.7	4.0	9.9						4	66	30	SiCL	10	Lacustrine
SE 16-36-27W	5.3-6.8	2.1	43.7	47.2	15.2	29.5						7	74	19	SiL		Lacustrine
Homestead (HMD)	1.4-2.3	1.0	87.3	13.9	2.7	10.3						4	58	38	SiCL	11	Fluvial
SE 15-36-27W	2.7-3.2	2.1	51.0	15.2	5.3	9.1				10	36	46	34	20	L		Fluvial
	3.9-4.1	2.0	56.2	41.8	9.4	29.8	2	2	3	6	10	23	42	35	CL		Fluvial
	4.1-5.3	1.9	49.9	43.7	15.5	26.0	1	1	1	4	4	11	65	24	CiL		Fluvial
Gilbert (GBT)	3.9-4.1	0.4	67.4	28.3	13.9	13.3										12	Lacustrine
SE 14-36-27W	4.1-5.1	0.8	46.8	15.2	4.9	10.9						4	22	74	C		Lacustrine
	5.1-5.4	0.7	91.5	31.3	17.2	13.0			1	18	29	48	27	25	SCL		Lacustrine
	5.4-5.7	0.8	62.4	44.5	15.5	26.7	1	1	1	3	5	11	39	50	C		Lacustrine
	5.7-6.1	0.7	94.8	30.6	15.0	14.4	1	1	1	3	4	10	39	51	C		Lacustrine
Lenswood (LSW)	0.6-1.2														LFS	13	Lacustrine
NE 12-36-27W	5.3-5.9	1.1	29.4	36.2	12.7	20.9	2	4	7	17	16	46	37	17	L		Lacustrine
Malonton (MNT)	0.7-1.8														LFS	14	Lacustrine
SW 30-36-27W	4.8-5.3	1.7	100.9	16.5	2.7	12.6						11	68	21	SiL		Lacustrine
	5.3-7.6	1.0	71.3	4.9	14.0				1	2	9	12	55	33	SiCL		Lacustrine
Swanford (SWF)	1.0-1.4	0.4	35.5	23.2	5.3	16.4			1	2	26	28	60	12	SiL	15	Lacustrine
SW 29-36-27W	2.6-3.1	1.3	47.2	38.5	20.3	16.7	2	2	4	10	11	29	44	27	CL		Lacustrine
Gilbert (GBT)	8.4-10.0	1.0	72.9	17.1	3.3	12.8						5	70	25	SiL	16	Lacustrine
NE 24-36-27W	10.0-10.6	1.2	96.5	14.7	3.5	10.3						4	59	37	SiCL		Lacustrine
Gilbert (GBT)	0.3-0.6														LFS	17	Lacustrine
NW 22-36-27W	2.3-3.1	0.2	84.1	34.0	13.6	18.8						10	39	51	C		Lacustrine
	3.1-3.8	0.3	37.6	32.1	12.7	17.8	2	3	5	18	19	47	39	14	L		Lacustrine

Table 1. Cont'd

Soil Type and Location	Depth m	EC mS/cm	Saturation %	$CaCO_3$ Equiv. %	Calsite %	Dolomite %	Particle Size Analysis								Textural Class	Drill Log No.	Remarks
							VCS %	CS %	MS %	FS %	VFS %	Total Sand %	Silt %	Clay %			
Lenswood (LSW)	0.3-0.7	1.6	37.4												FSL	18	Lacustrine
SE 29-36-27W	2.8-3.6	0.7	33.6	30.3	7.5	21.1	3	4	6	14	16	43	42	15	L		Lacustrine
Lenswood (LSW)	0.5-2.0	0.3	18.2												LCS	19	Lacustrine
NW 23-36-27W	3.5-5.3	0.4	72.9	23.9	8.2	14.5	0	1	2	5	8	16	42		SiC		Lacustrine
	5.3-6.1	0.9	48.0	42.7	18.4	22.3	1	3	5	9	11	29	45	26	L		Lacustrine
Gilbert (GBT)	1.0-1.8														LS	20	Lacustrine
NW 24-36-27W	6.6-7.9	1.2	67.5	21.4	5.6	14.5	1	1	1	3	12	18	51	31	SiCL		Lacustrine
	7.9-8.3	1.5	19.6	21.3	6.7	13.5	1	3	9	22	24	59	34	7	VFSL		Lacustrine
Oaknook (ONK)	0.4-1.0	5.1	31.7	47.2	15.4	29.3	1	2	4	9	7	23	61	16	SiL	21	Morainal
SE 17-36-27W	1.0-1.4	1.3	38.8	43.0	12.0	28.6	1	1	2	7	7	18	61	21	SiL		Morainal

Particle Size Analysis

VCS	Very Coarse Sand
CS	Coarse Sand
MS	Medium Sand
FS	Fine Sand
VFS	Very Fine Sand
Si	Silt
C	Clay

Textural Class

LFS	Loamy Fine Sand
FSL	Fine Sandy Loam
SCL	Sandy Clay Loam
CL	Clay Loam
L	Loam
S	Sand
SiL	Silt Loam
SiCL	Silty Clay Loam
SiC	Silty Clay
C	Clay

Very strongly calcareous loamy glacial till outcrops immediately south of the Town of Swan River at elevations generally above 338 m a.s.l. The surface of this loam, till has been waterworked in the shallow waters of glacial Lake Agassiz. The scouring action of waves on the glacial till results in an erosion surface as indicated by a more or less continuous layer of flat lying cobbles just below the soil surface. In many instances, the surface of such areas appears relatively stone free as a result of subsequent deposition of thin layers of lacustrine overlay. These glacial till deposits are often less stony and bouldery below the eroded cobbly bog. A prominent till ridge rises above 350 m a.s.l. in the extreme northwest corner of the study area and a small outcropping of glacial till occurs above 345 m a.s.l. in the extreme southeast corner of the study area. The till deposits in areas adjacent to these outcroppings commonly occur within one meter of the surface and for the most part are overlain by shallow veneers of lacustrine sediments.

Deep (>1 m) weakly to moderately calcareous, stratified sandy to fine loamy fluvial (alluvial) sediments are confined to the more recent flood plains of the Swan River, Roaring River and Tamarack Creek. The gravel substrates encountered below the sandy lacustrine sediments south of the townsite occur adjacent to channel of the present Tamarack Creek and may represent fluvial materials deposited during times of much greater flow.

1.6 ELEVATION AND RELIEF

The principal relief features and range in elevation throughout the study area are shown in Figure 8. The major portion of the area is a level to very gently sloping lacustrine plain. Regional relief over this plain changes 2.2 m per km (15 ft. per mile) from 337 m a.s.l. (1125 ft. a.s.l.) in the southwest corner to 315 m a.s.l. (1050 ft. a.s.l.) in the northeast corner. Greater local relief is associated with areas of ground moraine at elevations above 337 m (1125 ft.) in the northwest and southeast. A prominent till ridge rises some 15 m (45 ft.) above the surrounding terrain in the extreme northwest corner of the study area. In addition, local relief is provided by the drainage channels traversing the study area in a northeasterly direction.

The largest channel containing the Swan River is incised about 5 m below the land surface in the southwest portion of the study area and increases in depth to about 20 m in the northeast. This channel varies in width from 500 to 750 m and is characterized by steeply sloping sidewalls and gently undulating to undulating topography in the valley bottom resulting from periods of erosion and deposition as the river channel shifted position. The channel containing the Roaring River is slightly smaller than the Swan River channel and Tamarack Creek deepens from a shallow surface gully in the southwest to a v-shaped channel incised some 10 m below the land level on the eastern edge of the study area.

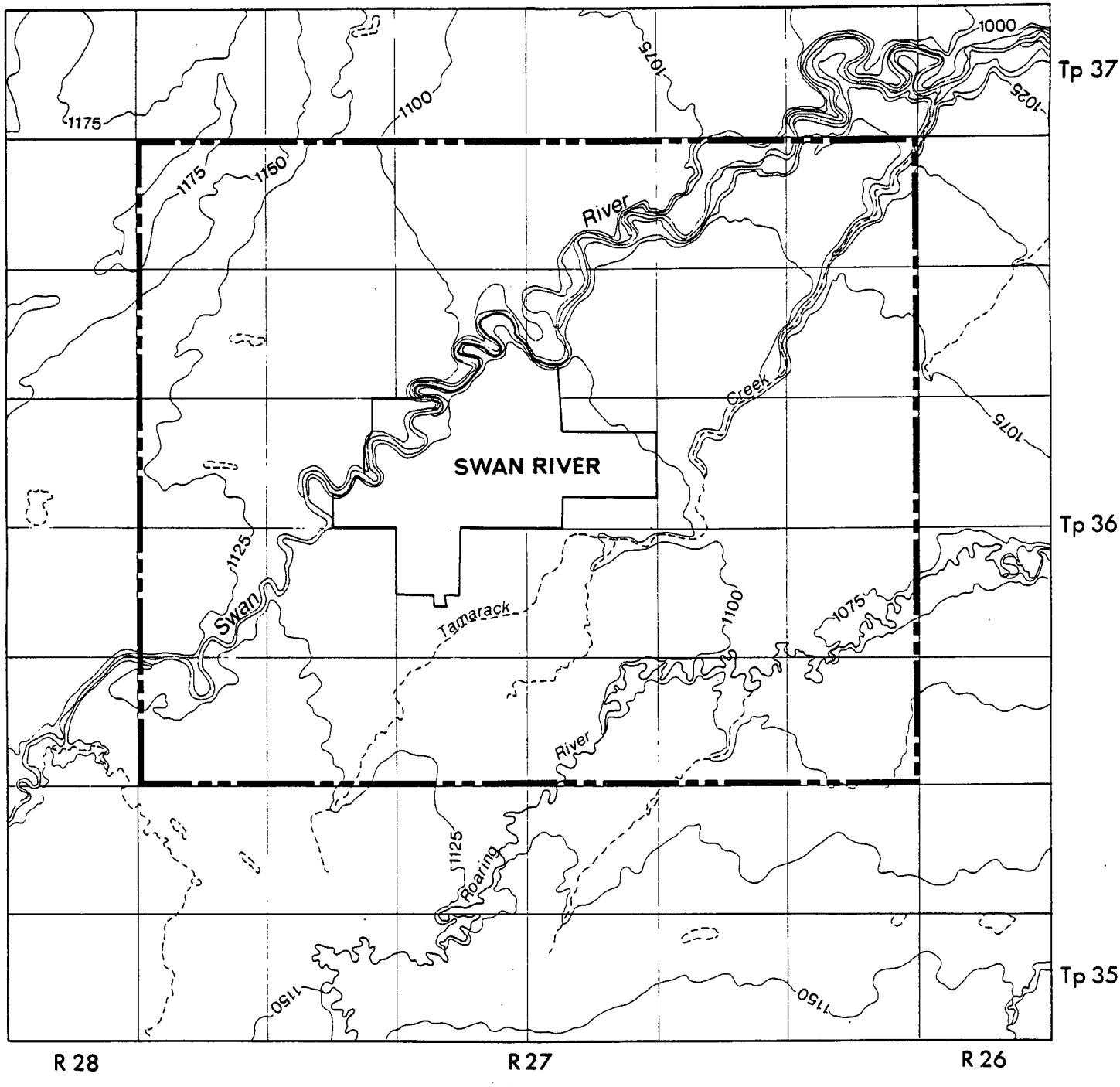


Figure 8: Relief and Drainage in the Swan River Townsite Study Area.

1.7 SURFACE DRAINAGE AND SUBSURFACE HYDROLOGY

Natural surface drainage in the study area is to the northeast and is provided primarily by the Swan River, Roaring River and Tamarack Creek (Figure 8). The Swan River is the longest and most mature of the three waterways carrying drainage waters from eastern Saskatchewan as well as providing local drainage through the study area. It is characterized by deeply incised (3 to 5 m) meander scars and abandoned oxbow channels within the valley. There is base flow in this channel throughout the year.

The Roaring River is also characterized by a deeply incised channel, meander scars and abandoned oxbows but is smaller and more shallow than Swan River.

This network of natural surface drainage combined with the installation of man-made drains has essentially eliminated surface ponding in the study area. When surface ponding does occur it is generally localized and of short duration.

Initial evaluation of groundwater conditions in the study area is provided in a groundwater availability study of the Swan Lake Map Sheet, NTS 63 C[3]. Near surface local groundwater conditions have not been studied in any detail but observation during the current study indicate that extensive areas of level to depressional lacustrine soils are affected by generally high water tables. The relatively high permeability of the sandy surficial materials facilitates recharge of local groundwaters which are often perched above the underlying less permeable and finer textured lacustrine or morainal deposits. Ground water seepage occurs in soil areas adjacent to the prominent till outcroppings in the northwest portion of the study area. Seepage is also evident in the valley sidewalls of the deep river channels and at the contact of the surficial lacustrine sediments and the underlying less permeable till.

Analysis of ground water samples in the study area indicate good suitability of water derived from shallow aquifers as well as from the underlying Swan River Formation[4].

1.8 CLIMATE

The Swan River area is characterized by a continental climate with short, cool summers and long cold winters. Although weather patterns within each season are extremely variable climatic conditions within the study area are reasonably well represented by long term meteorological data from the weather station at Swan River. Climatalogical data from Swan River are presented in Table 2. Other climatic parameters relevant to crop growth in the Swan River area are presented in Tables 6 and 7 in Part 4 of this report.

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[3] Little J., 1973. Ground-water Availability Study, Report No. 12, Swan Lake Map Sheet, 63C. Water Resources Branch, Manitoba Dept. of Mines, Resources and Environmental Management.

[4] Ibid

Table 2. Temperature and Precipitation Data Recorded at Swan River Manitoba (Lat. 52°07'N, Long. 101°16'W, Elevation 335 m.a.s.l)*

Month	Mean Daily Maximum °C	Mean Daily Minimum °C	Mean Monthly °C	Mean Monthly Rainfall mm	Mean Monthly Snowfall cm	Mean Monthly Total mm
January	-15.5	-25.2	-20.4	0.0	28.0	29.5
February	-10.2	-22.2	-16.2	0.0	19.4	20.6
March	-3.0	-15.1	-9.1	1.1	27.8	28.9
April	8.0	-4.0	2.0	12.2	10.4	22.8
May	17.2	3.4	10.3	29.7	2.3	42.1
June	22.3	8.9	15.6	76.1	0.0	76.1
July	25.1	11.6	18.4	69.7	0.0	69.7
August	23.6	9.9	16.8	65.9	0.0	65.9
September	16.8	4.3	10.6	52.4	1.3	53.7
Octover	10.3	-0.8	4.8	22.0	3.9	26.3
November	-1.7	-10.2	-6.0	2.0	21.7	23.7
December	-11.4	-20.7	-16.1	0.0	28.8	28.8
Yearly	6.8	-5.0	0.9	341.1	143.6	488.1

* Data obtained from Canadian Climate Normals, 1951-1980. Volume 2, Temperature and Volume 3, Precipitation, Atmospheric Environment Service, Environment Canada, 1982.

Aerial Climate

The average annual air temperature at Swan River is 0.9°C. Table 2 shows that the average lowest daily temperature ranges from near -25°C in winter to 11.6°C in summer and the average highest daily temperature ranges from -15.5°C in winter to near 25°C in summer. Approximately 70 percent of the annual precipitation of 488 mm falls as rain during the late spring, summer and early fall season and 30 percent as snow during the five winter months of November to March. Spring and fall precipitation is often uniformly distributed resulting from low pressure systems passing through the area. In summer, when local showers and thunderstorms are most frequent, accumulation of rainfall is extremely variable from place to place. Average precipitation is lowest in the winter months because of the greater frequency of high pressure systems and the dominance of dry Arctic air masses.

Soil Climate

Soil climate consists of soil temperature and soil moisture both of which are related to aerial climate and therefore have a direct influence on most biological, chemical and physical processes in the soil. The distribution of soil climate regimes in the Swan River region is related to the Ecoclimatic Regions shown in Figure 10. The dominant soil temperature regime of each region is described according to temperature classes defined for the Soil Climate Map of Canada[5] and modified based on soil temperature measurements of Manitoba soils[6].

Freely drained loamy soils in the Swan River area have mean annual soil temperature between 2°C and 5.5°C and mean summer soil temperature between 10°C and 12°C based on measurement at a depth of 50 cm. Soil temperature characteristics measured in a Valley soil developed on loamy to fine loamy materials and imperfect drainage conditions are presented in Table 3. The annual pattern of soil temperature distribution at three depths in this soil are shown in Figure 9. Clayey soils with higher moisture contents will have slightly lower temperatures whereas sandy soils with lower moisture contents will be warmer. Soils on east and north facing slopes are cooler than these on west and south facing slopes.

The moisture status of soils in the Swan River study area is described in terms of periods of saturation for poorly drained soils and according to length of period and degree of water deficit during the growing season for imperfectly and well drained soils. Although no soil moisture measurements have been made in the Swan River area, this characteristic has been estimated for each soil type (Table 4) according to criteria defined for the Soil Climate Map of Canada. Freely drained loamy soils in this area have a subhumid moisture regime characterized by unsaturated soil conditions with significant (50 to 250 mm) soil water deficits. Soil water deficits will be larger on sandy soils with lower water holding capacity and smaller on clayey soils with higher water hold-

[5] Soil Climates of Canada, 1972. Soil Research Institute, Research Branch, Canada Dept. of Agriculture, Ottawa.

[6] Mills, G.F., C. Tarnocai and C.F. Shaykewich, 1977. Characteristics and Distribution of Soil Temperature Regimes in Manitoba, Canada. Papers presented at the 21st Annual Manitoba Soil Science Meeting. pp. 56-85.

ing capacity. Large areas of imperfectly drained soils in the study area have high water tables (within 1 meter of the surface) and lower effective soil water deficit.

Climatic and Ecologic Relationships

The relationships existing among climate, vegetation and soil in the Swan River area are summarized in the ecological zonation shown in Figure 10. This zonation is described in terms of broadly defined units called Ecoclimatic Regions. Such regions usually cover a continuous geographic area and are characterized by distinctive ecological responses to macro-climate as expressed by vegetation, soil, fauna and aquatic systems.

A specific ecoclimatic region is distinguished from adjacent regions usually by one or more associations of soils and plants which differ in terms of ecologic properties or proportionate extent in the region. The change in regional climate in different regions usually alters site conditions sufficiently to result in development of different soil associations and vegetation types. Soil types developed on similar parent material and under similar drainage conditions but in different ecoclimatic regions are identified by different series or association names to indicate that many of the associated ecologic conditions are dissimilar.

The Swan River Townsite study area is characterized by climate, soil and vegetation conditions typical of northern portions of the Low Boreal subhumid ecoclimatic region. Selected climatic data from Swan River (Tables 2, 6 and 10) represent climatic conditions in the northern portion of this region. Associated ecological characteristics are summarized in Figure 10 and trends in soil development are described in Part 3.

TABLE 3

Soil Climate Data from a Valley soil

SITE	DEPTH					DATE 0 C		DAYS ABOVE	MAX		MIN		DATE 5 C		DAYS ABOVE	DEG. DAYS	DATE 15 C		DAYS ABOVE	DEG. DAYS
	CM	MEAN ANN TEMP	SPRING DAY	FALL DAY	MEAN SUMMER TEMP	SPRING	FALL OR WINTER	0 C	TEMP	DAY	TEMP	DAY	SPRING	FALL	5 C	5 C	SPRING	FALL	15 C	15 C
63C10	2.5	8.4	95.	277.	21.6	60.	312.	252.	23.3	186.	-6.6	4.	81.	290.	209.	2396.	121.	250.	129.	700.
	5	8.6	92.	274.	20.3	52.	314.	262.	22.0	183.	-4.9	1.	76.	290.	214.	2270.	121.	245.	125.	572.
	10	7.9	101.	283.	19.4	62.	322.	260.	20.8	192.	-4.9	10.	87.	297.	209.	2064.	135.	249.	115.	433.
	20	7.8	100.	283.	18.4	58.	324.	266.	19.6	192.	-4.1	9.	86.	296.	210.	1922.	138.	244.	106.	323.
	50	7.6	111.	294.	16.5	61.	344.	283.	17.5	203.	-2.4	20.	96.	309.	213.	1667.	160.	245.	85.	142.
	100	7.6	138.	320.	13.2	UUUU	UUUU	UUUU	15.0	229.	0.2	46.	117.	341.	224.	1384.	UUUU	UUUU	UUUU	UUUUU
	150	7.8	158.	340.	11.1	UUUU	UUUU	UUUU	13.7	249.	1.8	66.	129.	368.	239.	1268.	UUUU	UUUU	UUUU	UUUUU

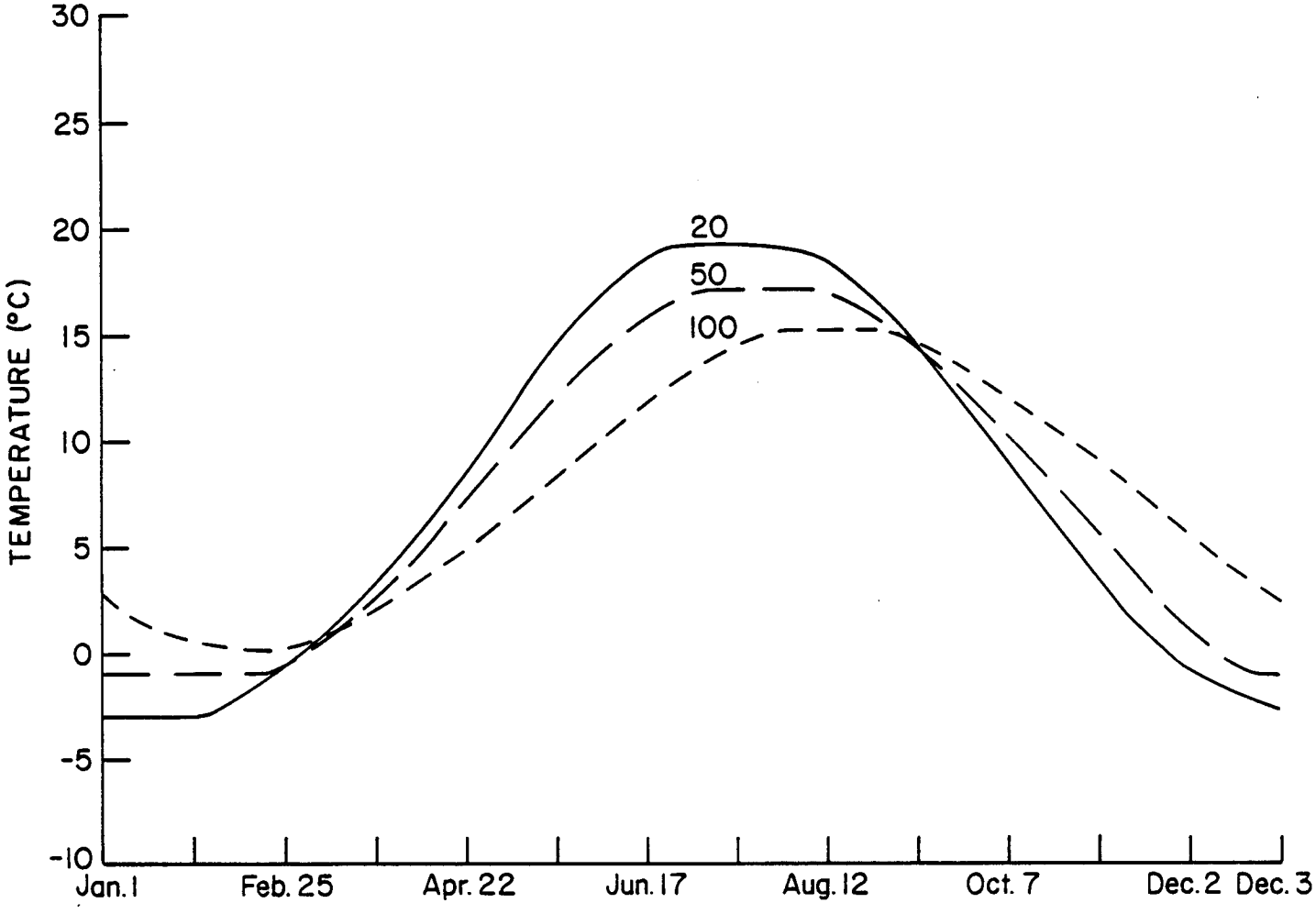


Figure 9: Annual Pattern of Soil Temperature at 20, 50 and 100 cm Depths in an Imperfectly Drained Gleyed Rego Black Soil (Valley Series).

TABLE 4

Soil Series of the Swan River Townsite Study Area Classified According to the System of Soil Classification for Canada 1978

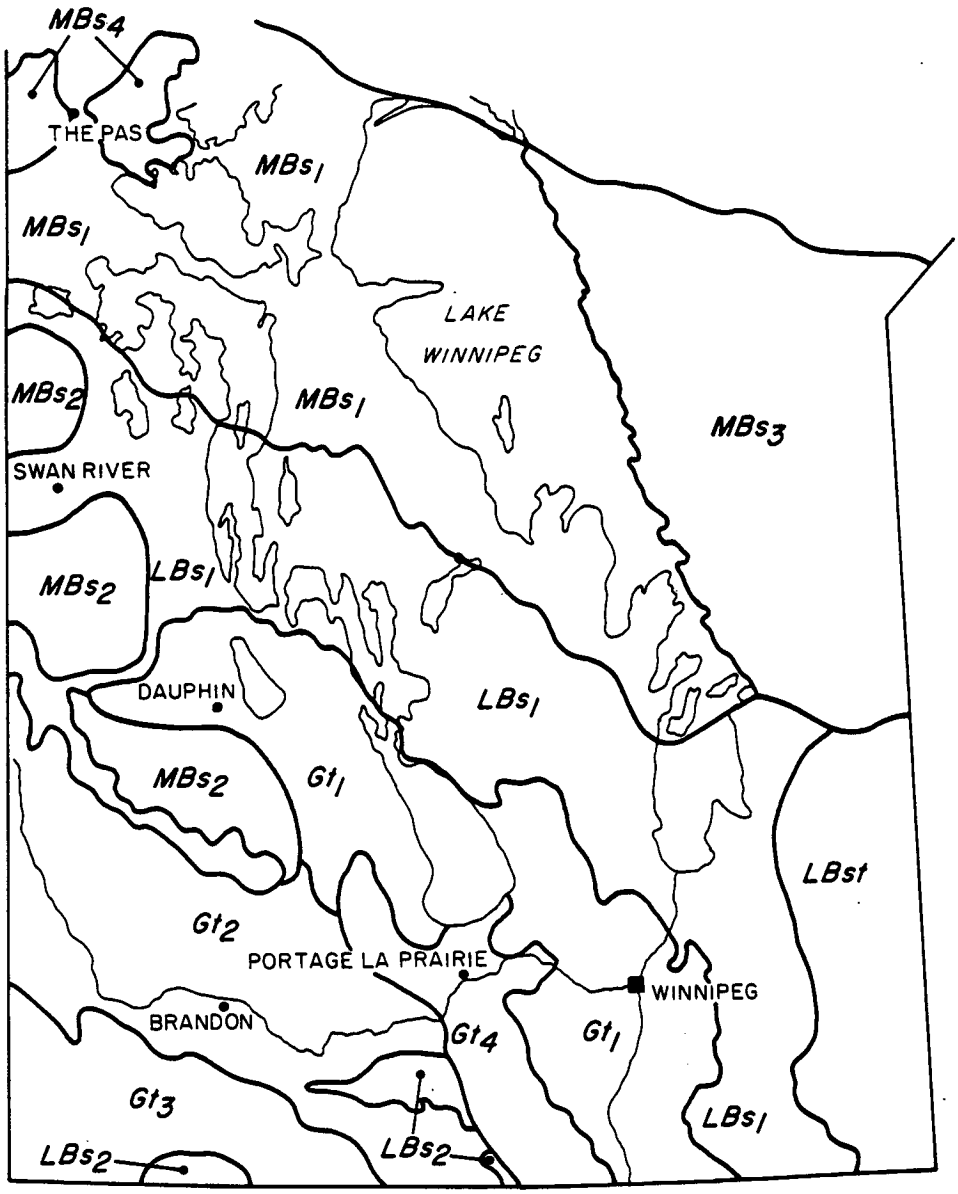
Soil Symbol	Soil Name	Family	Subgroup	Great Group	Order
ASZ	Agassiz	Sandy skeletal, mixed, strongly calcareous, cool semiarid	Orthic Black	Black	Chernozemic
BAM	Balmoral	Fine loamy, carbonatic, alkaline, cold, aquic	Rego Humic Gleysol carbonated phase	Humic Gleysol	Gleysolic
BAMp	Balmoral peaty phase	Fine loamy, carbonatic, alkaline, cold, aquic	Rego Humic Gleysol carbonated phase	Humic Gleysol	Gleysolic
BEV	Bell River	Sandy, mixed, strongly calcareous cool subhumic	Gleyed Cumulic Regosol	Regosol	Regosolic
BAX	Banks	Coarse loamy, mixed, strongly calcareous, cool, subhumid	Orthic Dark Gray	Dark Gray	Chernozemic
CGD	Craigsford	Coarse loamy, mixed, strongly calcareous, cool, subhumid	Gleyed Rego Black carbonated phase	Black	Chernozemic
DRB	Durban	Coarse loamy, mixed, strongly calcareous, cool, subhumid	Orthic Black	Black	Chernozemic
DTT	Dutton	Fine loamy, mixed, strongly calcareous, cool, subhumid	Orthic Black	Black	Chernozemic
DTT2	Dutton, gravel substrate variant	Fine loamy over sandy skeletal, mixed, strongly calcareous, cool, subhumid	Orthic Black	Black	Chernozemic
DVD	Davidson	Sandy, mixed, strongly calcareous, cool, subhumid	Orthic Black	Dark Gray	Chernozemic
ERX	Eroded Slopes Complex		Variable, Chernozemic and Regosolic subgroups		
ETT	Ethelbert	Sandy over loamy, mixed, strongly calcareous, cool, subhumid	Orthic Black	Black	Chernozemic

Table 4. Cont'd

Soil Symbol	Soil Name	Family	Subgroup	Great Group	Order
FOY	Foley	Coarse loamy, mixed, strongly calcareous, cold, aquic	Rego Humic Gleysol carbonated phase	Humic Gleysol	Gleysolic
GBT	Gilbert	Sandy, mixed, strongly calcareous, cool, subhumid	Orthic Black	Black	Chernozemic
GBT1	Gilbert, loamy substrate variant	Sandy over loamy, mixed, strongly calcareous, cool, subhumid	Orthic Black	Black	Chernozemic
GBT2	Gilbert, gravel substrate variant	Sandy over sandy skeletal, mixed, strongly calcareous, cool, subhumid	Orthic Black	Black	Chernozemic
HAU	Haute	Humic, euic, cold, peraquic, loamy	Terric Humisol	Humisol	Organic
HAY	Heatley	Loamy over sandy, mixed, alkaline, strongly calcareous, cool, subhumid	Gleyed Cumulic Regosol	Regosol	Regosolic
HMD	Homestead	Loamy, mixed, alkaline, strongly calcareous, cool, subhumid	Gleyed Cumulic Regosol	Regosol	Regosolic
LSW	Lenswood	Sandy, mixed, strongly calcareous, cool, subhumid	Gleyed Rego Black	Black	Chernozemic
LSW1	Lenswood, loamy substrate variant	Sandy over loamy, mixed, strongly calcareous, cool, subhumid	Gleyed Rego Black	Black	Chernozemic
LSW2	Lenswood, gravel substrate variant	Sandy over sandy skeletal, mixed, strongly calcareous, cool, subhumid	Gleyed Rego Black	Black	Chernozemic
MEH	Meharry	Loamy, carbonatic, alkaline, cool, subhumid	Rego Black	Black	Chernozemic
MNS	Minitonas	Loamy, mixed, strongly calcareous, cool, subhumid	Gleyed Rego Black	Black	Chernozemic
MNT	Malonton	Sandy, mixed, strongly calcareous, cold, aquic	Rego Humic Gleysol carbonated phase	Humic Gleysol	Gleysolic
NOV	Novra	Loamy, mixed, alkaline, strongly calcareous, cold, aquic	Rego Gleysol	Gleysol	Gleysolic

Table 4. Cont'd

Soil Symbol	Soil Name	Family	Subgroup	Great Group	Order
ONK	Oaknook	Loamy, carbonatic, alkaline, cool, subhumid	Gleyed Rego Black	Black	Chernozemic
PLN	Pelan	Sandy over loamy, mixed, strongly calcareous cool, subhumid	Gleyed Dark Gray	Dark Gray	Chernozemic
PMU	Pinoimuta	Fine loamy, carbonatic, alkaline, cold, aquic	Rego Humic Gleysol carbonated phase	Humic Gleysol	Gleysolic
PMUp	Pineimuta, peaty phase	Fine loamy, carbonatic, alkaline, cold, aquic	Rego Humic Gleysol carbonated phase	Humic Gleysol	Gleysolic
PRA	Prawda	Sandy over clayey, mixed, alkaline, cold, aquic	Rego Humic Gleysol carbonated phase	Humic Gleysol	Gleysolic
RDG	Rose Ridge	Loamy, carbonatic, alkaline, cool, subhumid	Orthic Dark Gray	Dark Gray	Chernozemic
SPG	Sprague	Sandy over loamy, mixed, strongly calcareous, cold, aquic	Rego Humic Gleysol carbonated phase	Humic Gleysol	Gleysolic
SVC	Sevick	Sandy over loamy, mixed, strongly calcareous, cool, subhumid	Gleyed Rego Black	Black	Chernozemic
SVK	Silver Creek	Sandy, mixed, strongly calcareous, cool, semiarid	Orthic Regosol	Regosol	Regosolic
SWF	Swanford	Coarse loamy, mixed, strongly calcareous, cool, subhumid	Gleyed Rego Black carbonated phase	Black	Chernozemic
SWF1	Swanford, loamy substrate variant	Coarse loamy, mixed, strongly calcareous, cool, subhumic	Gleyed Rego Black carbonated phase	Black	Chernozemic
SWV	Swan River	Loamy, mixed, strongly calcareous, cool, subhumid	Orthic Black	Black	Chernozemic
TBN	Timberton	Loamy, mixed, strongly calcareous, cool, subhumid	Orthic Black	Black	Chernozemic
VLY	Valley	Fine loamy, mixed, strongly calcareous, cool, subhumid	Gleyed Rego Black	Black	Chernozemic



Ecoclimatic Region[1]	Sub-region[2]	Dominant Soils	Soil Climate		Vegetation Zone
			Temperature Class	Moisture Subclass	
GRASSLAND TRANSITION	GT 1,2,3,4	Chernozemic Black, Gleysols	Boreal, cool to moderately cool	Subhumid	Grassland and Aspen Parkland
LOW BOREAL subhumid	LBs 1,2	Chernozemic Dark Gray, Brunisolic, Organic	Cryoboreal, moderately cold	Subhumid	Grassland-forest transition
LOW BOREAL, subhumid transition	LBst	Brunisols, Luvisols, Chernozemic Dark Gray, Gleysols, Organic	Cryoboreal, moderately cold	Humid to subhumid	Mixed Deciduous -Coniferous Forest
MID BOREAL, subhumid	MBs 1,2, 3,4	Luvisolic, Brunisols Gleysols, Organic	Cryoboreal, moderately cold	Subhumid to humid	Mixed Deciduous -Coniferous Forest

[1] Ecoclimatic Regions of Manitoba. Canada-Manitoba Soil Survey, 1985. Unpublished data, revised, 1987.

[2] Subregions reflect climatic influence which is expressed in local soil and vegetation relations and which affect land use, management and potential biomass production.

Figure 10: Ecoclimatic Regions and Subregions in Southern Manitoba.

1.9 VEGETATION

The Swan River study area occurs in the Manitoba Lowlands Section of the Boreal Forest Region[7]. As most of the study area is cultivated, natural vegetation is restricted to narrow bands of alluvium within the Swan River, Roaring River and Tamarack Creek valleys and along the steeply sloping valley side walls. Small areas of stony, ridged moraine in the northwest and central portion and duned sand areas on the west side of the map area also support native vegetation.

Aspen (Populus tremuloides) and balsam poplar (Populus balsamifera) are the dominant tree species on the stony till soils; bur oak (Quercus macrocarpa) occurring in association with aspen on drier sites. Upland sites include shrubs such as Saskatoon, chokecherry and dogwood. Manitoba maple (Acer negundo) occurs on moist alluvial soils. Poorly drained alluvial soils support sedge (Carex spp.) meadow grasses with clumps of willow (Salix spp.) swamp bush (Betula pumila) and alder (Alnus spp.). Tamarack (Larix laricina) is found on very poorly drained areas along Tamarack Creek. The steeply sloping valley side walls and portions of the narrow strip of land adjacent to these valleys are forested, often with mixtures of aspen and balsam poplar with occasional white spruce (Picea glauca) in places.

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[7] Rowe, J.S., 1972. Forest Regions of Canada. Canadian Forestry Service, Department of the Environment. Publ. No. 1300.

PART 2

METHODOLOGY

2.1 SURVEY AND MAPPING PROCEDURES

Soil mapping in this project was conducted by soil scientists employing a grid or systematic sampling method. They dug many holes to expose soil profiles to depths of one meter at sites approximately 150 m apart along foot traverses within each section of land. This method of traversing, when spaced approximately 0.8 km apart permitted two traverses in each section of land. The direction of each traverse was selected to maximize the information that could be derived from the expected soil-landscape variability in each section. Additional sites adjacent to the traverse and along road allowances were also examined to help locate soil boundaries between traverses and between adjacent sections of land. Aerial photointerpretation aided in the extrapolation of soil conditions and map unit boundaries.

Individual areas or delineations shown on a soil map are called map units. A map unit represents mappable portions of the soil landscape that have characteristics and properties varying within more or less narrow limits that are determined by the intensity of the survey. Some map units are made up dominantly of one kind of soil, others are made up of two or more kinds of soil and a few have little or no soil material at all. Certain proportions (varying within prescribed limits) of unnamed and undescribed soil inclusions usually occur in mapping units. Mapping units are delineated on the basis of the type and relative proportion of their soils or non-soils as well as on the basis of external landscape features such as erosion, slope, stoniness and salinity.

The basic unit used to describe soils in the Swan River area is the soil series. The soil series is defined as a naturally occurring soil body such that any profile within that body has a similar number and arrangement of horizons whose colour, texture, structure, consistence, reaction and composition are within a narrowly defined range. The soil series in the Swan River area are classified and named according to nationwide uniform procedures[8], which are summarized in the section on soil classification. Mapping in the Swan River area is based on application of criteria and guidelines provided in the Soil Mapping System for Canada[9].

The delineation of mapping units, whether they be single soil series or soil series complexes, is not exact; they vary with local topography, drainage, erosion and soil profile properties. The decision to delin-

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[8] Canada Soil Survey Committee, Subcommittee on Soil Classification, 1978. The Canadian System of Soil Classification. Can. Dept. Agric. Publ. 1646.

[9] Mapping Systems Working Group (K.W.G. Valentine Ed.) 1981. A Soil Mapping System for Canada, Revised. Land Resource Research Institute Agriculture, Canada, Ottawa.

eate and label any given area is based on interpretation and extrapolation of observed soil and landscape features and air photo interpretation. Delineation of soil boundaries serves to separate soils having significantly differing properties and conditions which will affect land use.

Delineated areas homogeneous in soil properties and external features are identified by a simple or pure mapping unit. However, this delineated area may contain a small proportion of related but unlike soil series or phases. In contrast, where different soils or external properties occur in intricate patterns and in such small areas that it is not practical to show them separately because of map scale, they are combined to form compound or complex mapping units. The dominant and significant kinds of related but unlike soil series and phases that occur in such units are indicated by decile proportions.

Very often, it is desirable to indicate by map unit symbol, minor variations in certain intrinsic properties of soils or landscape features that deviate from the normal. These variants or phases of series usually affect soil management. In the Swan River study, 6 soil variants were recognized. These soils have properties which are sufficiently different from other known soils to justify a new series name, but because their known extent comprises such a limited geographic area, creation of a new series is not justified. Several map units in the study area consist of poorly drained soils which may have thin peaty surface layers. This peaty surface is recognized as a peaty phase and is indicated by (P) placed after the series symbol. In addition, phases are used to recognize landscape features which affect soil management such as erosion, slope class, degree of stoniness and salinity. The degree or magnitude of the various classes used to describe such feature is designated in the following manner:

Erosion

- x - no or only very slight erosion
- 1 - weakly eroded
- 2 - moderately eroded
- 3 - severely eroded
- 0 - overblown

Slope Classes

- a - 0 to .5 percent slope
- b - .5 to 2 percent slope
- c - 2 to 5 percent slope
- d - 5 to 9 percent slope
- e - 9 to 15 percent slope
- f - 15 to 30 percent slope
- g - 30 to 45 percent slope
- x - less than 2 percent slope (a and b combined)

Stoniness

- x - non stony
- 1 - slightly stony
- 2 - moderately stony
- 3 - very stony
- 4 - exceedingly stony
- 5 - excessively stony

Salinity

- x - non saline
- s - weakly saline
- t - moderately saline
- u - strongly saline

The convention employed to indicate these features in the map symbol is as follows:

If none of the above properties are observed to be significant, the map symbol representing the typical soil series is used along without modifiers.

If one or more phase features are used, the appropriate letter or number is placed below the soil series symbol in one of four designated locations in the map unit symbol. The designated order is erosion, slope class, stoniness and salinity. If a particular feature is not observed to be significant, an x is used in its appropriate designated location in the map symbol.

For example, the following map unit delineation coded:

SWF - indicates that the area is composed of soils belonging to the Swanford series on terrain level to very gently sloping (less than 2 percent slope). There is no erosion and no stoniness or salinity.

SVC/1x1x - indicates that the area is composed of soils belonging to the Sevick series on terrain that is level to very gently sloping (less than 2 percent slope), slightly eroded, slightly stony and non saline.

The compound map unit coded as follows:

$$\frac{LSW^{6}}{2xxx} - MNT^{4}$$

is interpreted to mean that 60% of the mapping unit consists of soils belonging to the Lenswood series (LSW^{6}) having moderate erosion, level to very gently sloping topography (less than 2% slope) and which are non-stony and non-saline. The remaining 40% of the map unit consists of soils of the Malonton series (MNT^{4}) with no erosion on level to depressional (0-0.5% slope) terrain with no stones or salinity.

2.2 RELIABILITY OF MAPPING

A total of 794 soil inspections were made during the survey of the area in (Figure 11) giving a survey intensity level of one inspection per 10 ha of land. This intensity of sampling permitted the confident delineation of soil mapping units comprised of narrowly defined soil types and phases on maps at a scale of 1:20,000 (3 inches equal one mile).

2.3 METHODS OF DESCRIBING SOILS IN THE FIELD

Soils in the study area were sampled and described according to nationally accepted standards and procedures for describing soils in the field[10]. At each site inspection, detailed information was recorded as to landform, drainage, parent material and soil profile characteristics. The record of this information is maintained in the Daily File of the Canada Soil Information System (CanSIS).

During the course of field investigations and mapping, 25 soil sites were sampled at selected locations for soil characterization and classification studies. The description of these soils and analysis of the samples are stored in the Detail File of CanSIS and included in Appendix D1 of this report. Selected surface and subsurface samples were analyzed for salinity levels and textural variation and subsurface samples were analyzed for carbonate levels. Twenty-one sites were examined and sampled to depths of 6 meters to provide additional information on textural

[10] Expert Committee on Soil Survey. The Canada Soil Information System (CanSIS). Manual for Describing Soils in the field. 1982. Revised.

variability and chemical characteristics of the parent material. The results from these "deep drill" investigations were used to construct stratigraphic cross-sections of the surficial deposits in the study area.

2.4 LABORATORY ANALYSIS

Chemical and physical characterization of soils sampled in the study area was determined according to standard laboratory methods and proedures recommended for soil surveys. This analytical data is included with the soil descriptions in Appendix D2.

2.5 CARTOGRAPHIC PROCEDURES AND CANSIS MAP PRODUCTION

Soil boundaries were drawn on air photographs (scale of 1:15,840, 4 inches equal 1 mile) during field mapping. These photographs show woodlands, buildings, field outlines, roads and other details that help in identifying boundaries accurately. The soil boundaries were reduced and plotted on a soil map manuscript at a scale of 1:20,000 or 3 inches equal 1 mile. This map data in digital form is stored in the Cartographic File of the Canada Soil Information Ssytem (CanSIS). The data in this file provides the basis for producing various kinds of derived thematic maps quickly and inexpensively. Single feature maps for characteristics such as drainage, texture of surface deposits, slope, stoniness and distribution of salinity are examples. In addition, maps showing the sixteen engineering and recreational use interpretations that are provided in tabular form in Part 4 of this report can be derived from the basic soil map.

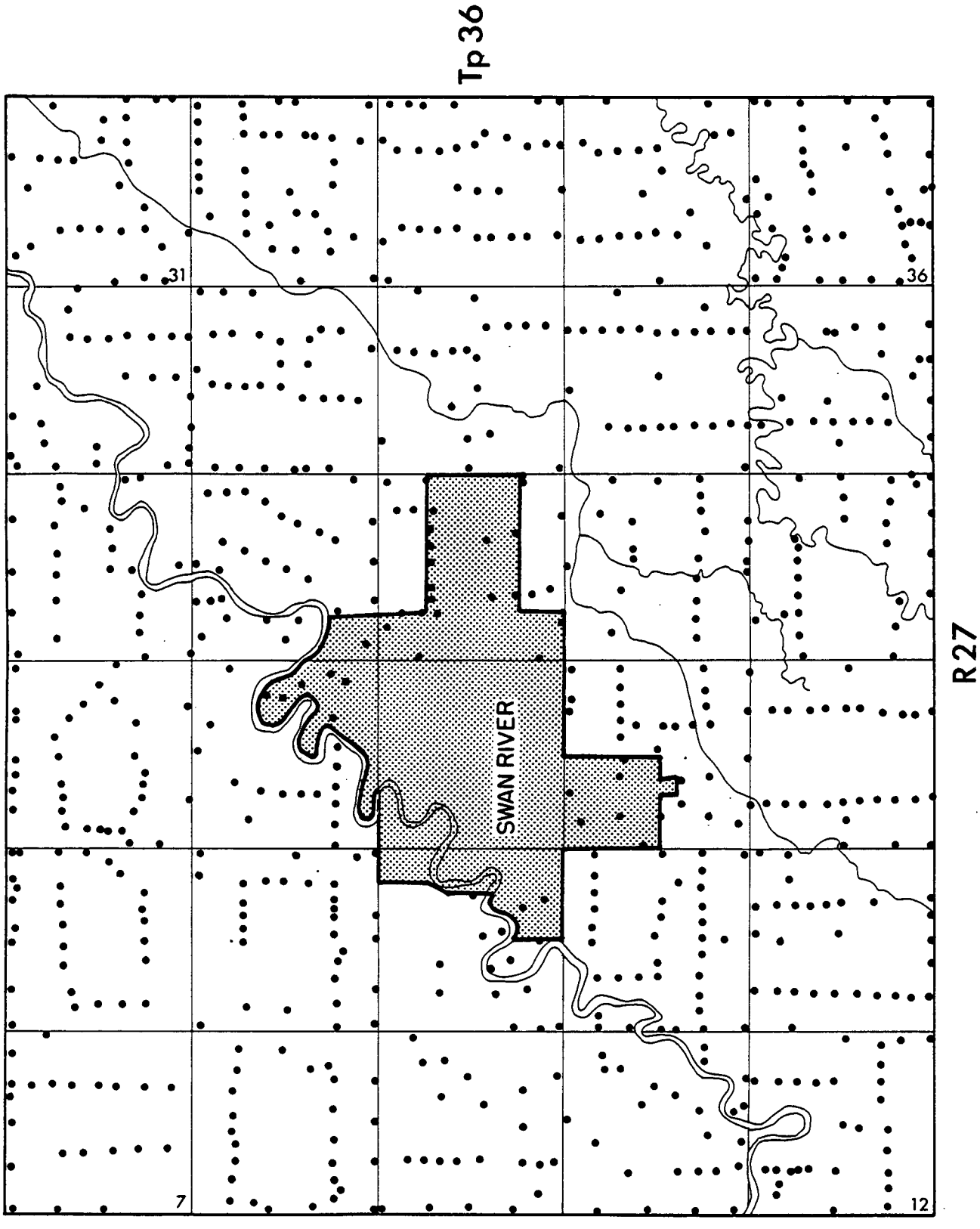

Figure 11: Location of Groundtruth Observation Sites.

PART 3

DEVELOPMENT, CLASSIFICATION AND DESCRIPTION OF SOILS

3.1 SOIL DEVELOPMENT

The principal factors affecting soil formation are: the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; relief and drainage; the length of time the forces of soil formation have acted on the soil material; and influence resulting from the work of man. The characteristics of a soil at any given place are determined by the interaction of these soil forming factors.

Soil characteristics are observed in the soil profile. A profile is the sequence of natural layers or horizons observed in vertical cross-section extending from the surface down into the relatively unweathered and unaltered soil parent material. The main or master horizons have been designated by the letters A, B and C for mineral horizons. Horizon characteristics and combinations of these horizons form the basis for soil classification[11]. The A and B horizons are a reflection of the active soil forming factors, climate and plant and animal life, chiefly plants operating on the parent material. Together the A and B horizons make up the solum. In general, A horizons or surface layers are subjected to the greatest amount of weathering and leaching and/or organic matter accumulation. The B horizons, lying immediately below the A horizon contain most of the material leached from the A horizons ie. clay, organic matter or iron and aluminium.

In some soils B horizons consist mainly of material that has been altered only slightly by soil forming processes, but has not been translocated. The C horizons represent the relatively unaltered parent material from which the solum has developed.

Within a particular climatic zone, soils differ due to texture and mineralogical composition of the parent material. The soil profile that develops is also very much influenced by soil drainage and groundwater hydrology. Soils developed on sandy to loamy materials are more permeable to water and permit greater leaching of soluble and colloidal components as compared to clayey soils. Soil profiles developed on moderately calcareous sediments are generally deeper than soils developed on strongly calcareous sediments. Restrictions on normal soil development often result from periods of saturation in areas affected by surface ponding, lateral inflow, seepage or near surface groundwater. Under such conditions, leaching of soil material is minimal and in some cases, the tran-

[11] Canada Soil Survey Committee, Subcommittee on Soil Classification. 1978. The Canadian System of Soil Classification. Can. Dept. Agric. Publ. 1646.

slocation of soluble materials is towards the surface. Poor soil drainage associated with depressional areas alters the soil environment from an oxidative state to a reductive state depleted of oxygen. Such soils with restricted drainage are characterized by dull (gleyed) soil colours, the presence of reddish yellow or brown mottles of iron and manganese, the presence of lime carbonate and/or soluble salts near the surface and a high water table. Very poorly drained depressional sites are saturated throughout the year and soils are often characterized by accumulation of shallow organic materials.

Soil development on the various parent materials in the Swan River Townsite study area is influenced by the regional climate and by soil drainage and groundwater hydrology. Soils in the Swan River area have developed under cool, subhumid Boreal climatic conditions which generally provide sufficient moisture and length of growing season for development of Chernozemic Black and Dark Gray soils. The native vegetation of the area consisted of near continuous aspen forest and groves of deciduous forest interspersed with tall prairie grass- wet meadow vegetation on well to imperfectly drained sites and treeless sedge meadows with clumps of willow and swamp birch on poorly drained sites. Better drained sites under grass vegetation show evidence of leaching and development of Orthic Black profiles characterized by dark coloured Ah horizons and brown B horizons. Dark Gray profiles with weakly leached surface horizons (Ahe) and an accumulation zone (Btj or Bt horizons) occur on well drained sites under more continuous tree cover. The dominant soils in the study area are imperfectly drained and characterized by Rego Black profiles with dark coloured Ah horizons underlain by calcareous parent material. Humic Gleysol soils found in associated poorly drained areas also have dark coloured Ah horizons which grade into dull coloured, mottled parent material. Profile development in both of these soil types has been restricted by soil moisture regime and proximity of groundwater to the soil surface. Soil development along creeks and rivers have been influenced by periodic flooding and accretion of sediments on the soil surface. The resulting Regosol soils have little or no horizon development.

3.2 SOIL CLASSIFICATION

Soils in the study area were classified according to the System of Soil Classification for Canada[12]. This system is hierarchical employing 5 levels of generalization or categories of classification. Beginning with the most generalized, these categories are the order, great group, subgroup, family and series. The classification is based on measurable soil properties that can be observed in the field, or can be inferred from other properties observable in the field. The properties selected as criteria for the higher categories are the result of soil genesis or of factors that affect soil genesis. Properties utilized to differentiate soils at the lower levels of family and series affect management. The five levels of generalization are defined as follows:

ORDER - Soil orders are defined on the basis of soil properties that reflect the soil environment and the kind and degree of dominant soil forming process. An example is Chernozem in which soils with dark col-

[12] Canada Soil Survey Committee, Subcommittee on Soil Classification. 1978. The Canadian System of Soil Classification. Canada Department of Agriculture. Publ. 1646.

oured surface horizons develop under subhumid climate and dominantly grassland environments.

GREAT GROUP - Each order is subdivided into great groups based on differences in strength of dominant processes or a major contribution of a process in addition to a dominant one. Such processes result in particular kinds, arrangement and degree of expressions of pedogenic horizons. An example is a Luvic Gleysol in which the dominant process is considered to be gleying but clay accumulation in the B horizon is also a major process.

SUBGROUP - Subgroups are subdivisions of great groups and are defined on the basis of kind and arrangement of horizons that indicate; the central concept of the great group eg. Orthic; intergrades toward soils in other orders, eg. Gleyed, or special features such as lime carbonate in B horizons.

FAMILY - Families are established within a subgroup based on similarity of physical and chemical properties that affect management. Among the properties considered important for recognizing families are particle size distribution, mineralogy, soil climate, soil reaction and thickness of solum.

SERIES - The series consists of soils that formed in a particular kind of material and have horizons whose color, texture, structure, consistence, thickness, reaction and chemical composition are similar in differentiating characteristics and in arrangement in the soils profile.

A summary of the classification of the soils in the Swan River Townsite study area is presented in Table 4 The correlation of these soils with the Reconnaissance Soil Study of the Swan River area is discussed in Appendix D3.

Soil parent material and soil moisture regime characteristics have a major influence on soil profile type and so become the dominant feature used in classifying and mapping soils. The relationship of variation in parent material and drainage to soil profile type (genetic subgroup) is shown in the key to soils of the Swan River study area presented in Table 5

3.3 DESCRIPTION OF SOIL SERIES AND MAPPING UNITS

Generalized descriptions for each soil series mapped in the survey area are presented in alphabetic order. Characteristics of the soil and the material in which it formed including extent of the soil, genetic profile type, texture, parent material type, topography and drainage are discussed for each series. The soil is compared to similar soils and to nearby soils of other series. Following this, the range of important characteristics of the soil series in the survey area is presented. Detailed morphological descriptions and chemical and physical characteristics for selected soils in the survey areas are presented in Appendix D2. Information on the suitability and management requirement for various agricultural and non-agricultural uses is presented in other sections of this report.

The generalized soil descriptions are based on summaries and averages of soil data systematically documented and recorded during the course of the field survey. A summary of the soil inspections used to compile the generalized soil descriptions is included in Appendix D (Table 19).

TABLE 5

Parent Materials Soils and Their Estimated Extent in the Swan River Townsite Study Area

	Map Symbol	Area (ha)	% of Map Area
A. Soils developed on morainal deposits.			
1. Very strongly calcareous loamy till.			
a) Well drained			
• Meharry Series (Rego Black)	MEH	111.01	1.40
• Rose Ridge Series (Orthic Dark Gray)	RDG	33.83	0.43
b) Imperfectly drained			
• Oaknook Series (Gleyed Rego Black)	ONK	133.03	1.68
SUB-TOTAL		277.87	3.51
B. Soils developed on lacustrine materials			
1. Moderately to strongly calcareous fine loamy sediments.			
a) Well drained			
• Dutton Series (Orthic Black)	DTT	44.30	0.56
b) Imperfectly drained			
• Valley Series (Gleyed Rego Black)	VLY	682.94	8.60
c) Poorly drained			
• Balmoral Series (Rego Humic Gleysol)	BAM	48.26	0.61
• Balmoral Series (Rego Humic Gleysol, peaty phase)	BAMp	4.56	0.06
SUB-TOTAL		780.56	9.83

2. Thin (less than 1 meter) moderately to strongly calcareous five loamy sediments overlying strongly calcareous loamy till.			
a) Well drained			
• Timberton Series (Orthic Black)	TBN	45.80	0.58
b) Imperfectly drained			
• Minitonas Series (Gleyed Rego Black)	MNS	124.59	1.57
c) Poorly drained			
• Pineimuta Series (Rego Humic Gleysol)	PMU	22.23	0.28
• Pineimuta Series (Rego Humic Gleysol, peaty phase)	PMUp	4.77	0.06
SUB-TOTAL		197.39	2.49
3. Thin (less than 1 meter) moderately to strongly calcareous fine loamy sediments overlying gravel.			
a) Well drained			
• Dutton Series gravel substrate variant (Orthic Black)	DTT2	20.17	0.25
SUB-TOTAL		20.17	0.25
4. Strongly to very strongly calcareous coarse loamy sediments.			
a) Well drained			
• Durban Series (Orthic Black)	DRB	26.36	0.33
b) Imperfectly drained			
• Swanford Series (Gleyed Rego Black)	SWF	555.62	7.00
c) Poorly drained			

• Foley Series (Rego Humic Gleysol)	FOY	81.98	1.03
SUB-TOTAL		663.96	8.56
5. Thin (less than 1 meter) strongly to very strongly calcareous, coarse loamy sediments overlying strongly calcareous loamy till.			
a) Well drained			
• Banks Series (Orthic Dark Gray)	BAX	14.74	0.19
b) Imperfectly drained			
• Craigsford Series (Gleyed Rego Black)	CGD	184.54	2.33
SUB-TOTAL		199.28	2.52
6. Thin (less than 1 meter) strongly to very strongly calcareous, coarse loamy sediments overlying clayey sediments.			
a) Imperfectly drained			
• Swanford Series clayey substrate variant (Gleyed Rego Black)	SWF1	439.70	5.54
SUB-TOTAL		439.70	5.54
7. Weakly to moderately calcareous sandy to coarse loamy sediments.			
a) Well drained			
• Davidson Series (Orthic Dark Gray)	DVD	150.84	1.90
• Gilbert Series (Orthic Black)	GBT	1,066.25	13.43
• Silver Creek Series (Orthic Regosol)	SVK	41.65	0.52
b) Imperfectly drained			

• Lenswood Series (Gleyed Rego Black)	LSW	1,327.60	16.73
c) Poorly drained			
• Malonton Series (Rego Humic Gleysol)	MNT	185.87	2.34
SUB-TOTAL		2,772.21	34.92
8. Thin (less than 1 meter) weakly to moderately calcareous sandy to coarse loamy sediments overlying strongly calcareous loamy till.			
a) Well drained			
• Ethelbert Series (Orthic Black)	ETT	300.26	3.78
b) Imperfectly drained			
• Pelan Series (Gleyed Dark Gray)	PLN	19.50	0.25
• Sevick Series (Gleyed Rego Black)	SVC	308.52	3.89
c) Poorly drained			
• Sprague Series (Rego Humic Gleysol)	SPG	73.95	0.93
SUB-TOTAL		702.23	8.85
9. Thin (less than 1 meter) weakly to moderately calcareous sandy to coarse loamy sediments, overlying clayey sediments.			
a) Well drained			
• Gilbert Series, loamy substrate variant (Orthic Black)	GBT1	212.96	2.68
b) Imperfectly drained			
• Lenswood Series, loamy substrate variant (Gleyed Rego Black)	LSW1	316.33	3.99

c) Poorly drained			
• Prawda Series (Rego Humic Gleysol)	PRA	7.43	0.09
SUB-TOTAL		536.72	6.76
10. Thin (less than 1 meter) weakly to moderately calcareous sandy to coarse loamy sediments overlying gravel.			
a) Well drained			
• Gilbert Series, gravelly substrate variant (Orthic Black)	GBT2	48.29	0.61
b) Imperfectly drained			
• Lenswood Series, gravelly substrate variant (Gleyed Rego Black)	LSW2	6.35	0.08
SUB-TOTAL		54.64	0.69
C. Soils developed on stratified sand and gravel beach and outwash deposits.			
1. Weakly to moderately calcareous sandy to gravelly beach deposits.			
a) Well drained			
• Agassiz Series (Orthic Black)	ASZ	12.01	0.15
SUB-TOTAL		12.01	0.15
D. Soils developed on recent fluvial (alluvial) materials.			
1. Weakly to moderately calcareous deposits			
a) Well drained			
• Swan River Series (Orthic Black)	SWV	165.12	2.08

b) Imperfectly drained			
• Homestead Series (Gleyed Cumulic Regosol)	HMD	373.74	4.71
c) Poorly drained			
• Novra Series (Rego Gleysol)	NOV	194.87	2.46
SUB-TOTAL		733.73	9.25
2. Thin (less than 1 meter) weakly to moderately calcareous fine loamy to coarse loamy sediments overlying gravel.			
a) Imperfectly drained			
• Heatley Series (Gleyed Cumulic Regosol)	HAY	17.09	0.22
SUB-TOTAL		17.09	0.22
3. Weakly to moderately calcareous coarse loamy to sandy deposits.			
a) Imperfectly drained			
• Bell River Series (Gleyed Cumulic Regosol)	BEV	29.89	0.38
SUB-TOTAL		29.89	0.38
E. Soils developed on Organic Deposits.			
1. Dominantly humic to mesic forest peat grading to humic fen peat.			
a) Shallow (40-160 cm) peat overlying loamy to clayey sediments.			
• Haute Series (Terric Humisol)	HAU	21.26	0.27
SUB-TOTAL		21.26	0.27
F. Undifferentiated materials and non-soil features.			

1. Moderately to strongly calcareous coarse loamy to fine loamy (lacustrine and colluvium).			
a) Well drained			
• Eroded Slopes Complex (Thin Black and Regosols)	ERX	7.29	0.09
SUB-TOTAL		7.29	0.09
2. WATER		82.81	1.04
3. LAGOON		29.17	0.37
4. SWAN RIVER TOWNSITE		359.13	4.52
TOTAL AREA		7,936.61	

Agassiz Series (ASZ)

The Agassiz series consists of well to rapidly drained, Orthic Black soils developed on strongly calcareous, deep, stratified, sandy to gravelly lacustrine beach deposits. These soils occur on crest and upper to mid slope positions of gently sloping, ridged landscapes and have very rapid permeability, moderate surface runoff and a low water table during the growing season. Agassiz soils are wind eroded. The native vegetation often comprises open stands of aspen and oak with an understory of grasses and forbs. The majority of these soils are currently used for crop production.

In a representative profile of Agassiz soil, the solum is generally 60 cm thick. The profile is characterized by a thin, 20 cm very dark gray loamy sand Ap horizon overlying a thin, 25 cm dark grayish brown loamy sand Bm horizon, and a pale brown stratified sand and fine gravel Ck horizon. The parent material is typically variably stratified coarse sand to fine gravel texture, pale brown and strongly calcareous.

Agassiz soils may occur in close association with Lenswood or Sevick soils. Agassiz soils have low available water holding capacity, low organic matter levels, and low natural fertility.

In this study, Agassiz soils vary slightly from the norm by having a dominance of coarse sand and fine gravel texture and less coarse gravel, cobbles and stone content.

Balmoral Series (BAM)

The Balmoral series consists of poorly drained carbonated Rego Humic Gleysol soils developed on strongly to very strongly calcareous, deep, uniform fine loamy lacustrine sediments. These soils occur in depressional positions of nearly level to level landscapes and have moderately slow permeability, very slow surface runoff and a high water table during the growing season. The native vegetation often comprises of sedges and meadow grasses with occasional clumps of willow. The majority of these soils are currently used for crop production.

In a representative profile of Balmoral soil, the solum is generally 30 cm thick. The profile is characterized by a thin, 25 cm very dark gray clay loam Apk horizon overlying a very thin, gray, clay loam transitional AC horizon, or a prominent light gray, silty clay loam Ccag horizon. The parent material is typically uniform gray to grayish brown, silty clay loam to clay loam, strongly mottled and very strongly calcareous.

Balmoral soils occur in close association with Valley soils. They are similar to Valley soils by having similar texture and sequence of horizons, but differ from Valley soils because of wetness and higher levels of free lime in the surface horizons. Balmoral soils have high available water holding capacity, high organic matter levels, and high natural fertility.

In this study some Balmoral soils vary slightly from the norm by having thin surface layers of herbaceous peat and have been mapped as Balmoral peaty phase soils.

Balmoral peaty phase (BAMp)

The Balmoral peaty phase series consists of poorly drained, peaty carbonated Rego Humic Gleysol soils developed on strongly to very strongly calcareous, deep, uniform, fine loamy lacustrine sediments. These soils occur in depressional positions of nearly level landscapes and have moderately slow permeability, very slow surface runoff and a high water table during the growing season. The native vegetation often comprises sedges and meadow grasses with occasional willow clumps. The majority of these soils are currently used for crop production.

In a representative profile of Balmoral peaty phase soil, the solum is generally 30 cm thick. The profile is characterized by a thin (15 to 40 cm) mesic sedge peat surface horizon overlying a thin, very dark gray clay loam Apk horizon, and a very thin, gray, clay loam ACKg horizon and/or a prominent light gray silty clay loam Ccag horizon. The parent material is typically uniform, gray to grayish brown silty clay loam, to clay loam, strongly mottled and very strongly calcareous.

Balmoral peaty phase soils occur in close association with Balmoral soils. They are similar to Balmoral soils by having similar profile characteristics, but differ from Balmoral soils because of the thin moderately well decomposed peat surface horizon. Balmoral peaty phase soils have high available water holding capacity, high organic matter levels, and high natural fertility.

Bell River Series (BEV)

The Bell River series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on moderately to strongly calcareous, deep stratified, coarse loamy to sandy, fluvial (alluvial) deposits. These soils occur on upper to middle slopes of gently sloping, undulating landscapes and have rapid permeability, moderate surface runoff and a generally low water table during the growing season. Bell River soils may be slightly water eroded. The native vegetation often comprises of mixed hardwood forest with an understory of low shrubs herbs and grasses. The majority of these soils are currently used for improved pasture.

In a representative profile of cultivated Bell River soil, the solum is generally 15 cm thick. The profile is characterized by a thin, 15 cm grayish brown loamy very fine sand Ap horizon overlying a light brownish gray to pale brown fine sand CKgj horizon. The parent material is typically variably stratified, loamy very fine sand textures with thin bands of silt loam and dark coloured organic rich layers and many weak, fine mottles.

Bell River soils occur in close association with Homestead soils. They are similar to Homestead soils by having similar profile characteristics, but differ from the Homestead soils because of dominantly coarser textured soil materials. Bell River soils have low available water holding capacity, medium organic matter levels, and medium natural fertility. Bell River soils correlate with the Bell River soils previously published in the Swan River soil report.

Banks Series (BAX)

The Banks series consists of well drained Orthic Dark Gray soils developed on strongly to very strongly calcareous, shallow (20 to 100 cm), uniform coarse loamy lacustrine sediments overlying very strongly calcareous, loamy morainal deposits. These soils occur on crest and upper slope positions of level to very gently sloping lacustrine veneer deposits and have moderate permeability slow surface runoff and a moderately low water table during the growing season. Banks soils are slightly stony. The native vegetation often comprises mixedwood forest of aspen and white spruce with occasional oak. The majority of these soils are currently used for crop production.

In a representative profile of Banks soil, the solum is generally 35 cm thick. The profile is characterized by a dark gray, loamy fine sand textured Ap horizon overlying a dark brown to brown fine sandy loam textured Bm horizon, and a grayish brown loamy fine sand Ck horizon. The parent material is typically light brownish gray loamy fine sand underlain by compact, light gray, loam to clay loam strongly calcareous till.

Banks soils occur in close association with Rose Ridge soils. They are similar to Rose Ridge soils by having similar horizon development, but differ in having deeper profiles and lower amounts of stones and cobbles on the surface. Banks soils have medium available water holding capacity, medium organic matter levels, and high natural fertility. Banks soils correlate with Onanole till substrate phase soils previously published in the West Lake soil report (Soil Report No. 8).

In this study Banks soils vary slightly from the norm by having a till substrate derived from dominantly limestone and granite rock materials.

Craigsford Series (CGD)

The Craigsford series consists of imperfectly drained carbonated Gleyed Rego Black soils developed on strongly to very strongly calcareous, shallow, uniform, coarse loamy, lacustrine sediment underlain by very strongly calcareous loamy morainal deposits of mixed limestone and grantic rock origin. These soils occur on level lacustrine veneer deposits and have moderate permeability, very slow surface runoff and a medium water table during the growing season. Craigsford soils are slightly wind eroded and slightly stony. The native vegetation often comprises meadow grasses, sedge and willow with open stands of aspen and balsam poplar. The majority of these soils are currently used for crop production.

In a representative profile of a Craigsford soil, the solum is generally 46 cm thick. The profile is characterized by a thin (30 cm) very dark gray, very strongly calcareous, loamy to very fine sandy loam Ap horizon overlying a thin dark grayish brown, calcareous, loam to very fine sandy loam AC horizon and sometimes a grayish to light grayish brown, loam to silt loam textured Ccagj horizon. The parent material is typically light brownish gray, calcareous and weakly mottled loam to very fine sandy loam sediments. A typical profile is also underlain by a pale brown to light brownish gray very strongly calcareous, mottled loam to clay loam stony till.

Craigsford soils occur in close association with Swanford soils. The are similar to Swanford soils by having similar texture, horizons and moisture holding capacity, but differ from Swanford soils because of the

presence of a clay loam textured, compact till substrate. Craigsford soils have medium available water holding capacity, high organic matter levels and high natural fertility. Craigsford soils correlate with Swanford till substrate phase soils previously published in the Swan River soil report (Soil Report No. 13).

Davidson Series (DVD)

The Davidson series consists of well drained slightly eroded Orthic Dark Gray soils developed on weakly to moderately calcareous deep sandy to coarse loamy lacustrine sediments. These soils occur on crests and upper slopes of nearly level landscapes and have rapid permeability, very slow surface runoff and a very low water table during the growing season. Davidson soils are commonly slightly eroded. The native vegetation often comprises mixed forest of aspen and white spruce with low shrub and mixed grass understory. The majority of these soils are currently used for crop production.

In a representative profile of Davidson soil, the solum is generally 87 cm thick. The profile is characterized by a 56 cm thick, dark gray fine sand Ahe horizon overlying a fine sand brownish coloured B horizon, and a grayish brown to pale brown fine sand Ck horizon. The parent material is typically uniform, strongly calcareous fine and very fine sand.

Davidson soils occur in close association with Gilbert and Silver Creek soils. They are similar to Gilbert and Silver Creek soils by having similar textures, but differ from both of these soils because of surface colour. Davidson soils have low available water holding capacity, low organic matter levels, and low natural fertility.

In this study Davidson soils vary slightly from the norm by having slight wind erosion and have been mapped as a slightly eroded phase.

Durban Series (DRB)

The Durban series consists of well drained Orthic Black soils developed on strongly to very strongly calcareous, deep, uniform coarse loamy lacustrine sediments. These soils occur on upper slopes of very gently sloping landscapes and have moderate permeability, slow surface runoff and a low water table during the growing season. Durban soils are slightly wind eroded. The native vegetation often comprises mixedwoods of poplar and white spruce, with low shrubs and grass ground cover. The majority of these soils are currently used for crop production.

In a representative profile of Durban soil, the solum is generally 50 cm thick. The profile is characterized by a thick (35 cm), very dark gray to dark gray A horizon overlying a light brown loam to fine sandy loam textured Bm or Btj horizon. The parent material is typically uniform, very light gray fine sandy loam and strongly calcareous.

Durban soils occur in close association with Banks soils. They are similar to Banks soils by having the same texture, drainage and profile type, but differ because of a less permeable till substrate within 1 m of the surface. Durban soils have medium available water holding capacity, medium organic matter levels, and medium natural fertility.

Dutton Series (DTT)

The Dutton series consists of well drained Orthic Black soils developed on moderately to strongly calcareous, deep, uniform, fine loamy, lacustrine sediments. These soils occur on level landscapes and have moderate permeability, slow surface runoff and a low water table during the growing season. The native vegetation often consists of aspen with an understory of low shrubs and grasses. The majority of these soils are currently used for crop and pasture.

In a representative profile of Dutton soil, the solum is generally about 50 cm thick. The profile is characterized by a thick (38 cm), dark gray, loam to clay loam Ah or Ap horizon overlying a dark brown, clay loam Bm or Btj horizon, and a carbonate-rich, light gray, silty clay loam Cca horizon. The parent material is typically uniform pale brown, clay loam to silty clay loam and moderately calcareous.

Dutton soils occur in close association with Valley soils. They are similar to Valley soils by having the same texture, but differ because of better drainage and the occurrence of a B horizon. Dutton soils have high available water holding capacity, high organic matter levels, and high natural fertility.

In this study some Dutton soils vary slightly from the norm by having a gravel substrate within 1 m of the soils surface, and have been mapped as a Dutton gravel substrate variant.

Dutton Series, gravel substrate variant (DTT2)

The Dutton gravel substrate variant consists of well drained Orthic Black soils developed on moderately to strongly calcareous, shallow, fine loamy lacustrine sediment, overlying fragmental fluvial deposits. These soils occur on simple slopes of nearly level landscapes and have moderate permeability, slow surface runoff and a generally low water table during the growing season. The native vegetation often includes aspen with a understory of shrubs and ground cover of grass. The majority of these soils are currently used for pasture.

In a representative profile of Dutton gravel substrate soil, the solum is generally 45 cm thick. The profile is characterized by a 35 cm thick, loam to clay loam textured very dark gray A horizon overlying a clay loam brownish coloured B horizon, and clay loam to silty clay loam Ck horizon. The parent material of the gravel substrate is typically loose and strongly calcareous.

The Dutton gravel substrate soils occur in close association with Dutton soils. They are similar to Dutton soils by having similar surface texture, but differ because of the presence of the gravel substrate. Dutton gravel substrate soils have high available water holding capacity, high organic matter levels, and high natural fertility.

In this study some Dutton gravel substrate soils vary slightly from the norm by having a thicker surface overlay and have been mapped as the normal Dutton series.

Eroded Slopes Complex (ERX)

The Eroded Slopes Complex consists of very rapidly to well drained Chernozemic Black, Dark Gray and Regosolic soils developed on moderately to strongly calcareous, loamy, lacustrine sediments. These soils occur on very strongly sloping, steep eroded gullies and valley sidewall deposits and have moderate permeability, very rapid surface runoff and a very low water table during the growing season. Eroded Slope Complex soils have the potential for severe gullying and dissection if not protected by vegetative cover. The native vegetation often comprises of mixed woods and aspen, birch white spruce and balsam poplar. The majority of these soils are currently used for wild life habitat.

In a representative profile of a thin or truncated Black soil, the solum is generally 10 to 15 cm thick. The profile is characterized by a thin, very dark gray, to dark gray loam textured Ah horizon, overlying a very strongly calcareous, light gray silt loam Cca horizon, and a very pale brown strongly calcareous, loam to clay loam textured Ck horizon. The parent material is typically somewhat stratified, pale brown, strongly calcareous very fine sandy loam to clay loam.

The thin Black soils occur in close association with weakly developed Chernozemic Dark Gray soils, and Orthic Regosol soils on steep slopes. The Orthic Regosol soils, differ from the Black and Dark Gray soils because of complete absence of profile development. Eroded Slopes Complex soils have moderate available water holding capacity, low organic matter levels and low natural fertility.

Ethelbert Series (ETT)

The Ethelbert series consists of well drained Orthic Black soils developed on strongly calcareous, shallow, sandy to coarse loamy lacustrine sediments overlying very strongly calcareous loamy till within one meter of the surface. These soils occur on level landscapes of lacustrine veneer deposits and have rapid surface permeability and low subsoil permeability, slow surface runoff and a low water table during the growing season. Ethelbert soils may be slightly eroded, and moderately stony. The native vegetation often consists of aspen associated with tall shrubs and a mixed grass ground cover. The majority of these soils are currently used for crop production.

In a representative profile of an Ethelbert soil, the solum is generally 44 cm thick. The profile is characterized by a thin, very dark gray, loamy fine sand A horizon overlying a fine sand to loamy fine sand brown coloured Bm horizon, and a pale brown fine sand Ck horizon. The parent material of the till substrate is typically compact loam textured and very strongly calcareous. Ethelbert soils occur in close association with Sevick soils. They are similar to Sevick soils by having the same texture and till substrate, but differ from them because of better drainage and lower water table. Ethelbert soils have low available water holding capacity, medium organic matter levels, and medium natural fertility. Ethelbert soils correlate with Gilbert till substrate phase soils previously published in the Swan River soil report (Soil Report No. 13).

Foley Series (FOY)

The Foley series consists of poorly drained, carbonated Rego Humic Gleysol soils developed on strongly to very strongly calcareous, deep, uniform, coarse loamy lacustrine sediments. These soils occur in depressional positions of level landscapes and have moderate permeability, very slow surface runoff and a high water table during the growing season. The native vegetation often comprises meadow grasses, sedges and occasional clumps of willow. The majority of these soils are currently used for crop production.

In a representative profile of Foley soil, the solum is generally 42 cm thick. The profile is characterized by a 30 cm thick, very dark gray, moderately calcareous very fine sandy loam A horizon, overlying a grayish brown, very fine sandy loam, strongly calcareous, AC transition horizon, and a light gray, very strongly calcareous loamy very fine sand mottled Ckg horizon. The parent material is typically uniform, light gray to pale brown, very strongly calcareous, mottled loamy very fine sand to fine sand.

Foley soils occur in close association with Swanford soils. They are similar to Swanford soils by having the same texture, but differ from them because of poor drainage and a high water table. Foley soils have medium available water holding capacity, high organic matter levels, and high natural fertility.

Gilbert Series (GBT)

The Gilbert series consists of well drained Orthic Black soils, developed on moderately to strongly calcareous, deep, uniform, sandy to coarse loamy lacustrine sediments. These soils occur on level landscapes and have rapid permeability, very slow surface runoff and a low water table during the growing season. Gilbert soils are slightly to severely eroded. The native vegetation often comprises of aspen with scattered white spruce and mixed grasses and shrubs in the understory. The majority of these soils are currently used for crop production.

In a representative profile of a Gilbert soil, the solum is generally about 70 cm thick. The profile is characterized by a thick (37 cm), very dark gray non-calcareous loamy fine sand A horizon overlying a thick dark brown non- calcareous loamy fine sand Bm horizon, and very pale brown moderately calcareous fine sand textured Ck horizon. The parent material is typically uniform, very pale brown, strongly calcareous fine and very fine sand.

Gilbert soils occur in close association with Lenswood soils. They are similar to Lenswood soils by having the same textural range, but differ because of better natural drainage and a lower water table. Gilbert soils have low available water holding capacity, medium organic matter levels, and medium natural fertility.

In this study some Gilbert soils vary slightly from the norm by having slight to moderate wind erosion and others by having a significant surface layer of wind blown, grayish brown loamy fine sand. They have been mapped as eroded and overblown phases respectively.

Gilbert, loamy substrate variant (GBT1)

The Gilbert loamy substrate variant consists of well drained Orthic Black soils developed on moderately to strongly calcareous, shallow, uniform, sandy to coarse loamy lacust-

rine sediments less than 1 m in depth overlying loamy lacustrine sediments. These soils occur on level lacustrine veneer deposits and have rapid surface permeability and low subsoil permeability in the loamy substrate, slow surface runoff and a low water table during growing season. The native vegetation often comprises aspen with occasional white spruce and an understory of mixed grasses and low shrubs. The majority of these soils are currently used for crop production.

In a representative profile of a Gilbert loamy substrate variant soil, the solum is generally 60 cm thick and ranges from 30 to 100 cm thick. The profile is characterized by a thick (36 cm), very dark gray, non-calcareous loamy fine sand Ap-Ah horizon overlying about 24 cm of yellowish brown to brown, non-calcareous loamy fine sand Bm horizon, and a light gray to pale brown, strongly calcareous very fine sand Ck horizon. The parent material of the substrate is typically stratified clay loam to silty clay loam texture.

Gilbert loamy substrate variant soils occur in close association with Lenswood loamy substrate variant soils and normal Gilbert soils. They are similar to the Lenswood loamy substrate variant soils by having clay loam to silty clay loam textured sediments within 1 m of the soil surface, but differ from the Gilbert soils because of deeper (>1 m) sandy veneers overlying the heavy substrate. Gilbert loamy substrate variant soils have medium available water holding capacity, medium organic matter levels, and medium natural fertility.

In this study some Gilbert loamy substrate variant soils vary slightly from the norm by having slight to moderate wind erosion and have been mapped as a eroded phases.

Gilbert, gravel substrate variant (GBT2)

The Gilbert gravel substrate variant consists of well drained Orthic Black soils developed on moderately to strongly calcareous, shallow, somewhat stratified sandy to coarse loamy lacustrine sediments underlain by stratified coarse sand and fine gravel fluvial deposits within 1 m. These soils occur on crest and upper slopes of nearly level lacustrine landscapes and have rapid permeability, slow surface runoff and a medium low water table during the growing season. The native vegetation often consists of mixed grasses, low shrubs and occasional groves of aspen. The majority of these soils are currently used for crop production.

In a representative profile of a Gilbert gravel substrate variant soil, the solum is generally about 50 cm thick. The profile is characterized by a 30 cm thick, very dark gray, non-calcareous very fine sand Ap-Ah horizon overlying a yellowish brown to brown non-calcareous fine sand textured Bm horizon about 30 cm thick, and a light gray, very fine sand, moderately calcareous Ck horizon. The parent material of the gravel substrate is typically stratified coarse sand and fine gravel and is moderately calcareous.

The Gilbert gravel substrate variant soils occur in close association with Lenswood gravel substrate variant soils. They are similar to the Lenswood gravel substrate soils by having similar texture, but differ from them because of having better drainage. Gilbert gravel substrate variant soils have low available water holding capacity, medium organic matter levels. and medium natural fertility.

In this study Gilbert gravel substrate soils vary slightly from the

norm by having slight to moderate wind erosion and have been mapped as eroded phases.

Haute Series (HAU)

The Haute series consists of very poorly drained Terric Humisol soils developed on shallow, woody organic humic to mesic forest peat grading to humic fen peat underlain by loamy to clayey sediments. These soils occur on depressional areas of level organic deposits and have moderate permeability, very slow surface runoff and a very high water table during the growing season. The native vegetation often comprises tamarack with high shrubs such as willow and alder and ground cover of aquatic mosses feathermoss and sedge. The majority of these soils currently exist in the native state and are used for wild life habitat.

In a representative profile of Haute soil, the solum is generally about 140 cm thick. The profile is characterized by 25 cm of mesic to humic woody forest peat overlying a humic sedge peat horizon, and strongly mottled, dark olive gray to gray, loam to clay textured calcareous Ckg horizon.

Haute soils in the study area occur in close association with Novra soils. They are similar to Novra soils by having very poor drainage, but differ from Novra soils because of deeper (in excess of 40 cm) peat layers. Haute soils have high available water holding capacity, high organic matter levels, and medium natural fertility. Haute soils correlate with the more highly decomposed members of the shallow peat soils previously published in the Swan River soil report.

Heatley Series (HAY)

The Heatley series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on moderately to strongly calcareous, shallow, stratified fine loamy to coarse loamy fluvial (alluvial) deposits less then 1 m in depth overlying gravelly fluvial deposits. These soils occur on middle positions of gently sloping undulating landscapes, and have moderate permeability, moderate surface runoff and a medium water table during the growing season. The native vegetation often consists of mixed hardwood forest of balsam poplar with some elm, ash and maple. The majority of these soils are currently used for cropland.

In a representative profile of a cultivated Heatley soil, the solum is generally about 20 cm thick corresponding to the depth of cultivation. The profile is characterized by a thin, grayish brown, weakly calcareous, loam textured Ap horizon overlying a stratified very fine sand to loam Ckgj horizon banded with dark coloured layers representing former surface horizons buried by depositions of fresh alluvium. The parent material is typically weakly mottled and moderately calcareous.

Heatley soils occur in close association with Homestead soils. They are similar to Homestead soils by having similar textures in the upper 20 to 80 cm, but differ from Homestead soils because of the underlying coarse textured gravelly substrate. Heatley soils have medium available water holding capacity, low organic matter levels, and medium natural fertility.

Homestead Series (HMD)

The Homestead series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on weakly to moderately calcareous, deep, stratified, fine loamy to coarse loamy fluvial (alluvial) deposits. These soils occur on upper and middle slopes of very gently undulating landscapes and have moderate permeability, moderate surface runoff and a medium high water table during the growing season. The native vegetation often comprises mixed hardwood forest of balsam poplar with some elm, ash and maple. The majority of these soils are currently used for cropland.

In a representative profile of a Homestead soil, the solum is generally about 16 cm thick, corresponding to the depth of cultivation. The profile is characterized by a thin grayish brown, weakly calcareous, loam textured Ap horizon overlying a stratified very fine sand to loam Ckgj horizon banded with dark coloured layers, representing former surface horizons buried by depositions of fresh alluvium. The parent material is typically weakly mottled and moderately calcareous.

Homestead soils occur in close association with Novra soils. They are similar to Novra soils by having the same stratification and texture, but differ from Novra soils because of better drainage. Homestead soils have medium available water holding capacity, low organic matter levels, and medium natural fertility. Homestead soils correlate with the imperfectly drainage member of the Alluvial complex soils previously published in the Swan River soil report.

Lenswood Series (LSW)

The Lenswood series consists of imperfectly drained, carbonated Gleyed Rego Black soils developed on moderately to strongly calcareous, deep, sandy to coarse loamy lacustrine deposits. These soils occur on level landscapes and have rapid permeability, slow surface runoff and a medium water table during the growing season. Lenswood soils may be slightly to severely eroded. The native vegetation often consists of black poplar with low shrubs such as willow and a ground cover of meadow grasses. The majority of these soils are currently used for crop production.

In a representative profile of a Lenswood soil, the solum is generally about 47 cm thick. The profile is characterized by 30 cm of very dark gray loamy fine sand Ap and Ah horizon overlying about 10 cm of dark grayish brown, calcareous, fine sand, mottled AC transition horizon, and a thin, light brownish gray, strongly calcareous, loamy very fine sand textured Ccag horizon. The parent material is typically mottled and carbonated very fine sand.

Lenswood soils occur in close association with Malonton and Gilbert soils. They are similar to Malonton soils by having mottled and carbonated profiles, but differ from Malonton soils because of better drainage and from the Gilbert soils because of the absence of a B horizon and the presence of carbonates to the soil surface. Lenswood soils have low available water holding capacity, medium organic matter levels, and medium natural fertility.

In this study some Lenswood soils vary slightly from the norm by having a loamy substrate or a gravelly substrate and have been mapped as loamy and gravelly substrate variants.

Lenswood, loamy substrate variant (LSW1)

The Lenswood loamy substrate variant consists of imperfectly drained carbonated Gleyed Rego Black soils developed on moderately to strongly calcareous, shallow, sandy to coarse loamy lacustrine sediments less than 1 m in thickness overlying loamy lacustrine sediments. These soils occur on level lacustrine veneer deposits and have rapid surface permeability and slow subsoil permeability, slow surface runoff and a medium water table during the growing season. Lenswood loamy substrate soils may be slightly eroded. The native vegetation often comprises black poplar, low willow shrubs and a ground cover of meadow grasses. The majority of these soils are currently used for crop production.

In a representative profile of Lenswood loamy substrate soil, the solum is generally about 50 cm thick. The profile is characterized by a 35 cm thick very dark gray fine sandy loam Ap and Ah horizon overlying loamy fine sand textured calcareous transitional AC horizon, and a pale yellow strongly calcareous fine sand mottled Ckgj horizon. The parent material of the loamy substrate is typically compact, stratified, yellow silt loam to clay loam mottled and strongly calcareous.

Lenswood loamy substrate variant soils occur in close association with Gilbert loamy substrate variant soils. They are similar to the Gilbert loamy substrate soils by having the same texture, but differ because of absence of a B horizon and the presence of carbonates to the soil surface. Lenswood loamy substrate soils have low available water holding capacity, medium organic matter levels, and medium natural fertility.

Lenswood, gravel substrate variant (LSW2)

The Lenswood gravel substrate variant consists of imperfectly drained carbonated Gleyed Rego Black soils developed on moderately to strongly calcareous, shallow, somewhat stratified sandy to coarse loamy lacustrine sediments less than 1 m thick overlying gravel glaciofluvial deposits. These soils occur on level lacustrine veneer deposits and have rapid permeability, slow surface runoff and a medium water table during the growing season. Lenswood gravel substrate soils may be slightly to severely eroded. The native vegetation often comprises black poplar associated with willow and a ground cover of meadow grasses. The majority of these soils are currently used for improved pasture.

In a representative profile of Lenswood gravel substrate variant soil, the solum is generally between 50 and 60 cm thick. The profile is characterized by a 30 cm thick very dark gray calcareous fine sandy loam Ap and Ah horizon overlying a thin gray calcareous fine sand mottled AC transition horizon, and pale yellow strongly calcareous mottled fine sand Ckgj horizon. The parent material of the gravel substrate is typically stratified coarse sand and fine gravel.

Lenswood gravel substrate soils occur in close association with Gilbert gravel substrate variant soils. They are similar to these soils by having the same texture and similar gravel substrate, but differ from the Gilbert gravel substrate soils because of lack of a B horizon and presence of carbonates to the soil surface. Lenswood gravel substrate variant soils have low available water holding capacity, medium organic matter levels, and medium natural fertility.

Malonton Series (MNT)

The Malonton series consists of poorly drained carbonated Rego Humic Gleysol soils developed on moderately to strongly calcareous, deep uniform sandy to coarse loamy lacustrine sediments. These soils occur in depressions of level lacustrine landscapes and have rapid permeability, very slow surface runoff and a high water table during the growing season. The native vegetation often comprises willow clumps and a ground cover of sedge and meadow grass. The majority of these soils are currently used for crop production.

In a representative profile of Malonton soil, the solum is generally about 45 cm thick. The profile is characterized by a 27 cm thick very dark gray, calcareous loamy fine sand Ap and Ah horizon overlying a grayish brown, calcareous loamy fine sand, mottled transition AC horizon, and a pale yellow, strongly calcareous, strongly mottled Ckg horizon. The parent material is typically carbonated and mottled throughout.

Malonton soils occur in close association with Lenswood soils. They are similar to Lenswood soils by having the same texture, but differ from Lenswood soils because of poor drainage. Malonton soils have low available water holding capacity, medium organic matter levels, and low natural fertility.

Meharry Series (MEH)

The Meharry series consists of well drained Rego Black soils developed on very strongly calcareous, deep, uniform, loamy morainal deposits. These soils occur on upper and mid slopes of very gently sloping undulating deposits and have moderate permeability, slow surface runoff and a low water table during the growing season. Meharry soils are moderately stony. The native vegetation often comprises mixed aspen and black poplar with shrubs such as dogwood and ground cover of tall prairie grasses. The majority of these soils are currently used for crop production although some areas remain in native bush or improved pasture.

In a representative profile of Meharry soil, the solum is generally 30 cm thick varying between 15 and 40 cm thick. The profile is characterized by a thin (20 cm) very dark gray non-calcareous fine sandy loam to loamy textured A horizon overlying a grayish brown loam to silt loam textured carbonated AC transition horizon, and often a strongly developed light gray strongly carbonated Cca horizon. The parent material is typically uniform, compact, very pale brown, very strongly calcareous loamy till.

Meharry soils occur in close association with Oaknook soils. They are similar to Oaknook soils by having the same texture, but differ from Oaknook soils because of better drainage and absence of carbonates in the surface horizons. Meharry soils have medium available water holding capacity, medium organic matter levels, and medium natural fertility. Meharry soils correlate with the well drained member of the Meharry Association previously published in the Swan River soil report.

Minitonas Series (MNS)

The Minitonas series consists of imperfectly drained Gleyed Rego Black soils developed on moderately to strongly calcareous, shallow, fine loamy lacustrine sediments less than 1 m thick overlying loamy morainal deposits. These soils occur on mid slopes of gently sloping lacustrine

veneer deposits and have moderate permeability, slow surface runoff and a medium water table during the growing season. Minitonas soils are slightly to moderately stony. The native vegetation often comprises of mixed aspen and black poplar, shrubs such as willow and a ground cover of meadow grasses. The majority of these soils are currently used for crop production.

In a representative profile of Minitonas soil, the solum is generally about 40 cm. thick ranging from 20 to 45 cm thick. The profile is characterized by a 30 cm thick very dark gray loamy textured, Ap and Ah horizon overlying a 15 cm thick grayish brown, loam textured carbonated transitional AC horizon, and a light gray, strongly calcareous loam textured mottled Ckgj horizon. The parent material of the till substrate is typically uniform, compact, pale yellow loam and very strongly calcareous and mottled.

Minitonas soils occur in close association with Timberton and Pineimuta soils. They are similar to these soils in texture but differ from Pineimuta because of better drainage and from Timberton soils because of absence of a B horizon and because of imperfect drainage. Minitonas soils have moderate available water holding capacity, moderate organic matter levels, and moderate natural fertility. Minitonas soils correlate with Valley till substrate phase soils previously published in the Swan River soil report (Soil Report No. 13).

Novra Series (NOV)

The Novra series consists of poorly drained Rego Gleysol soils developed on moderately to strongly calcareous, deep, stratified fine loamy to coarse loamy fluvial (alluvial) deposits. These soils occur in depressional positions of gently undulating deposits and have moderate permeability, very slow surface runoff and a high water table during the growing season. The native vegetation often comprises of balsam poplar, black spruce and willow with a ground cover of sedge and meadow grass. The majority of these soils are currently in unproductive wood land.

In a representative profile of cultivated Novra soil, the solum is generally about 15 cm thick corresponding to the plow layer. The profile is characterized by a 10 to 20 cm thick Ap horizon overlying grayish brown, weakly calcareous loam to clay loam textured, mottled Ckg horizon, which is stratified with thin bands of fine sand and clay and dark coloured layers representing former surface horizons buried by deposition of fresh alluvium. The parent material is typically dull coloured strongly mottled and strongly calcareous.

Novra soils occur in close association with Homestead soils. They are similar to Homestead soils by having similar stratification and the same texture, but differ from Homestead soils because of drainage. Novra soils have moderate available water holding capacity, low organic matter levels, and low natural fertility.

Oaknook Series (ONK)

The Oaknook series consists of imperfectly drained Gleyed Rego Black soils developed on very strongly calcareous, deep uniform loamy morainal deposits. These soils occur on level deposits and have moderate permeability, slow surface runoff and a medium water table during the growing season. Oaknook soils are moderately stony. The native vegetation often comprises of aspen and black poplar and shrubs such as willow and dogwood and a ground cover of meadow grasses. The majority of these soils are currently used for crop production.

In a representative profile of Oaknook soil, the solum is generally about 25 cm thick ranging from 12 to about 60 cm thick. The profile is characterized by a 22 cm thick very dark gray, calcareous loam textured Ap and Ah horizon overlying a transitional light brownish gray loamy textured AC horizon about 10 cm thick and a pale yellow, loam to clay loam textured Ckgj horizon. The parent material is typically compact, mottled and very strongly calcareous below the 40 cm depth.

Oaknook soils occur in close association with Meharry soils. They are similar to Meharry soils by having dark surface colours, but differ from Meharry soils because of poorer drainage and carbonates in the surface horizons. Oaknook soils have medium available water holding capacity, medium organic matter levels, and medium natural fertility. Oaknook soils correlate with the imperfectly drained member of the Meharry Association previously published in the Swan River soil report.

Pelan Series (PLN)

The Pelan series consists of imperfectly drained Gleyed Dark Gray soils developed on moderately to strongly calcareous, shallow, sandy to coarse loamy lacustrine sediments overlying strongly calcareous loamy morainal deposits of dominantly limestone origin. These soils occur on level lacustrine veneer deposits and have rapid permeability, slow surface runoff and a medium water table during the growing season. Pelan soils are slightly stony. The native vegetation often comprises of mixed hardwood forest of aspen and balsam poplar with occasional willow, dogwood and saskatoon and a ground cover of meadow grass and sedge. The majority of these soils are currently used as woodland.

In a representative profile of a Pelan soil, the solum is generally 42 cm thick. The profile is characterized by a thin (15 cm) dark gray fine sand Ahe horizon overlying a dark brown fine sand to loamy fine sand mottled Bmgj horizon. The parent material is typically calcareous, light brownish gray fine sand which is mottled. A typical profile also is characterized by a uniform, compact pale brown to light brownish gray silt loam glacial till subsoil which is very strongly calcareous and mottled.

Pelan soils occur in close association with Ethelbert soils. They are similar to Ethelbert soils by having the same texture, but differ from Ethelbert soils because of lighter surface colours and imperfect soil drainage. Pelan soils have low available water holding capacity, medium organic matter levels, and medium natural fertility. Pelan soils correlate with Pelan deep phase soils previously published in the Winnipeg-Morris soil report.

Pineimuta Series (PMU)

The Pineimuta series consists of poorly drained carbonated Rego Humic Gleysol soils developed on moderately to very strongly calcareous, shallow, fine loamy lacustrine sediments less than 1 m in thickness overlying loamy morainal deposits. These soils occur in depressional sites of nearly level, lacustrine veneer deposits and have moderate permeability, very slow surface runoff and a high water table during the growing season. The native vegetation often comprises sedge and meadow grass with clumps of willow. The majority of these soils are currently used for crop production.

In a representative profile of Pineimuta soil, the solum is generally about 50 cm thick. The profile is characterized by a thin, very dark gray calcareous clay loam textured Ap and Ah horizon overlying a grayish brown very strongly calcareous silty clay loam transition AC and/or Ccag horizon, and a light gray very strongly calcareous mottled clay loam textured Ckg horizon. The parent material of the till substrate is typically compact, light gray clay loam which is mottled and very strongly calcareous.

Pineimuta soils occur in close association with Minitonas soils. They are similar to Minitonas soils by having the same texture and number and kind of horizons, but differ from Minitonas soils because of being poorly drained. Pineimuta soils have high available water holding capacity, high organic matter levels, and medium natural fertility. Pineimuta soils correlate with Balmoral till substrate phase soils previously published in the Swan River soil report.

Pineimuta, peaty phase (PMUp)

The Pineimuta series peaty phase consists of poorly drained peaty, carbonated Rego Humic Gleysol soils developed on moderately to strongly calcareous, shallow, fine loamy lacustrine sediments less than 1 m in thickness overlying loamy morainal deposits. These soils occur in depressional areas of nearly level lacustrine veneer deposits and have moderate permeability, very slow surface runoff and a high water table during the growing season. The native vegetation often comprises sedge and meadow grass with clumps of willow. The majority of these soils are currently used for native pasture.

In a representative profile of Pineimuta, peaty phase soil, the solum is generally about 50 cm thick. The profile is characterized by 15 to 40 cm of mesic sedge peat overlying very dark gray calcareous clay loam textured Ahk horizon, and a grayish brown, calcareous, mottled silty clay loam transition AC horizon grading into light gray, very strongly calcareous, strongly mottled CKg horizon. The parent material of the till substrate is typically compact light gray clay loam which is mottled and very strongly calcareous.

Pineimuta peaty phase soils occur in close association with normal Pineimuta soils. They are similar to Pineimuta soils by having the same texture, but differ from them because of the presence of the peaty surface layer. Pineimuta peaty phase soils have high available water holding capacity, high organic matter levels, and medium natural fertility. Pineimuta peaty phase soils correlate with the peaty phase of the Balmoral till substrate soils previously published in the Swan River soil report.

Prawda Series (PRA)

The Prawda series consists of poorly drained carbonated Rego Humic Gleysol soils developed on moderately to strongly calcareous, shallow, sandy to coarse loamy lacustrine sediments less than 1 m in thickness overlying clayey lacustrine sediments. These soils occur in level to depressional areas of nearly level lacustrine veneer deposits and have rapid permeability in the surface soil and low subsoil permeability, very slow surface runoff and a high water table during the growing season. The native vegetation often comprises of sedges and meadow grasses with clumps of willow. The majority of these soils are currently used for crop production.

In a representative profile of Prawda soil, the solum is generally 50 cm thick. The profile is characterized by a 30 cm thick very dark gray, carbonated loamy fine sand Ap and Ah horizon overlying a transitional light brownish gray calcareous, mottled fine sand AC horizon, and light gray strongly calcareous fine sand textured Ckg horizon. The parent material of the substrate is typically compact, strongly calcareous, mottled and silt loam to clay textures.

Prawda soils occur in close association with Lenswood loamy substrate variant soils and Malonton soils. They are similar to the Lenswood loamy substrate soils by having the same texture and heavy substrate, but differ from the Malonton soils because of the clayey substrate. Prawda soils have low available water holding capacity, medium organic matter levels, and low natural fertility.

Rose Ridge Series (RDG)

The Rose Ridge series consists of well drained Orthic Dark Gray soils developed on very strongly calcareous, deep, uniform loamy morainal deposits. These soils occur on crest and upper slopes of moderately sloping ridged deposits and have moderate permeability, moderate surface runoff and a low water table during the growing season. Rose Ridge soils are very stony. The native vegetation often comprises of mixed aspen and bur oak or white spruce, tall shrubs and a ground cover of tall grasses. The majority of these soils are currently used for crop production although stonier areas remain in native bush or improved pasture.

In a representative profile of Rose Ridge soil, the solum is generally 23 cm thick. The profile is characterized by a thin (13 cm), dark gray loam textured Ap horizon overlying a dark grayish brown, loam textured Bt horizon, and a light gray loam textured Ck horizon. The parent material is typically uniform, compact, moderately cobbly and very strongly calcareous.

Rose Ridge soils occur in close association with Meharry soils. They are similar to Meharry soils by having similar texture and drainage, but differ from Meharry soils because of lighter surface colour and the presence of a B horizon. Rose Ridge soils have moderate available water holding capacity, low organic matter levels, and low natural fertility. Rose Ridge soils correlate wtih the well drained Orthic Dark Gray member of the Rose Ridge association published in the Swan River soil report.

Sevick Series (SVC)

The Sevick series consists of imperfectly drained Gleyed Rego Black soils developed on moderately to strongly calcareous, shallow, sandy to coarse loamy lacustrine sediments less than 1 m in thickness overlying loamy morainal deposits. These soils occur on nearly level, lacustrine veneer deposits and have rapid surface permeability and low subsoil permeability, slow surface runoff and a medium water table during the growing season. Sevick soils are slightly to moderately stony. The native vegetation often comprises of black poplar and aspen with shrubs such as willow and dogwood and a ground cover of meadow grasses. The majority of these soils are currently used for crop production.

In a representative profile of Sevick soil, the solum is generally about 48 cm thick. The profile is characterized by a 30 cm thick very dark gray, loamy fine sand, Ap and Ah horizon overlying a grayish brown, calcareous, loamy fine sand mottled AC transition horizon, and very pale brown strongly calcareous and mottled fine sand textured Ckgj horizon. The parent material of the till substrate is typically uniform, compact, very strongly calcareous and mottled loam to clay loam.

Sevick soils occur in close association with Lenswood and Ethelbert soils. They are similar to Ethelbert soils by having the same texture and till substrate and to the Lenswood soils by having the same drainage, but differ from the Ethelbert soils because of poorer drainage. Sevick soils have low available water holding capacity, medium organic matter levels, and medium natural fertility. Sevick soils correlate with Lenswood till substrate phase soils previously published in the Swan River soil report.

Silver Creek Series (SVK)

The Silver Creek series consists of well drained Orthic Regosol soils developed on weakly to moderately calcareous, deep, uniform sandy eolian deposits. These soils occur on crest, upper and mid slopes of hummocky eolian deposits and have rapid permeability, slow surface runoff and a low water table during the growing season. Silver Creek soils are severely eroded. The native vegetation often comprises of aspen, short shrubs such as rose and Saskatoon and ground cover of grass and sage with patches of bare soil. The majority of these soils currently support native vegetation and are used for pasture. Some Silver Creek soils occur in severely eroded portions of cultivated areas.

In a representative profile of Silver Creek soil, the solum is generally restricted to a very thin (5 to 10 cm) grayish brown A horizon. The profile is characterized by this very thin A horizon overlying very pale brown, weakly calcareous Ck horizon, which may contain dark coloured bands representing former surface horizons. The parent material is typically very pale brown to light gray, moderately calcareous fine sand.

Silver Creek soils when not mapped in pure areas occur in close association with Gilbert and Davidson soils. They are similar to Davidson soils by having a light coloured surface horizon but lack a B horizon. They differ from the Gilbert soils because of light surface colours. Silver Creek soils have low available water holding capacity, low organic matter levels, and low natural fertility. Silver Creek soils correlate with duned areas of Davidson and Gilbert soils previously published in the Swan River soil report.

Sprague Series (SPG)

The Sprague series consists of poorly drained, carbonated Rego Humic Gleysol soils developed on moderately to strongly calcareous, shallow, sandy to coarse loamy lacustrine sediments less than 1 m in thickness overlying loamy morainal deposits. These soils occur in depressional portions of level, lacustrine veneer deposits and have rapid permeability in the surface soil and slow subsoil permeability, very slow surface runoff and a high water table during the growing season. Sprague soils are slightly to moderately stony. The native vegetation often comprises of sedges and meadow grasses with clumps of willow. The majority of these soils are currently used for crop production.

In a representative profile of Sprague soils, the solum is generally about 30 cm thick. The profile is characterized by about a 20 cm thick, very dark gray, calcareous, loamy fine sand Ap and Ah horizon overlying a light brownish gray, calcareous, mottled, fine sand AC transition horizon, and a light gray, strongly calcareous, strongly mottled, fine sand Ckg horizon. The parent material of the till substrate is typically uniform, compact light gray, very strongly calcareous and mottled.

Sprague soils occur in close association with Sevick soils. They are similar to Sevick soils by having the same texture and till substrate, but differ from Sevick soils because of poor drainage. Sevick soils have low available water holding capacity, medium organic matter levels, low natural fertility. Sprague soils correlate with Malonton till substrate phase soils previously published in the Swan River soil report.

Swanford Series (SWF)

The Swanford series consists of imperfectly drained, carbonated Gleyed Rego Black soils developed on strongly to very strongly calcareous, deep uniform coarse loamy lacustrine sediments. These soils occur on level lacustrine deposits and have moderate permeability, slow surface runoff and a medium water table during the growing season. The native vegetation often comprises black poplar and aspen with an understory of tall shrubs and ground cover of meadow grasses. The majority of these soils are currently used for crop production.

In a representative profile of Swanford soil, the solum is generally 45 cm thick. The profile is characterized by about 30 cm of very dark gray, calcareous very fine sandy loam Ahk horizon overlying a transitional grayish brown calcareous and mottled, loamy very fine sand AC horizon, and a very pale brown very strongly calcareous mottled loamy very fine sand Ckgj horizon. The parent material is typically carbonated and mottled throughout.

Swanford soils occur in close association with Swanford loamy substrate variant and Foley soils. They are similar to Foley soils by having the same texture but differ from Foley soils because of better drainage. Swanford soils differ from Swanford loamy substrate variant soils because of absence of the underlying loamy sediments. Swanford soils have medium available water holding capacity, high organic matter levels and high natural fertility.

In this study some Swanford soils vary slightly from the norm as they are underlain by loamy textured lacustrine sediments and have been mapped as a Swanford loamy substrate variant.

Swanford, loamy substrate variant (SWF1)

The Swanford loamy substrate variant consists of imperfectly drained carbonated Gleyed Rego Black soils developed on strongly to very strongly calcareous, shallow, coarse loamy lacustrine sediments less than 1 m thickness overlying loamy lacustrine sediments. These soils occur on level, lacustrine veneer deposits and have moderate surface soil permeability and slow subsoil permeability, slow surface runoff and a medium water table during the growing season. The native vegetation often comprises of mixed black poplar and aspen with an understory of tall shrubs and ground cover of meadow grasses. The majority of these soils are currently used for crop production.

In a representative profile of Swanford loamy substrate variant soil, the solum is generally about 50 cm thick. The profile is characterized by a 37 cm thick, very dark gray, calcareous very fine sand, loam Ahk horizon overlying a grayish brown carbonated and mottled loamy a very fine sand transitional AC horizon, and very pale brown, very strongly calcareous, mottled, loamy very fine sand Ckgj horizon. The parent material of the loamy substrate is compact, stratified, yellow, very strongly calcareous and mottled silt loam to clay loam.

Swanford loamy substrate soils occur in close association with Swanford soils. They are similar to Swanford soils by having the same texture in the upper soil and have the same drainage, but differ from Swanford soils because of the occurrence of the underlying loamy material in the profile. Swanford loamy substrate variant soils have medium available water holding capacity, high organic matter levels, and high natural fertility.

Swan River Series (SWV)

The Swan River series consists of moderately well drained Orthic Black soils developed on moderately to strongly, calcareous, stratified, fine loamy to coarse loamy fluvial (alluvial) deposits. These soils occur on upper slopes of very gently sloping fluvial terrace deposits and have moderate permeability, moderate surface runoff and a low water table during the growing season. The native vegetation often comprises mixed forest of aspen and white spruce associated with shrubs and a ground cover of mixed grass. The majority of these soils are currently used for crop production.

In a representative profile of Swan River soil, the solum is generally about 45 cm thick. The profile is characterized by a 32 cm thick, very dark gray, loam Ap and Ah horizon overlying a dark grayish brown clay loam Btj or Bm horizon, and a light brownish gray to yellowish brown moderately calcareous Ck horizon. The parent material is typically stratified, moderately to strongly calcareous and may contain dark coloured layers high in organic matter.

Swan River soils occur on upper terraces of the flood plain associated with the Swan River. They are similar to Dutton soils by having a similar profile and the same texture, but differ from the Dutton soils because of greater textural variability associated with the stratified fluvial materials. Swan River soils have medium available water holding capacity, high organic matter levels, and high natural fertility. Swan River soils correlate with the well drained mature black soils associated with the Alluvial Complex previously published in the Swan River soil report.

Timberton Series (TBN)

The Timberton series consists of well drained Orthic Black soils developed on moderately to strongly calcareous, shallow, fine loamy lacustrine sediments less than 1 m in thickness overlying loamy morainal deposits. These soils occur on level, lacustrine veneer deposits and have moderate permeability, slow surface runoff and a low water table during the growing season. Timberton soils are slightly stony. The native vegetation often comprises aspen with an understory of low shrubs and mixed grass. The majority of these soils are currently used for crop production.

In a representative profile of Timberton soil, the solum is generally about 34 cm thick. The profile is characterized by a very dark gray, loam Ap and Ah horizon about 23 cm thick overlying a dark brown clay to clay loam Btj horizon, and a pale brown calcareous loam textured Ck horizon. The parent material of the till substrate is typically compact, very strongly calcareous, light brownish gray loam.

Timberton soils occur in close association with Dutton and Minitonas soils. They are similar to Dutton soils by having the same texture and drainage and to the Minitonas soils by having an underlying till substrate. Timberton soils differ from Minitonas soils because of better drainage. Timberton soils have high available water holding capacity, high organic matter levels, and high natural fertility. Timberton soils correlate with Dutton till substrate phase soils previously published in the Swan River soil report.

Valley Series (VLY)

The Valley series consists of imperfectly drained Gleyed Rego Black soils developed on moderately to strongly calcareous, uniform, fine loamy lacustrine sediments. These soils occur on level lacustrine deposits and have moderate permeability, slow surface runoff and a medium water table during the growing season. The native vegetation often comprises of black poplar and aspen with tall shrubs and a ground cover of meadow grass. The majority of these soils are currently used for crop production.

In a representative profile of Valley soil, the solum is generally about 45 cm thick. The profile is characterized by a very dark gray clay loam Ap and Ah horizon about 32 cm thick overlying a grayish brown, calcareous and mottled clay loam AC transition horizon, and a yellowish brown, calcareous and mottled clay loam to silty clay loam Ckgj horizon. The parent material is typically strongly calcareous and mottled thoughout.

Valley soils occur in close association with Dutton and Swanford soils. They are similar to Dutton soils by having the same texture, similar to Swanford soils by having the same drainage but differ from Dutton soils in not having a B horizon because of imperfect drainage. They differ from the Swanford soils because of finer texture. Valley soils have high available water holding capacity, high organic matter levels, and high natural fertility.

PART 4

USE AND MANAGEMENT INTERPRETATIONS OF SOILS

4.1 INTRODUCTION

This section provides predictions of performance or soil suitability ratings for various uses of soils based on field observations of soil and landscape characteristics, laboratory data and on observations of soil behavior under specified conditions of land use and management. Suitability ratings or interpretations are intended only to serve as guides for planners and managers. Caution, with an understanding of the limitations of the soil map must be exercised when applying suitability ratings to soil map units. The value of any rating or interpretation depends upon the nature and composition of individual map unit delineation which in turn depends on the scale of mapping and intensity of ground truthing employed in the survey.

In this section, interpretive soil information is provided for the following land use evaluations:

1. Agriculture
   a) dryland farming capability
   b) irrigation suitability
2. Engineering Uses
3. Recreation Uses

4.2 AGRICULTURAL LAND USE EVALUATION

Climatic Conditions for Crop Production

Regional climatic conditions in the Swan River area are favourable for the growth of cereals and other adapted crops. Maximum temperatures and precipitation at Swan River occur during the growing season. Mean daily temperatures during the growing season (May 1 to September 30) vary from a high of 18.4°C in July to a low of 10.3°C in May. Average growing season precipitation at Swan River is 304 mm. This rainfall, when combined with average levels of stored soil moisture is adequate for crop growth in most years. However, year to year variation in growing season precipitation may be quite large[13]. Insufficient growing season precipitation may affect crop yields about 25 percent of the time and excess precipitation through flooding during the growth period or excessive rainfall at harvest may affect yields over an additional 25 percent of the time. A summary of climatic information relevant to crop production in the Swan River area is presented in Tables 6 and 7.

At Swan River, the average date of last frost in spring is May 25 and the average date of the first fall

[13] Dunlop, S. and C.F. Shaykewich, 1982. Southern Manitobas' Climate and Agriculture. Manitoba Agriculture.

frost is September 13. These data indicate the average growing season is 110 days (Table 6). The probability of frost occurrences based on the frequency of past observations is also shown in Table 6. These probabilities are important for a proper evaluation of the suitability of an area for growing certain crops. These data give the chance or probability in years for the last spring frost to occur on or before, and the first fall frost to occur on or after a particular date. The probability of the frost-free period being equal to or less than the period indicated in days is also given.

Other climatic parameters relevant to the Swan River area are presented in Table 7. The length of growing season for hardy agricultural crops is best based on a killing frost of -2.2°C. Using this criterion, the average frost-free period is 131 days. Another climatic factor useful for evaluation of the agricultural potential of area is growing degree-days. For plant growth, degree-days accumulated for a base temperature of 5°C express the length and warmth of the growing season in a single figure. The heat unit figures serve as an index of the amount of energy available to plants for growth. Swan River averages 1431 growing degree-days during the May 1 to September 30 period. Corn Heat Units (CHU) provide yet another evaluation of the thermal attributes of a region in relation to a specific crop. The average accumulation of corn heat units in the Swan River area is 2129, generally not sufficient for grain corn production but suitable for silage production utilizing corn hybrids with lower heat unit requirements.

Most soils in the Swan River area experience varying degrees of soil water deficit for varying periods of time. Soil water deficits calculated for the Swan River area vary greatly depending on properties and characteristics of the soil and the period in the growing season for which the calculation is made. The soil moisture deficits shown in Table 7 are calculated for loamy textured soils with an available water holding capacity of about 200 mm. Research shows that about one-half of this amount, or 100 mm is readily available to plants. Once the first 100 mm is used up, the rate of plant growth drops, the crop is considered to be in a stress situation and the soil water status takes on negative values. The values shown in Table 7 will be higher on sandy soils with a lower soil water capacity (160 mm) and lower on clayey soils with a larger soil water holding capacity. Soils with a high water table will have lower soil water deficits as long as the water table is within 1 m of the soil surface.

Table 6. Frost Data, Average and Extreme Values and Probability Values for Last Freezing Temperature in Spring and First Freezing Temperature in Fall at Swan River, Manitoba*

Averages			Extremes					
			Last Frost (Spring)		First Frost (Fall)		Frost Free Period	
Frost-free Period (days)	Last Frost Spring	First Frost Fall	Earliest	Latest	Earliest	Latest	Longest days	Shortest days
110	May 25	Sept.3	May 6	June 20	Aug. 1	Sept. 30	146	45

	Probability Level						
	10% (1 in 10)	25% (1 in 4)	33% (1 in 3)	50% (1 in 2)	66% (2 in 3)	75% (3 in 4)	90% (9 in 10)
Probability of spring frost on or after	June 7	June 1	May 28	May 25	May 21	May 19	May 7
Probability of fall frost on or before	Aug. 31	Sept. 6	Sept. 8	Sept. 14	Sept. 17	Sept. 21	Sept. 25
Probability of frost-free period (days) equal to or less than	95	101	103	107	115	120	129

* Data obtained from Canadian Climate Normals, 1951-1980, Volume 6, Frost. Atmospheric Environment Service, Environment Canada, 1982.

Table 7. Other Climatic Parameters for Swan River*

	Mean	Standard Deviation	Risk Level 25%	10%
Last Spring Frost (-2.2°C)	May 15	13 days	May 24	June 1
First Fall Frost (-2.2°C)	Sept. 23	12 days	Sept. 15	Sept. 7
Frost-Free Period, days (-2.2°C)	131	18	119	108
Corn Heat Units (CHU)	212.9	203	1990.76	1864.49
Growing Degree-Days above 5°C, May 1-Sept. 30	1431	112	1354.73	1285.06
Precipitation mm May-Sept. 30**	307.5			
Soil Moisture, mm				
- at heading stage in wheat	26.91	30.56	6.07	-12.97
- at soft dough stage in wheat	-13.00	47.00	-45.05	-74.34
- after First Crop of Alfalfa	-43.18	45.49	-74.20	-102.59
- after Second Crop of Alfalfa	-133.69	84.73	-191.48	-244.35

* Parameters generated from Swan River Climatic Data 1929-1978. Dunlop, Susan 1981. An Agroclimatology of Southern Manitoba M.A. Thesis. Dept. of Geography University of Manitoba, Winnipeg, Manitoba.

** From Canadian Climatic Normals, 1951-1980 Vol. 3. Precipitation. Almospheric Environment Service, Environment Canada.

Soil Properties and Soil Management

Soil management problems affecting agricultural land use in the Swan River area include stoniness, drainage, excess soil moisture, erosion and soil fertility. This section discusses the soil properties related to each of these problems.

STONINESS - The effect of stones on soil management and productivity depends upon their number and size. Occasional surface stones offer no serious landscape to cultivation and cropping however extremely stony soils can prevent cultivation altogether.

In the Swan River study area various degrees of stone clearing are required on soils developed on glacial till (Meharry, Oaknook and Rose Ridge series) and to a lesser extent on soils developed on thin lacustrine veneers underlain by stony glacial till (Banks, Craigsford, Ethelbert, Minitonas, Pelan, Pineimuta, Sprague, Sevick and Timberton series). Although stone clearing can be a largely mechanized procedure such operations still incur costs not applicable to non-stony soils.

DRAINAGE - Soil drainage refers to the frequency and duration of periods when the soil is free of saturation or partical saturation. Soil drainage is affected by several factors acting separately or in combination including texture, structure, gradient and length of slope, water holding capacity and climatic factors controlling evaporation and evapotranspiration. Inadequate soil drainage occurs when these factors restrict or impede the movement of water from the soil resulting in conditions of excess water on or within the soil.

Soil drainage is the major management need on about 8 percent of the soils in the survey area. Under natural conditions some soils are so wet that the production of crops commonly grown in the area is generally not possible. The poorly drained Balmoral, Foley, Malonton, Novra. Pineimuta, Prawda and Sprague soils are used for production of annual crops only where artificial drainage is maintained. Artificial drainage of the very poorly drained Haute soils is usually not feasible. These soils remain in the native state supporting vegetation associated with swamp and marsh areas.

Bell River, Craigsford, Heatley, Homestead, Lenswood, Minitonas, Pelan, Oaknook, Sevick, Swanford and Valley soils have adequate drainage in most years. They tend to dry out slowly in the spring and in wet years tillage and planting are delayed. In most years drainage is adequate and the additional moisture resulting from the soil postion in the landscape is beneficial for crops. These soils covering about 57 percent of the map area will benefit from artificial drainage in some years. Well drained soils such as Agassiz, Banks, Durban, Dutton, Davidson, Ethelbert, Gilbert, Meharry, Rose Ridge, Silver Creek, Swan River and Timberton rarely require artificial drainage.

SOIL MOISTURE - In Manitoba, growing season precipitation is often insufficient to meet the needs of the crop. Agricultural crops will show stress on most soils during years of below normal precipitation. Well drained sandy soils in particular, have low water holding capacity and cause plants to undergo moisture stress at various times during the growing season when soil water is used up and the distribution of rainfall is somewhat erratic. These soils cover about 23 percent of the study area. Crops growing on Agassiz, Davidson, Gilbert and Silver Creek soils will be most susceptible to yield reduction resulting from lack of moisture.

The Ethelbert soils and Gilbert loamy substrate variant soils are slightly more drought resistant due to the occurrence of a less permeable till or lacustrine substrate. A number of management practices to maintain the soil in the best possible condition to take in and store precipitation falling on the land can be applied to these soils. Maintenance of a good supply of organic matter in the soil through continuous cropping, avoiding the use of summerfallow and maintaining a trash cover of stubble and straw all help to increase water use efficiency and to reduce loss of water by runoff or deep percolation. Timeliness of cultivating and seeding operations affect the conservation of soil moisture and also aid in erosion control.

EROSION - Soil erosion is a significantly serious regional soil problem in the Swan River Survey area. Loss of the surface layer through erosion is damaging for many reasons. One of the most important in an agricultural area such as Swan River is that productivity is reduced if the surface layer is lost and part of the subsoil is incorporated into the plow layer. This is particularly so on clayey soils where conditions of poor tilth may result, or on sandy soils such as Davidson or Gilbert soils that tend to be droughty. A second important reason is that erosion on farmland results in sediment entering drains, streams and lakes. Controlling erosion minimizes the pollution of streams and lakes by sediment and improves water quality for fish, wildlife and municipal use.

Historical soil erosion by water is of minor occurrence in the study area because of the dominance of nearly level terrain and permeable soils. The potential for serious water erosion in the form of gullying occurs mainly on the steeply sloping valley side walls of the Eroded Slopes complex associated with Swan River and Tamarack Creek. Water erosion may also occur within the flood plain of the Swan River during times when the river floods beyond its normal channel.

Wind erosion, on the other hand, is a slight to severe hazard on almost all soils in the survey area. Wind erosion has greatly affected the sandy and coarse loamy textured agricultural soils on relatively level landscapes. These soil and terrain conditions are found on over 67 percent of the map area. Wind erosion hazard is especially severe on the sandy Davidson, Gilbert, Lenswood, Ethelbert and Sevick soils and on the coarse loamy Craigsford, Durban and Swanford soils. The sandy surface of the gravelly Agassiz soil is also susceptible to serious wind erosion. The fine loamy Dutton, Minitonas, Swan River and Valley soils are only slightly affected by wind erosion. Wind erosion damage on susceptible soils can occur in a matter of a few hours if winds are strong and the soils are dry and bare of vegetation or surface mulch. Maintaining a plant cover, crop residue or rough surface through proper tillage minimizes the risk of erosion. In addition, erosion damage can be effectively reduced by the use of windbreaks of suitable trees and shrubs.

Research on wind erosion has been conducted in the United States for over 30 years[14]. The result of this work has been the development of eight Wind Erodibility Groups (WEG) made up of soils that have similar properties that affect their resistance to soil blowing if cultivated. Each WEG is based on soil conditions such as texture, structure and calca-

[14] Woodruff, N.P., and F.H. Siddoway, 1965. A Wind Erosion Equation. Soil Sci. 29 602-608.

reousness and has been equated with an estimated annual soil loss (tonnes/ha) on a hypothetical, isolated, smooth, wide, unsheltered bare field. The soil loss tolerance factor is the maximum rate of soil erosion, whether from rainfall or soil blowing that can occur without reducing crop production or environmental quality. The rate is expressed in tonnes of soil loss per hectare per year.

The WEG concept has been implemented at Swan River using soil and landscape factors measured during the soil survey (Table 8). Based on dominant texture and level of calcium carbonate for cultivated surface soils and estimates of soil structure related to clay content. The soils of the Swan River area have been placed in the appropriate wind erodibility group in Table 9. Only WEG's 1, 2, 3, 4L and 6 have been included in this table because most significant soils found in the study area can be placed in one of these groups.

Approximately 71 percent of the soils in the map area are at least moderately or more susceptible to wind erosion and 51 percent of the area is very highly to extremely erodible. Based on extrapolation of work in the United States and field measurements obtained in the Westbourne Soil Report area[15] it is estimated that from an isolated smooth unsheltered, wide and bare field in the Swan River study area, wind forces can erode an estimated 35 to 120 t/ha/year. Approximately 70 percent of the soils in the Swan River map area have the potential to exceed tolerable soil losses if not properly managed.

The estimates of potential erosion shown in Table 9 should not be confused with actual extent of past erosion in the study area. The erosion estimates indicate the potential for a specific soil to erode under a particular set of circumstances and do not refer to erosion that has actually occurred. The erosion phases attached to particular map units indicate where the soil surveyor has observed erosion of sufficient severity and extent to be included in the map unit description.

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[15] Langman, M.N., 1984. Soils of Selected Areas in the Rural Municipality of Westbourne, Soils Report No. D51. Canada-Manitoba Soil Survey.

TABLE 8

Selected Properties of Soil Surface Horizons

Soil Type	Sample Location	Depth (cm)	E.C. ms/cm	Org. C %	$CaCO_3$ Equiv. %	Particle Size Analysis					Total			Text. Class	Sat. %	% Slope	Length Slope (m)
						VCS	CS	MS	FS	VFS	S	Si	C				
BAM	SW 09-36-27W	0-20	0.5	8.55	-	0	1	1	3	9	14	46	40	SICL	79.0	0.0	-
BEV	NW 12-36-27W	0-10	0.3	0.88	11.5	0	0	5	48	25	78	11	11	FSL	28.0	3	-
CGD	SE 12-36-27W	0-20	0.5	3.39	1.3	0	0	6	54	27	88	7	5	FS	34.0	0.0	-
CGD	SW 18-36-27W	0-20	-	4.08	-	0	0	3	36	39	78	8	14	VFSL	-	0.0	-
CGD	SE 07-36-27W	0-15	0.5	2.29	2.8	0	1	2	31	42	76	9	15	VFSL	42.6	0.0	
CGD	SE 12-36-27W	0-20	-	6.43	2.9	0	1	2	40	35	78	9	13	VFSL	-	0.0	-
DTT	NW 35-36-27W	0-15	0.4	6.05	-	0	2	7	31	20	60	21	19	FSL	51.0	0.0	-
DVD	NW 12-36-27W	0-30	0.3	1.51	-	0	0	2	29	47	78	11	11	VFSL	40.0	0.0	-
ETT	NW 32-36-27W	0-20	0.4	3.35	-	0	4	17	26	20	67	17	16	FSL	44.0	0.0	-
FOY	SW 30-36-27W	25-45	1.3	1.88	40.1	0	0	2	5	32	39	36	25	L	45.0	0.0	-
GBT	SE 28-36-27W	0-35	0.2	2.58	-	0	4	10	29	42	85	8	7	LVFS	38.0	0.0	-
GBT	SE 25-36-27W	0-40	0.2	0.59	-	0	1	7	55	29	92	3	5	FS	29.0	0.0	-
HMD	NW 35-36-27W	0-15	0.6	2.34	-	0	1	5	19	24	49	33	18	L	44.0	0.0	-
LSW	SW 33-36-27W	0-15	0.5	3.61	2.6	0	0	3	24	46	73	20	7	VFSL	46	0.0	-
MEH	SW 17-36-27W	0-18	0.4	4.42	1.9	1	3	8	20	39	71	18	11	VFSL	48	0.0	-
MNS	NE 07-36-27W	0-15	0.8	6.71	6.4	0	1	5	24	27	57	21	22	SCL	59.0	0.0	-
MNS	NE 08-36-27W	0-15	0.8	7.67	5.9	1	1	3	19	28	52	23	25	VFSCL	67.0	0.0	-
MNS	SW 08-36-27W	0-20	-	5.26	6.0	0	2	7	19	32	60	16	24	-	-	0.0	-
MNT	SW 30-36-27W	18-45	1.7	2.51	10.5	0	0	4	48	18	70	20	10	FSL	38.0	0.0	-
NOV	NW 12-36-27W	0-15	0.5	4.53	-	0	1	4	18	13	36	32	32	CL	62.0	0.0	-
ONK	NE 08-36-27W	0-20	1.1	5.41	10.5	1	4	7	12	16	40	32	28	CL	61.9	0.0	-

Table 8. Cont'd

Soil Type	Sample Location	Depth (cm)	E.C. ms/cm	Org. C %	$CaCO_3$ Equiv. %	Particle Size Analysis					Total			Text. Class	Sat. %	% Slope	Length Slope (m)
						VCS	CS	MS	FS	VFS	S	Si	C				
PLN	NW 22-36-27W	0-15	0.7	4.87	-	0	1	6	34	46	87	8	5	LFS	68.0	0.0	
SPG	NE 16-36-27W	0-12	1.2	2.95	3.2	4	10	26	32	9	81	8	11	LS	34.0	0.0	-
SVC	SW 19-36-27W	0-15	0.5	5.9	-	0	1	3	29	49	82	9	9	LFS	50.0	0.0	-
SVC	SW 07-36-27W	0-20	1.4	9.1	7.9	0	1	1	31	36	69	14	17	VFSL	73.8	0.0	-
SVC	SE 17-36-27W	0-20	-	-	9.0	0	1	3	30	36	70	13	17	VFSL	-	0.0	-
SVK	NW 18-36-27W	0-20	0.2	0.82	-	0	1	7	44	46	98	2	0	FS	26.0	0.0	
SWF	SE 32-36-27W	0-15	1.6	4.72	7.2	0	2	2	7	25	36	40	24	L	55.0	0.0	-
SWF	SE 30-36-27W	0-12	1.3	3.54	5.4	0	1	2	5	60	68	16	16	VFSL	47.0	0.0	-
SWF	SW 36-36-27W	0-15	0.6	3.5	1.4	0	0	2	10	66	78	12	10	VFSL	48.5	0.0	
SWF	SW 36-36-27W	0-15	2.7	3.6	10.1	0	1	2	12	47	62	17	21	VFSCL	55.2	0.0	-
SWF	SW 36-36-27W	0-15	1.5	5.3	-	0	0	3	39	29	71	14	15	FSL	50.2	0.0	-
SWF	NE 25-36-27W	0-18	0.9	3.5	2.0	0	1	6	34	33	74	12	14	VFSL	44.9	0.0	-
SWF	SE 30-36-27W	0-20	0.5	-	11.6	0	0	2	5	48	55	31	14	VFSL	32.0	0.0	-
SWV	NW 35-36-27W	0-20	0.5	4.87	-	1	2	9	25	23	60	21	19	FSL	49.0	0.0	-
SWV	NW 35-36-27W	0-15	0.3	4.57	-	1	3	12	24	24	64	19	17	FSL	45.0	0.0	-
VLY	NE 33-36-27W	0-15	0.7	7.97	2.4	0	0	1	7	17	25	45	30	CL	78.0	0.0	
VLY	SW 27-36-27W	0-15	3.6	-	1.5	0	1	4	10	21	36	33	31	CL	62.0	0.5	
VLY	SE 27-36-27W	0-15	0.8	-	7.6	0	1	2	6	24	33	29	38	CL	60.4	0.0	-
VLY	NW 35-36-27W	0-20	0.3	3.11	-	0	1	2	6	20	29	38	33	CL	63.6	0.0	

TABLE 9

Estimated Wind Erosion Potential of Soils on the Swan River Townsite Study Area

Wind Erodibility Group	Extremely Erodible		Very Highly Erodible		Highly Erodible		Erodible		Very Slightly Erodible	
Textural Class[2] Percent $CaCO_3$	S, CS, FS, VFS		LS, LFS, LVFS		SL, CSL, FSL, VFSL		Loamy, 35% clay 5% $CaCO_3$		Loamy, 18-35% clay 5% $CaCO_3$	
	Symbol	Name	Symbol	Name	Symbol	Name	Symbol	Name	Symbol	Name
	ASZ	Agassiz	BEV	Bell River	BKS	Banks	BAM	Balmoral	DTT	Dutton
	DVD	Davidson eroded phases[3]	DVD	Davidson	CGD DRB	Craigsford Durban	BAMp	Balmoral peaty phase	DTT2	Dutton, gravel substrate
	ETT	Ethelbert eroded phases[3]	ETT GBT	Ethelbert Gilbert	HAY SWF	Heatley Swanford	FOY ONK	Foley Oaknook	HMD	Homestead
	GBT	Gilbert eroded phases[3]	GBT1	Gilbert loamy substrate	SWF1	Swanford loamy substrate	PMU	Pineimute peaty phase	MEH NOV	Meharry Novra
	GBT1	Gilbert loamy substrate variant, eroded phases[3]	GBT2	Gilbert gravel substrate					RDG	Rose Ridge
			LSW	Lenswood					SWV	Swan River
	LSW	Lenswood eroded phases[3]	LSW1	Lenswood loamy substrate					TBN	Timberton
									VLY	Valley
	LSW1	Lenswood loamy substrate variant, eroded phases[3]	LSW2	Lenswood gravel substrate						
			MNT	Malonton						
			PLN	Pelan						
	SVK	Silver Creek	PRA	Prawda						
			SPG	Sprague						
			SVC	Sevick						
Total Hectares	1724.11		2394.60		1238.05		294.83		1796.37	
Precent Map Area[4]	21.70		30.17		15.60		3.71		22.64	

1. Soils in wind, erodibility groups 4,5,7 and 8 are of minor extent and so are not listed.
2. Textural class abreviations: S=sand, C=coarse, F=fine, V=very, L=loam or loamy.
3. Includes overblown and moderately eroded phases.
4. Percent does not total 100 because area of water, townsite and lagoon not listed.

The amount of actual erosion observed in the study area is summarized in Table 10. The total area affected by slight to moderate erosion by wind, including soils affected by overblow, is 2357 ha or 29.7 percent of the map area. The extent of actual erosion indicated by these data differs markedly from the areal estimates of potential wind erosion which show that 67 percent of the map area is potentially highly to extremely erodible (Table 9). Further, 51 percent of the map area is considered to be potentially very highly to extremely erodible. Differences between actual and potential erosion of course reflect the interaction of past soil management practices with the properties of specific soil types. Factors such as wind breaks, field size and orientation relative to prevailing wind direction and maintenance of vegetive cover and various amounts of crop residue all contribute to less severe erosion than is potentially possible.

SOIL FERTILITY - Soil fertility is the ability of the soil to support proper plant growth. Soil fertility is naturally low in soils that are low in organic matter or in soils that are eroded. Sandy soils such as Gilbert, Lenswood, Ethelbert and Sevick have medium levels of organic matter and the sandy Davidson and gravelly Agassiz soils have low levels of organic matter which affect the natural fertility level. Erosion reduces organic matter levels even further. Under continuous cultivation all soils may be depleted of various essential plant nutrients through removal in harvested crops. For optimum plant growth this fertility must be restored. Additions of fertilizer to soils should be based on the results of plant available soil nutrient tests, on the needs of the crop and on expected level of yields. The type and amount of nutrients needed can be assessed by the Manitoba Provincial Soil Testing Laboratory.

TABLE 10

Estimated Extent of Actual Soil Erosion

Soil Erosion class	Areal Extent Ha	% of Map Area
Slight	607	7.65
Moderate	916	11.54
Severe	36	0.45
Overblown	798	10.05
Total	2357	29.69

4.3 SOIL CAPABILITY FOR AGRICULTURE

Dryland Agriculture

Soil capability classification for dryland agriculture is based on evaluation of both internal and external soil characteristics that influence soil suitability and limitations for agricultural use. In this classification, mineral soils are grouped into capability classes, subclasses and units based on their limitations for dryland farming, risk of damage when the soils are used and the way they respond to management[16]. There are seven capability classes, each of which groups soils together that have the same relative degree of limitation or hazard for agricultural use. The limitation becomes progressively greater from Class 1 to Class 7. The Class indicates the general suitability of the soils for agriculture. The first three classes are considered capable of sustained production of common field crops, the fourth is marginal for sustained arable culture, the fifth is suitable only for improved permanent pasture, the sixth is capable of use only for native pasture while the seventh class is for soils and land types considered incapable of use for arable agriculture or permanent pasture (See definitions, Appendix F).

Organic soils within the map area are rated for "potential" agricultural capability after the method of Leeson[17]. Capability ratings of organic soils for agriculture must recognize that most organic soils have little or no value for agriculture in their native state and their potential is only achieved through reclamation or development implemented with varying degrees of difficulty. Capability class definitions for organic soils are the same as for mineral soils. They are however, identified on maps and tables with the prefix "O".

Soil Capability subclasses are divisions within classes which group soils with similar kinds of limitations and hazards for agricultural use. The various kinds of limitations recognized at the subclass level are defined in Table 11

A summary of the soils in the Swan River area showing their major characteristics and their interpretive classification for dryland agricultural capability is presented in Table 12

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[16] ARDA. 1965. Land Capability Classification for Agriculture. Report No. 2. Canada Land Inventory, Canada Dept. of Regional Economic Expansion. Ottawa. 16 pp.

[17] Leeson, Bruce et al. 1969. An organic soil capability classification for agriculture and a study of the organic soils of Simcoe County, Soil Sci. Dept., Ontario Agricultural College, Guelph, Ontario.

TABLE 11

Agricultural Capability Subclass Limitations

C - Adverse climate: This subclass denotes a significant adverse climate for crop production as compared to the "median" climate which is defined as one with sufficiently high growing season temperatures to bring field crops to maturity, and with sufficient precipitation to permit crops to be grown each year on the same land without a serious risk of partial or total crop failures.

D - Undesirable soil structure and/or low permeability: This subclass is used for soils difficult to till, or which absorb water very slowly or in which the depth of rooting zone is restricted by conditions other than a high water table or consolidated bedrock.

E - Erosion: Subclass E includes soils where damage from erosion is a limitation to agricultural use. Damage is assessed on the loss of productivity and on the difficulties in farming land with gullies.

F - Low fertility: This subclass is made up of soils having low fertility that either is correctable with careful management in the use of fertilizers and soil amendments or is difficult to correct in a feasible way. The limitation may be due to lack of available plant nutrients, high acidity or alkalinity, low exchange capacity, high levels of carbonates or presence of toxic compounds.

I - Inundation by streams or lakes: This subclass includes soils subjected to inundation causing crop damage or restricting agricultural use.

L - Coarse wood fragments: In the rating of organic soils, woody inclusions in the form of trunks, stumps and branches (>10 cm diameter) in sufficient quantity to significantly hinder tillage, planting and harvesting operations.

M - Moisture limitation: This subclass consists of soils where crops are adversely affected by droughtiness owing to inherent soil characteristics. They are usually soils with low water-holding capacity.

N - Salinity: Designates soils which are adversely affected by the presence of soluble salts.

P - Stoniness: This subclass is made up of soils sufficiently stony to significantly hinder tillage, planting, and harvesting operations. Stony soils are usually less productive than comparable non-stony soils.

R - Consolidated bedrock: This subclass includes soils where the presence of bedrock near the surface restricts their agricultural use. Consolidated bedrock at depths greater than 1 meter from the surface is not considered as a limitation, except on irrigated lands where a greater depth of soil is desirable.

T - Topography: This subclass is made up of soils where topography is a limitation. Both the percent of slope and the pattern or frequency of slopes in different directions are important factors in increasing the cost of farming over that of smooth land, in decreasing the uniformity of growth and maturity of crops, and in increasing the hazard of water erosion.

W - Excess water: Subclass W is made up of soils where excess water other than that brought about by inundation is a limitation to their use for agriculture. Excess water may result from inadequate soil drainage, a high water table, seepage or runoff from surrounding areas.

X - Cumulative minor adverse characteristics: This subclass is made up of soils having a moderate limitation caused by the cumulative effect of two or more adverse characteristics which singly are not serious enough to affect the class rating.

Irrigated Agriculture

The irrigation suitability of soils is determined by evaluation the nature of both the internal and external soil characteristics[18].

1. Internal Characteristics

The internal characteristcs may be viewed as permanent and non-permanent properties; the permanent properties are those that will not change over time, while the non-permanent could be altered with time by specific management. These properties may be listed as follows:

a) permanent - texture, uniformity and depth of geologic deposit, hydraulic conductivity and water storage capacity

b) non-permanent - structure, drainage, fertility, reaction, salinity, exchangeable sodium

2. External Characteristics

The external characteristics refer to soil and landscape properties associated with the soil and land surface. These properties are listed as follows:

- topography (length and percent slope and pattern of slopes) erosion, stoniness, vegetative cover

The classification of soils for irrigation suitability consists of two categories. The suitability class groups soils having the same relative suitability or degree of limitation or hazard for irrigation use. The four classes in the irrigation suitability rating are defined as follows:

Class 1 - These are soils of fine sandy loam to clay loam texture which have no significant limitations in use for irrigation. Soils have good water retention capacity, good permeability, low salt content, good drainage and satisfactory gradient of land.

Class 2 - These are soils of loamy fine sand to clay loam which have slight limitations for use under irrigation. This class includes soil limitations (S) such as water holding capacity, permeability, depth of material, and salt content; topographic limitations (T) such as slope and pattern; or drainage limitations (D) such as surface drainage and depth to water table.

Class 3 - These are coarse to permeable, fine textured soils having some unfavorable characteristics that limit production and cause management problems under irrigation. These include soil (S), topographic (T) and drainage (D) factors that are more restrictive than in Class 2. The soils in this class have fair to marginal suitability for irrigation.

Class 4 - Soils in this class are considered poor to unsuitable for irrigation because of severe drainage problems, impermeable geological material, salinity, very low water retention capacity, very rapid permeability, topography or a combination of these problems.

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[18] PFRA. 1964. "Handbook for the Classification of Irrigated Land in the Prairie Provinces". PFRA, Regina, Sask.

The suitability subclass identifies soils with similar kinds of limitation and hazards related internal and external soil and landscape features.

The soils of the Swan River Study area have been rated for irrigation suitability (Table 12), using established guidelines summarized in Appendix F.

3. Irrigation Requirements

Irrigation requirement refers to the amount of water needed by the crop to meet the consumptive use requirements when the soil-water balance is zero. In other words, if there is no readily available water for crop use, the daily irrigation requirement is equal to the daily consumptive use. The consumptive use of water is the sum of the depths of water transpired by the plants and evaporated from the soil surface and from intercepted precipitation. It may be less or greater than potential evapotranspiration.

The climatic data indicate that the Swan River study area is generally suitable for a wide range of crops. Moisture on the average is not a serious limiting factor in the production of these crops, but supplementary irrigation to maintain maximum production may be desirable. Moisture is usually limiting at some periods in the growing season.

Risk analysis of weekly and seasonal climatic data are available for Swan River and serve as a useful guide in planning irrigation water requirements. Average annual soil moisture deficits as calculated for the Swan River study area are approximately 125 to 150 mm of water. Using risk analysis for the climatic data at Swan River as an approximate guide, there is a 25 percent probability that irrigation requirements (IR) for optimum forage production will exceed 190 mm, and only a 10 percent probability that IR will exceed 245 mm of water in any one year. These water requirements are in the range of those indicated in Table 7. Moisture requirements for optimum production of wheat and coarse grain production are less at each level of probability as the growing season for these annual crops in shorter (Table 7).

Table 12. Dryland Agriculture Capability(1) and Irrigation Suitability Classes(2) for the Soils of the Swan River Townsite Study Area

Map Symbol	Mapping Unit Name	Agricultural Capability (1)	Irrigation Suitability (2)
ASZ	Agassiz, sand	5M	4Svq
ASZ/xdxx	Agassiz, sand, gently sloping	5M	4Svq
BAM	Balmoral, clay loam	3W	4D
BAMp	Balmoral, peaty	3W	4D
BEV	Bell River, fine sand	3MI	3Sq
BEV/xcxx	Bell River, very gently sloping	3T	3Sq
BAX	Banks, very fine sandy loam	1	1
CGD	Craigsford, very fine sandy loam	2W	3D
CGD/xx1x	Craigsford, slightly stony	2W	3D
DRB	Durban, very fine sandy loam	1	1
DVD	Davidson, loamy fine sand	3M	3Sq
DVD/oxxx	Davidson, overblown	3ME	3Sq
DVD/1xxx	Davidson, slightly eroded	3ME	3Sq
DVD/ocxx	Davidson, overblown very gently sloping	3ME	3Sq
DTT	Dutton, clay loam	1	1
DTT2	Dutton, gravel substrate variant	2M	2SK
ERX/xgxx	Eroded slopes complex, very strongly sloping	6TE	4T
ETT	Ethelbert, fine sandy loam	2M	3Sb
ETT/xx1x	Ethelbert, slightly stony	2M	3Sb
ETT/xx2x	Ethelbert, moderately stony	3P	3Sb
ETT/oxxx	Ethelbert, overblown	3ME	3Sb
ETT/2xxx	Ethelbert, moderately eroded	4EM	3Sq
FOY	Foley, very fine sandy loam	3W	4D
GBT	Gilbert, fine sandy loam	3M	2Sq
GBT/xcxx	Gilbert, very gently sloping	3M	2Sq
GBT/1xxx	Gilbert, slightly eroded	3M	2Sq
GBT/1cxx	Gilbert, slightly eroded, very gently sloping	3M	2Sq
GBT/oxxx	Gilbert, overblown	4ME	3Sq
GBT/2cxx	Gilbert, moderately eroded, very gently sloping	4EM	3Sq
GBT/ocxx	Gilbert, overblown, very gently sloping	4ME	3Sq
GBT/odxx	Gilbert, overblown, gently sloping	5ET	4SqT
GBT1	Gilbert, loamy substrate variant	2M	3Sb
GBT/1xxx	Gilbert, loamy substrate variant, slightly eroded	2M	3Sb
GBT1/oxxx	Gilbert, loamy substrate variant, overblown	2M	3Sb
GBT2	Gilbert, gravel substrate variant	4M	4SK
GBT2/xx2x	Gilbert, gravel substrate variant, moderately stony	4M	4SK
HAU	Haute, humic peat	04WL-2	4D
HAY	Heatley, loam	3M	3SK
HAY/xcxx	Heatley, loam, very gently sloping	2I	3SK
HMD	Homestead, loam	2I	2D
HMD/xcxx	Homestead, very gently sloping	2I	2D
HMD/xdxx	Homestead, gently sloping	3T	3TD

Table 12. Dryland Agriculture Capability(1) and Irrigation Suitability Classes(2) for the Soils of the Swan River Townsite Study Area

Map Symbol	Mapping Unit Name	Agricultural Capability (1)	Irrigation Suitability (2)
LSW	Lenswood, fine sandy loam	2M	3SqD
LSW/1xxx	Lenswood, slightly eroded	2M	3SqD
LSW/2xxx	Lenswood, moderately eroded	3EM	3SqD
LSW/oxxx	Lenswood, overblown	3ME	3SqD
LSW/2cxx	Lenswood, moderately eroded, very gently sloping	3EM	3SqD
LSW1	Lenswood, loamy substrate variant	2M	3SqD
LSW1/1xxx	Lenswood, loamy substrate variant, slightly eroded	2M	3SqD
LSW1/2xxx	Lenswood, loamy substrate variant, moderately eroded	3EM	3SqD
LSW/oxxx	Lenswood, loamy substrate variant, overblown	3ME	3SqD
LSW2	Lenswood, gravel substrate variant	3M	4SK
MEH	Meharry, loam	2X	3Sh
MEH/xx1x	Meharry, slightly stony	2X	3Sh
MEH/xx2x	Meharry, moderately stony	3P	3Sh
MEH/xx3x	Meharry, very stony	4P	3Shr
MEH/xc3x	Meharry, very gently sloping, very stony	4TP	3Shr
MNS	Minitonas, clay loam	2W	3SbD
MNS/xx1x	Minitonas, slightly stony	2W	3SbD
MNT	Malonton, fine sand	4W	4D
NOV	Novra, loam	6W	4D
ONK	Oaknook, loam	2W	4ShD
ONK/xx1x	Oaknook, slightly stony	2W	4ShD
ONK/xx2x	Oaknook, moderately stony	3WP	4ShD
PLN	Pelan, fine sand	3MW	3Sq
PMU	Pineimuta, clay loam	3W	4D
PMUp	Pineimuta, peaty	3W	4D
PRA	Prawda, fine sand	4W	4D
RDG	Rose Ridge, loam	3P	3Sh
RDG/xc1x	Rose Ridge, loam, very gently sloping, slightly stony	3TP	3Sh
RDG/xf2x	Rose Ridge, strongly sloping, moderately stony	5TP	4ShT
SPG	Sprague, fine sand	4W	4D
SPG/xx1x	Sprague, slightly stony	4W	4D
SVC	Sevick, loamy fine sand	2M	3SqD
SVC/xx1x	Sevick, slightly stony	2M	3SqD
SVC/xx2x	Sevick, moderately stony	3P	3SqD
SVC/oxxx	Sevick, overblown	3ME	3SqD
SVC/1x1x	Sevick, slightly eroded, slightly stony	2M	3SqD
SVK/3cxx	Silver Creek, sand, severely eroded, very gently sloping	5ME	4Sq
SVK/odxx	Silver Creek, overblown, gently sloping	5ME	4Sq
SWF	Swanford, very fine sandy loam	2W	2D
SWF1	Swanford, loamy substrate variant	2W	2D
SWF1/oxxx	Swanford, loamy substrate variant, overblown phase	2W	2D
SWV	Swan River, clay loam	1	1
SWV/xcxx	Swan River, very gently sloping	2T	2T
TBN	Timberton, clay loam	1	2Sq
TBN/xx1x	Timberton, slightly stony	1	2Sq
VLY	Valley, clay loam	2W	2SqD
VLY/xx1x	Valley, slightly stony	2W	2SqD

4.4 SOIL SUITABILITY FOR SELECTED ENGINEERING USES

This section provides information which can be used by engineers and land use planners concerned with engineering and related geotechnical aspects of soil. It is intended to supplement the information on the soil map with additional data on engineering properties of soils.

The criteria used to evaluate soil suitability for selected engineering and related recreational uses are adopted from guides found in Coen, et al[19]. and from guidelines developed by the Soil Conservation Service, United States Department of Agriculture[20] and the Canada Soil Survey Committee[21].

Definition of Soil Suitability Classes

Evaluation of soil suitability for engineering and recreation uses is based on both internal and external soil characteristics. Four soil suitability classes are used to evaluate both mineral and organic soils and hence, mapping units for selected uses. These ratings express relative degrees of suitability or limitation for potential uses of natural or essentially undisturbed soils. The long term effects of the potential use on the behavior of the soil are considered in the rating.

The four suitability class ratings are defined as follows:

Good - Soils in their present state have few or minor limitations that would affect the proposed use. The limitations would easily be overcome with minimal cost.

Fair - Soils in their present state have one or more moderate limitations that would affect the proposed use. These moderate limitations would be overcome with special construction, design, planning or maintenance.

Poor - Soils in their present state have one or more severe limitations that would severely affect the proposed use. To overcome these severe limitations would require the removal of the limitation or difficult and costly alteration of the soil or special design or intensive maintenance.

Very Poor - Soils have one or more features so unfavorable for the proposed use that the limitation is very difficult and expensive to overcome or the soil would require such extreme alteration that the proposed use is economically impractical.

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[19] Coen et al, 1977. Soil Survey of Yoho National Park, Canada. Alberta Soil Survey Report No. 37. 208pp. Alberta Institute of Pedology, University of Alberta, Edmonton, Alberta.

[20] USDA, 1971. Guide for Interpreting Engineering Uses of Soils. Soil Conservation Service USDA. SCS-45. 87pp.

[21] CSSC, 1973. Proceedings of the Ninth Meeting of the Canada Soil Survey Committee, University of Saskatchewan, Saskatoon. 357pp.

Soil Suitability Subclasses

The basic soil properties that singly or in combination with others commonly affect soil suitability for selected engineering properties and recreation uses are provided in Table 13. These subclass designations serve to identify the kind of limitation or hazard for a particular use.

Guides for Assessing Soil Suitability

Guides for assessing soil suitability for ten engineering related uses are given in Appendix D, Tables 21 to 30 These tables provide as specifically as possible, definitions of the soil properties which result in the specific suitability or degree of limitation. In assessing soil suitability for various engineering uses, the degree of suitability is determined by the most restrictive or severe rating assigned to any one of the listed soil properties. For example, if the suitability is "Good" for all but one soil property and it is estimated to be "Very Poor", then the overall rating of the soil for that selected use is "Very Poor". Suitability of individual soil properties, if estimated to be "Fair" or "Poor", can be accumulative in their effect for a particular use. Judgement is required to determine whether the severity of the combined effects of several soil properties on suitability for a particular use will result in downgrading an evaluation. This is left to the discretion of the interpreter. It is incorrect to assume that each of the major soil properties influencing a particular use has an equal effect. Class limits established for rating the suitability of individual soil properties take this into account. For a selected use, therefore, only those soil properties which most severely limit that use are specified.

Engineering test data for selected soils in the study area are provided in Table 14. Engineering descriptions and their estimated properties for significant to engineering are provided in Table 15. These data, in addition to information contained in other sections of the report have been used to rate the soils according to their suitability for ten selected engineering uses in Table 16. When using these interpretations, consideration must be given to the following assumptions:

1. Interpretations are based on predictions of soil behavior under defined conditions of use and management as specified in the preamble to each of Tables 21 through 30 (Appendix D).

2. Soil ratings do not include site factors such as nearness to towns and highways, water supply, aesthetic values, etc.

3. Soil ratings are based on natural, undisturbed soil.

4. Soil suitability ratings are usually given for the entire soil, but for some uses, they may be based on the limitations of an individual soil horizon or other earthy layer, because of its overriding importance. Ratings rarely apply to soil depths greater than 1 to 2 meters, but in some kinds of soils, reasonable estimates can be given for soil material at greater depths. It should be noted here that the term "soil" has been used throughout the report in the pedologic sense and differs in concept from that commonly used by engineers.

5. Poor and very poor soil ratings do not imply that a site cannot be changed to remove, correct or modify the soil limitations. The use of soils rated as poor depends on the nature of the limitations, whether or not the soil limitation can be altered successfully and economically, and on the scarcity of good sites.

6. Interpretations of map units do not eliminate the need for on-site evaluation by qualified professionals. Due to the variable nature of soils, and the scale of mapping, small, unmappable inclusions of soils with different properties may be present in an area where a development is planned. The need for or importance of on-site studies depends on the use to be made of the soil and the kinds of soil and soil problems involved.

4.5 SOIL SUITABILITY FOR SELECTED RECREATION USES

This section provides interpretations of the soil suitability for recreational development. All types of soil can be used for recreational activities of some kind.

Soils and their properties determine to a large degree, the type and location of recreational facilities. Wet soils are not suitable for campsites, roads, playgrounds or picnic areas. Soils that pond and dry out slowly after heavy rains present problems where intensive use is contemplated. It is difficult to maintain grass cover for playing fields and golf courses on droughty soils. The feasibility of many kinds of outdoor activities are determined by other basic soil properties such as depth to bedrock, stoniness, topography or land pattern, and the ability of the soil to support vegetation of different kinds as related to its natural fertility.

The suitability of the various soil series and phases for selected recreation uses is shown in Table 17 according to four classes, Good, Fair, Poor and Very poor defined previously in the section on Engineering Uses. Subclasses are employed to identify the kind of limitation or hazard for a particular use. An explanation of subclass symbols are provided in Table 13

The guidelines for various recreation uses are presented in Appendix D, Tables 31 to 34

TABLE 13

Codes utilized to identify limitations in evaluating soil suitability for selected Engineering and Recreational Uses

a subgrade properties

b thickness of topsoil

c coarse fragments on surface

d depth to bedrock

e erosion or erodibility

f susceptibility to frost hazard

g contamination hazard of groundwater

h depth to seasonal water table

i flooding or inundation

j thickness of slowly permeable material

k permeability or hydraulic conductivity

l shrink-swell properties

m moisture limitations or deficit

n salinity or sulphate hazard

o organic matter

p stoniness

q depth to sand or gravel

r rockiness

s surface texture

t topographic slope class

u moist consistence

w wetness or soil drainage class

z permafrost

TABLE 14

Engineering Test Data for Selected Soils in the Swan River Townsite Study Area

Soil Name and Location (Profile No.)	Horizon	Depth (cm)	% Passing Sieve			% Smaller Than		Liquid Limit	Plasticity Index P.I.	Shrinkage			Textural Classification			
			No.10 2.0mm	No.40 0.42mm	No.200 0.074mm	(.05 mm)	(.002 mm)			Limit %	Ratio	Lineal %	Sat. %	USDA	AASHO	Unified
Balmoral (42)	CKG1	30-60	100	97	95	92	31	51	26	13	2.1	27	90	SiCL	A-7-6(28)	CH
SW09-36-27W	CKG2	60-80	100	100	84	78	48	66	39	14	2.0	30	109	C	A-7-6(36)	CH
	CKG3	80-95	100	98	47	30	23	32	14	12	2.0	20	61	SCL	A-6 (3)	SC
Bell River (49)	CKGJ2	20-50	100	94	42	38	21	32	11	22	1.7	12	50	SCL	A-6 (1)	SC
NW12-36-27W	CKGJ4	95-120	100	100	42	31	14	26	5	24	1.7	9	43	FSL	A-4 (0)	SM-SC
Craigsford (45)	ACKGJ	30-55	98	96	26	18	10	ND	ND	ND	ND	ND	30	LFS	A-2-4	
SW12-36-27W	2CKGJ	55-100	98	94	90	88	22	28	10	20	1.8	15	54	SiL	A-6 (8)	CL
Dutton (56)	AHE	15-38	100	95	34	28	13	ND	ND	ND	ND	ND	40	FSL	A-4	
NW35-36-27	CK	80-100	100	100	85	76	24	43	20	27	1.7	18	76	SiL	A-7-6(18)	CL
Davidson (48)	AHE2	30-50	100	100	47	18	10	ND	ND	ND	ND	ND	34	LFS	A-4	SM
NW12-36-27W	CK1	120-190	100	100	52	29	14	28	4	26	1.6	9	47	VFSL	A-4 (0)	ML
	CKGJ2	190-250	100	100	99	96	30	44	23	19	1.8	22	86	SiCL	A-7-6(25)	CL
Ethelbert (46)	AH	20-32	99	90	40	30	15	ND	ND	ND	ND	ND	36	FSL	A-4	
NW32-36-27W	BM	32-40	85	74	28	23	13	24	7	18	1.8	11	41	SL	A-2-4(0)	SM-SC
	2CK	50-90	100	99	28	22	12	23	4	22	1.7	9	39	FSL	A-2-4(0)	SM-SC
Foley (44)	CKG1	60-80	100	100	86	64	11	26	1	21	1.8	12	49	SiL	A-4 (0)	ML
SW30-36-27W	CGK2	85-120	100	100	92	63	14	29	2	24	1.7	13	54	L	A-4 (2)	ML
Gilbert (35) SE25-36-27W	BM	40-90	100	98	25	8	3	ND	ND	ND	ND	ND	27	FS	A-2-4	SM
Gilbert (33)	BM	35-70	100	96	36	10	5	ND	ND	ND	ND	ND	28	FS	A-2-4	SM
SE28-36-27W	2CK1	105-130	100	99	91	58	21	41	20	22	1.7	19	75	L	A-7-6(19)	CL
	3CK1	205-245	96	91	81	77	33	37	19	18	1.9	22	75	SiCL	A-6 (14)	CL

Table 14. Engineering Test Data for Soils in the Swan River Area

Soil Name and Location (Profile No.)	Horizon	Depth (cm)	% Passing Sieve			% Smaller Than		Liquid Limit	Plasticity Index P.I.	Shrinkage			Textural Classification			
			No.10 2.0mm	No.40 0.42mm	No.200 0.074mm	(.05 mm)	(.002 mm)			Limit %	Ratio	Lineal %	Sat. %	USDA	AASHO	Unified
Homestead (53)	CKGJ2	38-58	100	99	77	64	23	34	14	20	1.8	16	60	L	A-6 (10)	CL
NW35-36-27W	CKGJ3	58-110	100	97	55	42	18	33	13	21	1.7	16	59	FSL	A-6 (5)	CL
Lenswood (51)	ACKGJ	15-50	100	100	31	18	7	ND	ND	ND	ND	ND	29	LFS	A-2-4	
SW33-36-17W	2CKG	65-130	100	100	93	80	16	29	7	25	1.6	14	61	SIL	A-4 (6)	CL
Meharry (41) SW17-36-27W	CK1	50-100	70	64	38	29	8	17	2	11	2.2	11	31	FSL	A-4 (0)	SM
Minitonas (52)	ACKGJ	25-35	100	97	54	36	18	24	6	19	1.8	11	44	VFSL	A-4 (1)	CL-ML
NE 7-36-27W	2CKGJ	35-90	100	92	59	49	13	17	3	14	1.9	11	34	L	A-4 (0)	ML
Minitonas (57)	ACKGJ	24-40	99	98	47	32	17	27	9	21	1.7	14	54	VFSL	A-4 (1)	SC
NE 8-36-27W	2CKGJ	50-75	86	83	75	73	16	24	6	19	1.8	13	50	SiL	A-4 (2)	ML
Malonton (43) SW30-36-27W	CKG1	56-85	100	100	24	11	6	ND	ND	ND	ND	ND	26	FS	A-2-4	SM
Novra (50)	CKG1	36-70	100	99	92	89	42	61	29	15	1.9	25	88	SiC	A-7-5(32)	MH
NW12-36-27W	CKG3	100-130	100	99	88	76	23	38	18	19	1.8	18	66	SiL	A-6 (16)	CL
Pelan	BMGJ	15-50	100	98	20	8	3	ND	ND	ND	ND	ND	33	FS	A-2-4	SM
NW22-36-27W	2CKGJ	80-100	69	59	32	25	5	17	1	16	1.9	7	29	FSL	A-2-4(0)	SM
Sprague (39)	AHKGJ2	12-25	99	80	22	18	10	22	3	20	1.7	9	38	LS	A-2-4(0)	SM
NE16-36-27W	ACKG	25-36	96	80	14	12	7	NP	NP	18	1.8	4	25	LS	A-2-4	SM
	2CKG1	95-115	93	91	87	85	46	60	37	8	2.2	33	115	SiC	A-7-6(35)	CH

Table 14. Engineering Test Data for Soils in the Swan River Area

Soil Name and Location (Profile No.)	Horizon	Depth (cm)	% Passing Sieve			% Smaller Than		Liquid Limit	Plasticity Index P.I.	Shrinkage			Textural Classification			
			No.10 2.0mm	No.40 0.42mm	No.200 0.074mm	(.05 mm)	(.002 mm)			Limit %	Ratio	Lineal %	Sat. %	USDA	AASHO	Unified
Swanford (37)	ACKGJ	15-25	100	99	81	64	21	ND	ND	ND	ND	ND	43	L	A-4	CL
SE32-36-27W	CKGJ1	42-80	100	100	96	85	20	31	8	18	1.9	17	58	SiL	A-4 (8)	ML
Swanford (38)	ACKGJ	12-27	100	99	80	35	14	ND	ND	ND	ND	ND	35	VFSL	A-4	
SE30-36-27W	CKGJ	40-65	100	100	94	51	14	26	3	16	1.8	14	47	L	A-4 (2)	ML
	CKG	65-100	100	100	95	60	9	27	2	18	1.8	13	47	SiL	A-4 (2)	ML
Swan River (54) NW35-36-27W	CK2	80-100	100	99	32	24	11	19	1	20	1.7	7	34	FSL	A-2-4(0)	SM
Swan River (55) NW35-36-27W	CK2	70-100	100	99	54	40	18	27	10	19	1.8	15	52	FSL	A-4 (3)	CL
Sevick (47)	AHGJ	15-30	100	99	35	15	8	ND	ND	ND	ND	ND	30	LVFS	A-2-4	
SW19-36-27W	2CKJ	53-100	96	91	74	68	31	36	20	19	1.9	21	72	CL	A-6 (13)	CL
Silver Creek (36) NW18-36-27W	AC	20-48	100	98	21	1	0	ND	ND	ND	ND	ND	26	FS	A-3	SP
Valley (34) NE33-36-27W	CKGJ2	65-95	100	100	99	95	26	35	13	23	1.7	18	69	SiL	A-6 (14)	CL

TABLE 15

Engineering Description of Soils and Their Estimated Properties Significant to Engineering

Map Symbol	Soil Series	Depth (cm)	Classification USDA	Unified	AASHO	% Passing No.10 (2.0mm)	No.40 (0.42mm)	No. 200 (0.074mm)	Permeability (cm/hr)*	Reaction	Sulfate Hazard	Dispersion	Shrink-Swell Potential	Depth to Water Table
ASZ	Agassiz	0-25	S-CS	SW	A-1	50-70	20-30	10-15		6.5-7.0	none	low	low	2m
		25-100	S-FGR	SP-GP	A-1	30-50	30-40	0-10		7.5-8.0	none	low	low	
BAM	Balmoral	0-40	CL	CL-CH	A-7-6 to A-4	100	95-100	70-95	0.13-1.5	7.0-8.0	low	low	moderate	seasonal
		40-90	CL-SiCL	CL-ML	A-4	100	100	70-95	0.13-1.5	7.5-8.0	moderate	low	moderate	0.6-1.3m
		90+	VFSL-SiL	ML	A-4	100	100	40-60	0.13-2.5	7.5-8.0	low	low	moderate	
BAMp	Balmoral, peaty phase	20-0	Mesic Peat	PT	-	-	-	-	5-10	7.0-7.5	low	-	-	seasonal
		0-100	similar to Balmoral above											0.6-1.3m
BEV	Bell River	0-75	LFS-FS	SP-SC	A-2-6 to A-6	100	90-100	30-50	5-25	7.0-7.5	low	low	low	1.5-2.0m
		75-120	LS-FS	SP-SM	A-4	100	90-100	30-70	5-15	7.5-8.0	low	low	low	
BAX	Banks	0-70	VFSL-LVFS	ML-SM	A-4	100	100	70-85	2.5-5	6.5-7.0	low	low	low	2m
		70-100	L	ML-CL	A-4 to A-6	70-90	60-80	30-60	0.13-2.5	7.5-8.0	low	low	low	
CGD	Craigsford	0-65	VFSL-LVFS	ML-SM	A-4	100	100	70-85	2.5-5	7.0-7.5	low	low	low	seasonal
		65-100	L	ML-CL	A-4 to A-6	70-90	60-80	30-60	0.13-2.5	7.5-8.0	low	low	low	to 0.6m
DRB	Durban	0-70	VFSL-LVFS	ML-SM	A-4	100	100	70-85	2.5-5	6.5-7.0	low	low	low	2m
		70-100	VFSL-SiL	ML	A-4 to A-6	100	100	80-90	2.5-5	7.5-8.0	low	low	low	
DVD	Davidson	0-60	LFS-FS	SM-SW	A-2-4	100	100	10-35	15-25	6.5-7.0	none	low	low	3m
		60-100	FS	SW	A-3	100	100	5-20	15-25	7.0-8.0	none	low	low	
DTT	Dutton	0-60	L-CL	CL-ML	A-6	100	100	95-100	1.5-2.5	6.5-7.0	low	low	moderate	2m
		60-100	SiL-CL	CL	A-6	100	100	95-100	1.5-2.5	7.0-8.0	low	low	moderate	
DTT2	Dutton, gravel substrate variant	0-55	L-CL	CL-ML	A-6	100	100	95-100	1.5-2.5	6.5-7.0	low	low	moderate	2m
		55-100	CS-GR	GP	A-1	20-70	20-70	10-15	25	7.0-8.0	low	low	low	
ERX	Eroded Slopes	0-40	VFSL-L	ML	A-4	100	100	95-100	2.5-5.0	7.0-7.5	low	low	low	2m
		40+	L-CL	ML-CL	A-6	100	100	95-100	1.5-2.5	7.5-8.0	low	low	moderate	
ETT	Ethelbert	0-60	FS	SW	A-2-4	100	100	10-35	15-35	6.5-7.0	none	low	low	2m
		60-100	L	ML-CL	A-4 to A-6	70-90	60-80	30-60	0.13-2.5	7.5-8.0	low	low	low	

Table 15. Cont'd

Map Symbol	Soil Series	Depth (cm)	Classification USDA	Unified	AASHO	% Passing No.10 (2.0mm)	No.40 (0.42mm)	No.200 (0.074mm)	Permeability (cm/hr)*	Reaction	Sulfate Hazard	Dispersion	Shrink-Swell Potential	Depth to Water Table
FOY	Foley	0-35	VFSL-L	ML	A-4	100	100	80-90	2.5-5.0	7.0-7.5	low	low	low	seasonal
		35-100	VFSL-SiL	ML	A-4 to A-6	100	100	80-90	2.5-5.0	7.5-8.0	low	low	low	at 0.5m
GBT	Gilbert	0-55	LS-LFS	SM-SW	A-2-4	100	100	10-35	15-25	6.5-7.0	none	low	none	3m
		55+	FS	SW	A-3	100	100	5-20	15-25	7.0-8.0	none	low	none	
GBT1	Gilbert, loamy substrate variant	0-80	LFS-FS	SM-SW	A-2-4	100	100	10-35	15-25	6.5-7.0	none	low	low	2m
		85-100	SIL-CL	ML-CL	A-4 to A-6	100	100	90-100	1.5-2.5	7.5-8.0	low	low	moderate	
GBT2	Gilbert, gravel substrate variant	0-70	LFS-FS	SM-SW	A-2-4	100	100	10-35	15-25	6.5-7.0	none	low	low	3m
		70-100	CS-Gr	GP	A-1	20-70	20-70	10-15	25	7.0-8.0	low	low	low	
HAU	Haute	0-25	Mesic Peat	PT	-	-	-	-	5-10	6.0-6.5	-	-	-	at surface
		25-140	Humic Peat	PT	-	-	-	-	1.5-2.5	6.5-7.0	-	-	-	to 30cm
		140+	FSL-CL	SM-CL	A-4 to A-6	100	70-90	50-80	1.5-2.5	7.0-8.0	low	low	low	
HAY	Heatley	0-60	FSL-L	SM-ML	A-4 to A-6	100	95-100	70-90	1.5-5.0	7.0-7.5	low	low	low	0.7-1.5m
		60-100	CS-FGr	SP-GP	A-1	50-70	30-50	0-10	25	7.5-8.0	low	low	low	
HMD	Homestead	0-45	VFSL-SIL	ML	A-6	100	100	70-90	2.5-5.0	7.0-7.5	low	low	low	seasonal
		45+	VFS-SIL	SM-ML	A-4 to A-6	100	100	60-70	2.5-5.0	7.5-8.0	low	low	low	at 0.8m
LSW	Lenswood	0-40	LS-LFS	SM-SW	A-2-4	100	100	10-35	15-25	7.0-7.5	low	low	low	seasonal
		40-100	FS	SW	A-3	100	100	5-20	15-25	7.5-8.0	low	low	low	to 0.7m
LSW1	Lenswood, loamy substrate variant	0-75	LS-LFS	SM-SW	A-2-4	100	100	10-35	15-25	7.0-7.5	low	low	low	seasonal
		75-100	CL	ML-CL	A-4 to A-6	100	100	90-100	1.5-2.5	7.5-8.0	low	low	moderate	to 0.7m
LSW2	Lenswood, gravel substrate variant	0-80	LS-LFS	SM-SW	A-2-4	100	100	10-35	15-25	6.5-7.0	none	low	low	seasonal
		80-100	CS-Gr	GP	A-1	20-70	20-70	10-15	25	7.0-8.0	low	low	low	to 0.9m
MEH	Meharry	0-40	FSL-L	SM-ML	A-2-4 to A-4	70-95	60-80	30-60	1.5-2.5	7.0-7.5	low	low	low	2m
		40-100	L-SIL	ML-CL	A-4 to A-6	70-95	60-80	30-60	0.13-2.5	7.5-8.0	low	low	low	

Table 15. Cont'd

Map Symbol	Soil Series	Depth (cm)	Classification USDA	Unified	AASHO	% Passing No.10 (2.0mm)	No.40 (0.42mm)	No.200 (0.074mm)	Permeability (cm/hr)*	Reaction	Sulfate Hazard	Dispersion	Shrink-Swell Potential	Depth to Water Table
MNS	Minitonas	0-50	L-CL	CL-ML	A-6	100	100	95-100	1.5-2.5	7.0-7.5	low	low	low	seasonal
		50-100	SIL-CL	ML-CL	A-4 to A-6	70-95	60-80	30-60	0.13-2.5	7.5-8.0	low	low	low	to 0.7m
MNT	Malonton	0-50	LFS-FS	SM-SW	A-2-4	100	100	10-35	15-25	7.5-8.0	low	low	low	seasonal
		50-100	FS	SW	A-3	100	100	5-20	15-25	7.5-8.0	low	low	low	1m
NOV	Novra	0-60	SIL-CL	CL-OL	A-6	100	100	80-90	1.5-2.5	7.0-7.5	low	low	low	seasonal
		60+	VFSL-CL	CL-ML	A-4 to A-6	100	100	70-80	2.5-5.0	7.5-8.0	low	low	low	0-0.8m
ONK	Oaknook	0-35	L	ML-CL	A-4 to A-6	70-95	60-80	30-60	1.5-2.5	7.5-8.0	low	low	low	0.7-1.5m
		35-100	FSL-SIL	SM-ML	A-2-4 to A-4	70-95	60-80	30-60	0.13-2.5	7.5-8.0	low	low	low	
PLN	Pelan	0-80	LFS-VFS	SM	A-2-4	100	100	10-25	15-25	6.5-7.0	low	low	low	seasoanl
		80-100	L	ML-CL	A-4 to A-6	70-90	60-80	30-60	0.13-2.5	7.5-8.0	low	low	low	to 0.6m
PMU	Pineimuta	0-35	L-CL	CL-ML	A-4 to A-6	100	100	70-95	0.13-1.5	7.5-8.0	low	mod.	moderate	seasonal
		35-75	CL-SICL	CL	A-6	100	100	70-95	0.13-1.5	7.5-8.0	mod.	mod.	moderate	0-0.8m
		75+	L	ML-CL	A-4 to A-6	70-95	60-80	30-60	0.13-2.5	75.-8.0	mod.	mod.	moderate	
PMUp	Pineimuta peaty phase	25-0	Humic Peat	PT	-	-	-	-	1.5-2.5	6.5-7.0	low	-	low	0-0.8m
		0-80+	as Pineimuta above											
PRA	Prawda	0-75	LFS-FS	SM-SW	A-2-4	100	100	10-35	15-25	7.0-7.5	low	low	low	seasonal
		75-100	SIL-CL	ML-CL	A-4 to A-6	100	100	90-100	1.5-2.5	7.5-8.0	low	low	moderate	1m
RDG	Rose Ridge	0-60	FSL-L	SM-ML	A-2-4 to A-4	70-95	60-80	30-60	1.5-2.5	7.0-7.5	low	low	low	2m
		60-100	L-SIL	ML-CL	A-4 to A-6	70-95	60-80	30-60	0.13-2.5	7.5-8.0	low	low	low	
SPG	Sprague	0-50	LFS-FS	SM-SW	A-2-4	100	100	10-35	15-25	7.0-7.5	low	low	low	seasonal
		50-100	L-CL	ML-CL	A-4 to A-6	70-95	60-80	30-60	0.13-2.5	7.5-8.0	mod.	mod.	moderate	1m
SVC	Sevick	0-60	LFS-FS	SM-SW	A-2-4	100	100	10-35	15-25	7.0-7.5	low	low	low	0.7-1.5m
		60-100	CL-L	ML-CL	A-4 to A-6	70-95	60-80	30-60	0.13-2.5	7.5-8.0	low	low	low	

Table 15. Cont'd

Map Symbol	Soil Series	Depth (cm)	Classification USDA	Unified	AASHO	% Passing No.10 (2.0mm)	No.40 (0.42mm)	No.200 (0.074mm)	Permeability (cm/hr)*	Reaction	Sulfate Hazard	Dispersion	Shrink-Swell Potential	Depth to Water Table
SVK	Silver Creek	0-20	FS-LFS	SM-SW	A-2-4	100	100	10-35	15-25	6.0-6.5	none	low	none	3 m
		20-100+	FS	SW	A-3	100	100	5-20	15-25	6.5-7.5	none	low	none	
SWF	Swanford	0-75	VFSL-LVFS	ML-SM	A-4	100	100	70-85	2.5-5.0	7.0-7.5	low	low	low	seasonal
		75-100	L-SIL	ML	A-4 to A-6	100	100	80-90	2.5-5.0	7.5-8.0	low	low	low	to 0.8 m
SWF1	Swanford, loamy substrate variant	0-70	VFSL-LVFS	ML-SM	A-4	100	100	70-85	2.5-5.0	7.0-7.5	low	low	low	seasonal
		70-100	SIL-CL	ML-CL	A-4 to A-6	100	100	90-100	1.5-2.5	7.5-8.0	mod.	low	moderate	to 0.8 m
SWV	Swan River	0-45	L-FSL	ML-SM	A-4 to A-2-4	100	90-100	30-60	1.5-5.0	6.5-7.0	low	low	moderate	2 m
		45-80	L-CL	CL-ML	A-4 to A-6	100	100	70-90	1.5-2.5	7.0-7.5	low	low	moderate	
		80+	FSL-SICL	SM-CL	A-2-4 to A-6	100	70-90	50-80	1.5-5.0	7.5-8.0	low	low	moderate	
TBN	Timberton	0-45	L	CL-ML	A-6	100	100	95-100	1.5-2.5	6.5-7.0	low	low	moderate	2 m
		45-100	L-CL	ML-CL	A-4 to A-6	70-95	60-80	30-60	0.13-2.5	7.5-8.0	low	low	low	
VLY	Valley	0-55	L-CL	CL-ML	A-4 to A-6	100	100	95-100	1.5-2.5	7.0-7.5	low	low	moderate	seasonal
		55-100	L-SICL	ML-CL	A-6 to A-4	100	100	95-100	1.5-2.5	7.5-8.0	mod.	low	moderate	to 0.8 m

* The permeability of horizons or layers is expressed in cm/per hour.
The classes of permeability are as follows:

	cm/hr		cm/hr
very rapid	25.0	moderately slow	1.5-2.5
rapid	15.0-25.0	slow	0.13-1.5
moderately rapid	5.0-15.0	very slow	0.13
moderate	2.5-5.0		

TABLE 16. SUITABILITY RATINGS OF SOILS FOR SELECTED ENGINEERING USES

Map Symbol and Phase	Soil Name	Top Soil (21)*	Sand & Gravel (22)	Road Fill (23)	Permanent Bldgs. With Basements (24)	Local Roads and Streets (25)	Sanitary Trench (26)	Landfill Area (27)	Cover Material (28)	Sewage Lagoons (29)	Septic Fields (30)
ASZ	Agassiz	Ps	G	G	G	G	Vsk	Vk	Vs	Vak	Gg
ASZ /xdxx	Agassiz	Ps	G	G	G	G	Vsk	Vk	Vs	Vak	Gg
BAM	Balmoral	Fs	Va	Paw	Pw	Pw	Vw	Pw	Pw	Fk	Vh
BAMp	Balmoral	Fs	Va	Paw	Pw	Pw	Vw	Pw	Pw	Fk	Vh
BEV	Bell River	Fi	Pa	Fa	Pwi	Fwi	Pik	Pik	Fs	Pik	Fk
BEV /xcxx	Bell River	Fi	Pa	Fa	Pwi	Fwi	Pik	Pik	Fs	Pik	Fk
BKS	Banks	G	Va	Fa	Fa	Fa	G	G	G	Fk	Fk
CGD	Craigford	G	Va	Fa	Pw	Fwa	Pwh	Fw	G	Fa	Fh
CGD /xx1x	Craigford	G	Va	Fa	Pw	Fwa	Pwh	Fw	G	Fa	Fh
DRB	Durban	G	Va	Fa	Fa	Fa	G	G	G	Fk	Fk
DTT	Dutton	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fka	Fk
DTT2	Dutton	Fs	Pq	Fa	Fa	Fa	Vsk	G	Fs	Vka	Fkg
DVD	Davidson	Ps	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
DVD /oxxx	Davidson	Ps	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
DVD /1xxx	Davidson	Ps	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
DVD /ocxx	Davidson	Ps	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
ERX /xgxx	Eroded Slope Compl	Vt	Va	Vt	Vt	Vt	Vt	Vt	Vt	Vt	Vt
ERR	Ethelbert	Ps	Fa	G	G	G	Fs	Fk	Fs	Pka	Gg
ETT /xx1x	Ethelbert	Ps	Fa	G	G	G	Fs	Fk	Fs	Pka	Gg
ETT /xx2x	Ethelbert	Ps	Fa	G	G	G	Fs	Fk	Fs	Pka	Gg
ETT /oxxx	Ethelbert	Ps	Fa	G	G	G	Fs	Fk	Fs	Pka	Gg
ETT /2xxx	Ethelbert	Vb	Fa	G	G	G	Fs	Fk	Fs	Pka	Gg
FOY	Foley	Fb	Va	Pw	Pw	Pw	Vw	Pw	Pw	Vh	Vh
GBT	Gilbert	Ps	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
GBT /xcxx	Gilbert	Ps	Fa	G	G	G	Vsk	Pk	Vs	Vk	Gg
GBT /1xxx	Gilbert	Ps	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
GBT /1cxx	Gilbert	Ps	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
GBT /oxxx	Gilbert	Ps	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
GBT /2cxx	Gilbert	Vb	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
GBT /ocxx	Gilbert	Ps	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg

TABLE 16. SUITABILITY RATINGS OF SOILS FOR SELECTED ENGINEERING USES

Map Symbol and Phase	Soil Name	Top Soil (21)*	Sand & Gravel (22)	Road Fill (23)	Permanent Bldgs. With Basements (24)	Local Roads and Streets (25)	Sanitary Trench (26)	Landfill Area (27)	Cover Material (28)	Sewage Lagoons (29)	Septic Fields (30)
GBT /odxx	Gilbert	Ps	Fa	G	Gt	G	Vsk	Vk	Vs	Vk	Gg
GBT1	Gilbert	Ps	Fa	G	Fa	G	Fs	Pk	Fs	Fka	Fk
GBT1/1xxx	Gilbert	Ps	Fa	G	Fa	G	Fs	Fk	Fs	Fka	Fk
GBT1/oxxx	Gilbert	Ps	Fa	G	Fa	G	Fs	Fk	Fs	Fka	Fk
GBT2	Gilbert	Ps	Faq	G	G	G	Vsk	Vk	Vs	Vka	Gg
GBT2/xx2x	Gilbert	Ps	Faq	G	G	G	Vsk	Vk	Vs	Vka	Gg
HAU	Haute	Vw	Va	Va	Vwa	Vwa	Vsw	Vw	Vs	Vah	Vh
HAY	Heatly	Fi	Fq	Fwa	Pwi	Fwi	Vsk	Pk	Vs	Vka	Gg
HAY /xcxx	Heatly	Fi	Fq	Fwa	Pwi	Fwi	Vsk	Pk	Vs	Vka	Gg
HMD	Homestead	Fi	Va	Fwa	Pwi	Fwi	Pwi	Pi	Fs	Pi	Fk
HMD /xcxx	Homestead	Fi	Va	Fa	Pwi	Fwi	Pwi	Pi	Fs	Pi	Fk
HMD /xdxx	Homestead	Fit	Va	Fa	Pwi	Fwi	Pwi	Pi	Fs	Pit	Fk
LSW	Lenswood	Ps	Fa	Fw	Pw	Fw	Vsk	Vk	Vs	Vk	Phg
LSW /1xxx	Lenswood	Ps	Fa	Fw	Pw	Fw	Vsk	Vk	Vs	Vk	Phg
LSW /2xxx	Lenswood	Ps	Fa	Fw	Pw	Fw	Vsk	Vk	Vs	Vk	Phg
LSW /oxxx	Lenswood	Ps	Fa	Fw	Pw	Fw	Vsk	Vk	Vs	Vk	Phg
LSW /2cxx	Lenswood	Ps	Fa	Fw	Pw	Fw	Vsk	Vk	Vs	Vk	Phg
LSW1	Lenswood	Ps	Fa	Fw	Pw	Fw	Pw	Fw	Fs	Ph	Phg
LSW1/1xxx	Lenswood	Ps	Fa	G	Pw	Fw	Pw	Fw	Fs	Ph	Phg
LSW1/2xxx	Lenswood	Ps	Fa	G	Pw	Fw	Pw	Fw	Fs	Ph	Phg
LSW1/oxxx	Lenswood	Ps	Fa	G	Pw	Fw	Pw	Fw	Fs	Ph	Phg
LSW2	Lenswood	Ps	Faq	Fw	Pw	Fw	Vsk	Pk	Vs	Vk	Phg
MEH	Meharry	Fb	Va	Fa	Fa	Fa	Fs	G	G	Fka	Fk
MEH /xx1x	Meharry	Fb	Va	Fa	Fa	Fa	Fs	G	G	Fka	Fk
MEH /xx2x	Meharry	Fb	Va	Fa	Fa	Fa	Fp	G	G	Fka	Fk
MEH /xx3x	Meharry	Pbp	Va	Fap	Pzp	Fap	Pp	G	Pp	Fkp	Fk
MEH /xc3x	Meharry	Pbp	Va	Fap	Pap	Fap	Pp	G	Pp	Fkp	Fk
MNS	Minitonas	Fs	Va	Pa	Pw	Faw	Pw	Fw	Fs	Fka	Phk
MNS /xx1x	Minitonas	Fs	Va	Pa	Pw	Faw	Pw	Fw	Phk	Fka	phk
MNT	Malonton	Ps	Ph	Pw	Pw	Pw	Vws	Vk	Vs	Vhk	Vhg

TABLE 16.SUITABILITY RATINGS OF SOILS FOR SELECTED ENGINEERING USES

Map Symbol and Phase	Soil Name	Top Soil (21)*	Sand & Gravel (22)	Road Fill (23)	Permanent Bldgs. With Basements (24)	Local Roads and Streets (25)	Sanitary Trench (26)	Landfill Area (27)	Cover Material (28)	Sewage Lagoons (29)	Septic Fields (30)
NOV	Novra	Pi	Va	Pw	Vwi	Pwi	Vwi	Vwi	Pw	Vi	Vh
ONK	Oaknook	Pb	Va	Faw	Pw	Faw	Pw	Fw	G	Fka	Ph
ONK /xx1x	Oaknook	Pb	Va	Faw	Pw	Faw	Pw	Fw	G	Fka	Ph
ONK /xx2x	Oaknook	Pb	Va	Faw	Pw	Faw	Pw	Fw	Fp	Fka	Ph
PLN	Pelan	Ps	Pa	Fw	Pw	Fw	Pw	Pk	Fs	Pka	Ph
PMU	Pineimuta	Fs	Va	Pw	Pw	Pw	Vw	Pw	Pw	Fk	Vh
PMUp	Pineimuta	Ps	Va	Pw	Pw	Pw	Vw	Pw	Pw	Fk	Vh
PRA	Prawda	Ps	Ph	Pw	Pw	Pw	Vw	Pw	Pw	Vh	Vhg
RDG	Rose Ridge	Pb	Va	Fa	Fa	Fa	Fs	G	G	Fka	Fk
RDG /xc1x	Rose Ridge	Pb	Va	Fa	Fa	Fa	Fs	G	G	Fka	Fk
RDG /xf2x	Rose Ridge	Vbt	Va	Fa	Fa	Fat	Fp	Pt	Pt	Vt	Pt
SPG	Sprague	Ps	Pah	Pw	Pw	Pw	Vw	Pw	Pw	Pk	Vh
SPG /xx1x	Sprague	Ps	Pah	Pw	Pw	Pw	Vw	Pw	Pw	Pk	Vh
SVC	Sevick	Ps	Fa	G	Pw	Fw	Pw	Fw	Fs	Pka	Ph
SVC /xx1x	Sevick	Ps	Fa	G	Pw	Fw	Pw	Fw	Fs	Pka	Ph
SVC /xx2x	Sevick	Ps	Fa	G	Pw	Fw	Pw	Fw	Fsp	Pka	Ph
SVC /oxxx	Sevick	Ps	Fa	G	Pw	Fw	Pw	Pk	Fs	Pka	Ph
SVC /1x1x	Sevick	Ps	Fa	G	Pw	Fw	Pw	Pk	Fs	Vh	Ph
SVK /3cxx	Silver Creek	Vb	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
SVK /odxx	Silver Creek	Vb	Fa	G	G	G	Vsk	Vk	Vs	Vk	Gg
SWF	Swanford	G	Va	Faw	Pw	Fwa	Pw	Fw	G	Pka	Ph
SWF1	Swanford	G	Va	Fw	Pw	Fwa	Pw	Fw	G	Fka	Ph
SWF1/oxxx	Swanford	G	Va	Fw	Pw	Fwa	Pw	Fw	G	Fka	Ph
SWV	Swan River	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fka	Fk
SWV /xcxx	Swan River	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fka	Fk
TBN	Timberton	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fka	Fk
TBN /xx1x	Timberton	Fs	Va	Fa	Fa	Fa	Fs	G	Fs	Fka	Fk
VLY	Valley	Fs	Va	Pa	Pw	Faw	Pw	Fw	Fs	Fka	Phk
VLY /xx1x	Valley	Fs	Va	Pal	Pw	Faf	Pw	Pw	Fs	Fka	Phk

* Guide table numbers in Appendix E

TABLE 17. SUITABILITY RATINGS OF SOILS FOR RECREATIONAL USES

Map Symbol and Phase	Soil Name	Play Ground (31)*	Picnic Area (32)	Camp Area (33)	Path and Trails (34)	Permanent Bldgs. Without Basements (24)
ASZ	Agassiz	Pms	Pm	Fs	Gs	G
ASZ /xdxx	Agassiz	Pts	Fs	Fs	Ps	G
BAM	Balmoral	Pw	Pw	Pw	Pw	Pwf
BAMp	Balmoral	Vws	Vws	Vws	Vws	Pwf
BEV	Bell River	Fi	Fiw	Fiw	Fiw	Fw
BEV /xcxx	Bell River	Fti	Fiw	Fiw	Fiw	Fw
BKS	Banks	G	G	G	G	G
CGD	Craigford	Fw	Fw	Fw	Fw	Fw
CGD /xx1x	Craigford	Fw	Fw	Fw	Fw	Fw
DRB	Durban	G	G	G	G	G
DTT	Dutton	Fs	Fs	Fs	Fs	Fa
DTT2	Dutton	Fs	Fs	Fs	Fs	Fa
DVD	Davidson	Fsm	Fsm	Fs	G	G
DVD /oxxx	Davidson	Vs	Vsm	Vs	Vs	G
DVD /1xxx	Davidson	Ps	Fsm	Fs	G	G
DVD /ocxx	Davidson	Vs	Vs	Vs	Vs	G
ERX /xgxx	Eroded Slope	Vt	Vt	Vt	Pt	Vt
ETT	Ethelbert	Fs	Fsm	Fs	G	G
ETT /xx1x	Ethelbert	Fs	Fs	Fs	G	G
ETT /xx2x	Ethelbert	Fsp	Fs	Fsp	G	G
ETT /oxxx	Ethelbert	Vs	Vsm	Vs	Vs	G
ETT /2xxx	Ethelbert	Ps	Fsm	Fs	Ps	G
FOY	Foley	Pw	Pw	Pw	Pw	Pw
GBT	Gilbert	Fs	Fsm	Fs	G	G
GBT /xcxx	Gilbert	Ft	Fsm	Fs	G	G
GBT /1xxx	Gilbert	Ps	Fsm	Fs	G	G
GBT /1cxx	Gilbert	Ps	Fsm	Fs	G	G
GBT /oxxx	Gilbert	Vs	Vsm	Vs	Vs	G
GBT /2cxx	Gilbert	Ps	Fsm	Fs	Ps	G
GBT /ocxx	Gilbert	Vs	Vsm	Vs	Vs	G
GBT /odxx	Gilbert	Vs	Vsm	Vs	Vs	G
GBT1	Gilbert	Fs	Fsm	Fs	G	G
GBT1/1xxx	Gilbert	Ps	Fsm	Fs	G	G
GBT1/oxxx	Gilbert	Vs	Vsm	Vs	Vs	G
GBT2	Gilbert	Fs	Fsm	Fsp	G	G
GBT/xx2x	Gilbert	Fsp	Fs	Fs	G	G
HAU	Haute	Vsw	Vsw	Vsw	Vsw	Vw
HAY	Heatly	Fw	Fw	Fw	Fw	Pi
HAY /xcxx	Heatly	Ftw	Fw	Fw	Fw	Pi
HMD	Homestead	Fw	Fw	Fwi	Fw	Pi

TABLE 17. SUITABILITY RATINGS OF SOILS FOR RECREATIONAL USES

Map Symbol and Phase	Soil Name	Play Ground (31)*	Picnic Area (32)	Camp Area (33)	Path and Trails (34)	Permanent Bldgs. Without Basements (24)
HMD /xcxx	Homestead	Fst	Fw	Fw	Fw	Pi
HMD /xdxx	Homestead	Pt	Fw	Fw	Fw	Pi
LSW	Lenswood	Fws	Fws	Fws	Fw	Fw
LSW /1xxx	Lenswood	Ps	Fws	Fws	Fw	Fw
LSW /2xxx	Lenswood	Ps	Fws	Fws	Ps	Fw
LSW /oxxx	Lenswood	Vs	Vs	Vs	Vs	Fw
LSW /2cxx	Lenswood	Ps	Fws	Fws	Ps	Fw
LSW1	Lenswood	Fws	Fws	Fws	Fw	Fw
LSW1/1xxx	Lenswood	Ps	Fws	Fws	Fw	Fw
LSW1/2xxx	Lenswood	Ps	Fws	Fws	Ps	Fw
LSW1/oxxx	Lenswood	Vs	Vs	Vs	Vs	Fw
LSW2	Lenswood	Fws	Fws	Fws	Fw	Fw
MEH	Meharry	Fs	Fs	Fs	Fs	Fa
MEH /xx1x	Meharry	Fs	Fs	Fs	Fs	Fa
MEH /xx2x	Meharry	Fsp	Fs	Fsp	Fs	Fap
MEH /xx3x	Meharry	Pp	Fsp	Pp	Fsp	Pp
MEH /xc3x	Meharry	Pp	Fsp	Pp	Fsp	Pp
MNS	Minitonas	Fws	Fws	Fws	Fws	Faw
MNS /xx1x	Minitonas	Fws	Fws	Fws	Fws	Faw
MNT	Malonton	Pws	Pws	Pws	Pws	Pw
NOV	Novra	Pw	Pw	Pw	Pw	Pw
ONK	Oaknook	Fws	Fws	Fws	Fws	Faw
ONK /xx1x	Oaknook	Fws	Fws	Fws	Fws	Faw
ONK /xx2x	Oaknook	Fwp	Fws	Fwp	Fws	Faw
PLN	Pelan	Fws	Fws	Fws	Fw	Fw
PMU	Pineimuta	Pw	Pw	Pw	Pw	Pw
PMUp	Pineimuta	Vws	Vws	Vws	Vws	Pwf
PRA	Prawda	Pws	Pws	Pws	Pws	Pw
RDG	Rose Ridge	Fs	Fs	Fs	Fs	Fa
RDG /xc1x	Rose Ridge	Fts	Fs	Fs	Fs	Fa
RDG /xf2x	Rose Ridge	Vt	Pt	Pt	Fst	Pt
SPG	Sprague	Pws	Pws	Pws	Pws	Pw
SPG /xx1x	Sprague	Pws	Pws	Pws	Pws	Pw
SVC	Sevick	Fws	Fws	Fws	Fw	Fw
SVC /xx1x	Sevick	Fws	Fws	Fws	Fw	Fw
SVC /xx2x	Sevick	Fwp	Fws	Fwp	Fw	Fw
SVC /oxxx	Sevick	Vs	Vs	Vs	Vs	Fw
SVC /1x1x	Sevick	Ps	Fws	Fws	Fw	Fw
SVK /3cxx	Silver Creek	Vs	Vs	Vs	Vs	G
SVK /odxx	Silver Creek	Vsm	Vsm	Vs	Vs	G

TABLE 17. SUITABILITY RATINGS OF SOILS FOR RECREATIONAL USES

Map Symbol and Phase	Soil Name	Play Ground (31)*	Picnic Area (32)	Camp Area (33)	Path and Trails (34)	Permanent Bldgs. Without Basements (24)
SWF	Swanford	Fw	Fw	Fw	Fw	Fw
SWF1	Swanford	Fw	Fw	Fw	Fw	Fw
SWF1/oxxx	Swanford	Fws	Fw	Fw	Fw	Fw
SWV	Swan River	Fs	Fs	Fs	Fs	Fa
SWV /xcxx	Swan River	Fst	Fs	Fs	Fs	Fa
TBN	Timberton	Fs	Fs	Fs	Fs	Fa
TBN /xx1x	Timberton	Fs	Fs	Fs	Fs	Fa
VLY	Valley	Fws	Fws	Fws	Fws	Faw
VLY /xx1x	Valley	Fws	Fws	Fws	Fws	Faw

* Guide table numbers in Appendix E

Appendix A

GLOSSARY

AASHO classification (soil engineering) - The official classification of soil materials and soil aggregate mixtures for highway construction used by the American Association of State Highway Officials.

Acid soil - A soil having a pH less than 7. See pH and Reaction, soil.

Alkaline soil - A soil having a pH greater than 7. See Reaction, soil.

Alluvium - A general term for all deposits of rivers and streams.

Arable soil - Soil suitable for plowing and cultivation.

Association - A sequence of soils of about the same age, derived from similar parent material, and occuring under similar climatic conditions but showing different characteristics due to variations in relief and in drainage.

1/3 Atmosphere Moisture - The moisture percentage on dry weight basis of a soil sample that has been air dried, screened, saturated and subjected to a soil moisture tension of 345 cm of water through a permeable membrane for a period of 48 hours. It approximates the soil moisture retention capacity.

Available nutrient - That portion of any element or compound in the soil that can be readily absorbed and assimilated by growing plants.

Available soil moisture - The portion of water in a soil that can be readily absorbed by plant roots: generally considered to be that water held in the soil up to approximately 15 atmospheres pressure.

Bearing capacity - Capacity of soil (in moist to wet conditions) to support loads such as buildings, people, vehicles, and animals.

Bedrock - The solid rock that underlies soil and regolith or that is exposed at the surface.

Boulders - Stones which are larger than 60 cm in diameter.

Bulk density - The weight of oven dry soil (105 degrees C) divided by its volume at field moisture conditions, expressed in grams per cubic centimeter.

Buried soil - Soil covered by an alluvial, loessial, or other deposit, usually to a depth greater than the thickness of the solum.

Calcareous soil - Soil containing sufficient calcium carbonate (often with magnesium carbonate) to effervesce visibly when treated with hydrochloric acid.

Calcium Carbonate Equivalent - Refers to the percent of carbonates in the soil expressed on the basis of calcium carbonate. Terms used to express the carbonate contents of soils are:

noncalcareous	<1%
weakly calcareous	1-5%
moderately calcareous	6-15%
strongly calcareous	16-25%
v. strongly calcareous	26-40%
extremely calcareous	>40%

Capillary fringe - A zone of essentially saturated soil just above the water table. The size distribution of the pores determines the extent and degree of the capillary fringe.

Carbon-nitrogen ratio (C/N ratio) - The ratio of the weight of organic carbon to the weight of total nitrogen in a soil or in an organic material.

Cation Exchange Capacity (CEC) - A measure of the total amount of exchangeable cations that can be held by a soil. Expressed in milliequivalents per 100g of soil.

Clay - As a soil separate, the mineral soil particles less than 0.002 mm in diameter: usually consisting largely of clay minerals. As a soil textural class, soil materials that contain 40 or more percent clay, less than 45 percent sand and less than 40 percent silt.

Cobbles - Rock fragments 8 to 25 cm in diameter.

Color - Soil colors are compared with a Munsell color chart. The Munsell system specifies the relative degrees of the three simple variables of color: hue, value and chroma. For example: 10YR 6/4 means a hue of 10YR, a value of 6, and a chroma of 4.

Complex (soil) - A mapping unit used in detailed and reconnaissance soil surveys where two or more soil series that are so intimately intermixed in an area that it is impractical to separate them at the scale of mapping used.

Concretions - Hard grains, pellets or nodules from concentration of compounds in the soil that cement soil grains together.

Conductivity, electrical - A physical quantity that measures the readiness with which a medium (irrigation water and soil extracts) transmits electricity. It expresses the concentration of salt in terms of the conductance (reciprocal of the electric resistance in ohms) in millisiemens per cm.

Consistence (soil) - The mutual attraction of the particles in a soil mass, or their resistance to separation or deformation. It is described in terms such as loose, soft, friable, firm, hard, sticky, plastic or cemented.

Consumptive use factor (CU) - The ratio of consumptive use of water by a crop to potential evapotranspiration. and transpiration. An actively growing crop that completely covers the soil over a large area and that has an ample supply of readily available soil water has a consumptive use factor of 1.0.

Consumptive use of water - The sum of the depths of water transpired by the plants and evaporated from the soil surface and from intercepted precipitation. It may be less or greater than potential evapotranspiration.

Contour - An imaginary line connecting points of equal elevation on the surface of the soil.

Cover - This term generally has one of the following meanings:

1. Vegetation or other material providing protection

2. In forestry, low growing shrubs and herbaceous plants under trees (i.e., ground cover vs. tree cover)

3. Any vegetation producing a protective mat on or just above the soil surface.

Creep (soil) - Slow mass movement of soil and soil material down rather steep slopes primarily under the influence of gravity, but aided by saturation with water and by alternate freezing and thawing.

Decile portion - A one-tenth portion. As used in the soil map symbol A7-B3 means that the A soils cover seven tenths and the B soils cover three tenths of the map unit.

Delta - A fluvial or glaciofluvial fan shaped deposit at the mouth of a river that empties into a lake or sea.

Deflocculate - To separate or to break up soil aggregates into individual particles by chemical or physical means or both.

Degradation (of soils) - The changing of a soil to a more highly leached and more highly weathered condition, usually accompanied by morphological changes such as the development of an eluviated light colored (Ae) horizon.

Dispersion - Is rated high, moderate or low depending on how readily the soil structure breaks down or slakes because of excess moisture. A rating of high indicates that soil aggregates slake readily; a rating of low indicates that aggregates are resistant to dispersion and remain clumped together.

Drainage (soil) - (1) The rapidity and extent of the removal of water from the soil by runoff and flow through the soil to underground spaces. (2) As a condition of the soil, it refers to the frequency and duration of periods when the soil is free of saturation.

Drainage in soil reports is described on the basis of actual moisture content in excess of field capacity and length of the saturation period within the plant root zone. The terms are as follows:

Very rapidly drained - Water is removed from the soil very rapidly in relation to supply. Excess water flows downward very rapidly if underlying material is pervious. There may be very rapid subsurface flow during heavy rainfall provided there is a steep gradient. Soils have very low available water storage capacity (usually less than 2.5 cm) within the control section and are usually coarse in texture, or shallow, or both. Water source is precipitation.

Rapidly drained - Water is removed from the soil rapidly in relation to supply. Excess water flows downward if underlying material is pervious. Subsurface flow may occur on steep gradients during heavy rainfall. Soils have low available water storage capacity (2.5-4 cm) within the

control section, and are usually coarse in texture, or shallow, or both. Water source is precipitation.

Well drained - Water is removed from the soil readily but not rapidly. Excess water flows downward readily into underlying pervious material or laterally as subsurface flow. Soils have intermediate available water storage capacity (4-5 cm) within the control section, and are generally intermediate in texture and depth. Water source is precipitation. On slopes subsurface flow may occur for short durations but additions are equaled by losses. These soils are usually free of mottles within 100 cm of the surface but may be mottled below this depth. Soil horizons are usually bright colored.

Moderately well drained - Water is removed from the soil somewhat slowly in relation to supply. Excess water is removed somewhat slowly due to low perviousness, shallow water table, lack of gradient, or some combination of these. Soils have intermediate to high water storage capacity (5-6cm) within the control section and are usually medium to fine in texture. Soils are commonly mottled in the 50 to 100 cm depth. Colors are dull brown in the subsoil with stains and mottles.

Imperfectly drained - Water is removed from the soil sufficiently slowly in relation to supply to keep the soil wet for a significant part of the growing season. Excess water moves slowly downward if precipitation is major supply. If subsurface water or groundwater, or both, is the main source, flow rate may vary but the soil remains wet for a significant part of the growing season. Precipitation is the main source if available water storage capacity is high; contribution by subsurface flow or groundwater flow, or both, increases as available water storage capacity decreases. Soils have a wide range in available water supply, texture, and depth, and are gleyed phases of well drained subgroups. These soils generally have mottling below the surface layers and generally have duller colors with depth, generally brownish gray with mottles of yellow and gray.

Poorly drained - Water is removed so slowly in relation to supply that the soil remains wet for a comparatively large part of the time the soil is not frozen. Excess water is evident in the soil for a large part of the time. Subsurface flow or groundwater flow, or both, in addition to precipitation are main water sources; there may also be a perched water table, with precipitation exceeding evapotranspiration. Poorly drained soils have a wide range in available water storage capacity, texture, and depth, and are gleyed subgroups, Gleysols, and Organic soils.

Very poorly drained - Water is removed from the soil so slowly that the water table remains at or on the surface for the greater part of the time the soil is not frozen. Excess water is present in the soil for the greater part of the time. Groundwater flow and subsurface flow are major water sources. Precipitation is less important except where there is a perched water table with precipitation exceeding evapotranspiration. These soils have a wide range in available water

storage capacity, texture, and depth, and are either Gleysolic or Organic.

Dryland farming - The practice of crop production in low rainfall areas without irrigation.

Eluvial horizon - A horizon from which material has been removed in solution or in water suspension.

Eolian - Soil material accumulated through wind action.

Erosion - The wearing away of the land surface by detachment and transport of soil and rock material through the action of moving water, wind or other geological processes. The ratings of erosion are:

Erosion 1 slightly eroded - soil with a sufficient amount of the A horizon removed that ordinary tillage will bring up and mix the B horizon or other lower lying horizons with surface soil in the plow layer.

Erosion 2 moderately eroded - soil with all of the A horizon and a part of the B or other lower lying horizons removed. The plow layer consists mainly of the original horizons below the A or below the original plow layer.

Erosion 3 severely eroded - soils have practically all of the original surface soil removed. The plow layer consists mainly of C horizon material, especially on knolls and steep upper slope positions.

Evapotranspiration - The combined loss of water from a given area, and during a specific period of time, by evaporation from the soil surface and transpiration from plants.

Field Moisture Equivalent - The minimum moisture content at which a drop of water placed on a smoothed surface of the soil will not be absorbed immediately by the soil, but will spread out over the surface and give it a shiny appearance.

Flood plain - The land bordering a stream, built up of sediments from overflow of the stream and subject to inundation when the stream is at flood stage.

Fluvial deposits - All sediments past and present, deposited by flowing water, including glaciofluvial deposits.

Frost heave - The raising of the surface caused by ice in the subsoil.

Friable - Soil aggregates that are soft and easily crushed between thumb and forefinger.

Glaciofluvial deposits - Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. These deposits are stratified and may occur in the form of outwash plains, deltas, kames, eskers and kame terraces.

Gleyed soil - An imperfectly or poorly drained soil in which the material has been modified by

reduction or alternating reduction and oxidation. These soils have lower chromas or more prominent mottling or both in some horizons than the associated well-drained soil.

Gleysolic - An order of soils developed under wet conditions and permanent or periodic reduction. These soils have low chromas or prominent mottling or both, in some horizons.

Gravel - Rock fragments 2 mm to 7.5 cm in diameter.

Ground Moraine - An unsorted mixture of rocks, boulders, sand, silt and clay deposited by glacial ice. The predominant material is till; most till is thought to have accumulated under the ice by lodgment, but some till has been let down from the upper surface of the ice by ablation. Resorting and modification may have taken place to some extent by wave-action of glacial melt waters. The topography is most commonly in the form of undulating plains with gently sloping hills and enclosed depressions.

Groundwater - Water beneath the soil surface, usually under conditions where the voids are completely filled with water (saturation).

Halophytic vegetation - vegetation that grows naturally in soils having a high content of various salts. It usually has fleshy leaves or thorns and resembles desert vegetation.

Horizon (soil) - A layer in the soil profile approximately parallel to the land surface with more or less well-defined characteristics that have been produced through the operation of soil forming processes.

Horizon boundary - The lower boundary of each horizon is described by indicating its distinctness and form. The distinctness depends on the abruptness of vertical change (thickness). The form refers to the variation of the boundary plane.

Distinctness -
abrupt - less than 2 cm
clear - 2 to 5 cm
gradual - 5 to 15 cm
diffuse - more than 15 cm

Form -
smooth - nearly plain
wavy - pockets are wider than deep
irregular - pockets are deeper than wide
broken - parts of the horizon are unconnected with other parts

Humic layer - A layer of highly decomposed organic soil material containing little fibre.

Hydraulic Conductivity - Refers to the effective flow velocity or discharge velocity in soil at unit hydraulic gradient. It is an approximation of the permeability of the soil and is expressed in cm per hour. The classes are described in general or specific terms as:

High	>15	Very rapid	>50
		Rapid	15-50
Medium	0.5-15	Mod. rapid	5.0-15
		Moderate	1.5-5.0
		Mod. slow	0.5-1.5
Low	<0.5	Slow	0.15-0.5
		Very slow	0.015-0.15
		Extremely slow	<.015

Hydrologic cycle - The conditions through which water naturally passes from the time of precipitation until it is returned to

the atmosphere by evaporation and is again ready to be precipitated.

Hydrophyte - Plants growing in water or dependent upon wet or saturated soil conditions for growth.

Illuvial horizon - A soil horizon in which material carried from an overlying layer has been precipitated from solution or deposited from suspension. The layer of accumulation.

Impeded drainage - A condition that hinders the movement of water by gravity through the soils.

Inclusion - Soil type found within a mapping unit that is not extensive enough to be mapped separately or as part of a complex.

Infiltration - The downward entry of water into the soil

Irrigation - The artificial application of water to the soil for the benefit of growing crops.

Irrigation requirement (IR) - Refers to the amount of water exclusive of effective precipitation that is required for crop production.

Lacustrine deposits - Material deposited by or settled out of lake waters and exposed by lowering of the water levels or elevation of the land. These sediments range in texture from sand to clay and are usually varved (layered annual deposits).

Landforms - See Description of Landforms

Landscape - All the natural features such as fields, hills, forest, water, etc., which distinguish one part of the earth's surface from another part.

Leaching - The removal from the soil of materials in solution.

Liquid limit (upper plastic limit) - The water content corresponding to an arbitrary limit between the liquid and plastic states of consistency of a soil. The water content at this boundary is defined as that at which a pat of soil cut by a groove of standard dimensions will flow together for a distance of 1.25 cm under the impact of 25 blows in a standard liquid limit apparatus.

Lineal shrinkage - This is the decrease in one dimension expressed as a percentage of the original dimension of the soil mass when the moisture content is reduced from a stipulated percentage (usually field moisture equivalent) to the shrinkage limit.

Mapping Unit - Any delineated area shown on a soil map that is identified by a symbol. A mapping unit may be a soil unit, a miscellaneous land type, or a soil complex.

Marsh - Periodically flooded or continually wet areas having the surface not deeply submerged. It is covered dominantly with sedges, cattails, rushes or other hydrophytic plants.

Mature soil - A soil having well-developed soil horizons produced by the natural processes of soil formation.

Mesophyte - Plants requiring intermediate moisture conditions and are not very resistant to drought.

Microrelief - Small-scale, local differences in relief including mounds, swales or hollows.

Milliequivalent (me) - One-thousandth of an equivalent. An equivalent is the weight in grams of an ion or compound that combines with or replaces one gram of hydrogen. The atomic or formula weight divided by valence.

Mottles - Irregularly marked spots or streaks, usually yellow or orange but sometimes blue. They are described in order of abundance (few, common, many), size (fine, medium, coarse) and contrast (faint, distinct, prominent). Mottles in soils indicate poor aeration and lack of good drainage.

Organic carbon - Carbon derived from plant and animal residues.

Organic matter - The fraction of the soil which consists of plant and animal residues at various stages of decomposition, cells and tissues of soil organisms and substances synthesized by the soil population. It is determined on soils that have been sieved through a 2.0 mm sieve. It is estimated by multiplying the organic carbon by a factor of 1.72.

Outwash - Sediments "washed out" beyond the glacier by flowing water and laid down in thin beds or strata. Particle size may range from boulders to silt.

Ovendry soil - Soil that has been dried at 105 degrees C until it has reached constant weight.

Parent material - The unaltered or essentially unaltered mineral or organic material from which the soil profile develops by pedogenic processes.

Particle size, soil - The grain size distribution of the whole soil including the coarse fraction. It differs from texture, which refers to the fine earth (less than 2mm) fraction only. In addition, textural classes are usually assigned to specific horizons whereas soil family particle-size classes indicate a composite particle size of a part of the control section that may include several horizons. See Textural Triangle at end of Glossary.

The particle-size classes for family groupings are as follows:

Fragmental Stones, cobbles and gravel, with too little fine earth to fill interstices larger than 1 mm.

Sandy-skeletal Particles coarser than 2 mm occupy 35% or more by volume with enough fine earth to fill interstices larger than 1 mm; the fraction finer than 2 mm is that defined for the sandy particle-size class.

Loamy-skeletal Particles 2 mm-25 cm occupy 35% or more by volume with enough fine earth to fill interstices larger than 1 mm; the fraction finer than 2 mm is that defined for the loamy particle-size class.

Clayey-skeletal Particles 2 mm-25 cm occupy 35% or more by volume with enough fine earth to fill interstices larger than 1 mm; the fraction finer than 2 mm is that defined for the clayey particle-size class.

Sandy The texture of the fine earth includes sands and loamy sands, exclusive of loamy very fine sand and very fine sand textures; particles 2 mm- 25 cm occupy less than 35% by volume.

Loamy The texture of the fine earth includes loamy very fine sand, very fine sand, and finer textures with less than 35% clay; particles 2 mm-25 cm occupy less than 35% by volume.

Coarse-loamy. A loamy particle size that has 15% or more by weight of fine sand (0.25-0.1 mm) or coarser particles, including fragments up to 7.5 cm, and has less than 18% clay in the fine earth fraction.

Fine-loamy. A loamy particle size that has 15% or more by weight of fine sand (0.25-0.1 mm) or coarser particles, including fragments up to 7.5 cm, and has 18-35% clay in the fine earth fraction.

Coarse-silty. A loamy particle size that has less than 15% of fine sand (0.25-0.1 mm) or coarser particles, including fragments up to 7.5 cm, and has less than 18% clay in the fine earth fraction.

Fine-silty. A loamy particle size that has less than 15% of fine sand (0.25-0.1 mm) or coarser particles, including fragments up to 7.5 cm, and has 18-35% clay in the fine earth fraction.

Clayey. The fine earth contains 35% or more clay by weight and particles 2mm-25 cm occupy less than 35% by volume.

Fine-clayey. A clayey particle size that has 35-60% clay in the fine earth fraction.

Very-fine-clayey. A clayey particle size that has 60% or more clay in the fine earth fraction.

Ped - An individual soil aggregate such as granule, prism or block formed by natural processes (in contrast with a clod which is formed artificially).

Pedology - Those aspects of soil science involving constitution, distribution, genesis and classification of soils.

Percolation - The downward movement of water through soil; specifically, the downward flow of water in saturated or nearly saturated soil at hydraulic gradients of 1.0 or less.

Permafrost -

1. Perennially frozen material underlying the solum.

2. A perennially frozen soil horizon.

Permafrost table - The upper boundary of permafrost, usually coincident with the lower limit of seasonal thaw (active layer).

Permeability - The ease with which water and air pass through the soil to all parts of the profile. See hydraulic conductivity.

pH - The intensity of acidity and alkalinity, expressed as the negative logarithm of the hydrogen ion concentration. A pH of 7 is neutral, lower values indicate acidity and higher values alkalinity (see Reaction, soil).

Phase, soil - A soil phase is used to characterize soil and landscape properties that are not used as criteria in soil taxonomy. The major phase differentiae are: slope, erosion, deposition, stoniness, texture, salinity, and calcareousness.

Plastic Limit - The water content corresponding to an arbitrary limit between the plastic and the semisolid states of consistency of a soil.

Plasticity Index - The numerical difference between the liquid and the plastic limit. The plasticity index gives the range of moisture contents within which a soil exhibits plastic properties.

Potential evapotranspiration (PE) - The maximum quantity of water capable of being lost as water vapor, in a given climate, by a continuous stretch of vegetation covering the whole ground and well supplied with water.

Profile, soil - A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil - The acidity or alkalinity of a soil. Soil reaction classes are characterized as follows:

extremely acid	pH <4.5
very strongly acid	4.5 to 5.0
strongly acid	5.1 to 5.5
medium acid	5.6 to 6.0
slightly acid	6.1 to 6.5
neutral	6.6 to 7.3
mildly alkaline	7.4 to 7.8
mod. alkaline	7.9 to 8.4
strongly alkaline	8.5 to 9.0
very strongly alkaline	>9.0

Regolith - The unconsolidated mantle of weathered rock and soil material on the earth's surface.

Relief - The elevation of inequalities of the land surface when considered collectively.

Runoff - The portion of the total precipitation on an area that flows away through stream channels. Surface runoff does not enter the soil. Groundwater runoff or seepage flow from groundwater enters the soil before reaching the stream.

Saline Soil - A nonalkali soil containing soluble salts in such quantities that they interfere with the growth of most crop plants. The conductivity of the saturation extract is greater than 4 millisiemens/cm (ms/cm), the exchangeable-sodium percentage is less than 15, and the pH is usually less than 8.5. Approximate limits of salinity classes are:

non-saline	0 to 4 ms/cm
weakly saline	4 to 8 mS/cm
mod. saline	8 to 15 ms/cm
strongly saline	>15 ms/cm

Salinization - The process of accumulation of salts in the soil.

Salt-Affected Soil - Soil that has been adversely modified for the growth of most crop plants by the presence of certain types of exchangeable ions or of soluble salts. It includes soils having an excess of salts, or an excess of exchangeable sodium or both.

Sand - A soil particle between 0.05 and 2.0 mm in diameter. The textural class name for any soil containing 85 percent or more of sand and not more than 10 percent of clay.

Saturation Percentage - The moisture percentage of a saturated soil paste, expressed on an oven dry weight basis.

Seepage -

1. The escape of water downward through the soil.

2. The emergence of water from the soil along an extensive line of surface in contrast to a spring where water emerges from a local spot.

Series, soil - A category in the Canadian System of Soil Classification. It consists of soils that have soil horizons similar in their differentiating characteristics and arrangement in the profile, except for surface texture and are formed from a particular type of parent material.

Shrinkage limit - This is the moisture content at which an equilibrium condition of volume change is reached and further reduction in moisture content will not cause a decrease in the volume of the soil mass.

Shrinkage ratio - This is the ratio between the volume change and a corresponding change in moisture content. It equals the apparent specific gravity of the dried soil.

Silt - (a) Individual mineral particles of soil that range in diameter between 0.05 to .002 mm. (b) Soil of the textural class silt contains greater than 80 percent silt and less than 12 percent clay.

Slickenside - Smoothed surfaces along planes of weakness resulting from the movement of one mass of soil against another in soils dominated by swelling clays.

Sodium-Adsorption Ratio (S.A.R.) - A ratio for soil extracts and irrigation waters used to express the relative activity of sodium ions in exchange reactions with other cations in the soil SAR = $Na/((Ca+Mg)/2)^{1/2}$ where the cation concentrations are expressed as milliequivalents per litre.

Soil - The unconsolidated mineral material on the immediate surface of the earth that serves as a natural medium for the growth of land plants. Soil has been subjected to and influenced by genetic and environmental factors of: parent material, climate (including moisture and temperature effects), macro- and microorganisms, and topography, all acting over a period of time.

Solum - The upper horizons of a soil above the parent material and in which the processes of soil formation are active. It usually comprises the A and B horizons.

Stones - Rock fragments greater than 25 cm in diameter.

Stoniness - The percentage of land surface occupied by stones. The classes of stoniness are defined as follows:

Stones 0. Nonstony -- Land having less than 0.01% of surface occupied by stones.

Stones 1. Slightly stony -- Land having 0.01-0.1% of surface occupied by stones. Stones 15-30 cm in diameter, 10-30 m apart. The stones offer only slight to no hindrance to cultivation.

Stones 2. Moderately stony -- Land having 0.1-3% of surface occupied by stones. Stones 15-30 cm in diameter, 2-10 m apart. Stones cause some interference with cultivation.

Stones 3. Very stony -- Land having 3-15% of surface occupied by stones. Stones 15-30 cm in diameter, 1-2 m apart. There are

sufficient stones to constitute a serious handicap to cultivation.

Stones 4. Exceedingly stony -- Land having 15-50% of surface occupied by stones. Stones 15-30 cm in diameter, 0.7-1.5 m apart. There are sufficient stones to prevent cultivation until considerable clearing has been done.

Stones 5. Excessively stony -- Land having more than 50% of surface occupied by stones. Stones 15-30 cm in diameter, less than 0.7 m apart. The land is too stony to permit cultivation.

Storage Capacity - Refers to the maximum amount of readily available water that can be stored within the rooting zone of a crop in a given soil. For practical irrigation purposes, 50 percent of the total soil water between field capacity and wilting point may be considered as readily available.

Stratified materials - Unconsolidated sand, silt and clay arranged in strata or layers. In stratified materials, a bed is a unit layer distinctly separable from other layers and is one or more cm thick but a lamina is a similar layer less than 1 cm thick.

Structure - The combination or arrangement of primary soil particles into aggregates of secondary soil particles, units or peds, which are separated from each other by surfaces of weakness. Structure is expressed in terms of grade, size class and shape type. Grade refers to the distinctness of aggregate development, and is described as structureless, weak, moderate or strong. Structureless refers to the absence of observable aggregation of definite orderly arrangement; the term amorphous is used if soil is massive or coherent, single-grained if noncoherent. The weak to strong aggregates vary in size and are described by class as fine, medium, coarse, and very coarse depending on the shape types. The shape types refers to the dominant configuration of the aggregates and the way they are accommodated. The general shape types are plate-like, block-like and prism-like. The terms are:

Platy - Having thin, plate-like aggregates with faces mostly horizontal

Prismatic - Having prism-like aggregates with tops and edges, appear plane, level and somewhat angular.

Columnar - Having prism-like aggregates with vertical edges near the top of columns, not sharp.

Granular - Having block-like aggregates that appear as spheroids or polyhedrons having plane or curved surfaces which have slight or no accommodation to the faces of the surrounding peds.

Blocky - Having block-like aggregates with sharp, angular corners

Subangular blocky - Having block-like aggregates with rounded and flattened faces and rounded corners.

By convention an aggregate is described in the order of grade, class and type, e.g. strong, medium, blocky. In the parent material of soils the material with structural shapes may be designated as pseudo-blocky, pseudo-platy, etc.

Soil Survey - The systematic examination, description, classification, and mapping of soil in an area.

Sulfate Hazard - Refers to the relative degree of attack on concrete by soil and water containing various amounts of sulfate ions. It is estimated from electrolyte measurements and salt analysis on selected profiles and soil samples, and by visual examination of free gypsum within the profile during the course of soil investigation.

Swamp - See Description of Landforms

Texture, soil - The relative proportions of the fine earth (less than 2 mm.) fraction of a soil. Textural classes are usually assigned to specific horizons whereas family particle size classes indicate a composite particle size of a portion of the control section that may include several horizons. See Texture Triangle at end of Glossary.

The size range of the constituent primary particles are as follows:

	Diameter (mm)
Very coarse sand	2.0-1.0
Coarse sand	1.0-0.5
Medium sand	0.5-0.25
Fine sand	0.25-0.10
Very fine sand	0.10-0.05
Silt	0.05-0.002
Clay	< 0.002
Fine clay	< 0.0002

Till, glacial - Unstratified glacial deposits consisting of clay, sand, gravel, and boulders intermingled in any proportion.

Tilth - The physical condition of soil as related to its ease of tillage, fitness as a seedbed, and its impedance to seedling emergency and root penetration.

Topography - Refers to the percent slope and the pattern or frequency of slopes in different directions. A set of 10 slope classes are used to denote the dominant but not necessarily most abundant slopes within a mapping unit.

Slope Class	Slope Name	Percent slope	Approx. degrees
1	level	0-0.5	0
2	nearly level	.5-2.5	.3-1.5
3	very gentle	2-5	1-3
4	gentle	6-9	3.5-5
5	moderate	10-15	6-8.5
6	strong	16-30	9-17
7	very strong	31-45	17-24
8	extreme	46-70	25-35
9	steep	71-100	35-45
10	very steep	>100	>45

Underground runoff - (or seepage)-Water flowing towards stream channels after infiltration into the ground.

Unified Soil Classification System (engineering) - A classification system based on the identification of soils according to their particle size, gradation, plasticity index and liquid limit.

Urban Land - Areas so altered or obstructed by urban works or structures that identification of soils is not feasible.

Variant, soil - A soil whose properties are believed to be sufficiently different from other known soils to justify a new series name, but comprising such a limited geographic area that creation of a new series is not justified.

Varve - A distinct band representing the annual deposit in sedimentary materials regardless of origin and usually consisting of two layers, one thick light colored layer of silt and fine sand laid

down in the spring and summer, and the other a thin, dark colored layer of clay laid down in the fall and winter.

Water balance, soil - Is the daily amount of readily available water retained by the soil. The daily soil-water balance is decreased by the amount that the daily consumptive use exceeds the daily rainfall. When daily rainfall exceeds the consumptive use, the daily balance increases by the amount of the difference unless the soil-water balance is at storage capacity, in which case the excess is assumed to be lost by runoff or deep percolation.

Water table - (groundwater surface; free water surface; groundwater elevation) Elevation at which the pressure in the water is zero with respect to the atmospheric pressure.

Water-holding capacity - The ability of a soil to hold water against the force of gravity in a freely drained soil.

Weathering - The physical and chemical disintegration, alteration and decomposition of rocks and minerals at or near the earth's surface by atmospheric agents.

Xerophyte - Plants capable of surviving extended periods of soil drought.

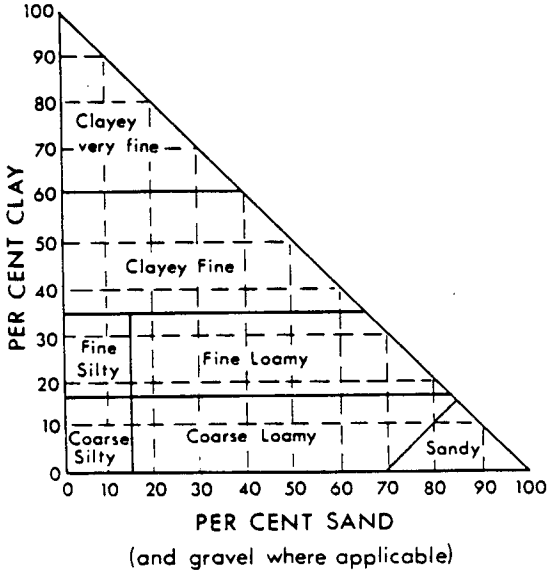
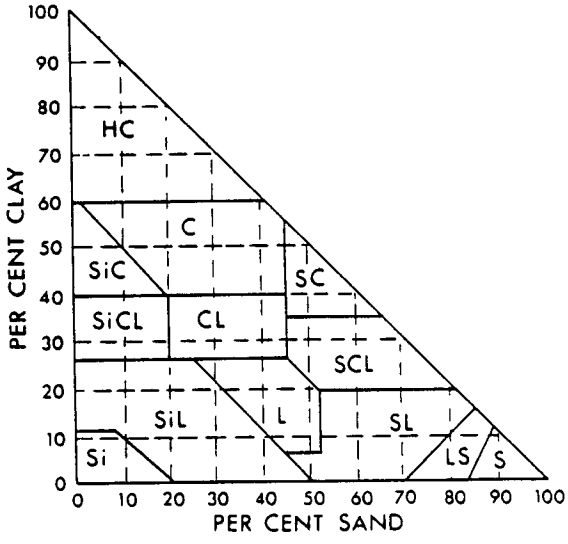


Figure 12: Family particle-size classes.



Texture Group	Class Symbol	Class Name
Coarse	S	sand
	LS	loamy sand
Moderately coarse	SL	sandy loam
	LVFS	loamy very fine sand
Medium	Si	silt
	SiL	silt loam
	L	loam
	VFSL	very fine sandy loam
Moderately fine	SCL	sandy clay loam
	CL	clay loam
	SiCL	silty clay loam
Fine	SC	sandy clay
	C	clay
	SiC	silty clay
Very fine	HC	heavy clay

Figure 13: Soil Textural Classes.

Appendix B

SOIL HORIZON DESIGNATIONS

ORGANIC HORIZONS

Organic horizons are found in Organic soils, and commonly at the surface of mineral soils. They may occur at any depth beneath the surface in buried soils, or overlying geologic deposits. They contain more than 17% organic carbon (approximately 30% organic matter) by weight. Two groups of these horizons are recognized, O horizons and the L, F, and H horizons.

O This is an organic horizon developed mainly from mosses, rushes, and woody materials.

Of The fibric horizon is the least decomposed of all the organic soil materials. It has large amounts of well-preserved fiber that are readily identifiable as to botanical origin. A fibric horizon has 40% or more of rubbed fiber by volume and a pyrophosphate index of 5 or more. If the rubbed fiber volume is 75% or more, the pyrophosphate criterion does not apply.

Om The mesic horizon is the intermediate stage of decompostion with intermediate amounts of fiber, bulk density and water-holding capacity. The material is partly altered both physically and biochemically. A mesic horizon is one that fails to meet the requirements of fibric or humic.

Oh The humic horizon is the most highly decomposed of the organic soil materials. It has the least amount of fiber, the highest bulk density, and the lowest saturated water-holding capacity. It is very stable and changes very little physically or chemically with time unless it is drained. The humic horizon has less than 10% rubbed fiber by volume and a pyrophosphate index of 3 or less.

LFH These organic horizons developed primarily from leaves, twigs, woody materials and a minor component of mosses under imperfectly to well drained forest conditions.

L This is an organic horizon characterized by an accumulation of organic matter in which the original structures are easily discernible.

F This is an organic horizon characterized by an accumulation of partly decomposed organic matter. The original structures in part are difficult to recognize. The horizon may be partly comminuted by soil fauna as in moder, or it may be a partly decomposed mat permeated by fungal hyphae as in mor.

H This is an organic horizon

characterized by an accumulation of decomposed organic matter in which the original structures are indiscernible. This material differs from the F horizon by its greater humification chiefly through the action of organisms. It is frequently intermixed with mineral grains, especially near the junction with the mineral horizon.

MASTER MINERAL HORIZONS

Mineral horizons are those that contain less than 30% organic matter by weight as specified for organic horizons.

A This is a mineral horizon or horizons formed at or near the surface in the zone of leaching or removal of materials in solution and suspension or of maximum in situ accumulation of organic matter, or both. Included are:

1. horizons in which organic matter has accumulated as a result of biological activity (Ah);

2. horizons that have been eluviated of clay, iron, aluminum, or organic matter, or all of them (Ae);

3. horizons having characteristics of 1) and 2) above but transitional to underlying B or C (AB or A and B);

4. horizons markedly disturbed by cultivation or pasture (Ap).

B This is a mineral horizon or horizons characterized by one or more of the following:

1. an enrichment in silicate clay, iron, aluminum, or humus, alone or in combination (Bt,Bf,Bfh,Bhf, and Bh);

2. a prismatic or columnar structure that exhibits pronounced coatings or stainings and significant amount of exchangeable Na (Bn);

3. an alteration by hydrolysis, reduction, or oxidation to give a change in color or structure from horizons above or below, or both, and does not meet the requirements of 1) and 2) above (Bm,Bg).

C This is a mineral horizon or horizons comparatively unaffected by the pedogenic processes operative in A and B, excepting (i) the process of gleying, and (ii) the accumulation of calcium and magnesium carbonates and more soluble salts (Cca,Csa,Cg, and C). Marl and diatomaceous earth are considered to be C horizons.

R This is consolidated bedrock that is too hard to break with the hands or to dig with a spade when moist and that does not meet the requirement of a C horizon. The boundary between the R layer and overlying unconsolidated material is called a lithic contact.

W This is a layer of water in Gleysolic, Organic, or Cryosolic soils. It is called a hydric layer in Organic soils.

LOWER-CASE SUFFIXES

b Buried soil horizon.

c A cemented (irreversible) pedogenic horizon. The ortstein of a Podzol, and a layer cemented by calcium carbonate and a duripan are examples.

ca A horizon with secondary carbonate enrichment where the concentration of lime exceeds that present in the unenriched parent material. It is more than 10 cm thick, and if it has a CaCO3 equivalent of less than 15 percent it should have at least 5 percent more CaCO3 equivalent than the parent material (IC). If it has more than 15 percent CaCO3 equivalent it should have 1/3 more CaCO3 equivalent than the IC. If no IC is present, this horizon is more than 10 cm thick and contains more than 5 percent by volume of secondary carbonates in concretions or soft, powdery forms.

cc Cemented (irreversible) pedogenic concretions.

e A horizon characterized by the eluviation of clay, iron, aluminum, or organic matter alone or in combination. When dry, it is usually higher in color value by 1 or more units than an underlying B horizon. It is used with A (Ae).

f A horizon enriched with amorphous material, principally Al and Fe combined with organic matter. It usually has a hue of 7.5YR or redder or its hue is 10YR near the upper boundary and becomes yellower with depth. When moist, the chroma is higher than 3 or the value is 3 or less. It contains 0.6% or more pyrophosphate-extractable Al+Fe in textures finer than sand and 0.4% or more in sands (coarse sand, sand, fine sand, and very fine sand). The ratio of pyrophosphate-extractable Al+Fe to clay (less than 0.002mm) is more than 0.05 and organic C exceeds 0.5%. Pyrophosphate-extractable Fe is at least 0.3%, or the ratio of organic C to pyrophosphate-extractable Fe is less than 20, or both are true. It is used with B alone (Bf), with B and h (Bhf), with B and g (Bfg), and with other suffixes. The criteria for "f" do not apply to Bgf horizons. The following horizons are differentiated on the basis of organic carbon content: Bf - 0.5% to 5% organic carbon. Bhf- more than 5% organic carbon.

g A horizon characterized by gray colors, or prominent mottling, or both, indicative of permanent or periodic intense reduction. Chromas of the matrix are generally 1 or less. It is used with A and e (Aeg); with B alone (Bg); with B and f (Bfg); with B, h, and f (Bhfg); with B and t (Btg); with C alone (Cg); with C and k (Ckg); and several others. In some reddish parent materials, matrix colors of reddish hues and high chromas may persist despite long periods of reduction. In these soils, horizons are designated as g if there is gray mottling or if there is marked bleaching on ped faces or along cracks.

Aeg This horizon must meet the definitions of A,e, and g.

Bg These horizons are analogous to Bm horizons but they have colors indicative of poor drainage and periodic reduction. They include horizons occurring between A and C horizons in which the main features are (i) colors of low chroma, that is: chromas of 1 or less, without mottles on ped surfaces or in the

matrix if peds are lacking; or chromas of 2 or less in hues of 10YR or redder, on ped surfaces or in the matrix if peds are lacking, accompanied by more prominent mottles than those in the C horizon; or hues bluer than 10Y, with or without mottles on ped surfaces or in the matrix if peds are lacking. (ii) colors indicated in (i) and a change in structure from that of the C horizons. (iii) color indicated in (i) and illuviation of clay too slight to meet the requirements of Bt; or accumulation or iron oxide too slight to meet the limits of Bgf. (iv) colors indicated in (i) and removal of carbonates. Bg horizons occur in some Orthic Humic Gleysols and some Orthic Gleysols.

Bfg, Bhfg, Btg, and others. When used in any of these combinations the limits set for f, hf, t, and others must be met.

Bgf The dithionite-extractable Fe of this horizon exceeds that of the IC by 1% or more. Pyrophosphate-extractable Al + Fe is less than the minimum limit specified for 'f' horizons. This horizon occurs in Fera Gleysols and Fera Humic Gleysols, and possibly below the Bfg of gleyed Podzols. It is distinguished from the Bfg of gleyed Podzols on the basis of the extractability of the Fe and Al. The Fe in the Bgf horizon is thought to have accumulated as a result of the oxidation of ferrous iron. The iron oxide formed is not associated intimately with organic matter or with Al, and it is sometimes crystalline. The Bgf horizons are usually prominently mottled, with more than half of the soil material occurring as mottles of high chroma.

Cg, Ckg, Ccag, Csg, Csag. When g is used with C alone, or with C and one of the lower-case suffixes k, ca, s, or sa, it must meet the definition for C and for the particular suffix.

h A horizon enriched with organic matter. It is used with A alone (Ah); or with A and e (Ahe); or with B alone (Bh); or with B and f (Bhf).

Ah A horizon enriched with organic matter that either has a color value at least one unit lower than the underlying horizon or contains 0.5% more organic carbon than the IC, or both. It contains less than 17% organic carbon by weight.

Ahe An Ah horizon that has undergone eluviation as evidenced, under natural conditions, by streaks and splotches of differing shades of gray and often by platy structure. It may be overlain by a darker-colored Ah and underlain by a lighter-colored Ae.

Bh This horizon contains more than 1% organic carbon, less than 0.3% pyrophosphate-extractable Fe, and has a ratio of organic carbon to pyrophosphate-extractable Fe of 20 or more.

Generally the color value and chroma are less than 3 when moist.

Bhf Defined under 'f'.

j Used as a modifier of the suffixes e, f, g, n, and t to denote an expression of, but failure to meet, the specified limits of the suffix it modifies. It must be placed to the right and adjacent to the suffix it modifies. For example Bfgj means a Bf horizon with weak expression of gleying; Bfjgj means a B horizon with weak expression of both 'f' and 'g' features.

Aej It denotes an eluvial horizon that is thin, discontinuous or slightly discernible.

Btj It is a horizon with some illuviation of clay, but not enough to meet the limits of Bt.

Btgj, Bmgj. Horizons that are mottled but do not meet the criteria of Bg.

Bfj It is a horizon with some accumulation of pyrophosphate-extractable Al and Fe but not enough to meet the limits of Bf.

Bntj or Bnj. Horizons in which development of solonetzic B properties is evident but insufficient to meet the limits for Bn or Bnt.

k Denotes the presence of carbonate, as indicated by visible effervescence when dilute HCl is added. Most often it is used with B and m (Bmk) or C (Ck), and occasionally with Ah or Ap (Ahk, Apk), or organic horizons (Ofk, Omk).

m A horizon slightly altered by hydrolysis, oxidation, or solution, or all three, to give a change in color or structure, or both. It has:

1. Evidence of alteration in one of the following forms:

   a) Higher chromas and redder hues than the underlying horizons.

   b) Removal of carbonates, either partially (Bmk) or completely (Bm).

2. Illuviation, if evident, too slight to meet the requirements of a Bt or a podzolic B.

3. Some weatherable minerals.

4. No cementation or induration and lacks a brittle consistence when moist. This suffix can be used as Bm, Bmgj, Bmk, and Bms.

n A horizon in which the ratio of exchangeable Ca to exchangeable Na is 10 or less. It must also have the following distinctive morphological characteristics: prismatic or columnar structure, dark coatings on ped surfaces, and hard to very hard consistence when dry. It is used with B, as Bn or Bnt.

p A horizon disturbed by man's activities, such as cultivation, logging, habitation, etc. It is used with A and O.

s A horizon with salts, including gypsum, which may be detected as crystals or veins, as surface crusts of salt crystals, by depressed crop growth, or by the presence of salt-tolerant plants.

It is commonly used with C and k (Csk), but can be used with any horizon or combination of horizon and lowercase suffix.

sa A horizon with secondary enrichment of salts more soluble than calcium and magnesium carbonates, in which the concentration of salts exceeds that present in the unenriched parent material. The horizon is 10 cm or more thick. The conductivity of the saturation extract must be at least 4 ms/cm and must exceed that of the C horizon by at least one-third.

t An illuvial horizon enriched with silicate clay. It is used with B alone (Bt), with B and g (Btg), with B and n (Bnt), etc.

Bt A Bt horizon is one that contains illuvial layer-lattice clays. It forms below an eluvial horizon, but may occur at the surface of a soil that has been partially truncated. It usually has a higher ratio of fine clay to total clay than IC. It has the following properties:

1. If any part of an eluvial horizon remains and there is no lithologic discontinuity between it and the Bt horizon, the Bt horizon contains more total and fine clay than the eluvial horizons, as follows:

   a) If any part of the eluvial horizon has less than 15% total clay in the fine earth fraction (2mm) the Bt horizon must contain at least 3% more clay, e.g.,Ae 10% clay-Bt minimum 13% clay.

   b) If the eluvial horizon has more than 15% and less than 40% total clay in the fine earth fraction, the ratio of the clay in the Bt horizon to that in the eluvial horizon must be 1.2 or more, e.g., 20% clay increase in the Bt over Ae.

   c) If the eluvial horizon has more than 40% total clay in the fine earth fraction, the Bt horizon must contain at least 8% more clay than the eluvial horizon, e.g. Ae 50% clay; Bt at least 58% clay.

2. A Bt horizon must be at least 5 cm thick. In some sandy soils where clay accumulation occurs in the lamellae, the total thickness of the lamellae should be more than 10 cm in the upper 150 cm of the profile.

3. In massive soils the Bt horizon should have oriented clays in some pores and also as bridges between the sand grains.

4. If peds are present, a Bt horizon shows clay skins on some of the vertical and horizontal ped surfaces and in the fine pores, or shows oriented clays in 1% or more of the cross section, as viewed in thin section.

5. If a soil shows a lithologic discontinuity between the eluvial horizon and the Bt horizon, or if only a plow layer overlies the Bt horizon, the Bt horizon need show only clay skins in some part, either in some fine pores or on some vertical and horizontal ped surfaces. Thin sections should show that some part of the horizon has about 1% or more of oriented clay bodies.

Btj, Btj, and Btg are defined under j and g.

u A horizon that is markedly disrupted by physical or faunal processes other than cryoturbation. Evidence of marked disruption such as the inclusion of material from other horizons, absence of the horizon, etc. must be evident in at least half of the cross section of the pedon. Such turbation can result from blowdown of trees, mass movement of soil on slopes, and burrowing animals. It can be used with any horizon or subhorizon with the exception of A or B alone; e.g. Aeu, Bfu, BCu.

x A horizon of fragipan character. A fragipan is a loamy subsurface horizon of high bulk density and very low organic matter content. When dry, it has a hard consistence and seems to be cemented. When moist, it has moderate to weak brittleness. It frequently has bleached fracture planes and is overlain by a friable B horizon. Air dry clods of fragic horizons slake in water.

y A horizon affected by cryoturbation as manifested by disrupted and broken horizons,, incorporation of materials from other horizons and mechanical sorting in at least half of the cross section of the pedon. It is used with A, B, and C alone or in combination with other subscripts, e.g. Ahy, Ahgy, Bmy, Cy, Cgy, Cygj, etc.

z A frozen layer. It may be used with any horizon or layer, e.g. Ohz, Bmz, Cz, Wz.

Appendix C

DESCRIPTION OF LANDFORMS

C.1 GENETIC MATERIALS

Unconsolidated mineral component

The unconsolidated mineral component consists of clastic sediments that may or may not be stratified, but whose particles are not cemented together. They are essentially of glacial or post-glacial origin but include poorly consolidated and weathered bedrock.

Anthropogenic - Man-made or man-modified materials, including those associated with mineral exploitation and waste disposal.

Colluvial - Massive to moderately well stratified, nonsorted to poorly sorted sediments with any range of particle sizes from clay to boulders and blocks that have reached their present position by direct, gravity-induced movement.

They are restricted to products of mass-wasting whereby the debris is not carried by wind, water, or ice (excepting snow avalanches).

Eolian - Sediment, generally consisting of medium to fine sand and coarse silt particle sizes, that is well sorted, poorly compacted, and may show internal structures such as cross bedding or ripple laminae, or may be massive. Individual grains may be rounded and show signs of frosting.

These materials have been transported and deposited by wind action.

Fluvial - Sediment generally consisting of gravel and sand with a minor fraction of silt and clay. The gravels are typically rounded and contain interstitial sand. Fluvial sediments are commonly moderately to well sorted and display stratification, but massive, nonsorted fluvial gravels do occur. These materials have been transported and deposited by streams and rivers. Finer textured Fluvial deposits of modern rivers are termed Alluvium.

Lacustrine - Sediment generally consisting of either stratified fine sand, silt, and clay deposited on the lake bed; or moderately well sorted and stratified sand and coarser materials that are beach and other nearshore sediments transported and deposited by wave action.

These are materials that either have settled from suspension in bodies of standing fresh water or have accumulated at their margins through wave action.

Marine - Unconsolidated deposits of clay, silt, sand, or gravel that are well to moderately well sorted and well stratified to moderately stratified (in some places containing shells). They have settled from suspension in salt or brackish water bodies or have

accumulated at their margins through shoreline processes such as wave action and longshore drift.

Morainal - Sediment generally consisting of well compacted material that is nonstratified and contains a heterogeneous mixture of particle sizes, often in a mixture of sand, silt, and clay that has been transported beneath, beside, on, within and in front of a glacier and not modified by any intermediate agent.

Saprolite - Rock containing a high proportion of residual silts and clays formed by alteration, chiefly by chemical weathering.

The rock remains in a coherent state, interstitial grain relationships are undisturbed and no downhill movement due to gravity has occurred.

Undifferentiated - A layered sequence of more than three types of genetic material outcropping on a steep erosional escarpment.

Volcanic - Unconsolidated pyroclastic sediments. These include volcanic dust, ash, cinders, and pumice.

Qualifying Descriptors

These have been introduced to qualify the genetic materials and to supply additional information about the mode of formation or depositional environment.

Glacial - Used to qualify nonglacial genetic materials or process modifiers where there is direct evidence that glacier ice exerted a strong but secondary or indirect control upon the mode of origin of the materials or mode of operation of the process. The use of this qualifying descriptor implies that glacier ice was close to the site of the deposition of a material or the site of operation of a process.

Glaciofluvial - Fluvial materials showing clear evidence of having been deposited either directly in front of or in contact with glacier ice.

Glaciolacustrine - Lacustrine materials deposited in contact with glacial ice.

Glaciomarine - Materials of glacial origin laid down in a marine environment, as a result of settling from melting, floating ice and ice shelves.

Organic component

The organic component consists of peat deposits containing >30% organic matter by weight that may be as thin as 10 cm if they overlie bedrock but are otherwise greater than 40 cm and generally greater than 60 cm thick. The classes and their definitions follow.

B	Bog
N	Fen
S	Swamp

Bog - A bog is a peat-covered or peat-filled area, generally with a high water table. Since the surface of the peatland is slightly elevated, bogs are either unaffected or partly affected by nutrient-rich groundwaters from the surrounding mineral soils. The groundwater is generally acidic and low in nutrients (ombrotrophic). The dominant peat materials are sphagnum and forest peat, underlain, at times, by fen peat.

Fen - A fen is a peat-covered or peat-filled area with a high water table, which is usually at the surface. The dominant materials are shallow to deep, well to moderately decomposed fen peat. The waters are mainly rich in nutrients (minerotrophic) and are derived from mineral soils. The peat materials are therefore higher in both nutrients and pH than the peats associated with bogs.

Swamp - A swamp is a peat-covered or peat-filled area. The peat surface is level or slightly concave in cross section. The water table is frequently at or above the peat surface. There is strong water movement from margins or other mineral sources. The microrelief is hummocky, with many pools present. The waters are neutral or slightly acid. The dominant peat materials are shallow to deep mesic to humic forest and fen peat.

C.2 GENETIC MATERIAL MODIFIERS

Material modifiers are used to qualify unconsolidated mineral and organic deposits. Particle-size classes serve to indicate the size, roundness, and sorting of unconsolidated mineral deposits. Fiber classes indicate the degree of decomposition and fiber size of organic materials.

Particle size classes for unconsolidated mineral materials

Blocky: An accumulation of angular particles greater than 256 mm in size.

Bouldery: An accumulation of rounded particles greater than 256 mm in size.

Clayey: An accumulation of particles where the fine earth fraction contains 35% or more clay (<0.002 mm) by weight and particles greater than 2 mm are less than 35% by volume.

Cobbly: An accumulation of rounded particles having a diameter of 64-256 mm.

Gravelly: An accumulation of rounded particles ranging in size from pebbles to boulders.

Loamy: An accumulation of particles of which fine earth fraction contains 35% or less clay (<0.002 mm) by weight and particles greater than 2 mm are less than 35% by volume.

Pebbly: An accumulation of rounded particles having a diameter of 2-64 mm.

Rubbly: An accumulation of angular fragments having a diameter of 2-256 mm.

Sandy: An accumulation of particles of which the fine earth fraction contains more than 70% by weight of fine sand or coarser particles. Particles greater than 2 mm occupy less than 35% by volume.

Silty: An accumulation of particles of which the fine earth fraction contains less than 15% of fine sand or coarser particles and has less than 35% clay. Particles greater than 2 mm occupy less than 35% by volume.

Fiber classes for organic materials

The amount of fiber and its durability are important characterizing features of organic deposits in that they reflect on the degree of decomposition of the material. The prevalence of woody materials in peats is also of prime importance.

Fibric: The least decomposed of all organic materials; there is a large amount of well-preserved fiber that is readily identifiable as to botanical origin. Fibers retain their character upon rubbing.

Mesic: Organic material in an intermediate stage of decompostion; intermediate amounts of fiber are present that can be identified as to their botanical origin.

Humic: Highly decomposed organic material; small amounts of fiber are present that can be identified as to their botanical origin. Fibers can be easily destroyed by rubbing.

Woody: Organic material containing more than 50% of woody fibers.

C.3 SURFACE EXPRESSION

The surface expression of genetic materials is their form (assemblage of slopes) and pattern of forms. Form as applied to unconsolidated deposits refers specifically to the product of the initial mode of origin of the materials. When applied to consolidated materials, form refers to the product of their modification by geological processes. Surface expression also indicates the manner in which unconsolidated genetic materials relate to the underlying unit.

Consolidated and Unconsolidated mineral surface classes

Apron - A relatively gentle slope at the foot of a steeper slope and formed by materials from the steeper, upper slope.

Blanket - A mantle of unconsolidated materials thick enough to mask minor irregularities in the underlying unit but still conforming to the general underlying topography.

Fan - A fan-shaped form similar to the segment of a cone and having a perceptible gradient from the apex to the toe.

Hummocky - A very complex sequence of slopes extending from somewhat rounded depressions or kettles of various sizes to irregular to conical knolls or knobs. There is a general lack of concordance between knolls or depressions. Slopes are generally 9-70% (5-35 degrees).

Inclined - A sloping, unidirectional surface with a generally constant slope not broken by marked irregularities. Slopes are 2-70% (1-35 degrees). The form of inclined slopes is not related to the initial mode of origin of the underlying material.

Level - A flat or very gently sloping, unidirectional surface with a generally constant slope not broken by marked elevations and depressions. Slopes are generally less than 2% (1 degree).

Rolling - A very regular sequence of moderate slopes extending from rounded, sometimes confined concave depressions to broad, rounded convexities producing a wave-lake pattern of moderate relief. Slope length is often 1.6 km or

greater and gradients are greater than 5% (3 degrees).

Ridged - A long, narrow elevation of the surface, usually sharp crested with steep sides. The ridges may be parallel, subparallel, or intersecting.

Steep - Erosional slopes, greater than 70% (35 degrees), on both consolidated and unconsolidated materials. The form of a steep erosional slope on unconsolidated materials is not related to the initial mode of origin of the underlying material.

Terraced - Scarp face and the horizontal or gently inclined surface (tread) above it.

Undulating - A very regular sequence of gentle slopes that extends from rounded, sometimes confined concavities to broad rounded convexities producing a wavelike pattern of low local relief. Slope length is generally less than 0.8 km and the dominant gradient of slopes is 2-5% (1-3 degrees).

Veneer - Unconsolidated materials too thin to mask the minor irregularities of the underlying unit surface. A veneer will range from 10 cm to 1 m in thickness and will possess no form typical of the material's genesis.

Organic surface classes

Blanket - A mantle of organic materials that is thick enough to mask minor irregularities in the underlying unit but still conforms to the general underlying topography.

Bowl - A bog or fen occupying concave-shaped depressions.

Domed - A bog with an elevated, convex, central area much higher than the margin. Domes may be abrupt (with or without a frozen core) or gently sloping or have a stepped surface.

Floating - A level organic surface associated with a pond or lake and not anchored to the lake bottom.

Horizontal - A flat peat surface not broken by marked elevations and depressions.

Plateau - A bog with an elevated, flat, central area only slightly higher than the margin.

Ribbed - A pattern of parallel or reticulate low ridges associated with fens.

Sloping - A peat surface with a generally constant slope not broken by marked irregularities.

Veneer - A thin (40 cm-1m) mantle of organic materials which generally conforms to the underlying topography. They may or may not be associated with discontinuous permafrost.

Appendix D

SUPPLEMENTAL SOIL INFORMATION

TABLE 18

Areal extent of Map Units within the Swan River Townsite Area

LNK0151 MAP INDEX LINKAGE FOR MN018100 SWAN RIVER AREA

NO. OF AREAS	TOTAL ACREAGE	TOTAL HECTARES	TOTAL SQ MILES		FIRST / UNIQUE SYMBOL
2	204.7	82.81	0.32	1	ZZ
2	204.7	82.81	0.32	2	ZZ
2	29.7	12.01	0.05	3	ASZ
1	19.4	7.83	0.04	4	ASZ
1	10.4	4.19	0.02	5	ASZ/XDXX
4	84.8	34.32	0.14	6	BAM
4	84.8	34.32	0.14	7	BAM
1	11.3	4.56	0.02	8	BAMB
1	11.3	4.56	0.02	9	BAMB
2	73.9	29.89	0.12	10	BEV
1	21.3	8.60	0.04	11	BEV
1	52.7	21.30	0.09	12	BEV/XCXX
1	36.5	14.74	0.06	13	BAX
1	36.5	14.74	0.06	14	BAX
8	370.7	150.00	0.58	15	CGD
3	104.8	42.39	0.17	16	CGD
2	266.0	107.62	0.42	17	CGD/XX1X
1	106.7	43.18	0.17	18	CGD8
1	106.7	43.18	0.17	19	CGD8-MEH2/XX1X-XX2X
1	48.2	19.50	0.08	20	PLN
1	48.2	19.50	0.08	21	PLN
2	65.2	26.36	0.11	22	DRB
2	65.2	26.36	0.11	23	DRB
3	52.7	21.29	0.09	24	DTT
3	52.7	21.29	0.09	25	DTT
2	49.9	20.17	0.08	26	DTT2
2	49.9	20.17	0.08	27	DTT2
8	314.4	127.22	0.50	28	DVD
2	101.9	41.20	0.16	29	DVD
3	154.5	62.52	0.25	30	DVD/0XXX
3	58.1	23.50	0.10	31	DVD/1XXX
1	73.0	29.52	0.12	32	DVD8
1	73.0	29.52	0.12	33	DVD8-SVK2/CXXX-0DXX
2	18.0	7.29	0.03	34	ERX
2	18.0	7.29	0.03	35	ERX/XGXX
6	534.3	216.22	0.84	36	ETT

TABLE 18 cont.

LNK015I MAP INDEX LINKAGE FOR MN018100 SWAN RIVER AREA

NO. OF AREAS	TOTAL ACREAGE	TOTAL HECTARES	TOTAL SQ MILES		FIRST / UNIQUE SYMBOL	
3	105.4	42.63	0.17	37		ETT
1	125.8	50.91	0.20	38		ETT/XX1X
2	250.9	101.51	0.40	39		ETT/XX2X
1	41.5	16.79	0.07	40		ETT/0XXX
1	10.9	4.39	0.02	41		ETT/2XXX
2	346.1	140.07	0.55	42	ETT6	
1	100.2	40.52	0.16	43		ETT6-SVC4
1	246.0	99.55	0.39	44		ETT6-SVC4/0-XX1X
7	202.6	81.98	0.32	45	FOY	
7	202.6	81.98	0.32	46		FOY
34	2564.4	1037.78	4.01	47	GBT	
12	605.5	245.02	0.95	48		GBT
1	18.7	7.55	0.03	49		GBT/C
1	31.1	12.58	0.05	50		GBT/CXXX
2	43.2	17.47	0.07	52		GBT/XCXX
3	495.7	200.58	0.78	53		GBT/0CXX
2	27.5	11.09	0.05	54		GBT/0DXX
9	335.0	135.55	0.53	55		GBT/0XXX
2	117.6	47.56	0.19	56		GBT/1XXX
2	890.6	360.41	1.40	57		GBT/2CXX
12	526.3	212.96	0.83	58	GBT1	
10	386.2	156.53	0.61	59		GBT1
1	35.3	14.29	0.06	60		GBT1/0XXX
1	104.2	42.16	0.17	61		GBT1/1XXX
3	119.4	48.29	0.19	62	GBT2	
2	89.4	36.16	0.14	63		GBT2
1	30.0	12.14	0.05	64		GBT2/XX2X
1	56.9	23.00	0.09	65	GBT7	
1	56.9	23.00	0.09	66		GBT7-SVR3/1XXX-3CXX
1	75.1	30.37	0.12	67	HAU7	
1	75.1	30.37	0.12	68		HAU7-NOV3
3	42.3	17.09	0.07	69	HAY	
2	5.2	2.11	0.01	70		HAY
1	37.1	14.98	0.06	71		HAY/XCXX
16	312.2	126.35	0.49	74	HMD	
12	246.0	99.53	0.39	75		HMD
4	66.3	26.82	0.11	76		HMD/XCXX
1	41.6	16.82	0.07	77	HMD7	
1	41.6	16.82	0.07	78		HMD7-NOV3/XCXX-0
2	640.7	259.27	1.01	79	HMD8	
1	51.3	20.76	0.09	80		HMD8-NOV2/XCXX-0

TABLE 18 cont.

LNK0151 MAP INDEX LINKAGE FOR MN018100 SWAN RIVER AREA

NO. OF AREAS	TOTAL ACREAGE	TOTAL HECTARES	TOTAL SQ MILES		FIRST / UNIQUE SYMBOL
1	589.4	238.51	0.93	81	HMD8-NOV2/XDXX-0
3	56.9	23.01	0.09	82	KVL
3	56.9	23.01	0.09	83	KVL
1	72.1	29.17	0.12	84	LAGOON
1	72.1	29.17	0.12	85	LAGOON
39	2882.2	1166.39	4.51	86	LSW
22	580.2	234.79	0.91	87	LSW
5	481.2	194.74	0.76	88	LSW/0XXX
7	852.6	345.05	1.34	89	LSW/1XXX
1	154.1	62.35	0.25	90	LSW/2CXX
4	814.2	329.48	1.28	91	LSW/2XXX
5	781.7	316.33	1.23	92	LSW1
2	214.0	86.60	0.34	93	LSW1
2	186.5	75.47	0.30	94	LSW1/0XXX
3	204.4	82.71	0.32	95	LSW1/1XXX
1	176.9	71.57	0.28	96	LSW1/2XXX
1	15.7	6.35	0.03	97	LSW2
1	15.7	6.35	0.03	98	LSW2
2	163.8	66.27	0.26	99	LSW6
1	134.9	54.59	0.22	100	LSW6-MNT4/2XXX-0
1	28.9	11.68	0.05	101	LSW6-PRA4
1	90.8	36.72	0.15	102	LSW7
1	90.8	36.72	0.15	103	LSW7-MNT3/2CXX-0
3	185.2	74.93	0.29	104	LSW8
1	61.6	24.89	0.10	105	LSW8-MNT2
1	89.7	36.27	0.15	106	LSW8-MNT2/2XXX-0
1	34.1	13.78	0.06	107	LSW8-PRA2
7	206.0	83.34	0.33	108	MEH
1	5.6	2.24	0.01	109	MEH
1	118.2	47.84	0.19	110	MEH/XC3X
2	47.3	19.14	0.08	111	MEH/XX1X
1	5.8	2.35	0.01	112	MEH/XX2X
1	15.1	6.11	0.03	113	MEH/XX3X
1	14.1	5.70	0.03	114	MEH/2CXX
1	248.5	100.57	0.39	115	MNS
1	248.5	100.57	0.39	116	MNS/XX1X
1	74.2	30.02	0.12	117	MNS8
1	74.2	30.02	0.12	118	MNS8-UNK2/0-XX2X
12	347.9	140.78	0.55	119	MNT
12	347.9	140.78	0.55	120	MNT

TABLE 18 cont.

LNK015I MAP INDEX LINKAGE FOR MN018100 SWAN RIVER AREA

NO. OF AREAS	TOTAL ACREAGE	TOTAL HECTARES	TOTAL SQ MILES		FIRST / UNIQUE SYMBOL
3	74.7	30.23	0.12	121	NOV
3	74.7	30.23	0.12	122	NOV
1	25.2	10.17	0.04	123	NOV7
1	25.2	10.17	0.04	124	NOV7-HMD3
3	310.8	125.77	0.49	125	NOV8
3	310.8	125.77	0.49	126	NOV8-HMD2
7	125.9	50.92	0.20	127	ONK
2	14.3	5.79	0.03	128	ONK
3	85.0	34.38	0.14	129	ONK/XX1X
2	26.6	10.76	0.05	130	ONK/XX2X
1	235.1	95.14	0.37	131	ONK8
1	235.1	95.14	0.37	132	ONK8-MEH2/XX2X-XX3X
2	55.0	22.23	0.09	133	PMU
2	55.0	22.23	0.09	134	PMU
1	11.8	4.77	0.02	135	PMU2
1	11.8	4.77	0.02	136	PMU2
3	83.6	33.83	0.14	137	RDG
1	3.6	1.46	0.01	138	RDG
1	9.6	3.87	0.02	139	RDG/XC1X
1	70.5	28.51	0.12	140	RDG/XE2X
3	157.4	63.70	0.25	141	SPG
2	15.0	6.04	0.03	142	SPG
1	142.5	57.66	0.23	143	SPG/XX1X
17	564.9	228.58	0.89	144	SVC
11	245.9	99.52	0.39	145	SVC
3	150.6	60.99	0.24	146	SVC/XX1X
1	39.3	15.91	0.07	147	SVC/XX2X
1	35.5	14.38	0.06	148	SVC/0XXX
1	93.4	37.80	0.15	149	SVC/1X1X
1	84.4	34.15	0.14	150	SVC7
1	84.4	34.15	0.14	151	SVC7-SPG3
1	101.9	41.22	0.16	152	SVK7
1	101.9	41.22	0.16	153	SVK7-GBT3/3CXX-1CXX
1	887.5	359.13	1.39	154	SWAN
1	887.5	359.13	1.39	155	SWAN RIVER
5	1217.1	492.56	1.91	156	SWF
5	1217.1	492.56	1.91	157	SWF
10	1086.5	439.70	1.70	158	SWF1

TAPLE 18 cont.

LNK015I MAP INDEX LINKAGE FOR MN018100 SWAN RIVER AREA

NO. OF AREAS	TOTAL ACREAGE	TOTAL HECTARES	TOTAL SQ MILES		FIRST / UNIQUE SYMBOL
9	1030.3	416.95	1.61	159	SWF1
1	56.3	22.76	0.09	160	SWF1/0XXX
1	222.6	90.08	0.35	161	SWF7
1	222.6	90.08	0.35	162	SWF7-LSW3
17	408.0	165.12	0.64	163	SWV
10	160.0	64.72	0.25	164	SWV
7	248.1	100.40	0.39	165	SWV/XCXX
3	113.2	45.80	0.18	166	TBN
2	81.9	33.14	0.13	167	TBN
1	31.3	12.67	0.05	168	TBN/XX1X
14	1549.8	627.18	2.43	169	VLY
13	1491.7	603.69	2.34	170	VLY
1	58.1	23.49	0.10	171	VLY/XX1X
1	172.3	69.70	0.27	172	VLY8
1	172.3	69.70	0.27	173	VLY8-BAM2
304	19611.4	7936.61	30.65		

TABLE 19

Summary of Soil Characteristics Recorded on Daily field Sheets

Soil Series			Dominant Texture				Rge. cm A hor. Solum	Av. Thickness (cm)		Dominant Class			Dom. Slope			Dom. P.L.U.	Soil Class	Surface Deposit
Symbol	Name	Sites	A	B	C	BC		A	A and B	Drainage	S. Runoff	Pervious	Type	Class	Position			
ASZ	Agassiz	1	LS	LS	S	-	45-60	45	45/60	Mod. Well	Moderate	Rapidly	Simple	B	Upper	Crop	O.BL	Lacustrine
BAM	Balmoral	10	CL	-	CL	-	15-15 25-40	25.5	31.1	Poor	Very Slow	Moderately	Simple	A	Level	Crop	R.HG	Lacustrine
BAMp	Balmoral, peaty phase	1	CL	-	CL	S	-	15	25.	Poor	Very Slow	-	Simple	A	Level	Crop	R.HG	Lacustrine
BEV	Bell River	1	LVFS	-	FS	-	-	15	-	Mod. Well	Mod. Slow	Moderately	Complex	B	-	Pasture	CU.R	Fluvial
BAX	Banks	1	LFS	FSL	-	L-CL	25-35	25	25/35	Well	Moderate	Moderately	Simple	A	Level	Crop	O.DG	Lacustrine
CGD	Craigsford	15	L-VFSL	-	LFS-LVFS	CL-SICL	20-50 25-75	31.1	46.5	Imperfect	Slow	Moderately	Simple	A	Level	Crop	GLR.BL	Lacustrine
DRB	Durban	1	L	L-FSL	FSL	L-SIL	20-45 30-55	35	50	Well	Slow	Moderately	Simple	C	Upper	Woodland Grazing	O.BL	Lacustrine
DTT	Dutton	4	L-CL	CL	L-SIL-CL	-	20-50 35-75	38.3	53.3	Mod. Well	Slow	Moderately	Simple	A	Level	Crop and Pasture	O.BL	Lacustrine
DTT2	Dutton	1	L	L	SIL	LCS	-	35.0	45.0	Mod. Well	Moderate	Moderately	Simple	A	Level	Pasture	O.BL	Lacustrine
DVD	Davidson	13	FS	FS	FS	SiL	25-90 45-140	56.1	87.3	Well	Slow	Rapidly	Simple	A	Level	Crop	O.DG	Lacustrine
ETT	Ethelbert	14	LFS	FS-LFS	FS	L	8-45 25-60	21.3	41.1	Moderately	Slow	Moderately	Simple	A	Level	Crop	O.BL	Lacustrine
FOY	Foley	7	VFSL	-	LVFS	-	10-40 30-65	30.0	41.6	Poorly	Very Slow	Moderately	Simple	A	Level	Crop	R.HG	Lacustrine
GBT	Gilbert	90	LFS	LFS	FS	L	10-80 20-145	37.2	69.0	Well	Slow	Rapidly	Simple	A	Level	Crop	O.BL	Lacustrine
GBT1	Gilbert1, loamy sub.	36	LFS	LFS	FS	L-CL	15-80 30-100	36.1	60-6	Mod. Well	Slow	Rapidly	Simple	A	Level	Crop	O.BL	Lacustrine
GBT2	Gilbert2 gr. sub.	1	FS	FS	FS	GR	-	30	50	Mod. Well	Slow	Rapidly	Simple	A	Level	Crop	O.BL	Lacustrine

TABLE 19 cont.

Soil Series		Dominant Texture					Rge. cm A hor. Solum	Av. Thickness (cm)		Dominant Class				dom. Slope		Dom. P.L.U.	Soil Class	Surface Deposit
Symbol	Name	Sites	A	B	C	¤C		A	A and B	Drainage	S. Runoff	Pervious	Type	Class	Position			
HAU	Haute	1	-	-	LFS	-	-	-	-	Very Poor	Ponded	Moderately	Simple	A	Depression	Swamp	T.H	Peat
HMD	Homestead	14	L	-	L	-	-	15.9	17.	Imperfect	Moderate	Moderately	Complex	A	Level	Crop	GLCU.R	Fluvial
LSW	Lenswood	52	LFS	-	FS	-	12-70 15-75	32	47.3	Imperfect	Slow	Rapidly	Simple	A	Level	Crop	GLR.BL	Lacustrine
LSW1	Lenswood1 loamy sub.	14	FSL	LFS	FS	CL-SiCL	15-80 35-90	34.5	53.2	Imperfect	Slow	Rapidly	Simple	A	Level	Crop	GLR.BL	Lacustrine
LSW2	Lenswood2 loamy sub.	1	FSL	LFS	FS	-	-	22.0	57.	Imperfect	Slow	Rapidly	Simple	A	Level	Unproductive Woodland	GLR.BL	Lacustrine
MEH	Meharry	9	L-FSL	-	L-FSL	-	15-40 20-40	21.6	29.7	Mod. Well	Slow	Moderately	Simple	A	Level	Crop	R.BL	Morainal
MNS	Minitonas	15	L	-	L	CL	20-45 25-60	29.3	39.5	Imperfect	Slow	Moderately	Simple	A	Level	Crop	GLR.BL	Lacustrine
MNT	Malonton	17	LFS	-	FS	-	10-55 32-70	27.4	46.4	Poor	Very Slow	Rapidly	Simple	A	Level	Crop	R.HG	Lacustrine
NOV	Novra	4	SiL-CL	-	SIL	-	8-20 8-20	17	17	Poor	Very Slow	Moderately	Complex	A	Depression	Unproductive Woodland	R.G	Fluvial
ONK	Oaknook	12	L	-	L-CL	-	10-50 12-60	22.3	26.0	Imperfect	Slow	Moderately	Simple	A	Level	Crop	GLR.BL	Morainal
PLN	Pelan	2	FS	FS-LFS	FS	SIL	15-15 35-50	15.	42.5	Imperfect	Slow	Rapidly	Simple	A	Level	Productive Woodland	GL.DG	Lacustrine
PMU	Pineimuta	3	CL	-	CL-LFS	CL	50-90	55.	63.3	Poor	Very Slow	Moderately	Simple	A	Level	Crop	R.HG	Lacustrine
PMUp	Pineimuta, peaty phase	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 19 cont.

Soil Series			Dominant Texture				Rge. cm A hor. Solum	Av. Thickness (cm)		Dominant Class			Dom. Slope			Dom. P.L.U.	Soil Class	Surface Deposit
Symbol	Name	Sites	A	B	C	□C		A	A and B	Drainage	S. Runoff	Pervious	Type	Class	Position			
PRA	Prawda	4	LFS	-	FS	SIL	20-35 20-60	31.2	50.0	Poor	Very Slow	Rapidly	Simple	A	Depression	Crop	R.H.G	Lacustrine
RDG	Rose Ridge	5	L	L	L	-	6-20 10-45	13	23	Well	Slow Mod.	Moderately	Simple	-	Upper	Crop	O.DG	Morainal
SPG	Sprague	3	LFS	-	FS	L-CL	15-40 20-40	25	30.	Poor	Very Slow	Moderately	Simple	A	Depression	Crop	R.HG	Lacustrine
SVC	Sevick	25	LFS	LFS	FS	L	15-60 15-70	32.2	48.4	Imperfect	Slow	Moderately	Simple	A	Level	Crop	GLR.BL	Lacustrine
SVK	Silver Creek	2	LFS	FS-LS	S	-	-	-	-	Mod. Well	Slow Mod.	Rapidly	Complex	C	Middle	Pasture	O.R	Lacustrine
SWF	Swanford	63	VFSL	-	VFSL	-	15-65 15-90	32.8	44.6	Imperfect	Slow	Moderately	Simple	A	Level	Crop	GLR.BL	Lacustrine
SWF1	Swanford1 loamy sub.	28	VFSL	-	LVFS	SIL	15-70 25-75	37.2	50.7	Imperfect	Slow	Moderately	Simple	A	Level	Crop	GLR.BL	Lacustrine
SWV	Swan River	3	L	CL	SiL	-	25-40 40-52	31.6	47.3	Mod. Well	Moderate	Moderately	Complex	B	-	Crop	O.BL	Fluvial
TBN	Timberton	4	L	C	L-FSL	L	22-40 28-55	22.5	33.7	Mod. Well	Slow	Moderately	Simple	A	Level	Crop	O.BL	Lacustrine
VLY	Valley	54	CL	-	CL-SICL	-	25-45 40-75	31.8	44.3	Imperfect	Slow	Moderately	Simple	A	Level	Crop	GLR.BL	Lacustrine

D.1 MORPHOLOGICAL AND ANALYTICAL DATA FOR SELECTED SOILS IN THE SWAN RIVER AREA

Soil Symbol	Soil Name	Profile Number
BAM	Balmoral	42
BEV	Bell River	49
CGD	Craigford	45
DTT	Dutton	56
DVD	Davidson	48
ETT	Ethelbert	46
FOY	Foley	44
GBT	Gilbert	33
GBT	Gilbert	35
HMD	Homestead	53
LSW	Lenswood	51
MEH	Meharry	41
MNS	Minitonas	52
MNS	Minitonas	57
MNT	Malonton	43
NOV	Novra	50
PLN	Pelan	40
SPG	Sprague	39
SVC	Sevick	47
SVK	Silver Creek	36
SWF	Swanford	37
SWF	Swanford	38
SWV	Swan River	54
SWV	Swan River	55
VLY	Valley	34

* Profile descriptions have been computer generated from detailed sample sites and analytical information stored in the Canada Soil Information System (CanSIS) data bank.

Analytical Methodology:

Field samples were collected from representative sites. Samples were air-dried and ground, and the less than 2 mm size fraction was used for subsequent analysis.

pH:	0.01 M $CaCl_2$
Organic Carbon:	Wet oxidation (Walkley-Black)
Total Nitrogen:	Macro-Kjeldahl; NO_2 and NO_3 not included
Equivalent:	Pressure method
Extractable Acidity:	$BaCl_2$ - Triethanolamine, pH 8.0
Cation Exchange Capacity:	Buffered NH_4Ac; pH 7.0 solution, done by atomic absorption procedure
Electrical Conductivity:	saturated paste, using conductivity cell-cup
Particle Size Analysis:	Pipette method. Pretreatment removal of organic matter and salts. Dispersion with sodium hexameta-phosphate
Water Content:	Pressure membrane method. Samples are ground, sieved, and oven-dried
Atterberg Limits:	A.S.T.M. Designation D423-54T, "Procedures for Testing Soils", pages 94-101
Shrinkage Limit:	Evaporation method

Codes for Engineering Classification

AASHO

A-1	= 10	A-3	= 30
A-1-a	= 11	A-4	= 40
A-1-b	= 12	A-5	= 50
A-2	= 20	A-6	= 60
A-2-4	= 24	A-7	= 70
A-2-5	= 25	A-7-5	= 75
A-2-6	= 26	A-7-6	= 76
A-2-7	= 27	A-8	= 80

Unified

GW	= 01	DL	= 11
GP	= 02	MH	= 12
GM	= 03	CH	= 13
GC	= 04	OH	= 14
SW	= 05	PT	= 15
SP	= 06	Cl	= 16
SM	= 07	GM-GC	= 17
SC	= 08	SM-SC	= 18
ML	= 09	CL-ML	= 19
CL	= 10		

GBT MANITOBA 1980 PROFILE NO. 33

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; EXTENSIVE; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC BLACK. MINERAL SOIL FAMILY: SANDY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: GBT. SOIL PHASES: LEVEL.

LOCATION: MILITARY GRID REF. 14 ULN 4567 7628; NTS MAP AREA 63C ; SE 28 36 27 W.

CLIMATE: 339 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER

VEGETATION: GRASSES AND FORBES. NATIVE AND DISTURBED GRASS SPECIES.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, SANDY, MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), LACUSTRINE, MIXED; PARENT MATERIAL 2: WEAK CHEMICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY); PARENT MATERIAL 3: UNSPECIFIED WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL), IGNEOUS AND LIMESTONE; LANDFORM CLASSIFICATION: LACUSTRINE, LEVEL; SLOPE: SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING LEVEL; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, RAPIDLY PERVIOUS, VERY SLOW SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: BUILT-UP AREAS.

SPECIAL NOTES: SITE SAMPLED BY BACKHOE IN SEWER AND WATER EXCAVATION .GOOD CHARACTERIZATION OF STRATIGRAPHY

AH: 0 TO 35 CM, RANGE 30 TO 50 CM; HORIZON DRY; MATRIX MOIST 10YR 3/1, MATRIX DRY 10YR 3.5/1; LOAMY FINE SAND; STRUCTURELESS, SINGLE GRAIN STRUCTURE; VERY FRIABLE, LOOSE, NONPLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; HIGHLY POROUS; SMOOTH, CLEAR HORIZON BOUNDARY; SLIGHTLY ACID 6.1-6.5 FIELD PH.

BM: 35 TO 70 CM, RANGE 35 TO 40 CM; HORIZON DRY; MATRIX MOIST 10YR 4/4; FINE SAND; STRUCTURELESS, SINGLE GRAIN STRUCTURE; VERY FRIABLE, LOOSE, NONPLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; HIGHLY POROUS; SMOOTH, CLEAR HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

BC: 70 TO 85 CM, RANGE 10 TO 20 CM; HORIZON MOIST; MATRIX MOIST 10YR 4/4; FINE SAND; STRUCTURELESS, SINGLE GRAIN STRUCTURE; VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; VERY FEW, MICRO, VERTICAL, EXPED ROOTS; HIGHLY POROUS; SMOOTH, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKGJ: 85 TO 105 CM; HORIZON MOIST; MATRIX MOIST 10YR 5/4; LOAMY VERY FINE SAND; COMMON, FINE, FAINT, 10YR 5/6 MOTTLES; VERY WEAK, VERY FINE TO FINE, GRANULAR STRUCTURE; VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; VERY FEW ROOTS; HIGHLY POROUS; WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

2CK1: 105 TO 130 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4/2; GRAVELLY LOAM; COMMON, FINE, FAINT, 10YR 5/6 MOTTLES; STRUCTURELESS, MASSIVE STRUCTURE; WEAK, FINE, GRANULAR SECONDARY STRUCTURE; STICKY, FIRM, HARD, SLIGHTLY PLASTIC CONSISTENCE; SLIGHTLY POROUS; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; COMMON, MEDIUM, HORIZONTAL, IRREGULAR, STREAKED BANDED ; SMOOTH, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

2CK2: 130 TO 205 CM; HORIZON MOIST; MATRIX MOIST 10YR 4/1, MATRIX MOIST 2.5Y 4/2; SILTY CLAY LOAM; COMMON, FINE, FAINT, 10YR 5/6 MOTTLES; STRUCTURELESS, MASSIVE STRUCTURE; WEAK TO MODERATE, FINE TO MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; STICKY, FIRM, HARD, SLIGHTLY PLASTIC CONSISTENCE; SLIGHTLY POROUS; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; COMMON, MEDIUM, HORIZONTAL, IRREGULAR, STREAKED BANDED ; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

3CK1: 205 TO 245 CM; HORIZON MOIST; MATRIX MOIST 10YR 4/3, MATRIX MOIST 10YR 4/2; GRITTY SILTY CLAY LOAM; COMMON, MEDIUM, FAINT, 5Y 6/1 MOTTLES; PLATY STRUCTURE LAMINATED; VERY WEAK, FINE, GRANULAR SECONDARY STRUCTURE; FIRM, VERY HARD, NONPLASTIC CONSISTENCE; SLIGHTLY POROUS; VERY STRONGLY CALCAREOUS; HOMOGENEOUS ; 10% ANGULAR GRAVELLY AND ANGULAR COBBLY COARSE FRAGMENTS; SMOOTH, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

3CK2: 245 TO 310 CM; HORIZON MOIST; MATRIX MOIST 10YR 5/4; GRITTY LOAM; COMMON, MEDIUM, FAINT, 5Y 6/1 MOTTLES; WEAK TO MODERATE, MEDIUM, PLATY STRUCTURE LAMINATED; VERY WEAK, FINE, GRANULAR SECONDARY STRUCTURE; FIRM, VERY HARD, NONPLASTIC CONSISTENCE;

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SLIGHTLY POROUS; VERY STRONGLY CALCAREOUS; HOMOGENEOUS ; 10% ANGULAR GRAVELLY AND ANGULAR COBBLY COARSE FRAGMENTS; SMOOTH, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AH	6.2	2.58	0.19				4.4	18.9		18.0	1.9	0.1	0.4
BM	7.0	0.31	0.05				1.5	8.4		9.0	1.8	0.1	0.2
BC	7.4	0.22	0.03				0.5	5.7		11.0	1.0	0.2	0.2
CKGJ	7.5			13.6	4.4	8.5		4.3		17.3	1.0	0.3	0.1
2CK1	7.6			17.1	8.6	7.8		21.0		31.8	6.2	0.1	0.9
2CK2	7.4			13.9	7.2	6.1		35.2		37.9	11.3	0.1	1.1
3CK1	7.5			29.6	14.1	14.2		17.8		32.9	6.7	0.2	1.0
3CK2	7.6			33.1	19.9	12.2		5.4		27.7	2.5	0.1	0.2

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AH	0.2	38.0
BM	0.2	28.0
BC	0.3	23.0
CKGJ	0.3	25.0
2CK1	0.3	44.0
2CK2	0.3	64.0
3CK1	0.3	43.0
3CK2	0.3	26.0

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PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AH						4	10	29	42	85		8	7	
BM						2	8	34	46	90		5	5	
BC					2	13	32	24	17	88		8	4	
CKGJ					1	3	14	15	44	76		19	5	
2CK1						1	1	3	37	42		37	21	
2CK2										4		62	34	
3CK1				96	2	2	3	6	7	20		46	34	
3CK2				89	4	4	7	20	15	50		37	13	

PHYSICAL DATA

SURVEY (CON'T) — ENGINEERING

HORIZON	MOISTURE STATUS (%) 0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AH		20.2	7.3										
BM		8.1	3.6									40	07
BC													
CKGJ													
2CK1		39.2	13.6			21.0	41.0	22.0					CL
2CK2													
3CK1						18.0	37.0	18.0					CL
3CK2													

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IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; EXTENSIVE; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: GLEYED REGO BLACK. MINERAL SOIL FAMILY: FINE LOAMY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COLD, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: VLY, ASSOCIATED SOILS: SNF.

LOCATION: MILITARY GRID REF. 14 ULN 4545 7915; NTS MAP AREA 63C ; NE 33 36 27 W.

CLIMATE: 327 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS VERY GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: GRASSES AND FORBES. NATIVE GRASS ON HEAD-LAND ADJACENT TO CULTIVATED FIELD.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), LACUSTRINE, MIXED; LANDFORM CLASSIFICATION: LACUSTRINE, LOAMY, LEVEL; SLOPE: SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING LEVEL; SOIL MOISTURE AND DRAINAGE: SUBHUMID, IMPERFECTLY DRAINED, MODERATELY PERVIOUS, SLOW SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND, DITCH DRAINED.

AHK1: 0 TO 15 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 3/1; CLAY LOAM; FEW MOTTLES; MODERATE, FINE TO MEDIUM, GRANULAR STRUCTURE; FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; PLENTIFUL, MICRO AND FINE, RANDOM, EXPED ROOTS; HIGHLY POROUS, MANY, FINE, RANDOM, EXPED, CONTINUOUS PORES; WEAK EFFERVESCENCE; WEAKLY CALCAREOUS; HOMOGENEOUS ; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

AHK2: 15 TO 30 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/1; CLAY LOAM; FEW, FINE, FAINT MOTTLES; WEAK TO MODERATE, FINE, GRANULAR STRUCTURE; FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; VERY FEW, MEDIUM, VERTICAL, EXPED ROOTS; MODERATELY POROUS, FEW, VERY FINE, RANDOM, EXPED, DISCONTINUOUS PORES; WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; HOMOGENEOUS ; SMOOTH, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

AC: 30 TO 47 CM, RANGE 15 TO 25 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/2; CLAY LOAM; FEW, FINE, FAINT MOTTLES; WEAK, FINE, GRANULAR STRUCTURE; FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; VERY FEW, FINE, OBLIQUE ROOTS; MODERATELY POROUS, FEW, VERY FINE, RANDOM, EXPED, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; HOMOGENEOUS ; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKGJ1: 47 TO 65 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4/4; SILT LOAM; FEW, FINE, FAINT MOTTLES; WEAK, VERY FINE TO FINE, GRANULAR STRUCTURE; FRIABLE, SLIGHTLY HARD, PLASTIC CONSISTENCE; SLIGHTLY POROUS, VERY FEW, MICRO, RANDOM, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; VERY STRONGLY CALCAREOUS; HOMOGENEOUS ; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKGJ2: 65 TO 95 CM; HORIZON MOIST; MATRIX MOIST 10YR 5/4; SILT LOAM; FINE, FAINT MOTTLES; WEAK, FINE TO MEDIUM, GRANULAR STRUCTURE; FIRM, SLIGHTLY HARD, PLASTIC CONSISTENCE; SLIGHTLY POROUS, VERY FEW, MICRO, RANDOM, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; VERY STRONGLY CALCAREOUS; HOMOGENEOUS ; SMOOTH, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKGJ3: 95 TO 140 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 5/4, MATRIX DRY 10YR 6/4; SILT LOAM; COMMON, FINE, DISTINCT, 10YR 5/8 MOTTLES; WEAK, VERY FINE TO FINE, GRANULAR STRUCTURE STRATIFIED; VERY FRIABLE, SOFT, SLIGHTLY PLASTIC CONSISTENCE; SLIGHTLY POROUS, VERY FEW, MICRO, RANDOM, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; VERY STRONGLY CALCAREOUS; HOMOGENEOUS ; MILDLY ALKALINE 7.4-7.8 FIELD PH.

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CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AHK1	7.4	7.97	0.60	2.4	1.2	1.1	3.9	56.2		39.6	19.8	0.2	0.8
AHK2	7.7	4.72	0.32	9.2	6.6	2.4		37.9		35.1	18.2	0.1	0.6
AC	7.8	1.99	0.18	11.8	8.8	2.7		28.3		31.4	16.4	0.2	0.5
CKGJ1	7.8			26.3	12.4	12.9		18.0		23.8	11.1	0.2	0.6
CKGJ2	7.7			27.4	14.8	11.6		19.8		26.0	12.7	0.3	0.6
CKGJ3	7.7			26.5	8.1	16.9		16.3		23.4	9.0	0.2	0.6

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AHK1	0.7	78.0
AHK2	0.7	66.0
AC	0.7	50.0
CKGJ1	1.1	40.0
CKGJ2	1.1	49.0
CKGJ3	0.5	40.0

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AHK1							1	7	17	25		45	30	
AHK2						1	1	7	18	27		42	31	
AC							1	10	18	29		43	28	
CKGJ1								2	9	11		66	23	
CKGJ2										5		69	26	
CKGJ3								1	14	15		68	17	

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PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AHK1		53.7	25.2										
AHK2													
AC													
CKGJ1													
CKGJ2		37.1	12.2			22.0	35.0	23.0					CL
CKGJ3													

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IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC BLACK. MINERAL SOIL FAMILY: SANDY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: GBT. SOIL PHASES: OVERBLOWN.

LOCATION: MILITARY GRID REF. 14 ULN 5072 7632; NTS MAP AREA 63C ; SE 25 36 27 W.

CLIMATE: 323 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS VERY GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: GRASSES AND FORBES. NATIVE AND DISTURBED GRASSES ON HEADLAND-ROAD ALLOWANCE NEXT TO CULTIVATED FIELD.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, SANDY, WEAKLY CALCAREOUS (1 TO 6% CACO3), LACUSTRINE, MIXED; LANDFORM CLASSIFICATION: LACUSTRINE, SANDY, RIDGED; SLOPE: SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING LEVEL, SITE AT CREST POSITION; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, RAPIDLY PERVIOUS, SLOW SURFACE RUNOFF, SEEPAGE ABSENT, WIND ERODED ; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: SITE RECEIVES SOME OVERBLOW ANNUALLY.LACK OF ORIGINAL AH OVER BM INDICATES ITS REMOVAL BEFORE THE MAJORITY OF OVERBLOW ACCUMULATED.AH IS LOW IN ORGANIC MATTER AND CONSISTS MOSTLY OF OVERBLOW.BM HORIZON HAS MANY GOPHER HOLES FILLED WITH HIGH ORGANIC MATERIAL(AH) OR CALCAREOUS SOIL(CK).A THIN CCAG LAYER REFLECTS AVERAGE UPPER FLUCTUATION OF WATERTABLE.LEECHING INDICATED BY LACK OF SURFACE CARBONATES AND A THIN CLAY ACCUMULATION IN LOWER BM HORIZON.

AH: 0 TO 40 CM; HORIZON DRY; MATRIX DRY 10YR 3/2, MATRIX DRY 10YR 4/3; FINE SAND; STRUCTURELESS, SINGLE GRAIN STRUCTURE; NONPLASTIC CONSISTENCE; ABUNDANT, VERY FINE, RANDOM, EXPED ROOTS; HIGHLY POROUS, MANY, VERY FINE, EXPED PORES; WAVY, CLEAR HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

BM: 40 TO 90 CM; HORIZON DRY; MATRIX MOIST 10YR 4/4; FINE SAND; STRUCTURELESS, SINGLE GRAIN STRUCTURE; NONPLASTIC CONSISTENCE; VERY FEW, FINE, VERTICAL, EXPED ROOTS; HIGHLY POROUS, MANY, VERY FINE, EXPED PORES; SMOOTH, CLEAR HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

CKGJ: 90 TO 115 CM; MATRIX MOIST 10YR 4/4; LOAMY FINE SAND; COMMON, MEDIUM, DISTINCT, 10YR 5/6 MOTTLES; STRUCTURELESS, SINGLE GRAIN STRUCTURE; NONPLASTIC CONSISTENCE; VERY FEW ROOTS; HIGHLY POROUS, MANY, VERY FINE, EXPED PORES; WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; HOMOGENEOUS ; SMOOTH, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKG1: 115 TO 125 CM; MATRIX MOIST 10YR 6/4; FINE SAND; FEW, COARSE, PROMINENT, 7.5YR 4/6 MOTTLES; STRUCTURELESS, SINGLE GRAIN STRUCTURE; NONPLASTIC CONSISTENCE; HIGHLY POROUS, MANY, VERY FINE, EXPED PORES; WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; HOMOGENEOUS ; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CCAG: 125 TO 128 CM; MATRIX MOIST 10YR 7/2; VERY FINE SANDY LOAM; FEW, COARSE, PROMINENT, 7.5YR 4/6 MOTTLES; STRUCTURELESS, MASSIVE STRUCTURE; VERY WEAK, VERY FINE TO FINE, GRANULAR SECONDARY STRUCTURE; NONPLASTIC CONSISTENCE; MODERATELY POROUS, FEW, MICRO, EXPED PORES; STRONG EFFERVESCENCE; VERY STRONGLY CALCAREOUS; HOMOGENEOUS BANDED ; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKG2: 128 TO 150 CM; MATRIX MOIST 10YR 5/3, MATRIX MOIST 10YR 6/2; VERY FINE SAND; COMMON, MEDIUM, DISTINCT, 10YR 5/6 MOTTLES; NONPLASTIC CONSISTENCE; HIGHLY POROUS, MANY, VERY FINE, EXPED PORES; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; HOMOGENEOUS ; MILDLY ALKALINE 7.4-7.8 FIELD PH.

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CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AH	7.2	0.59	0.05				1.1	7.3		5.5	0.7		0.1
BM	7.1	0.26	0.03				1.0	5.9		4.4	0.8	0.1	0.1
CKGJ	7.5			11.1	4.4	6.2		5.9		18.3	1.2	0.1	0.1
CKG1	7.6			13.9	7.3	6.1		2.4		17.3	0.5	0.1	0.1
CCAG	7.6			35.9	27.1	8.1		9.5		30.9	2.3	0.1	0.2
CKG2	7.6			13.9	5.4	7.8		2.7		17.5	0.6	0.1	0.1

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AH	0.2	29.0
BM	0.3	27.0
CKGJ	0.4	27.0
CKG1	0.2	26.0
CCAG	0.3	38.0
CKG2	0.2	27.0

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	% OF SAMPLE V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AH						1	7	55	29	92		3	5	
BM						1	7	53	31	92		5	3	
CKGJ						1	6	49	30	86		10	4	
CKG1							3	49	44	96		4	0	
CCAG						1	2	20	35	58		30	12	
CKG2							3	33	54	90		8	2	

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PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AH		9.8	3.0										
BM		13.7	2.6									24	07
CKGJ													
CKG1		10.0	1.8										
CCAG													
CKG2													
												40	07

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SVK MANITOBA 1980 PROFILE NO. 36

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: UNDECIDED; VERY LIMITED EXTENT; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC REGOSOL. MINERAL SOIL FAMILY: SANDY, MIXED NONCLAY, ALKALINE, WEAKLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: SVK. SOIL PHASES: BLOWN OUT LAND.

LOCATION: MILITARY GRID REF. 14 ULN 4130 7393; NTS MAP AREA 63C ; NW 18 36 27 W.

CLIMATE: 339 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: GRASSES,FORBES AND SHRUBS, REGENERATING. KEY SPECIES LISTING: 1 POPULUS BALSAMIFERA - BALSAM POPLAR, 2 RO. GRASSES.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, SANDY, WEAKLY CALCAREOUS (1 TO 6% CACO3), EOLIAN, MIXED; LANDFORM CLASSIFICATION: EOLIAN, SANDY, DEFLATED, HUMMOCKY; SLOPE: 10% COMPLEX SLOPE OF CLASS 5 (10-15%), FACING SOUTHEAST, SITE AT UPPER SLOPE POSITION, 20 M LONG; SOIL MOISTURE AND DRAINAGE: SUBHUMID, RAPIDLY DRAINED, RAPIDLY PERVIOUS, MODERATE SURFACE RUNOFF, SEEPAGE ABSENT, BLOWN-OUT LAND ; NONSTONY; NONROCKY; PRESENT LAND USE: OUTDOOR RECREATION; HUMUS-FORM: FIBRIMOR.

INTERPRETATIONS: CLI AGRICULTURE 6/MT.

SPECIAL NOTES: SOLUM DEVELOPEMENT VERY WEAK,CARBONATES ARE LEACHED TO 90CM AND SOME DARKENING OF SURFACE WITH OM.BEST CLASSIFIED AS AN ORTHIC REGOSOL. A NEW SERIES NEEDED, DUNES ARE FAIRLY STABLE LEAVING SUFFICIENT TIME FOR THIS PROFILE TO FORM.NO EVIDENCE OF BURIED SURFACE LAYERS.

LF: 3 TO 0 CM; ORGANIC; ABUNDANT, VERY FINE AND MEDIUM, RANDOM, EXPED ROOTS; SMOOTH, ABRUPT HORIZON BOUNDARY; SLIGHTLY ACID 6.1-6.5 FIELD PH.

AH: 0 TO 20 CM; MATRIX MOIST 10YR 3/2, MATRIX DRY 10YR 5/2; FINE SAND; STRUCTURELESS, SINGLE GRAIN STRUCTURE; NONSTICKY, LOOSE, LOOSE, NONPLASTIC CONSISTENCE; FEW, VERY FINE AND MEDIUM, VERTICAL, EXPED ROOTS; HIGHLY POROUS; SMOOTH, CLEAR HORIZON BOUNDARY; SLIGHTLY ACID 6.1-6.5 FIELD PH.

AC: 20 TO 48 CM; MATRIX MOIST 10YR 3/3, MATRIX DRY 10YR 5/3; FINE SAND; STRUCTURELESS, SINGLE GRAIN STRUCTURE; NONSTICKY, LOOSE, LOOSE, NONPLASTIC CONSISTENCE; VERY FEW, VERY FINE AND MEDIUM, VERTICAL, EXPED ROOTS; HIGHLY POROUS; SMOOTH, CLEAR HORIZON BOUNDARY; SLIGHTLY ACID 6.1-6.5 FIELD PH.

CK1: 48 TO 90 CM; MATRIX MOIST 10YR 4.5/4, MATRIX DRY 10YR 5/4; FINE SAND; STRUCTURELESS, SINGLE GRAIN STRUCTURE; NONSTICKY, LOOSE, LOOSE, NONPLASTIC CONSISTENCE; HIGHLY POROUS; SMOOTH, CLEAR HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

CK2: 90 TO 140 CM; MATRIX MOIST 10YR 5/4, MATRIX DRY 10YR 6/4; FINE SAND; STRUCTURELESS, SINGLE GRAIN STRUCTURE; NONSTICKY, LOOSE, LOOSE, NONPLASTIC CONSISTENCE; HIGHLY POROUS; VERY WEAK EFFERVESCENCE; WEAKLY CALCAREOUS; MILDLY ALKALINE 7.4-7.8 FIELD PH.

SVK MANITOBA 1980 PROFILE NO. 36

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
LF	6.4	0.82	0.42				5.6	29.0		19.4	4.1	0.1	0.8
AH	6.2	1.29	0.10				2.4	8.3		5.0	0.4		0.3
AC	6.2	0.44	0.04				1.7	4.4		3.0	0.1		0.2
CK1	7.0	0.13	0.02	1.4	0.7	0.6	0.5	2.7		4.0	0.4	0.1	0.1
CK2	7.6			4.0	2.1	1.8		2.3		5.5	0.1		

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
LF	0.2	34.0
AH	0.2	26.0
AC	0.2	24.0
CK1	0.2	26.0
CK2		

PHYSICAL DATA (SURVEY)

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	PARTICLE SIZE ANALYSIS V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
LF						1	7	44	46	98		2	0	
AH						1	8	47	43	99		1	0	
AC						1	12	47	39	99		1	0	
CK1						1	9	59	30	99		1	0	
CK2														

AUG 07, 1986

SVK MANITOBA 1980 PROFILE NO. 36

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
LF		8.0	4.6										
AH		4.4	2.3									24	07
AC		3.4	1.5										
CK1		3.0	1.4									24	07
CK2													

SWF MANITOBA 1980 PROFILE NO. 37

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: GLEYED REGO BLACK. MINERAL SOIL FAMILY: COARSE SILTY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: SWF.

LOCATION: MILITARY GRID REF. 14 ULN 4431 7795; NTS MAP AREA 63C ; SE 32 36 27 W.

CLIMATE: 332 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS VERY GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED. CULTIVATED.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, COARSE LOAMY AND COARSE SILTY (<18% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), LACUSTRINE; LANDFORM CLASSIFICATION: LACUSTRINE, LOAMY, LEVEL; SLOPE: 0% SIMPLE SLOPE , FACING LEVEL; SOIL MOISTURE AND DRAINAGE: SUBHUMID, IMPERFECTLY DRAINED, MODERATELY PERVIOUS, SLOW SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

INTERPRETATIONS: CLI AGRICULTURE 2/W.

SPECIAL NOTES: SOIL IS MODAL FOR SWF DEVELOPED DOMINANTLY ON MEDIUM TEXTURE-HIGH IN VFS AND SILT.IT OCCUPIES THE HEAVY END OF SWF.OTHER SWF TO BE SAMPLED ARE HIGHER IN CLAY AND SILT BUT WITH COARSER SAND SIZE.THE LIGHT END OF MODAL SWF DECREASES IN CLAY AND SILT BUT VFS STILL PREDOMINATES.NOTE GOPHER HOLES THROUGHOUT.MANY EARTH WORMS IN ACKGJ JUST BELOW PLOW LAYER.

APK: 0 TO 15 CM; HORIZON MOIST; CRUSHED MOIST 10YR 2/1, MATRIX DRY 10YR 3.5/1; LOAM; WEAK TO MODERATE, FINE TO MEDIUM, GRANULAR STRUCTURE; NONSTICKY, FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; FEW, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, FINE, RANDOM, EXPED PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; HOMOGENEOUS ; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

AC: 15 TO 25 CM, RANGE 8 TO 15 CM; HORIZON MOIST; MATRIX MOIST 10YR 2.5/2; LOAM; FEW, FINE, FAINT, 10YR 3/2 MOTTLES; WEAK, FINE TO MEDIUM, GRANULAR STRUCTURE; VERY WEAK, VERY FINE TO FINE, GRANULAR SECONDARY STRUCTURE; NONSTICKY, VERY FRIABLE, SLIGHTLY PLASTIC CONSISTENCE; VERY FEW, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, VERY FEW, VERY FINE PORES; STRONG EFFERVESCENCE; STRONGLY CALCAREOUS; HOMOGENEOUS ; WAVY, CLEAR HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

CCAGJ1: 25 TO 42 CM; HORIZON MOIST; MATRIX MOIST 10YR 6/4, MATRIX MOIST 2.5Y 5/2; SILT LOAM; COMMON, FINE, DISTINCT MOTTLES; 10YR 6/2 MOTTLES; VERY WEAK, FINE, GRANULAR STRUCTURE; STRUCTURELESS, VERY FINE TO FINE, SINGLE GRAIN SECONDARY STRUCTURE; NONSTICKY, VERY FRIABLE, SLIGHTLY PLASTIC CONSISTENCE; MODERATELY POROUS, VERY FEW, MICRO PORES; STRONG EFFERVESCENCE; VERY STRONGLY CALCAREOUS; HOMOGENEOUS ; SMOOTH, CLEAR HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

CCAGJ2: 42 TO 80 CM; HORIZON MOIST; MATRIX MOIST 10YR 5/4; SILT LOAM; COMMON, FINE, DISTINCT MOTTLES; 10YR 6/2 MOTTLES; WEAK, FINE TO MEDIUM, GRANULAR STRUCTURE; VERY WEAK, VERY FINE TO FINE, GRANULAR SECONDARY STRUCTURE; NONSTICKY, VERY FRIABLE, SLIGHTLY PLASTIC CONSISTENCE; MODERATELY POROUS, VERY FEW, MICRO PORES; STRONG EFFERVESCENCE; VERY STRONGLY CALCAREOUS; HOMOGENEOUS ; SMOOTH, CLEAR HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

CKGJ: 80 TO 110 CM; HORIZON MOIST; MATRIX MOIST 10YR 6/4; SILT LOAM; COMMON, FINE, DISTINCT MOTTLES; 10YR 6/2 MOTTLES; WEAK, VERY FINE TO FINE, PLATY STRUCTURE STRATIFIED; VERY WEAK, VERY FINE TO FINE, GRANULAR SECONDARY STRUCTURE; NONSTICKY, VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; MODERATELY POROUS, VERY FEW, MICRO PORES; STRONG EFFERVESCENCE; STRONGLY CALCAREOUS; HOMOGENEOUS ; MILDLY ALKALINE 7.4-7.8 FIELD PH.

SWF MANITOBA 1980 PROFILE NO. 37

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
APK	7.7	4.72	0.33	7.2	4.2	2.8	38.2		39.3	14.0	0.2	0.7
AC	7.9	1.51	0.12	15.2	10.7	4.6	21.9		32.7	13.1	0.2	0.1
CCAGJ1	8.0			27.6	16.7	10.1	14.6		24.7	8.6	0.2	0.1
CCAGJ2	7.9			26.8	11.8	13.8	15.2		26.5	8.2	0.2	0.2
CKGJ	7.8			23.8	7.1	15.4	11.3		21.5	4.1	0.2	0.3

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR	WATER EXTRACT DETERMINATIONS CA	MG	NA	K	CO3	HCO3	CL	SO4	NO3
APK	1.6	55.0	11.1	7.8	1.3			4.0	2.1	10.4	
AC	0.9	43.0									
CCAGJ1	0.8	39.0									
CCAGJ2	0.6	40.0									
CKGJ	0.5	38.0									

PHYSICAL DATA (SURVEY)

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	PARTICLE SIZE ANALYSIS V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
APK						2	2	7	25	36		40	24	
AC						1	2	9	24	36		43	21	
CCAGJ1							2	3	20	25		52	23	
CCAGJ2								1	14	15		65	20	
CKGJ								2	36	38		55	7	

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PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY, (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
APK		33.5	13.6										
AC		28.4	11.1										
CCAGJ1		29.0	10.9										
CCAGJ2		31.9	9.8			23.0	31.0	18.0					ML
CKGJ		32.1	6.3										

SWF MANITOBA 1980 PROFILE NO. 38

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: VARIANT; DEVIATION(S): TEXTURE; EXTENSIVE; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: GLEYED REGO BLACK. MINERAL SOIL FAMILY: COARSE SILTY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: SWF.

LOCATION: MILITARY GRID REF. 14 ULN 4233 7570; NTS MAP AREA 63C ; SE 30 36 27 W.

CLIMATE: 336 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS VERY GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: CROPS-FIELD (MANAGED), SUMMERFALLOW.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, COARSE LOAMY AND COARSE SILTY (<18% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), LACUSTRINE, MIXED; LANDFORM CLASSIFICATION: LACUSTRINE, LOAMY, LEVEL; SLOPE: 0% SIMPLE SLOPE , FACING LEVEL; SOIL MOISTURE AND DRAINAGE: SUBHUMID, IMPERFECTLY DRAINED, MODERATELY PERVIOUS, SLOW SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND, DITCH DRAINED.

INTERPRETATIONS: CLI AGRICULTURE 2/W.

SPECIAL NOTES: SOME AHK EXTENDED BELOW AP IN PORTIONS OF PROFILE.IT WASN'T SAMPLED.SOLUM MORE SHALLOW THAN MODAL AND SOIL TEXTURES ARE LIGHTER THAN MODAL

APK: 0 TO 12 CM, RANGE 10 TO 20 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 3.5/1; VERY FINE SANDY LOAM; VERY WEAK, VERY FINE TO FINE, GRANULAR STRUCTURE; STRUCTURELESS, SINGLE GRAIN SECONDARY STRUCTURE; VERY FRIABLE, SOFT AND SLIGHTLY HARD, NONPLASTIC CONSISTENCE; FEW, FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, FINE, RANDOM, EXPED, CONTINUOUS PORES; STRONG EFFERVESCENCE; WEAKLY CALCAREOUS; HOMOGENEOUS ; WAVY, ABRUPT HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

AC1: 12 TO 27 CM, RANGE 10 TO 15 CM; HORIZON MOIST; MATRIX MOIST 10YR 4/2, MATRIX MOIST 10YR 3/3; VERY FINE SANDY LOAM; FEW, FINE, FAINT, 10YR 4/2 MOTTLES; VERY WEAK, VERY FINE TO FINE, GRANULAR STRUCTURE; STRUCTURELESS, SINGLE GRAIN SECONDARY STRUCTURE; VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; MODERATELY POROUS, FEW, VERY FINE, RANDOM, EXPED, CONTINUOUS PORES; STRONG EFFERVESCENCE; STRONGLY CALCAREOUS; HOMOGENEOUS ; WAVY, ABRUPT HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

AC2: 27 TO 40 CM; HORIZON MOIST; MATRIX MOIST 10YR 6/4; VERY FINE SANDY LOAM; COMMON, MEDIUM, DISTINCT MOTTLES; MEDIUM, DISTINCT, 10YR 6/3 MOTTLES; VERY WEAK, FINE, PLATY STRUCTURE; STRUCTURELESS, SINGLE GRAIN SECONDARY STRUCTURE; VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; MODERATELY POROUS, FEW, VERY FINE, RANDOM, EXPED, CONTINUOUS PORES; STRONG EFFERVESCENCE; VERY STRONGLY CALCAREOUS; HOMOGENEOUS ; SMOOTH, CLEAR HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

CKGJ: 40 TO 65 CM; HORIZON MOIST; MATRIX MOIST 10YR 6/6; LOAM; MANY, MEDIUM, DISTINCT MOTTLES; COMMON, MEDIUM, PROMINENT, 10YR 6/3 MOTTLES; STRUCTURELESS, MASSIVE STRUCTURE; STRUCTURELESS AND VERY WEAK, GRANULAR AND SINGLE GRAIN SECONDARY STRUCTURE STRATIFIED; VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; FEW, VERY FINE, RANDOM, EXPED, CONTINUOUS PORES; STRONG EFFERVESCENCE; VERY STRONGLY CALCAREOUS; HOMOGENEOUS ; SMOOTH, CLEAR HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

CKG: 65 TO 100 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 5/4; SILT LOAM; MANY, MEDIUM, PROMINENT MOTTLES; COMMON, MEDIUM, PROMINENT, 7.5YR AND 10YR 4/6 AND 6/3 MOTTLES; STRUCTURELESS, MASSIVE STRUCTURE; STRUCTURELESS AND VERY WEAK, GRANULAR AND SINGLE GRAIN SECONDARY STRUCTURE STRATIFIED; VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; FEW, VERY FINE, RANDOM, EXPED, CONTINUOUS PORES; STRONG EFFERVESCENCE; VERY STRONGLY CALCAREOUS; HOMOGENEOUS ; CLEAR HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

SWF MANITOBA 1980 PROFILE NO. 38

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
APK	7.9	3.54	0.25	5.4	3.5	1.8	24.8		32.3	11.9	0.8	0.2
AC1	8.1	0.70	0.05	22.5	16.8	5.3	9.7		24.2	9.8	0.4	0.1
AC2	8.1			33.0	19.0	12.9	6.9		23.5	7.0	0.8	0.1
CKGJ	8.0			33.1	16.0	15.8	7.2		34.2	8.6	0.2	0.1
CKG	7.9			29.4	9.6	18.3	8.9		21.3	6.2	0.4	0.1

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR	WATER EXTRACT DETERMINATIONS CA	MG	NA	K	CO3	HCO3	CL	SO4	NO3
APK	1.3	47.0									
AC1	1.4	35.0									
AC2	2.1	31.0	9.0	15.1	6.6			3.3	1.3	26.0	
CKGJ	1.0	34.0									
CKG	1.0	41.0									

PHYSICAL DATA (SURVEY)

HORIZON	PARTICLE SIZE ANALYSIS % PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
APK						1	2	5	60	68		16	16	
AC1						1	3	8	53	65		21	14	
AC2							1	3	54	58		28	14	
CKGJ							1	1	47	49		37	14	
CKG								1	39	40		51	9	

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PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
APK		34.2	11.7										
AC1		21.4	9.6										
AC2		19.2	7.0										
CKGJ		18.7	6.6			23.0	26.0	16.0					ML
CKG		19.8	6.0			25.0	27.0	18.0					ML

SPG MANITOBA 1980 PROFILE NO. 39

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: REGO HUMIC GLEYSOL. MINERAL SOIL FAMILY: SANDY/CLAYEY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COLD, SUBAQUIC. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: SPG.

LOCATION: MILITARY GRID REF. 14 ULN 4550 7420; NTS MAP AREA 63C ; NE 16 36 27 W.

CLIMATE: 333 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS VERY GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: GRASSES,FORBES AND SHRUBS, UNDISTURBED. KEY SPECIES LISTING: 1 SALIX - WILLOW, 2 CAREX - SEDGES. IMPROVED DRAINAGE-ASPE N ESTABLISHED.ANEMONE CAN,PET.PA,LOOSESTRIFE,SOWTHISTLE ROS.AC.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, SANDY, LACUSTRINE, MIXED; PARENT MATERIAL 2: UNSPECIFIED WEATHERING, CLAYEY (>35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL); LANDFORM CLASSIFICATION: LACUSTRINE, SANDY, VENEER; SLOPE: SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING LEVEL, SITE AT DEPRESSION POSITION; SOIL MOISTURE AND DRAINAGE: SUBAQUIC, POORLY DRAINED, RAPIDLY PERVIOUS, VERY SLOW SURFACE RUNOFF, PERCHED WATERTABLE; NONSTONY; NONROCKY; PRESENT LAND USE: NATURAL GRAZING, DITCH DRAINED; HUMUS-FORM: HUMIMOR.

SPECIAL NOTES: CCAG FLUCTUATES IRREGULARLY WITH THE WATERTABLE. 2CK2 IS LIKELY A POCKET OF A MORE TILL-LIKE INCLUSION IN A BASICALLY CLAY TILL,STONE FREE MATRIX.

FH: 2 TO 0 CM, RANGE 2 TO 2 CM; HORIZON MOIST; ABUNDANT, MICRO AND MEDIUM, EXPED ROOTS; INTERSTITIAL PORES; WEAK EFFERVESCENCE; SMOOTH, CLEAR HORIZON BOUNDARY.

AHKG1: 0 TO 12 CM, RANGE 10 TO 15 CM; HORIZON MOIST; MATRIX MOIST 10YR 1/1; LOAMY SAND; VERY WEAK, FINE, GRANULAR STRUCTURE; STRUCTURELESS, SINGLE GRAIN SECONDARY STRUCTURE; VERY FRIABLE CONSISTENCE; PLENTIFUL, FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, RANDOM, EXPED, INTERSTITIAL PORES; MODERATE EFFERVESCENCE; WEAKLY CALCAREOUS; WAVY, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

AHKG2: 12 TO 25 CM, RANGE 6 TO 20 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/1.5; LOAMY SAND; VERY WEAK, FINE, GRANULAR STRUCTURE; STRUCTURELESS, SINGLE GRAIN SECONDARY STRUCTURE; VERY FRIABLE CONSISTENCE; PLENTIFUL, FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, RANDOM, EXPED, INTERSTITIAL PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; WAVY, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

AC: 25 TO 36 CM, RANGE 4 TO 10 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 3/2; LOAMY SAND; STRUCTURELESS, SINGLE GRAIN STRUCTURE; VERY FRIABLE CONSISTENCE; FEW, FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, RANDOM, EXPED, INTERSTITIAL PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; WAVY, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKG1: 36 TO 55 CM, RANGE 10 TO 22 CM; HORIZON MOIST; MATRIX MOIST 10YR 5/6; SAND; STRUCTURELESS, SINGLE GRAIN STRUCTURE; LOOSE CONSISTENCE; FEW, FINE, VERTICAL, EXPED ROOTS; HIGHLY POROUS, RANDOM, EXPED, INTERSTITIAL PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; IRREGULAR, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CCAG: 55 TO 60 CM, RANGE 3 TO 11 CM; HORIZON MOIST; MATRIX MOIST 10YR 7/1; CLAY LOAM; WEAK, FINE TO MEDIUM, GRANULAR STRUCTURE; VERY FRIABLE CONSISTENCE; VERY FEW, FINE, OBLIQUE, EXPED ROOTS; SLIGHTLY POROUS, RANDOM, EXPED, INTERSTITIAL PORES; STRONG EFFERVESCENCE; VERY STRONGLY CALCAREOUS; IRREGULAR, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKG2: 60 TO 95 CM; HORIZON MOIST; MATRIX MOIST 10YR 5/4; GRITTY SAND; MANY, MEDIUM, PROMINENT, 7.5YR 4/6 MOTTLES; STRUCTURELESS, SINGLE GRAIN STRUCTURE; LOOSE CONSISTENCE; VERY FEW, VERY FINE, VERTICAL, EXPED ROOTS; HIGHLY POROUS, EXPED, INTERSTITIAL PORES; IRON-MANGANESE CONCRETIONS LOCATED THROUGHOUT MATRIX ; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

2CKG1: 95 TO 115 CM; HORIZON MOIST; MATRIX MOIST 5Y 4/1; SILTY CLAY; STRUCTURELESS, MASSIVE STRUCTURE; MODERATE, FINE TO MEDIUM, GRANULAR SECONDARY STRUCTURE; FIRM, VERY PLASTIC CONSISTENCE; SLIGHTLY POROUS, EXPED, INTERSTITIAL PORES; MODERATE

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EFFERVESCENCE; STRONGLY CALCAREOUS; IRREGULAR, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

2CKG2: 115 CM; HORIZON MOIST; MATRIX MOIST 7.5YR 6/2; SILTY CLAY; MANY, MEDIUM, PROMINENT, 7.5YR 4/6 MOTTLES; FEW, MEDIUM, FAINT, 10YR 5/3 MOTTLES; STRUCTURELESS, MASSIVE STRUCTURE; WEAK, FINE, GRANULAR SECONDARY STRUCTURE; FIRM, VERY PLASTIC CONSISTENCE; SLIGHTLY POROUS, EXPED, INTERSTITIAL PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS AND VERY STRONGLY CALCAREOUS; 10% ANGULAR GRAVELLY AND ANGULAR COBBLY COARSE FRAGMENTS; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
FH												
AHKG1	7.8	2.95	0.20	3.2	1.6	1.5	22.3		22.8	10.3	0.2	0.1
AHKG2	7.7	0.85	0.60	10.8	6.0	4.4	12.0		23.0	7.8	0.2	0.1
AC	7.8	0.46	0.03	10.9	5.2	5.2	7.2		16.7	4.1	0.2	0.1
CKG1	7.7			18.2	8.3	9.1	4.6		15.7	2.5	0.2	0.1
CCAG	7.8			35.2	25.3	9.1	19.8		32.3	9.0	0.2	0.3
CKG2	7.8			19.2	10.4	8.2	5.5		18.2	2.1	0.2	0.2
2CKG1	7.7			18.8	7.9	10.0	31.8		34.0	11.5	0.4	0.2
2CKG2	7.7			39.0	22.0	15.7	17.2		28.7	7.0	0.4	0.2

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
FH		
AHKG1	1.2	34.0
AHKG2	0.9	25.0
AC	0.8	20.0
CKG1	0.6	20.0
CCAG	0.8	53.0
CKG2	0.5	21.0
2CKG1	0.6	71.0
2CKG2	0.5	55.0

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PHYSICAL DATA (SURVEY)

	PARTICLE SIZE ANALYSIS													
	% PASSING										% OF SAMPLE			
HORIZON	3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
FH														
AHKG1					4	10	26	32	9	81		8	11	
AHKG2				99	2	11	28	33	8	82		8	10	
AC				96	2	9	32	38	7	88		5	7	
CKG1				98	4	13	36	34	5	92		4	4	
CCAG				99	1	4	10	6	4	25		38	37	
CKG2				99	2	11	28	45	7	93		4	3	
2CKG1				93						9		42	49	
2CKG2				98	1	1	2	4	5	13		42	45	

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
FH													
AHKG1		19.2	9.8										
AHKG2		12.8	6.0										
AC		8.0	5.2										
CKG1		5.7	2.9									24	06
CCAG		33.6	15.1										
CKG2		7.2	3.5										
2CKG1		40.9	22.7			23.0	60.0	8.0					CH
2CKG2		30.6	16.1										

AUG 07, 1986

DKS MANITOBA 1980 PROFILE NO. 40

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. VERY LIMITED EXTENT; SURVEY REPORT NO. D37.

CLASSIFICATION: SUBGROUP: GLEYED DARK GRAY. MINERAL SOIL FAMILY: SANDY/LOAMY, MIXED NONCLAY, NEUTRAL, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: DKS.

LOCATION: MILITARY GRID REF. 14 ULN 4635 7546; NTS MAP AREA 63C ; NW 22 36 27 W.

CLIMATE: 332 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS VERY GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: FOREST,HARDWOOD, MATURE. KEY SPECIES LISTING: 1 POPULUS TREMULOIDES - TREMBLING ASPEN, 2 AMELANCHIER - JUNEBERRY OR SHADBUSH, 3 VIBURNUM - HIGH BUSH CRANBERRY,SQUASHBERRY. CORYLUS.SASKATOON.ROSA,VICIA,BEDSTRAW,THALICTRUM,GRASSES,PET.PALM,RUSH ASTER..

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, SANDY, LACUSTRINE, MIXED; PARENT MATERIAL 2: UNSPECIFIED WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL), MIXED; LANDFORM CLASSIFICATION: LACUSTRINE, SANDY, VENEER; SLOPE: SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING LEVEL; SOIL MOISTURE AND DRAINAGE: SUBHUMID, MODERATELY WELL DRAINED, RAPIDLY PERVIOUS, SLOW SURFACE RUNOFF, SEEPAGE ABSENT; SLIGHTLY STONY; NONROCKY; PRESENT LAND USE: PRODUCTIVE WOODLAND; HUMUS-FORM: DECIDUO AND GRANULO.

SPECIAL NOTES: LH HORIZON SAMPLED FROM BUSH SITE NEXT TO GRASS OPENING. IT HAS A PRONOUCED MINERAL ORGANIC GRANULAR STRUCTURE. ANT ACTIVITY HAS MIXED SOME MINERAL AH IN WITH LH HORIZON.

LH: 5 TO 0 CM; MATRIX MOIST 5YR 2.5/1, MATRIX MOIST 10YR 2/2; PLENTIFUL, VERY FINE AND MEDIUM, RANDOM, EXPED ROOTS; HIGHLY POROUS; SMOOTH, ABRUPT HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

AHE: 0 TO 15 CM, RANGE 10 TO 18 CM; MATRIX MOIST 10YR 3/1.5, MATRIX DRY 10YR 4/2; LOAMY FINE SAND; VERY WEAK, FINE, GRANULAR STRUCTURE; STRUCTURELESS, VERY FINE TO FINE, SINGLE GRAIN SECONDARY STRUCTURE; NONSTICKY, VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; PLENTIFUL, MICRO AND VERY FINE, RANDOM, EXPED ROOTS; HIGHLY POROUS, MANY, FINE, OBLIQUE, EXPED, DISCONTINUOUS PORES; WAVY, CLEAR HORIZON BOUNDARY; MEDIUM ACID 5.6-6.0 FIELD PH.

BMGJ: 15 TO 50 CM, RANGE 30 TO 40 CM; MATRIX MOIST 10YR 3/3, MATRIX DRY 10YR 3.5/3; FINE SAND; COMMON, MEDIUM, FAINT, 7.5YR AND 10YR 4/4 AND 3/1 MOTTLES; WEAK, FINE, GRANULAR STRUCTURE; STRUCTURELESS, VERY FINE TO FINE, SINGLE GRAIN SECONDARY STRUCTURE; NONSTICKY, VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; FEW, VERY FINE, OBLIQUE, EXPED ROOTS; HIGHLY POROUS; WAVY, CLEAR HORIZON BOUNDARY; MEDIUM ACID 5.6-6.0 FIELD PH.

CGJ: 50 TO 80 CM; MATRIX MOIST 10YR 4/4, MATRIX DRY 10YR 5/6; VERY FINE SAND; MANY, FINE, DISTINCT MOTTLES; 7.5YR AND 10YR 4/2 AND 4/6 MOTTLES; STRUCTURELESS, FINE TO MEDIUM, SINGLE GRAIN STRUCTURE; NONSTICKY, VERY FRIABLE, LOOSE, NONPLASTIC CONSISTENCE; VERY FEW, VERY FINE, OBLIQUE, EXPED ROOTS; HIGHLY POROUS; SMOOTH, CLEAR HORIZON BOUNDARY; MEDIUM ACID 5.6-6.0 FIELD PH.

2CKGJ: 80 TO 100 CM; MATRIX MOIST 10YR 5/6, MATRIX DRY 10YR 6/6; FINE SANDY LOAM; WEAK TO MODERATE, PLATY STRUCTURE LAMINATED; WEAK, FINE TO MEDIUM, GRANULAR SECONDARY STRUCTURE LAMINATED; NONSTICKY, FRIABLE, HARD, NONPLASTIC CONSISTENCE; MODERATELY POROUS; MODERATE EFFERVESCENCE; VERY STRONGLY CALCAREOUS; 20% GRAVELLY AND COBBLY AND FLAGGY COARSE FRAGMENTS; MILDLY ALKALINE 7.4-7.8 FIELD PH.

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CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
LH	7.2	23.33	0.98				10.0		78.9	58.2	16.0	0.1	1.2
AHE	5.9	4.87	0.31				4.3		27.6	20.9	5.2	0.1	0.6
BMGJ	5.8	0.53	0.06				2.8		9.2	5.6	1.2		0.4
CGJ	6.0						1.8		6.7	3.3	1.1		0.1
2CKGJ	7.5			25.9	11.1	13.6			5.3	25.2	2.0	0.1	0.1

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
LH	1.2	200.0
AHE	0.7	68.0
BMGJ	0.2	33.0
CGJ	0.1	29.0
2CKGJ	0.3	25.0

PHYSICAL DATA (SURVEY)

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	PARTICLE SIZE ANALYSIS V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
LH														
AHE						1	6	34	46	87		8	5	
BMGJ						1	5	38	48	92		5	3	
CGJ						1	4	39	50	94		4	2	
2CKGJ				69	7	6	9	22	20	64		29	7	

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PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
LH													
AHE		19.3	10.4										
BMGJ		10.6	3.5									24	07
CGJ													
2CKGJ		14.9	4.4										

MEH MANITOBA 1980 PROFILE NO. 41

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; LIMITED EXTENT; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: REGO BLACK. MINERAL SOIL FAMILY: COARSE LOAMY, MIXED NONCLAY, ALKALINE, EXTREMELY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: MEH. SOIL PHASES: MODERATELY STONY.

LOCATION: MILITARY GRID REF. 14 ULN 4320 7361; NTS MAP AREA 63C ; SW 17 36 27 W.

CLIMATE: 336 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS VERY GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, COARSE LOAMY AND COARSE SILTY (<18% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL), MIXED; LANDFORM CLASSIFICATION: MORAINAL, LOAMY, LEVEL; SLOPE: SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING LEVEL; SOIL MOISTURE AND DRAINAGE: SUBHUMID, MODERATELY WELL DRAINED, MODERATELY PERVIOUS, SLOW SURFACE RUNOFF, SEEPAGE ABSENT; MODERATELY STONY; NONROCKY; PRESENT LAND USE: CROPLAND.

INTERPRETATIONS: CLI AGRICULTURE 3/P.

SPECIAL NOTES: WATERWORKING AND THIN LACUSTRINE DEPOSITION RESULTS IN FAIRLY STONEFREE SURFACE AND A CONCENTRATION OF COBBLE AT THE UPPER CONTACT OF THE TILL.IN MOST CASES THE TILL IS ONLY MODERATELY COBBLY AND STONY,THE WORST CONDITION BEING AT THE WATERWORKED SURFACE.

APK: 0 TO 18 CM, RANGE 16 TO 20 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1; VERY FINE SANDY LOAM; WEAK, FINE, GRANULAR STRUCTURE; VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, MANY, FINE, RANDOM, DISCONTINUOUS PORES; VERY WEAK EFFERVESCENCE; WEAKLY CALCAREOUS; HOMOGENEOUS ; WAVY, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

AC: 18 TO 30 CM, RANGE 12 TO 15 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/3; GRAVELLY SANDY LOAM; VERY WEAK, FINE, GRANULAR STRUCTURE; STRUCTURELESS, FINE TO MEDIUM, SINGLE GRAIN SECONDARY STRUCTURE; VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; PLENTIFUL, FINE, HORIZONTAL, EXPED ROOTS; HIGHLY POROUS, MANY, COARSE, RANDOM, CONTINUOUS PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; HOMOGENEOUS ; 60% ANGULAR GRAVELLY COARSE FRAGMENTS; WAVY, ABRUPT HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

CCA: 30 TO 50 CM, RANGE 20 TO 25 CM; HORIZON MOIST; MATRIX MOIST 10YR 7/4; LOAM; WEAK, FINE, PLATY STRUCTURE; VERY WEAK, FINE, GRANULAR SECONDARY STRUCTURE; VERY FRIABLE, SLIGHTLY HARD, NONPLASTIC CONSISTENCE; MODERATELY POROUS, FEW, VERY FINE, VERTICAL PORES; STRONG EFFERVESCENCE; VERY STRONGLY CALCAREOUS; HOMOGENEOUS ; 10% ANGULAR COBBLY AND STONY (BOULDERY) COARSE FRAGMENTS; WAVY, CLEAR HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

CK1: 50 TO 100 CM; HORIZON MOIST; MATRIX MOIST 10YR 5/4; FINE SANDY LOAM; FEW, FINE, FAINT MOTTLES; WEAK, FINE TO MEDIUM, PLATY STRUCTURE; VERY WEAK, FINE, GRANULAR SECONDARY STRUCTURE; VERY FRIABLE, SLIGHTLY HARD, NONPLASTIC CONSISTENCE; MODERATELY POROUS, VERY FEW, VERY FINE, VERTICAL PORES; STRONG EFFERVESCENCE; VERY STRONGLY CALCAREOUS; HOMOGENEOUS ; 10% ANGULAR COBBLY AND STONY (BOULDERY) COARSE FRAGMENTS; SMOOTH, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CK2: 100 CM; HORIZON MOIST; MATRIX MOIST 10YR 5/4; FINE SANDY LOAM; WEAK, FINE TO MEDIUM, PLATY STRUCTURE; VERY WEAK, FINE, GRANULAR SECONDARY STRUCTURE; VERY FRIABLE, SLIGHTLY HARD, NONPLASTIC CONSISTENCE; MODERATELY POROUS, VERY FEW, VERY FINE, VERTICAL PORES; STRONG EFFERVESCENCE; STRONGLY CALCAREOUS; HOMOGENEOUS ; 10% ANGULAR COBBLY AND STONY (BOULDERY) COARSE FRAGMENTS; MILDLY ALKALINE 7.4-7.8 FIELD PH.

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CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
APK	7.7	4.42	0.29	1.9	0.2	1.6	1.0	29.2		31.2	4.9	0.2	0.1
AC	7.9	1.22	0.11	17.3	6.3	10.2		11.7		22.7	2.9	0.2	0.1
CCA	8.0			39.4	28.3	10.2		5.9		25.0	3.3	0.2	0.1
CK1	7.8			27.8	13.5	13.2		4.1		20.0	3.3	0.4	0.2
CK2	7.7			21.2	6.8	13.2		3.6		17.7	2.5	0.2	0.1

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
APK	0.4	48.0
AC	0.4	31.0
CCA	1.0	34.0
CK1	0.9	24.0
CK2	0.7	22.0

PHYSICAL DATA (SURVEY)

HORIZON	PARTICLE SIZE ANALYSIS % PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
APK				98	1	3	8	20	39	71		18	11	
AC				22	5	9	18	23	21	76		13	11	
CCA				80	3	4	7	15	20	49		28	23	
CK1				70	3	4	7	21	24	59		29	12	
CK2				62	3	4	6	21	29	63		31	6	

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PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
APK		35.7	10.4										
AC		15.6	6.7										
CCA													
CK1						15.0	17.0	11.0					SM
CK2		13.8	3.0										

BAM MANITOBA 1980 PROFILE NO. 42

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: VARIANT; DEVIATION(S): TEXTURE; VERY LIMITED EXTENT; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: REGO HUMIC GLEYSOL. MINERAL SOIL FAMILY: FINE LOAMY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COLD, SUBAQUIC. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: BAM.

LOCATION: MILITARY GRID REF. 14 ULN 4454 7117; NTS MAP AREA 63C ; SW 9 36 27 W.

CLIMATE: 338 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS VERY GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: CROPS-FIELD (MANAGED), SUMMERFALLOW.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY) AND STRATIFIED (MINERAL), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), LACUSTRINE; LANDFORM CLASSIFICATION: LACUSTRINE, LOAMY, LEVEL; SLOPE: SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING LEVEL; SOIL MOISTURE AND DRAINAGE: SUBAQUIC, POORLY DRAINED, MODERATELY PERVIOUS, VERY SLOW SURFACE RUNOFF, SEEPAGE ABSENT, 1.3 M TO APPARENT WATERTABLE; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

INTERPRETATIONS: CLI AGRICULTURE 3/W.

SPECIAL NOTES: DARK BURIED LAYERS OCCUR IN SUBSOIL IN A SEQUENCE THAT COULD REFLECT A BURIED SURFACE.THERE IS TEXTURAL STRATIFICATION FROM SANDY TO CLAYEY IN SUBSOIL. THE SURFACE 60CM IS NORMAL BALMORAL BUT A CLAYEY LAYER AND THE TREND TO COARSER SUBSTRATA ARE NOT MODAL.CARBONATE LEVELS OF THIS PARENT MATERIAL ARE LOWER THAN MODAL BAM FROM INTERLAKE BUT LIKELY TYPICAL OF SWAN RIVER AREA.

AP: 0 TO 20 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1; SILTY CLAY LOAM; MODERATE, FINE TO MEDIUM, GRANULAR STRUCTURE; STICKY, FRIABLE, SLIGHTLY HARD CONSISTENCE; VERY FEW, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, RANDOM, EXPED, DISCONTINUOUS PORES; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

AHKG: 20 TO 30 CM, RANGE 8 TO 12 CM; HORIZON MOIST; MATRIX MOIST 5Y 2.5/1; SILTY CLAY LOAM; STRUCTURELESS, MASSIVE STRUCTURE; MODERATE, FINE TO MEDIUM, GRANULAR SECONDARY STRUCTURE; STICKY, FIRM, HARD CONSISTENCE; VERY FEW, VERY FINE, RANDOM, EXPED ROOTS; SLIGHTLY POROUS, VERY FEW, MICRO, EXPED, DISCONTINUOUS PORES; VERY WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; WAVY, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKG1: 30 TO 60 CM, RANGE 23 TO 30 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4/2; SILTY CLAY LOAM; FEW, COARSE, DISTINCT, 10YR 3/3 MOTTLES; STRUCTURELESS, MASSIVE STRUCTURE; WEAK TO MODERATE, FINE TO MEDIUM, GRANULAR SECONDARY STRUCTURE; STICKY, FRIABLE, SLIGHTLY HARD CONSISTENCE; VERY FEW, VERY FINE, RANDOM, EXPED ROOTS; SLIGHTLY POROUS, VERY FEW, MICRO, EXPED, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKG2: 60 TO 80 CM, RANGE 18 TO 20 CM; HORIZON MOIST; MATRIX MOIST 5Y 3/1; CLAY; FEW, FINE, DISTINCT, 7.5YR 4/6 MOTTLES; STRUCTURELESS, MASSIVE STRUCTURE; MODERATE, MEDIUM, GRANULAR SECONDARY STRUCTURE; VERY STICKY, FIRM, VERY HARD CONSISTENCE; VERY FEW, VERY FINE, RANDOM, EXPED ROOTS; SLIGHTLY POROUS, VERY FEW, MICRO, EXPED, DISCONTINUOUS PORES; WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKG3: 80 TO 95 CM; HORIZON MOIST; MATRIX MOIST 5Y 2.5/1; SANDY CLAY LOAM; FEW MOTTLES; STRUCTURELESS, MASSIVE STRUCTURE; WEAK TO MODERATE, FINE TO MEDIUM, GRANULAR SECONDARY STRUCTURE; STICKY, FRIABLE, SLIGHTLY HARD CONSISTENCE; SLIGHTLY POROUS, VERY FEW, MICRO, EXPED, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; WEAKLY CALCAREOUS; SMOOTH, CLEAR HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

CKG4: 95 TO 110 CM; HORIZON MOIST; MATRIX MOIST 5Y 3/2; LOAMY VERY FINE SAND; COMMON MOTTLES; FEW, MEDIUM, FAINT, 7.5YR 3/2 MOTTLES; STRUCTURELESS, MASSIVE STRUCTURE; FINE, GRANULAR SECONDARY STRUCTURE; SLIGHTLY STICKY, FRIABLE, SLIGHTLY HARD CONSISTENCE; MODERATELY POROUS, COMMON, FINE, EXPED, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; WEAKLY CALCAREOUS; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKG5: 110 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4/2; VERY FINE SAND; MANY, FINE, PROMINENT, 7.5YR 4/6 MOTTLES; STRUCTURELESS,

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SINGLE GRAIN STRUCTURE; SLIGHTLY STICKY, VERY FRIABLE, SOFT CONSISTENCE; HIGHLY POROUS, COMMON, MEDIUM, EXPED, CONTINUOUS PORES; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	7.6	8.55	0.66				1.0	66.7		49.0	16.8	0.4	0.9
AHKG	7.6	1.14	0.41	9.5	0.2	8.5		50.1		42.2	16.4	0.4	0.5
CKG1	7.7			22.1	7.6	13.3		32.3		30.3	14.1	0.6	0.5
CKG2	7.8			9.5	3.7	5.3		41.9		33.8	20.4	1.3	0.7
CKG3	8.0			1.2				24.3		24.2	11.2	1.0	0.3
CKG4	7.8			1.9	0.1	1.6		11.5		16.2	5.3	0.7	0.3
CKG5	7.9			10.2	4.8	5.0		7.1		23.6	3.7	0.6	0.2

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.5	79.0
AHKG	0.4	72.0
CKG1	0.6	58.0
CKG2	0.6	70.0
CKG3	1.0	46.0
CKG4	1.2	28.0
CKG5	0.8	29.0

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PHYSICAL DATA (SURVEY)

	PARTICLE SIZE ANALYSIS													
	% PASSING					% OF SAMPLE								
HORIZON	3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AP						1	1	3	9	14		46	40	
AHKG							1	4	11	16		48	36	
CKG1										8		61	31	
CKG2							1	6	15	22		30	48	
CKG3						1	2	19	48	70		7	23	
CKG4							2	20	66	88		5	7	
CKG5							2	17	70	89		5	6	

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP		55.7	27.0										
AHKG		53.0	23.2										
CKG1						25.0	51.0	13.0					CH
CKG2		43.8	23.0			27.0	66.0	14.0					CH
CKG3						18.0	32.0	12.0					SC
CKG4		21.2	5.2										
CKG5													

MNT MANITOBA 1980 PROFILE NO. 43

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; LIMITED EXTENT; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: REGO HUMIC GLEYSOL. MINERAL SOIL FAMILY: SANDY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COLD, PERHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: MNT.

LOCATION: MILITARY GRID REF. 14 ULN 4105 7670; NTS MAP AREA 63C ; SW 30 36 27 W.

CLIMATE: 342 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS VERY GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, SANDY, MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), LACUSTRINE, MIXED; LANDFORM CLASSIFICATION: LACUSTRINE, SANDY, LEVEL; SLOPE: SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING LEVEL; SOIL MOISTURE AND DRAINAGE: PERHUMID, POORLY DRAINED, RAPIDLY PERVIOUS, VERY SLOW SURFACE RUNOFF, SEEPAGE ABSENT, 0.9 M TO APPARENT WATERTABLE; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND, DITCH DRAINED.

SPECIAL NOTES: CKG2 HORIZON SEPARATED ON BASIS OF FE-MN CONCRETIONS.PLOW LAYER CONSISTS MAINLY OF HUMIC FEN PEAT MIXED WITH SOME VFS.FEW SCATTERED COBBLES OCCUR THROUGH HALF OF SOLUM.

OPKG: 0 TO 18 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1; MUCKY FINE SANDY LOAM; VERY WEAK, FINE TO MEDIUM, GRANULAR STRUCTURE; SLIGHTLY STICKY, VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; PLENTIFUL, VERY FINE AND FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, RANDOM, EXPED, DISCONTINUOUS PORES; WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; HOMOGENEOUS ; SMOOTH, ABRUPT HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

AHKG: 18 TO 45 CM, RANGE 20 TO 30 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX MOIST 10YR 3/1; MUCKY FINE SANDY LOAM; FEW, FINE, FAINT MOTTLES; 7.5YR 4/2 MOTTLES; VERY WEAK, VERY FINE TO FINE, GRANULAR STRUCTURE; STRUCTURELESS, SINGLE GRAIN SECONDARY STRUCTURE; NONSTICKY, VERY FRIABLE, LOOSE, NONPLASTIC CONSISTENCE; HIGHLY POROUS, MANY, VERY FINE, RANDOM, EXPED, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; HOMOGENEOUS ; WAVY, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CCAG1: 45 TO 56 CM, RANGE 8 TO 12 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 5/2; LOAMY FINE SAND; FEW, MEDIUM, DISTINCT, 7.5YR 5/6 MOTTLES; VERY WEAK, FINE, GRANULAR STRUCTURE; STRUCTURELESS, SINGLE GRAIN SECONDARY STRUCTURE; NONSTICKY, VERY FRIABLE, LOOSE, NONPLASTIC CONSISTENCE; HIGHLY POROUS, MANY, VERY FINE, RANDOM, EXPED, DISCONTINUOUS PORES; STRONG EFFERVESCENCE; STRONGLY CALCAREOUS; HOMOGENEOUS ; WAVY, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CCAG2: 56 TO 85 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 6/4; FINE SAND; MANY, MEDIUM, PROMINENT, 5YR 4/6 MOTTLES; 10YR 7/2 MOTTLES; STRUCTURELESS, SINGLE GRAIN STRUCTURE; NONSTICKY, LOOSE, LOOSE, NONPLASTIC CONSISTENCE; HIGHLY POROUS, MANY, VERY FINE, RANDOM, EXPED, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; HOMOGENEOUS ; SMOOTH, GRADUAL HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKG2: 85 TO 120 CM; HORIZON WET; MATRIX MOIST 2.5Y 5/4; FINE SAND; MANY, MEDIUM, PROMINENT, 10YR 5/6 MOTTLES; STRUCTURELESS, SINGLE GRAIN STRUCTURE; NONSTICKY, LOOSE, LOOSE, NONPLASTIC CONSISTENCE; HIGHLY POROUS, MANY, VERY FINE, RANDOM, EXPED, DISCONTINUOUS PORES; COMMON, MEDIUM, IRREGULAR IRON-MANGANESE CONCRETIONS LOCATED LOCAL CONCENTRATIONS (10R 2/1); MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; HOMOGENEOUS ; MILDLY ALKALINE 7.4-7.8 FIELD PH.

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CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	PYRO EXTR C-%	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
OPKG	7.9	16.67	49.5	0.96	7.4	4.6	2.6	64.8		69.5	16.8	1.3	0.1
AHKG	7.8	2.51		0.17	10.5	8.8	1.6	8.2		33.0	4.5	0.6	0.1
CCAG1	7.8				18.9	14.0	4.5	3.3		21.2	2.5	0.8	
CCAG2	7.8				19.3	12.6	6.2	2.4		19.5	1.2	0.4	
CKG2	7.8				13.0	4.9	7.5	2.0		10.0	0.4	0.4	

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR	WATER EXTRACT DETERMINATIONS CA	MG	NA	K	CO3	HCO3	CL	SO4	NO3
OPKG	0.6	107.0									
AHKG	1.7	38.0	17.3	7.5	0.9			1.8	0.6	19.9	
CCAG1	0.8	29.0									
CCAG2	0.4	26.0									
CKG2	0.3	31.0									

PHYSICAL DATA (SURVEY)

HORIZON	RUB FIB %	UNRUB FIBRE %	% ASH	PARTICLE SIZE ANALYSIS % PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
OPKG	6	18	62							4	48	18	70		20	10	
AHKG										4	52	20	76		10	14	
CCAG1										4	63	17	84		6	10	
CCAG2										1	43	45	89		5	6	
CKG2										1	57	39	97		3	0	

MNT MANITOBA 1980 PROFILE NO. 43

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
OPKG		64.3	33.5										
AHKG		21.3	8.0									24	18
CCAG1		10.8	5.2										
CCAG2		7.9	2.1										
CKG2		3.7	1.6									24	07

AUG 07, 1986

FOY MANITOBA 1980 PROFILE NO. 44

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; VERY LIMITED EXTENT; SURVEY REPORT NO. 037.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: REGO HUMIC GLEYSOL. MINERAL SOIL FAMILY: COARSE SILTY, CARBONATIC, ALKALINE, EXTREMELY CALCAREOUS, COLD, PERHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: FOY.

LOCATION: MILITARY GRID REF. 14 ULN 4119 7645; NTS MAP AREA 63C ; SW 30 36 27 W.

CLIMATE: 342 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS VERY GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, COARSE LOAMY AND COARSE SILTY (<18% CLAY), EXTREMELY CALCAREOUS (>40% CACO3), LACUSTRINE, MIXED; LANDFORM CLASSIFICATION: LACUSTRINE, SILTY, LEVEL; SLOPE: SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING LEVEL; SOIL MOISTURE AND DRAINAGE: PERHUMID, POORLY DRAINED, MODERATELY PERVIOUS, VERY SLOW SURFACE RUNOFF, SEEPAGE ABSENT, 1.1 M TO APPARENT WATERTABLE; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND, DITCH DRAINED; HUMUS-FORM: HUMIC, CALCAREOUS, THIN.

INTERPRETATIONS: CLI AGRICULTURE 3/W.

SPECIAL NOTES: AHKG HORIZON IS HIGH IN CARBONATES WITH SOME ORGANIC MATTER.RGANIC MATTER IS HIGHER NEAR CONTACT WITH PEAT,A VERY THIN AH.A SECOND CCAG HORIZON IS THIN AND DISCONTINUOUS AT .8M AND REFLECTS A DOWNWARD SHIFT IN AVERAGE GROUND WATER FLUCTUATION.SOIL WAS SATURATED AT 1.1M.

OPK: 0 TO 25 CM; HORIZON MOIST; MATRIX MOIST 5YR 2.5/1; MUCKY ORGANIC; MODERATE, MEDIUM TO COARSE, SUBANGULAR BLOCKY STRUCTURE; VERY WEAK, FINE TO MEDIUM, SUBANGULAR BLOCKY AND GRANULAR SECONDARY STRUCTURE; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

AHKG: 25 TO 45 CM, RANGE 10 TO 30 CM; HORIZON MOIST; MATRIX MOIST 5Y 2.5/1; LOAM; FEW, MEDIUM, DISTINCT, 2.5Y 4/4 MOTTLES; WEAK TO MODERATE, PLATY STRUCTURE; WEAK, FINE, GRANULAR SECONDARY STRUCTURE; STRONG EFFERVESCENCE; EXTREMELY CALCAREOUS; IRREGULAR, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CCAG1: 45 TO 60 CM, RANGE 8 TO 20 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 5/2; LOAM; FEW, FINE, PROMINENT, 7.5YR 5/8 MOTTLES; STRUCTURELESS, MASSIVE STRUCTURE; WEAK, FINE TO MEDIUM, GRANULAR SECONDARY STRUCTURE; MODERATE EFFERVESCENCE; VERY STRONGLY CALCAREOUS; IRREGULAR, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKG1: 60 TO 80 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4/2; SILT LOAM; MANY, FINE, PROMINENT, 10YR 5/6 MOTTLES; STRUCTURELESS, MASSIVE STRUCTURE; VERY WEAK, FINE, GRANULAR SECONDARY STRUCTURE; WEAK EFFERVESCENCE; STRONGLY CALCAREOUS; SMOOTH AND IRREGULAR, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CCAG2: 80 TO 85 CM; HORIZON MOIST; MATRIX MOIST 5Y 4/1; LOAM; WEAK TO MODERATE, PLATY STRUCTURE; WEAK, FINE, GRANULAR SECONDARY STRUCTURE; STRONG EFFERVESCENCE; EXTREMELY CALCAREOUS; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKG2: 85 TO 120 CM; HORIZON WET; MATRIX MOIST 2.5Y 6/2; LOAM; MANY, FINE, PROMINENT, 10YR 5/6 MOTTLES; STRUCTURELESS, MASSIVE STRUCTURE; STRUCTURELESS, FINE TO MEDIUM, GRANULAR SECONDARY STRUCTURE; WEAK EFFERVESCENCE; STRONGLY CALCAREOUS; MILDLY ALKALINE 7.4-7.8 FIELD PH.

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CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	PYRO EXTR C-%	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
OPK	7.7	34.72	96.5	1.96	12.3	10.5	1.6	1.5	155.2		143.8	32.8	1.1	0.1
AHKG	7.7	1.88		0.13	40.1	30.2	9.1		16.2		33.0	4.1	0.6	0.1
CCAG1	7.7				25.7	13.8	11.0		10.3		24.0	3.3	0.4	0.2
CKG1	7.6				22.2	6.7	14.3		11.9		35.5	7.0	0.4	0.2
CCAG2	7.8				40.9	32.2	8.0		15.4		29.0	3.7	0.2	0.1
CKG2	7.7				17.3	0.7	15.3		14.9		12.7	4.5	0.2	0.2

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
OPK	1.3	268.0
AHKG	1.0	45.0
CCAG1	0.6	34.0
CKG1	0.6	37.0
CCAG2	0.8	56.0
CKG2	0.6	40.0

PHYSICAL DATA (SURVEY)

HORIZON	RUB FIB %	UNRUB FIBRE %	% ASH	PARTICLE SIZE ANALYSIS % PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
OPK	8	26	30							2	5	32	39		36	25	
AHKG										2	6	40	48		37	15	
CCAG1										1	5	30	36		53	11	
CKG1								1	2	2	10	21	36		41	23	
CCAG2											2	35	37		49	14	
CKG2																	

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PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
OPK													
AHKG		34.0	13.6										
CCAG1													
CKG1						25.0	26.0	21.0					ML
CCAG2		38.9	15.3										
CKG2						27.0	29.0	24.0					ML

CGD MANITOBA 1980 PROFILE NO. 45

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: VARIANT; DEVIATION(S): TEXTURE; LIMITED EXTENT; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: GLEYED REGO BLACK. MINERAL SOIL FAMILY: COARSE LOAMY, CARBONATIC, ALKALINE, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: CGD.

LOCATION: MILITARY GRID REF. 14 ULN 5007 7097; NTS MAP AREA 63C ; SE 12 36 27 W.

CLIMATE: 330 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS VERY GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, COARSE LOAMY AND COARSE SILTY (<18% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), LACUSTRINE, MIXED; PARENT MATERIAL 2: WEAK CHEMICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), EXTREMELY CALCAREOUS (>40% CACO3), MORAINAL (TILL), LIMESTONE; LANDFORM CLASSIFICATION: LACUSTRINE, LOAMY, VENEER; SLOPE: SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING LEVEL; SOIL MOISTURE AND DRAINAGE: SUBHUMID, IMPERFECTLY DRAINED, MODERATELY PERVIOUS, SLOW SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: ANALYSIS OF THIS SITE SHOULD BE CHECKED RE PSD,IN SWF/T OR LSW/T,USE CRAIGSFORD AS NEW SERIES FOR SWANFORD TILL SUB

APK: 0 TO 20 CM; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 3/1; FINE SAND; VERY WEAK, FINE TO MEDIUM, GRANULAR STRUCTURE; VERY WEAK, VERY FINE TO FINE, GRANULAR AND SINGLE GRAIN SECONDARY STRUCTURE; NONSTICKY, VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; FEW, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, EXPED PORES; VERY WEAK EFFERVESCENCE; WEAKLY CALCAREOUS; HOMOGENEOUS ; SMOOTH, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

AHK: 20 TO 30 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1; LOAMY FINE SAND; FEW, FINE, FAINT MOTTLES; VERY WEAK, VERY FINE TO FINE, GRANULAR STRUCTURE; NONSTICKY, VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; VERY FEW, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, FEW, VERY FINE, EXPED PORES; WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; HOMOGENEOUS ; SMOOTH, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

ACKGJ: 30 TO 55 CM; HORIZON MOIST; MATRIX MOIST 10YR 2.5/2; LOAMY FINE SAND; FEW, FINE, FAINT, 7.5YR 3/4 MOTTLES; VERY WEAK, VERY FINE TO FINE, GRANULAR STRUCTURE; NONSTICKY, VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; VERY FEW, MICRO, RANDOM, EXPED ROOTS; MODERATELY POROUS, FEW, VERY FINE, EXPED PORES; WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; HOMOGENEOUS ; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

2CKG: 55 TO 100 CM; HORIZON MOIST; MATRIX MOIST 10YR 6/4; GRITTY SILT LOAM; COMMON, MEDIUM, DISTINCT, 10YR 6/6 MOTTLES; MODERATE, MEDIUM TO COARSE, PLATY STRUCTURE LAMINATED; VERY WEAK, VERY FINE TO FINE, GRANULAR SECONDARY STRUCTURE; NONSTICKY, FRIABLE, SLIGHTLY HARD, NONPLASTIC CONSISTENCE; SLIGHTLY POROUS, VERY FEW, VERY FINE, HORIZONTAL, EXPED, DISCONTINUOUS PORES; STRONG EFFERVESCENCE; EXTREMELY CALCAREOUS; HOMOGENEOUS ; 10% ANGULAR COBBLY COARSE FRAGMENTS; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CGD MANITOBA 1980 PROFILE NO. 45

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
APK	7.7	3.39	0.24	1.3	0.6	0.6	23.3		28.6	4.8	0.1	0.4
AHK	7.8	2.43	0.17	6.0	4.3	1.6	18.2		31.0	4.9	0.1	0.3
ACKGJ	7.8	1.14	0.10	5.9	3.1	2.5	13.0		26.9	4.4		0.3
2CKG	7.8			53.2	23.1	27.8	6.5		26.3	4.4	0.1	0.2

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
APK	0.5	34.0
AHK	0.5	32.0
ACKGJ	0.6	30.0
2CKG	0.6	40.0

PHYSICAL DATA (SURVEY)

HORIZON	PARTICLE SIZE ANALYSIS % PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
APK						1	6	54	27	88		7	5	
AHK				98	1	1	6	55	19	82		10	8	
ACKGJ				98		1	6	56	19	82		8	10	
2CKG				98						10		68	22	

CGD MANITOBA 1980 PROFILE NO. 45

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
APK		23.1	13.4										
AHK													
ACKGJ													
2CKG		26.4	9.0			18.0	28.0	20.0					CL

AUG 07, 1986

ETT MANITOBA 1980 PROFILE NO. 46

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: UNDECIDED; LIMITED EXTENT; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC BLACK. MINERAL SOIL FAMILY: SANDY/LOAMY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: ETT.

LOCATION: MILITARY GRID REF. 14 ULN 4350 7922; NTS MAP AREA 63C ; NW 32 36 27 W.

CLIMATE: 338 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS MODERATE RELEVANCE TO THE SOIL SITE.

VEGETATION: CROPS-FIELD (MANAGED). ALFALFA-GRASS FORAGE.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, SANDY, WEAKLY CALCAREOUS (1 TO 6% CACO3), LACUSTRINE, MIXED; PARENT MATERIAL 2: UNSPECIFIED WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL), MIXED; LANDFORM CLASSIFICATION: LACUSTRINE, SANDY, VENEER; SLOPE: SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING SOUTHEAST, SITE AT UPPER SLOPE POSITION; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, MODERATELY PERVIOUS, MODERATE SURFACE RUNOFF, SEEPAGE ABSENT; SLIGHTLY STONY; NONROCKY; PRESENT LAND USE: IMPROVED PASTURE,FORAGE.

INTERPRETATIONS: CLI AGRICULTURE 4/MP.

SPECIAL NOTES: PHOTO NO 17 (SOIL) NO 18 VIEW TOWARDS VLY AND SWF AREA FROM MORANIC RIDGE. PARENT MATERIAL 2 IS MODIFIED TILL,QUITE STONEFREE BELOW EXTENSIVE BOULDER AND COBBLE LAYER AT 30-50 CM. TILL IS CALCAREOUS BUT SANDIER THAN MODAL MEHARRY TILL.SOLUM SHOWING DEGRADATION BUT MOST CULTIVATED AREAS ARE BLACK.

AP: 0 TO 20 CM; HORIZON MOIST; MATRIX MOIST 10YR 2.5/2; FINE SANDY LOAM; VERY WEAK, FINE, GRANULAR STRUCTURE; STRUCTURELESS, VERY FINE TO FINE, SINGLE GRAIN SECONDARY STRUCTURE; VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; PLENTIFUL, MEDIUM, RANDOM, EXPED ROOTS; HIGHLY POROUS, MANY, FINE, RANDOM, EXPED PORES; SMOOTH, CLEAR HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

AH: 20 TO 32 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1; FINE SANDY LOAM; VERY WEAK, FINE, GRANULAR STRUCTURE; STRUCTURELESS, VERY FINE TO FINE, SINGLE GRAIN SECONDARY STRUCTURE; VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; PLENTIFUL, MEDIUM AND VERY FINE, RANDOM, EXPED ROOTS; HIGHLY POROUS, MANY, FINE, RANDOM, EXPED PORES; WAVY, CLEAR HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

BM: 32 TO 40 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/4; SANDY LOAM; WEAK TO MODERATE, MEDIUM TO COARSE, GRANULAR STRUCTURE; VERY WEAK, FINE TO MEDIUM, GRANULAR SECONDARY STRUCTURE; FRIABLE, SOFT, NONPLASTIC CONSISTENCE; FEW, MEDIUM AND FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE AND FINE, RANDOM, INPED PORES; 30% COBBLY AND STONY (BOULDERY) COARSE FRAGMENTS; WAVY, ABRUPT HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

2BC: 40 TO 50 CM; HORIZON DRY; MATRIX MOIST 10YR 4/4; FINE SANDY LOAM; WEAK, FINE, GRANULAR STRUCTURE; VERY WEAK, FINE TO MEDIUM, GRANULAR SECONDARY STRUCTURE; FRIABLE, SLIGHTLY HARD, NONPLASTIC CONSISTENCE; FEW, FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, FEW, VERY FINE, RANDOM, EXPED PORES; VERY WEAK EFFERVESCENCE; WEAKLY CALCAREOUS; 20% COBBLY AND STONY (BOULDERY) COARSE FRAGMENTS; WAVY, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

2CK: 50 TO 90 CM; HORIZON DRY; MATRIX MOIST 10YR 6/4; FINE SANDY LOAM; STRUCTURELESS, VERY FINE TO FINE, SINGLE GRAIN SECONDARY STRUCTURE; VERY FRIABLE, HARD, NONPLASTIC CONSISTENCE; MODERATELY POROUS, FEW, VERY FINE, RANDOM, EXPED PORES; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; MILDLY ALKALINE 7.4-7.8 FIELD PH.

ETT MANITOBA 1980 PROFILE NO. 46

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	6.9	3.35	0.26				3.5	26.6		20.1	4.6	0.1	0.7
AH	7.0	1.25	0.11				2.6	18.7		14.5	3.7	0.1	0.5
BM	7.2	0.47	0.07				1.3	15.3		11.1	4.1	0.1	0.5
2BC	7.4	0.59	0.06	1.8	0.4	1.4		16.7		16.2	5.2		0.3
2CK	7.5			9.1	5.7	3.1		13.0		20.4	4.1		0.3

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.4	44.0
AH	0.3	36.0
BM	0.2	38.0
2BC	0.3	30.0
2CK	0.2	33.0

PHYSICAL DATA (SURVEY)

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	PARTICLE SIZE ANALYSIS V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AP						4	17	26	20	67		17	16	
AH				99		6	19	27	18	70		15	15	
BM				85		8	23	29	13	73		12	15	
2BC						2	9	46	17	74		11	15	
2CK							8	54	16	78		10	12	

ETT MANITOBA 1980 PROFILE NO. 46

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP		21.1	11.0										
AH													
BM						17.0	24.0	18.0					
2BC													
2CK		16.2	7.3			19.0	23.0	22.0					

SVC MANITOBA 1980 PROFILE NO. 47

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: UNDECIDED; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: GLEYED REGO BLACK. MINERAL SOIL FAMILY: SANDY/LOAMY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: SVC, ASSOCIATED SOILS: LSWAND SPG.

LOCATION: MILITARY GRID REF. 14 ULN 4123 7473; NTS MAP AREA 63C ; SW 19 36 27 W.

CLIMATE: 339 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, SANDY, WEAKLY CALCAREOUS (1 TO 6% CACO3), LACUSTRINE, MIXED; PARENT MATERIAL 2: WEAK CHEMICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL), MIXED; LANDFORM CLASSIFICATION: LACUSTRINE, SANDY, VENEER; SLOPE: SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING LEVEL; SOIL MOISTURE AND DRAINAGE: SUBHUMID, IMPERFECTLY DRAINED, MODERATELY PERVIOUS, VERY SLOW SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

INTERPRETATIONS: CLI AGRICULTURE 3/W.

SPECIAL NOTES: PARENT MATERIAL 2 IS MAINLY SICL MATRIX WITH POCKETS OF VFSL OF BRIGHT YELLOW COLOUR.PROFILE IS LEACHED BUT AC INTERPRETATION BASED ON WEAK DEVELOPMENT(CONCENTRATION OF MOTTLES RATHER THAN BROWN MATRIX)GL.BL PROFILES DO OCCUR BUT WEAKLY DEVELOPED GL.RBL SOILS ARE DOMINANT.MANY COBBLES AND SOME GRAVELLY LAG AT TOP OF TILL.VERY FEW COBBLES IN OVERLAY AND TILL IS RELATIVELY STONE FREE.

AP: 0 TO 15 CM; MATRIX MOIST 10YR 2/1; LOAMY FINE SAND; VERY WEAK, VERY FINE TO FINE, GRANULAR STRUCTURE; STRUCTURELESS, SINGLE GRAIN SECONDARY STRUCTURE; LOOSE, LOOSE, NONPLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, RANDOM, EXPED ROOTS; HIGHLY POROUS, MANY, VERY FINE, RANDOM, EXPED, CONTINUOUS PORES; SMOOTH, CLEAR HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

AHGJ: 15 TO 30 CM, RANGE 20 TO 35 CM; MATRIX MOIST 10YR 2.5/2; LOAMY VERY FINE SAND; COMMON, FINE, FAINT, 5YR 3/2 MOTTLES; VERY WEAK, VERY FINE TO FINE, GRANULAR STRUCTURE; STRUCTURELESS, SINGLE GRAIN SECONDARY STRUCTURE; LOOSE, LOOSE, NONPLASTIC CONSISTENCE; VERY FEW, VERY FINE, RANDOM, EXPED ROOTS; HIGHLY POROUS, MANY, VERY FINE, RANDOM, EXPED, CONTINUOUS PORES; WAVY, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

AC: 30 TO 40 CM, RANGE 25 TO 45 CM; MATRIX MOIST 10YR 3/3; LOAMY FINE SAND; MANY, FINE AND MEDIUM, DISTINCT, 5YR 3/2 MOTTLES; FEW, MEDIUM, 5YR 3/3 MOTTLES; VERY WEAK, VERY FINE, GRANULAR STRUCTURE; STRUCTURELESS, SINGLE GRAIN SECONDARY STRUCTURE; LOOSE, LOOSE, NONPLASTIC CONSISTENCE; VERY FEW, MICRO AND VERY FINE, RANDOM, EXPED ROOTS; HIGHLY POROUS, MANY, VERY FINE, RANDOM, EXPED, CONTINUOUS PORES; VERY WEAK EFFERVESCENCE; WEAKLY CALCAREOUS; WAVY, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKGJ: 40 TO 53 CM; MATRIX MOIST 10YR 3.5/3; VERY FINE SAND; COMMON, COARSE, FAINT, 10YR 6/3 MOTTLES; COMMON, MEDIUM, FAINT, 10YR 4/4 MOTTLES; STRUCTURELESS, SINGLE GRAIN STRUCTURE; LOOSE, LOOSE, NONPLASTIC CONSISTENCE; HIGHLY POROUS, MANY, VERY FINE, RANDOM, EXPED, CONTINUOUS PORES; VERY WEAK EFFERVESCENCE; WEAKLY CALCAREOUS; NONHOMOGENEOUS ; 20% COBBLY AND STONY (BOULDERY) COARSE FRAGMENTS; WAVY, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

2CKGJ: 53 TO 100 CM; MATRIX MOIST 10YR 6/4; CLAY LOAM; COMMON, FINE, FAINT, 10YR 6/3 MOTTLES; FEW, FINE, 10YR 4/4 MOTTLES; WEAK TO MODERATE, FINE, SUBANGULAR BLOCKY AND GRANULAR STRUCTURE LAMINATED; WEAK TO MODERATE, FINE TO MEDIUM, GRANULAR SECONDARY STRUCTURE; FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC AND PLASTIC CONSISTENCE; MODERATELY POROUS, FEW, HORIZONTAL, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; VERY STRONGLY CALCAREOUS; HOMOGENEOUS ; 10% COBBLY AND STONY (BOULDERY) COARSE FRAGMENTS; MILDLY ALKALINE 7.4-7.8 FIELD PH.

SVC MANITOBA 1980 PROFILE NO. 47

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	7.0	5.90	0.46				2.9	32.0		23.0	7.7	0.1	1.0
AHGJ	7.5	0.88	0.07				1.0	13.6		13.4	4.7	0.1	0.2
AC	7.6	0.55	0.05	2.3	0.5	1.6		10.4		11.7	4.1	0.1	0.2
CKGJ	7.6			5.1	2.1	2.8		7.1		13.7	2.9	0.1	0.2
2CKGJ	7.6			28.8	12.9	14.6		18.8		27.7	8.9	0.1	0.5

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.5	50.0
AHGJ	0.4	30.0
AC	0.4	29.0
CKGJ	0.4	30.0
2CKGJ	0.6	46.0

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AP						1	3	29	49	82		9	9	
AHGJ						1	3	31	50	85		7	8	
AC				96	1	1	3	40	43	88		6	6	
CKGJ				95	1	1	3	32	53	90		5	5	
2CKGJ				96	2	2	4	10	11	29		39	32	

SVC MANITOBA 1980 PROFILE NO. 47

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP		24.4	13.6										
AHGJ												40	07
AC													
CKGJ													
2CKGJ		27.4	13.7			16.0	36.0	19.0					CL

DVD MANITOBA 1980 PROFILE NO. 48

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; VERY LIMITED EXTENT; SURVEY REPORT NO. 037.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC DARK GRAY. MINERAL SOIL FAMILY: SANDY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: DVD.

LOCATION: MILITARY GRID REF. 14 ULN 4975 7260; NTS MAP AREA 63C ; NW 12 36 27 W.

CLIMATE: 327 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: FOREST,UNSPEC., REGENERATING. KEY SPECIES LISTING: 1 POPULUS TREMULOIDES - TREMBLING ASPEN. SCATTERED ASPEN WITH GROUND COVER OF MIXED GRASSES.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, STRATIFIED (MINERAL) AND SANDY, MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), LACUSTRINE, MIXED; LANDFORM CLASSIFICATION: LACUSTRINE, SANDY, LEVEL; SLOPE: SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING LEVEL; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, RAPIDLY PERVIOUS, SLOW SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: WOODLAND GRAZING.

INTERPRETATIONS: CLI AGRICULTURE 3/M.

SPECIAL NOTES: PHOTO 19,20 AND 21.FH SAMPLED BACK FROM CUT,MAY CONTAIN SOME BLOW. DEPTH OF SOLUM AND DEGREE OF DEGRADATION IS MAXIMUM AT THIS SITE BECAUSE OF EXTREMELY GOOD DRAINAGE. AHE2 AND/OR BM1 COULD BE CONSIDERED AS AN AE HORIZON.

FH: 7 TO 0 CM; HORIZON MOIST; MATERIAL COMPOSITION SLIGHT AND HIGH DECOMPOSITION; ABUNDANT, VERY FINE, VERTICAL, EXPED ROOTS; SMOOTH, ABRUPT HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

AHE1: 0 TO 30 CM; HORIZON MOIST; MATRIX MOIST 10YR 2.5/2, MATRIX DRY 10YR 3/3; VERY FINE SANDY LOAM; NONPLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, VERTICAL, EXPED ROOTS; HIGHLY POROUS, MANY, VERY FINE PORES; SMOOTH, CLEAR HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

AHE2: 30 TO 50 CM; HORIZON MOIST; MATRIX DRY 10YR 4/2, MATRIX DRY 10YR 3/2; LOAMY FINE SAND; NONPLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, VERTICAL, EXPED ROOTS; HIGHLY POROUS, MANY, VERY FINE PORES; SMOOTH, CLEAR HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

BM1: 50 TO 60 CM; HORIZON DRY; MATRIX DRY 10YR 3.5/3, MATRIX DRY 10YR 4/3; LOAMY FINE SAND; VERY FRIABLE, HARD, NONPLASTIC CONSISTENCE; FEW, VERY FINE, VERTICAL, EXPED ROOTS; HIGHLY POROUS, MANY, VERY FINE PORES; SMOOTH, GRADUAL HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

BM2: 60 TO 80 CM; HORIZON DRY; MATRIX DRY 10YR 4/4, MATRIX DRY 10YR 4/4; LOAMY VERY FINE SAND; VERY FRIABLE, HARD, NONPLASTIC CONSISTENCE; VERY FEW, MICRO AND VERY FINE, VERTICAL, EXPED ROOTS; HIGHLY POROUS, MANY, VERY FINE PORES; WAVY, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CCA: 80 TO 120 CM; HORIZON DRY; MATRIX DRY 10YR 7/3, MATRIX DRY 10YR 7/3; SILT LOAM; STRUCTURELESS, MASSIVE STRUCTURE; MODERATE, MEDIUM TO COARSE, ANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, HARD, NONPLASTIC CONSISTENCE; MODERATELY POROUS, FEW, FINE AND MEDIUM, RANDOM, EXPED PORES; STRONG EFFERVESCENCE; VERY STRONGLY CALCAREOUS; HOMOGENEOUS ; WAVY, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CK1: 120 TO 190 CM; HORIZON DRY; MATRIX MOIST 10YR 6/4, MATRIX DRY 10YR 6/3; VERY FINE SANDY LOAM; FEW, FINE, FAINT MOTTLES; STRUCTURELESS, SINGLE GRAIN STRUCTURE BEDDED; LOOSE, NONPLASTIC CONSISTENCE; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; WAVY, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKGJ2: 190 TO 250 CM; HORIZON DRY; MATRIX MOIST 2.5Y 5/2, MATRIX MOIST 10YR 5/3; SILTY CLAY LOAM; COMMON, FINE, DISTINCT, 7.5YR 5/6 MOTTLES; COMMON, MEDIUM, DISTINCT, 2.5Y 6/2 MOTTLES; MODERATE TO STRONG, MEDIUM TO COARSE, PLATY STRUCTURE BEDDED; FRIABLE, NONPLASTIC CONSISTENCE; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; MILDLY ALKALINE 7.4-7.8 FIELD PH.

DVD MANITOBA 1980 PROFILE NO. 48

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
FH	6.7	19.19	1.18				9.6	64.0		43.8	9.3	0.1	1.5
AHE1	7.3	1.51	0.38				0.9	17.4		12.8	3.5	0.1	0.6
AHE2	7.2	0.85	0.33				0.5	12.7		9.0	3.0	0.1	0.5
BM1	7.5	0.48	0.06				0.2	10.2		6.9	2.4	0.1	0.4
BM2	7.5	0.39	0.04				0.2	8.6		5.6	2.0	0.1	0.3
CCA	7.7			33.7	16.0	16.3		14.3		24.4	5.1	0.1	0.3
CK1	7.7			19.1	10.2	8.2		12.8		20.9	5.0	0.1	0.3
CKGJ2	7.8			24.6	9.0	14.4		24.1		28.0	10.8	0.1	0.4

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
FH		
AHE1	0.3	40.0
AHE2	0.4	34.0
BM1	0.4	30.0
BM2	0.3	31.0
CCA	0.4	42.0
CK1	0.3	36.0
CKGJ2	0.3	59.0

DVD MANITOBA 1980 PROFILE NO. 48

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
FH														
AHE1							2	29	47	78		11	11	
AHE2							2	31	49	82		8	10	
BM1							2	39	43	84		7	9	
BM2							3	34	50	87		7	6	
CCA							1	4	21	26		58	16	
CK1							1	14	56	71		15	14	
CKGJ2										4		66	30	

PHYSICAL DATA

SURVEY (CON'T) ENGINEERING

HORIZON	MOISTURE STATUS (%) 0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
FH													
AHE1		15.1	6.4										
AHE2												40	07
BM1		8.2	3.9										
BM2													
CCA													
CK1		23.4	10.4			24.0	28.0	26.0					ML
CKGJ2						21.0	44.0	19.0					CL

BEV MANITOBA 1980 PROFILE NO. 49

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; VERY LIMITED EXTENT; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: GLEYED CUMULIC REGOSOL. MINERAL SOIL FAMILY: COARSE LOAMY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: BEV.

LOCATION: MILITARY GRID REF. 14 ULN 4961 7253; NTS MAP AREA 63C ; NW 12 36 27 W.

CLIMATE: 323 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: GRASSES AND FORBES. IMPROVED PASTURE.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, STRATIFIED (MINERAL) AND SANDY, MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), FLUVIAL, MIXED; LANDFORM CLASSIFICATION: FLUVIAL, SANDY, UNDULATING; SLOPE: 3% COMPLEX SLOPE OF CLASS 3 (2-5%), FACING NORTHWEST, SITE AT MIDDLE POSITION; SOIL MOISTURE AND DRAINAGE: SUBHUMID, MODERATELY WELL DRAINED, RAPIDLY PERVIOUS, SLOW SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: IMPROVED PASTURE,FORAGE.

INTERPRETATIONS: CLI AGRICULTURE 3/T.

SPECIAL NOTES: PHOTO NO 22.AND 23.PARENT MATERIAL IS STRATIFIED WITH FS BEING DOMINANT.CKGJ 2 HORIZON IS COARSELY STRATIFIED WITH SHELL FRAGMENTS AND ORGANIC MATERIAL.DRAINAGE IS MOD.WELL.COLOURS ARE STILL DULL.VERY FEW MOTTLES.

APKGJ: 0 TO 10 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/3; FINE SANDY LOAM; VERY WEAK, VERY FINE TO FINE, GRANULAR STRUCTURE; STRUCTURELESS, SINGLE GRAIN SECONDARY STRUCTURE; VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; FEW, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, RANDOM, EXPED PORES; WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; SMOOTH, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKGJ1: 10 TO 20 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/2.5; FINE SANDY LOAM; FEW, FINE, FAINT MOTTLES; VERY WEAK, VERY FINE TO FINE, GRANULAR STRUCTURE; STRUCTURELESS, SINGLE GRAIN SECONDARY STRUCTURE; VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; VERY FEW, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, RANDOM, EXPED PORES; WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; WAVY, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKGJ2: 20 TO 50 CM; HORIZON MOIST; MATRIX MOIST 10YR 4/3, MATRIX MOIST 10YR 5/3; SANDY CLAY LOAM; FEW, FINE, FAINT MOTTLES; STRUCTURELESS, SINGLE GRAIN STRUCTURE; LOOSE, LOOSE, NONPLASTIC CONSISTENCE; VERY FEW, MICRO, RANDOM, EXPED ROOTS; HIGHLY POROUS, MANY, MEDIUM, RANDOM, EXPED PORES; VERY WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKGJ3: 50 TO 95 CM; HORIZON MOIST; MATRIX MOIST 10YR 6/4; SAND; FEW, FINE, FAINT MOTTLES; STRUCTURELESS, SINGLE GRAIN STRUCTURE; LOOSE, LOOSE, NONPLASTIC CONSISTENCE; HIGHLY POROUS, MANY, MEDIUM, RANDOM, EXPED PORES; VERY WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKGJ4: 95 TO 120 CM; HORIZON MOIST; MATRIX MOIST 10YR 4/3; FINE SANDY LOAM; FEW, FINE, FAINT MOTTLES; VERY WEAK, GRANULAR STRUCTURE; STRUCTURELESS, SINGLE GRAIN SECONDARY STRUCTURE; VERY FRIABLE, SOFT, NONPLASTIC CONSISTENCE; MODERATELY POROUS, COMMON, VERY FINE, RANDOM, EXPED PORES; WEAK EFFERVESCENCE; STRONGLY CALCAREOUS; MILDLY ALKALINE 7.4-7.8 FIELD PH.

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CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
APKGJ	7.5	0.88	0.05	11.5	5.3	5.7	16.2		17.9	2.3	0.1	0.5
CKGJ1	7.5			9.6	3.8	5.3	11.2		17.5	2.6	0.1	0.5
CKGJ2	7.6			13.9	8.0	5.4	21.1		23.1	4.4	0.1	1.0
CKGJ3	7.6			13.2	7.4	5.4	6.0		10.8	1.3	0.1	0.2
CKGJ4	7.6			16.1	8.0	7.5	14.6		20.7	3.1	0.1	0.3

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
APKGJ	0.3	28.0
CKGJ1	0.4	32.0
CKGJ2	0.3	34.0
CKGJ3	0.3	27.0
CKGJ4	0.4	36.0

PHYSICAL DATA (SURVEY)

HORIZON	PARTICLE SIZE ANALYSIS % PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
APKGJ							5	48	25	78		11	11	
CKGJ1							13	46	16	75		13	12	
CKGJ2						2	20	31	9	62		17	21	
CKGJ3						1	34	49	7	91		3	6	
CKGJ4							1	41	27	69		17	14	

BEV MANITOBA 1980 PROFILE NO. 49

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
APKGJ		12.9	5.3										
CKGJ1													
CKGJ2						21.0	32.0	22.0					SC
CKGJ3		6.0	3.1										
CKGJ4						21.0	26.0	24.0					

NOV MANITOBA 1980 PROFILE NO. 50

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: VARIANT; DEVIATION(S): COLORSURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: REGO HUMIC GLEYSOL. MINERAL SOIL FAMILY: FINE LOAMY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COLD, HUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: NOV, ASSOCIATED SOILS: HMD.

LOCATION: MILITARY GRID REF. 4915 7230; NTS MAP AREA 63C ; NW 12 36 27 W.

CLIMATE: 324 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY) AND STRATIFIED (MINERAL), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), FLUVIAL; LANDFORM CLASSIFICATION: FLUVIAL, LOAMY, UNDULATING; SLOPE: 0.5% COMPLEX SLOPE OF CLASS 3 (2-5%), SITE AT DEPRESSION POSITION; SOIL MOISTURE AND DRAINAGE: HUMID, POORLY DRAINED, MODERATELY PERVIOUS, SLOW SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

INTERPRETATIONS: CLI AGRICULTURE 2/WT.

SPECIAL NOTES: DRAINAGE HAS IMPROVED AS RIVER CUT DOWN,ALSO LESS WATER AS FLOWS HAVE DECREASED.AH HORIZON COULD BE DUE TO THE AGE OF SOIL,HOWEVER OM IS DISTRIBUTED VERY IRREGULARLY

APGJ: 0 TO 15 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1; CLAY LOAM; FEW, FINE, FAINT, 10YR 3/4 MOTTLES; STRUCTURELESS, MASSIVE STRUCTURE; WEAK, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; SLIGHTLY STICKY, FRIABLE, SLIGHTLY HARD, PLASTIC CONSISTENCE; SLIGHTLY POROUS, VERY FEW, MICRO, RANDOM, EXPED PORES; SMOOTH, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

AHGJ: 15 TO 36 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1; CLAY; FEW, FINE, FAINT, 10YR 3/4 MOTTLES; STRUCTURELESS, MASSIVE STRUCTURE; WEAK, MEDIUM, SUBANGULAR BLOCKY SECONDARY STRUCTURE; SLIGHTLY STICKY, FRIABLE, SLIGHTLY HARD, PLASTIC CONSISTENCE; SLIGHTLY POROUS, VERY FEW, MICRO, RANDOM, EXPED PORES; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKG1: 36 TO 70 CM; HORIZON MOIST; MATRIX MOIST 5Y 4/1; SILTY CLAY; COMMON, MEDIUM, PROMINENT, 10YR 3/4 MOTTLES; FEW, MEDIUM, PROMINENT, 2.5Y 4/4 MOTTLES; WEAK, FINE TO MEDIUM, SUBANGULAR BLOCKY STRUCTURE; WEAK, MEDIUM, GRANULAR SECONDARY STRUCTURE; SLIGHTLY STICKY, FRIABLE, SLIGHTLY HARD, PLASTIC CONSISTENCE; VERY FEW, MEDIUM, VERTICAL, EXPED ROOTS; SLIGHTLY POROUS, VERY FEW, MICRO, RANDOM, EXPED PORES; VERY WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; SMOOTH, GRADUAL HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKG2: 70 TO 100 CM; HORIZON MOIST; MATRIX MOIST 5Y 4/1; SILTY CLAY; COMMON, FINE, PROMINENT, 10YR 3/6 MOTTLES; WEAK, FINE TO MEDIUM, SUBANGULAR BLOCKY STRUCTURE; WEAK, MEDIUM, GRANULAR SECONDARY STRUCTURE; SLIGHTLY STICKY, FRIABLE, SLIGHTLY HARD, PLASTIC CONSISTENCE; SLIGHTLY POROUS, VERY FEW, MICRO, RANDOM, EXPED PORES; VERY WEAK EFFERVESCENCE; STRONGLY CALCAREOUS; SMOOTH, CLEAR HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

CKG3: 100 TO 130 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 4/2; SILT LOAM; MANY, MEDIUM, PROMINENT, 10YR 3/6 MOTTLES; STRUCTURELESS, MASSIVE STRUCTURE; WEAK, FINE TO MEDIUM, GRANULAR SECONDARY STRUCTURE; SLIGHTLY STICKY, FRIABLE, SLIGHTLY HARD, PLASTIC CONSISTENCE; SLIGHTLY POROUS, FEW, VERY FINE, RANDOM, EXPED PORES; WEAK EFFERVESCENCE; STRONGLY CALCAREOUS; MILDLY ALKALINE 7.4-7.8 FIELD PH.

NOV MANITOBA 1980 PROFILE NO. 50

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
APGJ	7.5	4.53	0.37				1.6	44.2		32.1	9.9	0.1	1.9
AHGJ	7.6	6.08	0.51				2.0	53.3		35.4	14.1	0.1	1.9
CKG1	7.7			8.6	0.2	7.8		39.8		25.6	17.8	0.1	1.6
CKG2	7.9			15.2	1.7	12.5		37.0		22.0	17.4	0.1	1.0
CKG3	7.8			20.4	4.3	14.9		22.2		24.7	8.4	0.1	0.7

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
APGJ	0.5	62.0
AHGJ	0.4	76.0
CKG1	0.3	67.0
CKG2	0.2	67.0
CKG3	0.2	49.0

PHYSICAL DATA (SURVEY)

HORIZON	PARTICLE SIZE ANALYSIS % PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
APGJ						1	4	18	13	36		32	32	
AHGJ						1	2	9	7	19		38	43	
CKG1						1	1	4	5	11		47	42	
CKG2										8		50	42	
CKG3						1	1	5	17	24		53	23	

NOV MANITOBA 1980 PROFILE NO. 50

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
APGJ		39.4	19.2										
AHGJ													
CKG1		39.3	23.3			32.0	61.0	15.0					MH
CKG2													
CKG3		37.7	15.6			20.0	38.0	19.0					CL

SWF MANITOBA 1980 PROFILE NO. 51

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: VARIANT; DEVIATION(S): TEXTURE; LIMITED EXTENT; SURVEY REPORT NO. 037.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: GLEYED REGO BLACK. MINERAL SOIL FAMILY: COARSE LOAMY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: LSW.

LOCATION: MILITARY GRID REF. 14 ULN 4468 7766; NTS MAP AREA 63C ; SW 33 36 27 W.

CLIMATE: 330 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS VERY GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, SANDY, MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), LACUSTRINE, MIXED; SLOPE: SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING LEVEL; SOIL MOISTURE AND DRAINAGE: SUBHUMID, IMPERFECTLY DRAINED, MODERATELY PERVIOUS, SLOW SURFACE RUNOFF, SEEPAGE ABSENT, WIND ERODED ; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: UNDERLYING L-CL LACUSTRINE MATERIALS RANGE FROM SURFACE TO BEYOND 2 M.INTERPRETATION OF AC HORIZON CAN VARY THE CLASSIFICATION OF THE SOIL.

APKGJ: 0 TO 15 CM; HORIZON MOIST; MATRIX MOIST 10YR 2.5/1; VERY FINE SANDY LOAM; VERY WEAK, FINE, GRANULAR STRUCTURE; STRUCTURELESS, SINGLE GRAIN SECONDARY STRUCTURE; NONSTICKY, VERY FRIABLE, LOOSE, NONPLASTIC CONSISTENCE; FEW, FINE, RANDOM, EXPED ROOTS; HIGHLY POROUS, MANY, VERY FINE, RANDOM, EXPED PORES; WEAK EFFERVESCENCE; WEAKLY CALCAREOUS; HOMOGENEOUS ; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

AC: 15 TO 50 CM, RANGE 25 TO 35 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/2; LOAMY FINE SAND; COMMON, FINE, FAINT MOTTLES; VERY WEAK, FINE, GRANULAR STRUCTURE; STRUCTURELESS, SINGLE GRAIN SECONDARY STRUCTURE; NONSTICKY, VERY FRIABLE, LOOSE, NONPLASTIC CONSISTENCE; FEW, FINE, RANDOM, EXPED ROOTS; HIGHLY POROUS, MANY, VERY FINE, RANDOM, EXPED PORES; WEAK EFFERVESCENCE; WEAKLY CALCAREOUS; HOMOGENEOUS ; WAVY, CLEAR HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

CKGJ1: 50 TO 65 CM, RANGE 15 TO 30 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 5/4; VERY FINE SANDY LOAM; MANY, MEDIUM, DISTINCT, 2.5Y 6/6 MOTTLES; STRUCTURELESS, SINGLE GRAIN STRUCTURE; NONSTICKY, VERY FRIABLE, LOOSE, NONPLASTIC CONSISTENCE; VERY FEW, VERY FINE, VERTICAL, EXPED ROOTS; HIGHLY POROUS, MANY, VERY FINE, RANDOM, EXPED PORES; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; HOMOGENEOUS ; SMOOTH, ABRUPT HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

CKGJ2: 65 TO 130 CM; HORIZON MOIST; MATRIX MOIST 2.5Y 5/2; SILT LOAM; MANY, MEDIUM, PROMINENT, 10YR 5/6 MOTTLES; WEAK TO MODERATE, FINE, PLATY STRUCTURE BEDDED; VERY WEAK, FINE, GRANULAR SECONDARY STRUCTURE; SLIGHTLY STICKY, FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; MODERATELY POROUS, FEW, MEDIUM, RANDOM, EXPED PORES; STRONG EFFERVESCENCE; STRONGLY CALCAREOUS; HOMOGENEOUS ; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
APKGJ	7.7	3.61	0.25	2.6	1.7	0.9	25.0		31.8	8.7		0.2
AC	7.9	0.59	0.05	2.8	1.6	1.1	9.9		20.2	8.5	0.1	0.2
CKGJ1	7.9			9.8	3.4	5.9	8.6		20.1	7.6	0.1	0.2
CKGJ2	7.8			24.6	9.4	14.0	15.7		25.8	11.4	0.1	0.4

SWF MANITOBA 1980 PROFILE NO. 51

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
APKGJ	0.5	46.0
AC	0.3	29.0
CKGJ1	0.4	26.0
CKGJ2	0.3	46.0

PHYSICAL DATA (SURVEY)

	PARTICLE SIZE ANALYSIS													
	% PASSING										% OF SAMPLE			
HORIZON	3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
APKGJ							3	24	46	73		20	7	
AC							3	34	45	82		11	7	
CKGJ1							2	31	40	73		20	7	
CKGJ2							1	3	16	20		64	16	

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
APKGJ		21.8	9.8										
AC												40	07
CKGJ1													
CKGJ2		35.0	11.2			22.0	29.0	25.0					CL

MNS MANITOBA 1980 PROFILE NO. 52

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: VARIANT; DEVIATION(S): TEXTURE; LIMITED EXTENT; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: GLEYED REGO BLACK. MINERAL SOIL FAMILY: FINE LOAMY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: MNS.

LOCATION: MILITARY GRID REF. 14 ULN 4207 7213; NTS MAP AREA 63C ; NE 7 36 27 W.

CLIMATE: 339 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS VERY GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), LACUSTRINE, MIXED; PARENT MATERIAL 2: WEAK CHEMICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL), MIXED AND IGNEOUS AND LIMESTONE; LANDFORM CLASSIFICATION: LACUSTRINE, LOAMY, VENEER; SLOPE: SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING LEVEL; SOIL MOISTURE AND DRAINAGE: SUBHUMID, IMPERFECTLY DRAINED, MODERATELY PERVIOUS, VERY SLOW SURFACE RUNOFF, SEEPAGE ABSENT; SLIGHTLY STONY; NONROCKY; PRESENT LAND USE: CROPLAND.

INTERPRETATIONS: CLI AGRICULTURE 2/W.

SPECIAL NOTES: SOIL TEXTURE IS CLOSE TO SWF OR CGD, COULD SHIFT BOUNDARY LINE.DEPTH OF OVERLAY IS MODAL.VERY STONY AND COBBLY AT C ONTACT OF THE TILL.THE ACKGJ HORIZON HAS SOME ROUNDED GRAVEL

APK: 0 TO 15 CM; MATRIX MOIST 10YR 2.5/1, MATRIX DRY 10YR 3/1; SANDY CLAY LOAM; WEAK TO MODERATE, FINE TO MEDIUM, GRANULAR STRUCTURE; WEAK, FINE, GRANULAR AND SINGLE GRAIN SECONDARY STRUCTURE; FRIABLE, SLIGHTLY HARD, NONPLASTIC CONSISTENCE; FEW, FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, RANDOM, EXPED PORES; WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; HOMOGENEOUS ; SMOOTH, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

AHK: 15 TO 25 CM, RANGE 10 TO 20 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1; SANDY CLAY LOAM; WEAK TO MODERATE, FINE TO MEDIUM, SUBANGULAR BLOCKY AND GRANULAR STRUCTURE; WEAK, FINE, GRANULAR SECONDARY STRUCTURE; FRIABLE, NONPLASTIC CONSISTENCE; VERY FEW, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, FEW, RANDOM, EXPED PORES; WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; HOMOGENEOUS ; WAVY, CLEAR HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

AC: 25 TO 35 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/2; VERY FINE SANDY LOAM; FEW, FINE, FAINT MOTTLES; WEAK TO MODERATE, FINE TO MEDIUM, SUBANGULAR BLOCKY AND GRANULAR STRUCTURE; VERY WEAK, FINE, GRANULAR SECONDARY STRUCTURE; NONPLASTIC CONSISTENCE; VERY FEW, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, FEW, RANDOM, EXPED PORES; WEAK EFFERVESCENCE; STRONGLY CALCAREOUS; HOMOGENEOUS ; WAVY, ABRUPT HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

2CKGJ: 35 TO 90 CM; HORIZON MOIST; MATRIX MOIST 10YR 7/4, MATRIX MOIST 10YR 5.5/4.4; LOAM; COMMON, FINE AND MEDIUM, FAINT MOTTLES; MODERATE, MEDIUM, PLATY STRUCTURE LAMINATED; VERY WEAK, VERY FINE TO FINE, GRANULAR SECONDARY STRUCTURE; SLIGHTLY PLASTIC CONSISTENCE; MODERATELY POROUS, FEW, HORIZONTAL, EXPED PORES; MODERATE EFFERVESCENCE; VERY STRONGLY CALCAREOUS; HOMOGENEOUS ; 10% ANGULAR COBBLY AND STONY (BOULDERY) COARSE FRAGMENTS; MILDLY ALKALINE 7.4-7.8 FIELD PH.

MNS MANITOBA 1980 PROFILE NO. 52

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
APK	7.8	6.71	0.52	6.4	3.0	3.2	45.5		40.8	16.4	0.1	0.5
AHK	7.9	4.09	0.33	7.1	3.8	3.0	35.2		35.7	14.1	0.1	0.3
AC	7.9	1.01	0.10	17.1	9.8	6.7	14.7		26.6	7.8	0.1	0.2
2CKGJ	7.8			30.9	11.8	17.6	5.0		22.0	5.0	0.1	0.1

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
APK	0.8	59.0
AHK	0.6	50.0
AC	0.7	35.0
2CKGJ	1.1	26.0

PHYSICAL DATA (SURVEY)

HORIZON	PARTICLE SIZE ANALYSIS % PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
APK						1	5	24	27	57		21	22	
AHK						2	5	23	29	59		20	21	
AC					1	1	5	27	30	64		18	18	
2CKGJ					3	4	6	20	18	51		36	13	

MNS MANITOBA 1980 PROFILE NO. 52

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
APK		34.3	18.2										
AHK													
AC						18.0	24.0	19.0					
2CKGJ		17.4	4.6			14.0	17.0	14.0					ML

AUG 07, 1986

HMD MANITOBA 1980 PROFILE NO. 53

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: GLEYED CUMULIC REGOSOL. MINERAL SOIL FAMILY: LOAMY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: HMD, ASSOCIATED SOILS: NOV.

LOCATION: MILITARY GRID REF. 14 ULN 4817 7858; NTS MAP AREA 63C ; NW 35 36 27 W.

CLIMATE: 300 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY) AND STRATIFIED (MINERAL), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), FLUVIAL, MIXED; LANDFORM CLASSIFICATION: FLUVIAL, LOAMY, UNDULATING; SLOPE: 0.5% COMPLEX SLOPE OF CLASS 1 (0-0.5%), FACING NORTHEAST, SITE AT UPPER SLOPE POSITION; SOIL MOISTURE AND DRAINAGE: SUBHUMID, IMPERFECTLY DRAINED, MODERATELY PERVIOUS, MODERATE SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

SPECIAL NOTES: SITE IS ON MOST RECENT ALLUVIAL TERRACE 3M ABOVE RIVER LEVEL AND 4M BELOW SECOND TERRACE

AP: 0 TO 15 CM; HORIZON MOIST; MATRIX MOIST 10YR 2.5/2, MATRIX DRY 10YR 4.5/2; LOAM; WEAK, FINE TO MEDIUM, SUBANGULAR BLOCKY STRUCTURE; WEAK, FINE TO MEDIUM, GRANULAR SECONDARY STRUCTURE; SLIGHTLY STICKY, VERY FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, RANDOM ROOTS; MODERATELY POROUS, FEW, FINE, RANDOM, EXPED, DISCONTINUOUS PORES; VERY WEAK EFFERVESCENCE; WEAKLY CALCAREOUS; HOMOGENEOUS ; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

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CKGJ1: 15 TO 38 CM; HORIZON MOIST; MATRIX MOIST 10YR 4/3; FINE SANDY LOAM; VERY WEAK, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; VERY WEAK, FINE, GRANULAR AND SINGLE GRAIN SECONDARY STRUCTURE; SLIGHTLY STICKY, VERY FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; PLENTIFUL, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, FEW, FINE, RANDOM, EXPED PORES; WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; HOMOGENEOUS ; SMOOTH, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKGJ2: 38 TO 58 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/3; LOAM; WEAK, MEDIUM TO COARSE, SUBANGULAR BLOCKY STRUCTURE; WEAK, FINE TO MEDIUM, GRANULAR SECONDARY STRUCTURE; STICKY, VERY FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; FEW, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, FEW, VERY FINE, RANDOM, EXPED PORES; WEAK EFFERVESCENCE; STRONGLY CALCAREOUS; HOMOGENEOUS ; SMOOTH, CLEAR HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

CKGJ3: 58 TO 110 CM; HORIZON DRY; MATRIX MOIST 10YR 4/3; FINE SANDY LOAM; WEAK, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; VERY WEAK AND WEAK, FINE, GRANULAR SECONDARY STRUCTURE; SLIGHTLY STICKY, FRIABLE, HARD, SLIGHTLY PLASTIC CONSISTENCE; WEAKLY CEMENTEDBY LIME, CONTINUOUS; MODERATELY POROUS, FEW, FINE, RANDOM, EXPED PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; HOMOGENEOUS ; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKG: 110 CM; HORIZON DRY; MATRIX MOIST 10YR 5/3; LOAMY SAND; FEW, FINE, DISTINCT MOTTLES; STRUCTURELESS, MASSIVE STRUCTURE; STRUCTURELESS, SINGLE GRAIN SECONDARY STRUCTURE; NONSTICKY, LOOSE, SOFT, NONPLASTIC CONSISTENCE; HIGHLY POROUS, MANY, FINE, RANDOM, EXPED, CONTINUOUS PORES; WEAK EFFERVESCENCE; STRONGLY CALCAREOUS; HOMOGENEOUS ; MILDLY ALKALINE 7.4-7.8 FIELD PH.

HMD MANITOBA 1980 PROFILE NO. 53

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	7.8	2.34	0.20					22.5	17.9	6.3		0.5
CKGJ1	7.8			14.0	6.5	6.9		11.5	14.8	5.3	0.1	0.2
CKGJ2	7.9			19.1	6.7	11.4		21.6	20.0	9.7	0.1	0.4
CKGJ3	7.8			16.6	8.5	7.5		17.7	22.5	6.2	0.1	0.4
CKG	7.8			17.0	9.1	7.3		10.7	16.6	3.5		0.3

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.6	44.0
CKGJ1	0.4	41.0
CKGJ2	0.7	45.0
CKGJ3	0.4	36.0
CKG	0.4	24.0

PHYSICAL DATA (SURVEY)

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	PARTICLE SIZE ANALYSIS V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AP						1	5	19	24	49		33	18	
CKGJ1							4	41	24	69		17	14	
CKGJ2							2	14	20	36		41	23	
CKGJ3						2	9	23	24	58		24	18	
CKG					1	4	33	32	10	80		11	9	

HMD MANITOBA 1980 PROFILE NO. 53

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP		24.9	10.8										
CKGJ1													
CKGJ2						20.0	34.0	20.0					CL
CKGJ3		27.9	13.4			20.0	33.0	21.0					CL
CKG													

SWV MANITOBA 1980 PROFILE NO. 54

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: UNDECIDED; VERY LIMITED EXTENT; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC BLACK. MINERAL SOIL FAMILY: LOAMY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: SWV.

LOCATION: MILITARY GRID REF. 14 ULN 4817 7863; NTS MAP AREA 63C ; NW 35 36 27 W.

CLIMATE: 303 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), FLUVIAL, MIXED; LANDFORM CLASSIFICATION: FLUVIAL, LOAMY, UNDULATING; SLOPE: 0.5% COMPLEX SLOPE OF CLASS 1 (0-0.5%), FACING NORTHEAST, SITE AT UPPER SLOPE POSITION; SOIL MOISTURE AND DRAINAGE: SUBHUMID, MODERATELY WELL DRAINED, MODERATELY PERVIOUS, MODERATE SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

INTERPRETATIONS: CLI AGRICULTURE 1.

SPECIAL NOTES: SITE IS ON SECOND ALLUVIAL TERRACE APPROX.4 M ABOVE SITE 9 AND 12 M BELOW TOP OF VALLEY WALL

AP: 0 TO 20 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 3/1; FINE SANDY LOAM; WEAK TO MODERATE, MEDIUM, GRANULAR STRUCTURE; WEAK, FINE, GRANULAR SECONDARY STRUCTURE; SLIGHTLY STICKY, VERY FRIABLE, SLIGHTLY PLASTIC CONSISTENCE; VERY FEW, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, FINE, RANDOM, EXPED, DISCONTINUOUS PORES; SMOOTH, CLEAR HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

AH: 20 TO 40 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1; SANDY CLAY LOAM; MODERATE, MEDIUM, GRANULAR STRUCTURE; SLIGHTLY STICKY, VERY FRIABLE, SLIGHTLY PLASTIC CONSISTENCE; VERY FEW, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, FINE, RANDOM, EXPED, DISCONTINUOUS PORES; WAVY, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

BT: 40 TO 63 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/2; SANDY CLAY LOAM; MODERATE, MEDIUM TO COARSE, ANGULAR BLOCKY STRUCTURE; WEAK TO MODERATE, MEDIUM, GRANULAR SECONDARY STRUCTURE; STICKY, FIRM, HARD, PLASTIC CONSISTENCE; FEW, VERY FINE, RANDOM, INPED ROOTS; MODERATELY POROUS, FEW, FINE AND MEDIUM, RANDOM, INPED, DISCONTINUOUS PORES; WAVY, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CK1: 63 TO 80 CM; HORIZON DRY; MATRIX DRY 10YR 4/3, MATRIX DRY 10YR 6/3; SANDY CLAY LOAM; STRUCTURELESS, MASSIVE STRUCTURE; WEAK TO MODERATE, FINE TO MEDIUM, ANGULAR BLOCKY SECONDARY STRUCTURE; SLIGHTLY STICKY, FRIABLE, VERY HARD, SLIGHTLY PLASTIC CONSISTENCE; FEW, MICRO, RANDOM, EXPED ROOTS; MODERATELY POROUS, VERY FEW, FINE AND MEDIUM, RANDOM, EXPED, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; COMMON, MEDIUM, RANDOM, HOMOGENEOUS AND STREAKED SECONDARY CARBONATES WITH FIRM , AND VERY HARD CONSISTENCE; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

CK2: 80 TO 100 CM; HORIZON DRY; MATRIX MOIST 10YR 5/4; FINE SANDY LOAM; STRUCTURELESS, MASSIVE STRUCTURE; STRUCTURELESS, SINGLE GRAIN SECONDARY STRUCTURE; NONSTICKY, VERY FRIABLE, SLIGHTLY HARD, NONPLASTIC CONSISTENCE; MODERATELY POROUS, VERY FEW, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; HOMOGENEOUS ; MILDLY ALKALINE 7.4-7.8 FIELD PH.

SWV MANITOBA 1980 PROFILE NO. 54

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	7.0	4.87	0.35				3.0	35.2		25.4	6.5	0.1	0.8
AH	7.5	3.39	0.25				2.0	30.0		22.2	6.0		0.3
BT	7.4	1.35	0.14				1.5	26.2		16.2	7.6		0.7
CK1	7.9			15.9	7.9	7.4		15.2		23.9	5.0		0.2
CK2	7.8			15.4	8.1	6.7		8.9		15.9	3.0		0.1

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.5	49.0
AH	0.4	48.0
BT	0.4	44.0
CK1	0.3	38.0
CK2	0.3	30.0

PHYSICAL DATA (SURVEY)

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	PARTICLE SIZE ANALYSIS V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AP					1	2	9	25	23	60		21	19	
AH					1	2	9	28	20	60		20	20	
BT						1	7	22	18	48		25	27	
CK1							4	26	25	55		25	20	
CK2							7	47	22	76		13	11	

SHV MANITOBA 1980 PROFILE NO. 54

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP		27.7	13.6										
AH													
BT		23.4	13.0										
CK1													
CK2		12.3	5.6			18.0	19.0	20.0					SM

SWV MANITOBA 1980 PROFILE NO. 55

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: UNDECIDED; VERY LIMITED EXTENT; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC BLACK. MINERAL SOIL FAMILY: LOAMY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: SWV.

LOCATION: MILITARY GRID REF. 14 ULN 4826 7882; NTS MAP AREA 63C ; NW 35 36 27 W.

CLIMATE: 311 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY) AND STRATIFIED (MINERAL), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), FLUVIAL, MIXED; LANDFORM CLASSIFICATION: FLUVIAL, LOAMY, UNDULATING; SLOPE: COMPLEX SLOPE OF CLASS 2 (0.5-2%), FACING LEVEL; SOIL MOISTURE AND DRAINAGE: SUBHUMID, MODERATELY WELL DRAINED, MODERATELY PERVIOUS, SLOW SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

INTERPRETATIONS: CLI AGRICULTURE 1.

SPECIAL NOTES: SITE FROM HIGHEST TERRACE IN THIS PART OF VALLEY.ABOUT 4M ABOVE SITE 10 AND 4M BELOW TOP OF VALLEY WALL.SOIL IS MORE DEGRADED THAN NO 10 AS SEEN IN STRONGER BT AND SALT AND PEPPER OF AH HORIZON.

AP: 0 TO 15 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 3.5/2; FINE SANDY LOAM; VERY WEAK, MEDIUM TO COARSE, SUBANGULAR BLOCKY STRUCTURE; WEAK TO MODERATE, FINE, GRANULAR SECONDARY STRUCTURE; SLIGHTLY STICKY, VERY FRIABLE, HARD, SLIGHTLY PLASTIC CONSISTENCE; PLENTIFUL, FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, VERY FINE, RANDOM, EXPED, DISCONTINUOUS PORES; SMOOTH, CLEAR HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

AH: 15 TO 30 CM, RANGE 15 TO 30 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 3/2; VERY FINE SANDY LOAM; VERY WEAK, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; WEAK TO MODERATE, FINE, GRANULAR SECONDARY STRUCTURE; SLIGHTLY STICKY, VERY FRIABLE, HARD, SLIGHTLY PLASTIC CONSISTENCE; FEW, FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, RANDOM, EXPED, DISCONTINUOUS PORES; IRREGULAR, ABRUPT HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

BTJ: 30 TO 43 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/3; SANDY CLAY LOAM; WEAK TO MODERATE, MEDIUM TO COARSE, ANGULAR BLOCKY STRUCTURE; WEAK, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; STICKY, FRIABLE, VERY HARD, PLASTIC CONSISTENCE; VERY FEW, FINE, RANDOM, INPED ROOTS; MODERATELY POROUS, FEW, VERY FINE AND MEDIUM, RANDOM, INPED, DISCONTINUOUS PORES; SMOOTH, ABRUPT HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

CK1: 43 TO 70 CM; HORIZON MOIST; MATRIX MOIST 10YR 5/4, MATRIX DRY 10YR 6/4; LOAM; STRUCTURELESS, MASSIVE STRUCTURE; WEAK TO MODERATE, MEDIUM TO COARSE, PLATY SECONDARY STRUCTURE PSEUDO AND LAMINATED; SLIGHTLY STICKY, FIRM, VERY HARD, SLIGHTLY PLASTIC CONSISTENCE; VERY FEW, FINE, VERTICAL, EXPED ROOTS; MODERATELY POROUS, FEW, FINE, RANDOM, EXPED, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; SMOOTH, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CK2: 70 TO 100 CM; HORIZON DRY; MATRIX MOIST 10YR 5/4, MATRIX DRY 10YR 6/4; FINE SANDY LOAM; STRUCTURELESS, MASSIVE STRUCTURE; MEDIUM, PLATY SECONDARY STRUCTURE PSEUDO AND LAMINATED; SLIGHTLY STICKY, FRIABLE, VERY HARD, SLIGHTLY PLASTIC CONSISTENCE; MODERATELY POROUS, FEW, FINE, RANDOM, EXPED, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; STRONGLY CALCAREOUS; MILDLY ALKALINE 7.4-7.8 FIELD PH.

SNV MANITOBA 1980 PROFILE NO. 55

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	6.7	4.57	0.32				4.5	32.5		22.6	6.0		0.8
AH	7.2	2.18	0.15				3.0	23.7		15.6	5.3		0.5
BTJ	7.2	0.93	0.10				3.0	22.8		13.8	6.5	0.1	0.5
CK1	7.8			20.2	9.3	10.0		14.5		23.8	5.1	0.1	0.3
CK2	7.8			20.6	9.3	10.4		12.6		23.5	4.5	0.1	0.3

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.3	45.0
AH	0.3	38.0
BTJ	0.3	37.0
CK1	0.4	38.0
CK2	0.4	29.0

PHYSICAL DATA (SURVEY)

PARTICLE SIZE ANALYSIS

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AP					1	3	12	24	24	64		19	17	
AH						1	8	23	28	60		21	19	
BTJ							3	15	33	51		24	25	
CK1							3	15	33	51		29	20	
CK2							2	30	28	60		22	18	

SWV MANITOBA 1980 PROFILE NO. 55

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP		27.4	12.5										
AH													
BTJ		24.4	11.2										
CK1													
CK2		20.9	7.9			17.0	27.0	19.0					CL

KVL MANITOBA 1980 PROFILE NO. 56

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; VERY LIMITED EXTENT; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: ORTHIC BLACK. MINERAL SOIL FAMILY: LOAMY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: TAXONOMIC SERIES, NOTATION: KVL, ASSOCIATED SOILS: DRBAND VLY.

LOCATION: MILITARY GRID REF. 14 ULN 4755 7832; NTS MAP AREA 63C ; NW 35 36 27 W.

CLIMATE: 324 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS VERY GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY) AND STRATIFIED (MINERAL), LACUSTRINE, MIXED; LANDFORM CLASSIFICATION: LACUSTRINE, LOAMY, LEVEL; SLOPE: SIMPLE SLOPE OF CLASS 1 (0-0.5%), FACING LEVEL; SOIL MOISTURE AND DRAINAGE: SUBHUMID, WELL DRAINED, MODERATELY PERVIOUS, SLOW SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

INTERPRETATIONS: CLI AGRICULTURE 1.

SPECIAL NOTES: SURFACE COLOUR IS BLACK WHEN MOIST BUT SALT AND PEPPER OF AHE,DEPTH AND DEGREE OF DEVELOPMENT OF BT INDICATE SUFFICIENT LEACHING TO BE DARK GRAY.CHECK DRY COLOUR

AP: 0 TO 15 CM; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 3.5/2; FINE SANDY LOAM; WEAK TO MODERATE, FINE TO MEDIUM, GRANULAR STRUCTURE; VERY FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; FEW, FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, FINE, RANDOM, EXPED, DISCONTINUOUS PORES; SMOOTH, ABRUPT HORIZON BOUNDARY; SLIGHTLY ACID 6.1-6.5 FIELD PH.

AHE: 15 TO 38 CM; MATRIX MOIST 10YR 2/1, MATRIX MOIST 10YR 3/2; FINE SANDY LOAM; WEAK TO MODERATE, FINE TO MEDIUM, GRANULAR STRUCTURE; VERY FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; FEW, VERY FINE AND FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, FINE, RANDOM, EXPED, DISCONTINUOUS PORES; WAVY, ABRUPT HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

BT: 38 TO 52 CM; MATRIX MOIST 10YR 3/3; LOAM; VERY WEAK, MEDIUM TO COARSE, PRISMATIC STRUCTURE; WEAK TO MODERATE, FINE, SUBANGULAR BLOCKY SECONDARY STRUCTURE; FRIABLE, HARD, PLASTIC CONSISTENCE; FEW, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, FEW, VERY FINE AND MEDIUM, VERTICAL, INPED, DISCONTINUOUS PORES; COMMON, VERY THIN CLAY FILMS ON PED FACES-UNSPECIFIED, 10YR 2/2; SMOOTH, CLEAR HORIZON BOUNDARY; NEUTRAL 6.6-7.3 FIELD PH.

BC: 52 TO 64 CM; MATRIX MOIST 10YR 3/3; LOAM; WEAK TO MODERATE, MEDIUM, SUBANGULAR BLOCKY STRUCTURE; VERY FRIABLE, SLIGHTLY HARD, PLASTIC CONSISTENCE; MODERATELY POROUS, FEW, VERY FINE, RANDOM, EXPED, DISCONTINUOUS PORES; VERY WEAK EFFERVESCENCE; MODERATELY CALCAREOUS; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CK1: 64 TO 80 CM; MATRIX MOIST 10YR 6/3; SILT LOAM; STRUCTURELESS, MASSIVE STRUCTURE; VERY WEAK, FINE, GRANULAR SECONDARY STRUCTURE; VERY FRIABLE, HARD, SLIGHTLY PLASTIC CONSISTENCE; MODERATELY POROUS, FEW, VERY FINE, RANDOM, EXPED, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; VERY STRONGLY CALCAREOUS; HOMOGENEOUS ; WAVY, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CK2: 80 TO 100 CM; MATRIX MOIST 10YR 6/3, MATRIX MOIST 10YR 5/3; SILT LOAM; COMMON, FINE, DISTINCT, 10YR 5/8 MOTTLES; VERY WEAK, MEDIUM, PLATY STRUCTURE LAMINATED; VERY WEAK, FINE, GRANULAR SECONDARY STRUCTURE; VERY FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; MODERATELY POROUS, FEW, VERY FINE, RANDOM, EXPED, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; VERY STRONGLY CALCAREOUS; STREAKED SECONDARY CARBONATES 10YR 8/2; MILDLY ALKALINE 7.4-7.8 FIELD PH.

KVL MANITOBA 1980 PROFILE NO. 56

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	EXTR ACID	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
AP	6.3	6.05	0.46				5.5	39.1		26.8	5.9	0.1	1.4
AHE	6.6	1.77	0.15				2.0	18.8		13.3	3.8	0.1	0.4
BT	6.9	0.63	0.07				2.3	22.9		12.4	8.4	0.1	0.6
BC	7.4	0.77	0.08	6.8	0.8	5.6		25.6		17.2	9.7	0.2	0.6
CK1	7.6			25.7	12.1	12.5		25.4		24.4	9.9	0.1	0.4
CK2	7.8			26.2	13.7	11.5		18.2		24.7	8.8	0.1	0.4

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR
AP	0.4	51.0
AHE	0.2	40.0
BT	0.3	39.0
BC	0.4	47.0
CK1	0.4	51.0
CK2	0.3	49.0

PHYSICAL DATA (SURVEY)

HORIZON	PARTICLE SIZE ANALYSIS % PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
AP						2	7	31	20	60		21	19	
AHE					1	3	9	45	14	72		15	13	
BT					1	1	4	21	19	46		30	24	
BC						1	1	8	22	32		43	25	
CK1							1	3	14	18		56	26	
CK2							1	6	17	24		52	24	

KVL MANITOBA 1980 PROFILE NO. 56

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
AP		36.9	15.2										
AHE													
BT		26.8	13.0										
BC													
CK1													
CK2		34.1	13.8			23.0	43.0	27.0					CL

AUG 07, 1986

MNS MANITOBA 1980 PROFILE NO. 57

IDENTIFICATION: SURVEYED BY GFM, FOR THE PURPOSE OF DETAILED SURVEY; PROVINCIAL SOIL SURVEY, WINNIPEG,MAN. STATUS: MODAL; LIMITED EXTENT; SURVEY REPORT NO. D37.

CLASSIFICATION: TAXONOMIC SYSTEM OF THE YEAR 1978, SUBGROUP: GLEYED REGO BLACK. MINERAL SOIL FAMILY: LOAMY, MIXED NONCLAY, ALKALINE, STRONGLY CALCAREOUS, COOL, SUBHUMID. SOIL MAP UNIT: NOTATION: MNS, ASSOCIATED SOILS: MEH.

LOCATION: MILITARY GRID REF. 14 ULN 4331 7256; NTS MAP AREA 63C ; NE 8 36 27 W.

CLIMATE: 337 METERS ABOVE MEAN SEA LEVEL. STATION AT SWAN RIVER HAS VERY GOOD RELEVANCE TO THE SOIL SITE.

VEGETATION: CROPS-FIELD (MANAGED), CROPPED.

SOIL SITE: PARENT MATERIAL 1: WEAK CHEMICAL WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), LACUSTRINE, MIXED; PARENT MATERIAL 2: UNSPECIFIED WEATHERING, FINE LOAMY AND FINE SILTY (18 TO 35% CLAY), MODERATELY TO VERY STRONGLY CALCAREOUS (6-40% CACO3), MORAINAL (TILL), IGNEOUS AND LIMESTONE; LANDFORM CLASSIFICATION: LACUSTRINE, LOAMY, VENEER; SLOPE: CLASS 1 (0-0.5%), FACING LEVEL; SOIL MOISTURE AND DRAINAGE: SUBHUMID, IMPERFECTLY DRAINED, MODERATELY PERVIOUS, VERY SLOW SURFACE RUNOFF, SEEPAGE ABSENT; NONSTONY; NONROCKY; PRESENT LAND USE: CROPLAND.

INTERPRETATIONS: CLI AGRICULTURE 2/W.

SPECIAL NOTES: CKGJ HORIZON IS SANDIER CONTAINING A FEW COARSE FRAGMENTS POSSIBLY A WATERWORKING OF TILL. THE SURFACE OF THE TILL HAS A CONTINUOUS COBBLE LAYER FROM WATERWORKING AND BECOMES LESS STONY WITH DEPTH.AC HORIZON IS SIMILAR TO A BMKGJ HORIZON.

APK: 0 TO 15 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1, MATRIX DRY 10YR 3/1; VERY FINE SANDY CLAY LOAM; MODERATE, MEDIUM TO COARSE, SUBANGULAR BLOCKY STRUCTURE; WEAK, FINE, GRANULAR SECONDARY STRUCTURE; SLIGHTLY STICKY, FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; VERY FEW, VERY FINE, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, FINE, RANDOM, EXPED, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; SMOOTH, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

AHK: 15 TO 24 CM, RANGE 10 TO 15 CM; HORIZON MOIST; MATRIX MOIST 10YR 2/1; VERY FINE SANDY CLAY LOAM; WEAK, FINE TO MEDIUM, GRANULAR STRUCTURE; SLIGHTLY STICKY, FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; VERY FEW, MICRO, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, FINE, RANDOM, EXPED, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; WAVY, ABRUPT HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

AC: 24 TO 40 CM, RANGE 15 TO 25 CM; HORIZON MOIST; MATRIX MOIST 10YR 3/2; VERY FINE SANDY LOAM; STRUCTURELESS, MASSIVE STRUCTURE; WEAK, FINE, GRANULAR SECONDARY STRUCTURE; SLIGHTLY STICKY, FRIABLE, SLIGHTLY HARD, SLIGHTLY PLASTIC CONSISTENCE; VERY FEW, MICRO, RANDOM, EXPED ROOTS; MODERATELY POROUS, COMMON, FINE, RANDOM, EXPED, DISCONTINUOUS PORES; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; SMOOTH, CLEAR HORIZON BOUNDARY; MILDLY ALKALINE 7.4-7.8 FIELD PH.

CKGJ: 40 TO 50 CM; HORIZON MOIST; MATRIX MOIST 10YR 5/4; VERY FINE SANDY LOAM; STRUCTURELESS, MASSIVE STRUCTURE; VERY WEAK, VERY FINE TO FINE, GRANULAR SECONDARY STRUCTURE; NONSTICKY, VERY FRIABLE, SLIGHTLY HARD, NONPLASTIC CONSISTENCE; HIGHLY POROUS, COMMON, MEDIUM, RANDOM, EXPED PORES; MODERATE EFFERVESCENCE; MODERATELY CALCAREOUS; SMOOTH, ABRUPT HORIZON BOUNDARY; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

2CKGJ: 50 TO 75 CM; HORIZON MOIST; MATRIX MOIST 10YR 7/4; SILT LOAM; WEAK TO MODERATE, FINE TO MEDIUM, PLATY STRUCTURE LAMINATED; WEAK, FINE, GRANULAR SECONDARY STRUCTURE; SLIGHTLY STICKY, FIRM, VERY HARD, SLIGHTLY PLASTIC CONSISTENCE; SLIGHTLY POROUS, VERY FEW, VERY FINE, RANDOM, EXPED PORES; STRONG EFFERVESCENCE; EXTREMELY CALCAREOUS; 10% GRAVELLY AND COBBLY AND ANGULAR COBBLY COARSE FRAGMENTS; MODERATELY ALKALINE 7.9-8.4 FIELD PH.

MNS MANITOBA 1980 PROFILE NO. 57

CHEMICAL DATA (SURVEY)

HORIZON	PH 1	ORG C (%)	TOTAL N (%)	CALC CARB EQU.%	CAL-CITE (%)	DOLO-MITE (%)	C.E.C. (ME/100G) BUFF.	C.E.C. (ME/100G) PERM. CHARG	EXCHANGEABLE CATIONS BUFFERED (ME/100G) CA	MG	NA	K
APK	7.6	7.67	0.59	5.9	5.6	0.3	51.2		41.3	26.1	0.2	0.7
AHK	7.8	3.98	0.34	8.8	5.6	3.0	33.2		28.6	22.1	0.2	0.4
AC	7.8	1.77	0.12	10.9	5.7	4.8	17.8		21.7	13.8	0.2	0.2
CKGJ	7.9			12.4	4.2	7.5	8.7		15.4	8.4	0.2	0.2
2CKGJ	7.9			49.4	14.6	32.0	5.5		22.0	10.6	0.7	0.1

CHEMICAL DATA (SURVEY)

HORIZON	ELEC COND (MMHOS/CM)	% H2O AT SATUR	WATER EXTRACT DETERMINATIONS CA	MG	NA	K	CO3	HCO3	CL	SO4	NO3
APK	0.8	67.0									
AHK	0.8	57.0									
AC	0.9	41.0									
CKGJ	0.9	31.0									
2CKGJ	4.9	36.0	18.9	47.2	14.7			1.8	1.0	77.6	

PHYSICAL DATA (SURVEY)

HORIZON	% PASSING 3 SIEVE	.75 SIEVE	NO.4 SIEVE	NO.10 SIEVE	PARTICLE SIZE ANALYSIS V.C. SAND	C. SAND	MED. SAND	F. SAND	V.F. SAND	TOT. SAND	% OF SAMPLE 70-2U SILT	50-2U SILT	2U CLAY	0.2U CLAY
APK					1	1	3	19	28	52		23	25	
AHK					1	1	3	23	31	59		18	23	
AC				99		1	3	30	34	68		15	17	
CKGJ				96	1	1	4	39	33	78		13	9	
2CKGJ				86	2	1	2	6	4	15		66	19	

MNS MANITOBA 1980 PROFILE NO. 57

PHYSICAL DATA

	SURVEY (CON'T)					ENGINEERING							
	MOISTURE STATUS (%)												
HORIZON	0.1 ATM	0.33 ATM	15 ATM	HYGR. MOIST	FIELD MOIST	ATTERBURG PLASTIC LIMIT (%)	ATTERBURG LIQUID LIMIT (%)	SHRINKAGE LIMIT (%)	OPT MOIST CONTENT (%)	MAX DRY DENSITY (G/CC)	COLE VALUE	AASHO CLASS	UNIFIED CLASS
APK		45.1	22.9										
AHK													
AC		26.2	11.2			18.0	27.0	21.0					SC
CKGJ													
2CKGJ		24.0	8.4			18.0	24.0	19.0					ML

D.2 SOIL CORRELATION OF THE SWAN RIVER TOWNSITE STUDY AREA WITH THE SOILS REPORTED IN THE RECONNAISSANCE SOIL SURVEY OF THE SWAN RIVER AREA REPORT NO. 13, 1962

The Swan River Townsite soil study replaces that portion of the 1962 reconnaissance soil survey of the Swan River map sheet area that immediately surrounds the Town of Swan River. This resurvey benefits from advantages derived from more intensive examination of soils in the field, use of a larger mapping scale to permit delineation of numerous important local soils, use of modern aerial photographs and use of improved methods of studying soils in the laboratory.

The detailed soil map of the Swan River Townsite study area differs substantially from the 1962 reconnaissance map of the Swan River area. The main differences are the map scale and degree of detail shown. Most map units shown on the reconnaissance map of the Swan River area are simple map units consisting dominantly of single soil types known as soil series. Several map units are complex units that are comprised of closely related soil types known collectively as a soil association. Most soil associations have a dominant soil type interspersed with related but somewhat dissimilar local soil types in lesser proportion. These individual, associated soils developed on the same soil parent material are referred to as soil associates and are usually equivalent to soil series. They are recognized by differences in their soil profile characteristics as a result of differences in drainage and soil climate, often over short distances in the same field. For example, on irregular gently sloping ground moraine near Swan River, Black soils are most common. The dominant well drained soils are thin, Rego Black types, the subdominant soils on imperfectly drained intermediate or lower slopes are Gleyed Rego Blacks, while Rego Humic Gleysols occur in poorly drained depressions. Each of these soil types or Soil Series developed on the same geological deposit, will show different profile characteristics when examined in cross- section and are all members of one particular soil association.

Map units in the present detailed resurvey of the Swan River Townsite area are either simple units consisting dominantly of a single soil series or specifically defined compound units containing a dominant soil series and usually one other named subdominant soil series associated with it. Many of the soil series used in the resurvey conform to the soil series established for the 1962 reconnaissance survey. Additional, more specifically defined soil series have been established in the resurvey to recognize significant soil associates or Soil Series formerly included in soil associations as mapped in 1962. Additional soil series also have been established to identify soil variability previously described as till substrate phases of a particular series.

In the Swan River Townsite soil study, these more specifically defined soil series are grouped into soil associations to accommodate field mapping and classification. Correlation of these additional soil associations and soil series with the associations and soil series published in the 1962 study is provided in Table 20.

TABLE 20

Soil Correlation of the Swan River Townsite Study Area with Soils Reported in the Reconnaissance Soil Survey of the Swan River Area, Report No. 13, 1962

Swan River Townsite Soil Study, 1986				Soil Series, Phases and Associations of the Swan River Reconnaissance Soil Study, 1962
Soil Symbol	Soil Name	Subgroup	Soil Association	
ASZ	Agassiz	Orthic Black	Agassiz	Agassiz series, no change; well drained member of Agassiz association
BAM	Balmoral	Rego Humic Gleysol carbonated phase	Dutton	Balmoral series formerly classified as a Peaty Calcareous Meadow
BAMp	Balmoral peaty phase	Rego Humic Gleysol carbonated phase	Dutton	Balmoral series formerly classified as a Peaty Calcareous Meadow
BEV	Bell River	Gleyed Cumulic Regosol	Bell River	Bell River series, no change; also correlates with coarse textured imperfectly drained soils of the Alluvial complex
BAX	Banks	Orthic Dark Gray	Banks	Durban till substrate phase; underlying substrate is dominantly loamy very strongly calcareous till in study area
CGD	Graigsford	Gleyed Rego Black carbonated phase	Banks	Craigsford soils correlate with Swanford till substrate phase
DRB	Durban	Orthic Black	Durban	Durban soils formerly classified as Orthic Dark Gray soils are classified as Orthic Black based on current soil classification criteria
DTT	Dutton	Orthic Black	Dutton	Dutton series, no change; well drained member of the Dutton association
DTT2	Dutton, gravel substrate variant	Orthic Black		Dutton gravel substrate was not recognized in the Swan River reconnaissance survey
DVD	Davidson	Orthic Dark Gray	Davidson	Davidson series, no change

Table 20. Cont'd

Swan River Townsite Soil Study, 1986				Soil Series, Phases and Associations of the Swan River Reconnaissance Soil Study, 1962
Soil Symbol	Soil Name	Subgroup	Soil Association	
ERX	Eroded Slopes complex	Variable, Chernozemic and Regosolic subgroup		Eroded Slopes complex, no change; includes Truncated Chernozemic and Regosolic soils found on steeply sloping valley side walls of Swan River and Tamarack Creek.
ETT	Ethelbert	Orthic Black	Ethelbert	Ethelbert soils correlate with Gilbert till substrate phase soils.
FOY	Foley	Rego Humic Gleysol	Durban	Foley series formerly classified as Peaty Calcareous Meadow.
GBT	Gilbert	Orthic Black	Gilbert	Gilbert series, no change.
GBT1	Gilbert, loamy substrate variant	Orthic Black		The clayey substrate of the Gilbert soils was described but not mapped in the Swan River reconnaissance study. Insufficient area is mapped to establish a new series.
GBT2	Gilbert, gravel substrate variant	Orthic Black		Gilbert gravel substrate was not recognized in the Swan River reconnaissance study. Insufficient area is mapped to establish a new series.
HAU	Haute	Terric Humisol	Haute complex	Haute series includes shallow well decomposed peat deposits of the Shallow Peat complex associated with Floodplain Swamps.
HAY	Heatley	Gleyed Cumulic Regosol		Heatley series was not recognized in the Swan River reconnaissance study. The series includes imperfectly drained soils within the Alluvial complex consisting of thin fine loamy to coarse loamy deposits underlain by stratified fluvial gravels.
HMD	Homestead	Gleyed Cumulic Regosol	Homestead	Homestead series was not recognized in the Swan River reconnaissance study. The series includes imperfectly drained, fine loamy to coarse loamy soils of the Alluvial complex.

Table 20. Cont'd

Swan River Townsite Soil Study, 1986				Soil Series, Phases and Associations of the Swan River Reconnaissance Soil Study, 1962
Soil Symbol	Soil Name	Subgroup	Soil Association	
PMUp	Pineimuta, peaty phase	Rego Humic Gleysol, carbonated phase	Timberton	Pineimuta peaty phase correlates with Balmoral till substrate phase soils. This soil was formerly classified as a Peaty Calcareous Meadow.
PRA	Prawda	Rego Humic Gleysol, carbonated phase		Not mapped in the Swan River reconnaissance soil study.
RDG	Rose Ridge	Orthic Dark Gray	Rose Ridge	Rose Ridge soils correlate with the well drained Orthic Dark Gray member of the Rose Ridge association
SPG	Sprague	Rego Humic Gleysol, carbonated phase	Pelan	Sprague series correlates with Malonton till substrate phase soils. This soil was formerly classified as a Peaty Calcareous Meadow.
SVC	Sevick	Gleyed Rego Black	Ethelbert	Sevick series correlates with Lenswood till substrate phase soils.
SVK	Silver Creek	Orthic Regosol	Gilbert	Not mapped in the Swan River reconnaissance soil study. Silver Creek series established to recognize eolian sand dunes with no profile development. Sand dunes were formerly recognized by on-site map symbol
SWF	Swanford	Gleyed Rego Black, carbonated phase	Durban	Swanford series, no change.
SWF1	Swanford, loamy substrate variant	Gleyed Rego Black carbonated phase		The clayey substrate of the Swanford soils was not recognized in the Swan River reconnaissance soil study. Insufficient area is mapped to establish a new series.
SWV	Swan River	Orthic Black		Swan River series correlates with the well drained fine loamy mature soils developed on upper terraces of the flood plain deposits mapped as Alluvial complex.
TBN	Timberton	Orthic Black	Timberton	Timberton series correlates with Dutton till substrate soils which were recognized but not mapped in the Swan River Reconnaissance soil study.
VLY	Valley	Gleyed Rego Black	Dutton	Valley series, no change.

Table 20. Cont'd

Swan River Townsite Soil Study, 1986				Soil Series, Phases and Associations of the Swan River Reconnaissance Soil Study, 1962
Soil Symbol	Soil Name	Subgroup	Soil Association	
LSW	Lenswood	Gleyed Rego Black	Gilbert	Lenswood series, no change; imperfectly drained member of the Gilbert association.
LSW1	Lenswood, loamy substrate variant	Gleyed Rego Black		The clayey substrate of the Lenswood soils was described but not mapped in the Swan River reconnaissance soil study. Insufficient area is mapped to establish a new series.
LSW2	Lenswood, gravel substrate variant	Gleyed Rego Black		Lenswood gravel substrate was not recognized in the Swan River reconnaissance soil study. Insufficient area is mapped to establish a new series.
MEH	Meharry	Rego Black	Meharry	Not mapped in the Swan River reconnaissance soil study. Correlates with the well drained member of the Meharry association.
MNS	Minitonas	Gleyed Rego Black	Timberton	Minitonas soils correlate with Valley till substrate phase soils.
MNT	Malonton	Rego Humic Gleysol, carbonated phase	Gilbert	Malonton series formerly classified as a Peaty Calcareous Meadow.
NOV	Novra	Rego Gleysol	Homestead	Novra series, no change.
ONK	Oaknook	Gleyed Rego Black	Meharry	Not mapped in the Swan River reconnaissance soil study. Correlates with the imperfectly drained member of the Meharry association.
PLN	Pelan	Gleyed Dark Gray	Pelan	Pelan series correlates with Berlo till substrate phase soils.
PMU	Pineimuta	Rego Humic Gleysol, carbonated phase	Timberton	Pineimuta series correlates with Balmoral till substrate phase. This soil was formerly classified as a Peaty Calcareous Meadow.

Appendix E

GUIDES FOR EVALUATING SOIL SUITABILITY FOR SELECTED USES

TABLE 21

Guide for assessing soil suitability as source of topsoil

The term "topsoil" includes soil materials used to cover barren surfaces exposed during construction, and materials used to improve soil conditions on lawns, gardens, flower beds, etc. The factors to be considered include not only the characteristics of the soil itself, but also the ease or difficulty of excavation, and where removal of topsoil is involved, accessibility to the site.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
u	Moist Consistence[2]	Very friable, friable	Loose, firm	Very firm	Cemented
i	Flooding	None	May flood occasionally for short periods	Frequent flooding	Constantly flooded
w	Wetness[2]	Wetness is not determining if better than very poorly drained.			Very poorly drained and permanently wet soils
t	Slope	0-5%	5-9%	9-15%	>15%
p	Stoniness[2]	Stones 10 m apart (Class 0 and 1)	Stones 2-10 m apart (Class 2)	Stones 0.1-2 m apart (Class 3 and 4)	Stones 0.1 m apart (Class 5)
c	Coarse fragments[2]: percent, by volume	<3%	3-15%	15-35%	>35%
s	Texture[2]	FSL, VFSL, L, SiL, SL, SC if 1:1 clay is dominant	CL, SCL, SiCL, SC if 2:1 clay is dominant; c and sic if 1:1 clay is dominant	S, LS, C and SiC if 2:1 clay is dominant. organic soils[3]	Marl, diatomaceous earth
b	Depth of Topsoil[4]	>40 cm	15-40 cm	8-15 cm	<8 cm
n	Salinity of Topsoil[5]	E.C. 0-1	E.C. 1-4	E.C. 4-8	E.C. >8

[1] The symbols are used to indicate the nature of the limitation.

[2] For an explanation of texture, consistence, stoniness, coarse fragments and soil drainage classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[3] Non-woody organic materials are assessed as good sources for topsoil if mixed with or incorporated into mineral soil.

[4] The remaining soil material (at least 8 cm) must be reclaimable after the uppermost soil is removed.

[5] E.C. = Electrical Conductivity (millisiemens/cm).

TABLE 22

Guide for assessing soil suitability as source of sand and gravel

The purpose of this table is to provide guidance for assessing the probable supply as well as quality of the sand or gravel for use as road base material and in concrete. The interpretation pertains mainly to the characteristics of the soil substratum to a depth of 150 cm, augmented by observations made in deep cuts as well as geological knowledge where available.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
a	Unified Soil Group	SW SP GW GP	SW-SM SP-SM GP-GM GW-GM	SM SW-SC SP-SC GM GP-GC GW-GC	All other groups and bedrock
h	Depth to Seasonal Water Table	Not class determining if deeper than 50 cm		50 cm	
q	Depth to Sand and Gravel	<25 cm	25-75 cm[2]	>75 cm[2]	
p	Stoniness[3]	Not class determining if stones >.5 m apart (Class 0, 1, 2 and 3)		Stones 0.1-0.5 m apart (Class 4)	Stones <0.1 m apart (Class 5)
d	Depth to Bedrock	>100 cm	50-100 cm	<50 cm	

[1] The symbols are used to indicate the nature of the limitation.

[2] Rated good if it is known that the underlying gravel or sand deposit is thick (>100 cm).

[3] For an explanation of stoniness and rockiness, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

TABLE 23

Guide for assessing soil suitability as source of roadfill

Fill material for buildings or roads are included in this use. The performance of the material when removed from its original location and placed under load at the building site or road bed are to be considered. Since surface materials are generally removed during road or building construction their properties are disregarded. Aside from this layer, the whole soil to a depth of 150-200 cm should be evaluated. Soil materials which are suitable for fill can be considered equally suited for road subgrade construction.

Symbol[1]	Items Affecting Use[2]	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
a	Subgrade[3]				
	a. AASHO group index[4]	0-4	5-8	>8	
	b. Unified soil classes	GW, GP, SW, SP, SM, GC[5] and SC[5]	CL (with P.I.[6] <15) and ML	CL (with P.I.[6] of 15 or more), CH and MH[7]	OL, OH and Pt
l	Shrink-swell potential	Low	Moderate	High	
f	Susceptibility to frost action[8]	Low	Moderate	High	
t	Slope	0-15%	15-30%	30-45%	>45%
p	Stoniness[9]	Stones >2 m apart (Class 0, 1 and 2)	Stones 0.5-2 m apart (Class 3)	Stones 0.1-0.5 m apart (Class 4)	Stones <0.1 m apart (Class 5)
r	Rockiness[9]	Rock exposures >35 m apart and cover <10% of the surface	Rock exposure 10-35 m apart and cover 10-25% of the surface	Rock exposure 3.5-10 m apart and cover 25-50% of the surface	Rock exposures <3.5 m apart and cover 50-90% of the surface
w	Wetness[9]	Excessively drained to moderately well drained	Imperfectly drained	Poorly drained	Very poorly drained or permanently wet soils
d	Depth to Bedrock	>100 cm	50-100 cm	20-50 cm	<20 cm
h	Depth to Seasonal Water Table	>150 cm	75-150 cm	50-75 cm	<50 cm

1/ The symbols are used to indicate the nature of the limitation.

2/ The first three items pertain to soil after it is placed in a fill; the last six items pertain to soil in its natural condition before excavation for road fill.

3/ This item estimates the strength of the soil material, that is, its ability to withstand applied loads.

4/ Use AASHO group index only where laboratory data are available for the kind of soil being rated; otherwise, use Unified soil groups.

5/ Downgrade suitability rating to fair if content of fines is more than about 30 percent.

6/ P.I. means plasticity index.

7/ Upgrade suitability rating to fair if MH is largely kaolinitic, friable, and free of mica.

8/ Use this item only where frost penetrates below the paved or hardened surface layer and where moisture transportable by capillary movement is sufficient to form ice lenses at the freezing front.

9/ For an explanation of stoniness, rockiness and soil drainage classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

TABLE 24

Guide for assessing soil suitability for permanent buildings

This guide applies to undisturbed soils to be evaluated for single-family dwellings and other structures with similar foundation requirements. The emphasis for rating soils for buildings is on foundation requirements; but soil slope, susceptibility to flooding and other hydrologic conditions, such as wetness, that have effects beyond those related exclusively to foundations are considered too. Also considered are soil properties, particularly depth to bedrock, which influence excavation and construction costs for the building itself and for the installation of utility lines. Excluded are limitations for soil corosivity, landscaping and septic tank absorption fields.

Symbol[2]	Items Affecting Use	Degree of Soil Suitability[3]			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	Wetness[4]	With Basements: Very rapidly, rapidly and well drained. Without Basements: Very rapidly, rapidly, well and moderately well drained.	With Basements: Moderately well drained. Without Basements: Imperfectly drained.	With Basements: Imperfectly, poorly, and very poorly drained. Without Basements: Poorly and very poorly drained.	With Basements: Permanently wet soils. Without Basements: Permanently wet soils.
h	Depth to Seasonal Water Table	With Basements: >150 cm Without Basements: >75 cm	With Basements: 75-150 cm Without Basements: 50-75 cm	With Basements: 25-75 cm Without Basements: 25-50 cm	With Basements: <25 cm Without Basements: <25 cm
i	Flooding	None	None	Occasional flooding (once in 5 years)	Frequent flooding (every year)
t	Slope[5]	0-9%	9-15%	15-30%	>30%
a	Subgrade[6]				
	a. AASHO group index[7]	0-4	5-8	>8	
	b. Unified soil classes	GW, GP, SW, SP, SM and GC and SC	CL (with P.I.[8] <15) and ML	CL (with P.I.[8] of 15 or more), CH and MH	OH, OL and Pt
f	Potential Frost Action[9]	Low (F1, F2)	Moderate (F3)	High (F4)	
p	Stoniness[4]	Stones >10 m apart (Class 0 to 1)	Stones 2-10 m apart (Class 2[10])	Stones 0.1-2 m apart (Class 3[10] to 4)	Stones <0.1 m apart (Class 5[10])
r	Rockiness[4],[11]	Rock exposures >100 m apart and cover <2% of the surface	Rock exposures 30-100 m apart and cover 2-10% of the surface	Rock exposures <30 m apart and cover >10% of the surface	Rock exposures too frequent to allow location of permanent buildings
d	Depth to Bedrock[11]	With Basements: >150 cm Without Basements: >100 cm	With Basements: 100-150 cm Without Basements: 50-100 cm	With Basements: 50-100 cm Without Basements: <50 cm	With Basements: <50 cm

1/ By halving the slope limits, this table can be used for evaluating soil suitability for buildings with large floor areas, but with foundation requirements not exceeding those of ordinary three-storey dwellings.

2/ The symbols are used to indicate the nature of the limitation.

3/ Some soils assessed as fair or poor may be good sites from an aesthetic or use standpoint, but they will require more site preparation and/or maintenance.

4/ For an explanation of rockiness, stoniness and soil drainage classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

5/ Reduce the slope limits by one half for those soils subject to hillside slippage.

6/ This item estimates the strength of the soil, that is, its ability to withstand applied loads. When available, AASHO Group Index values from laboratory tests were used; otherwise the estimated Unified classes were used.

7/ Group index values were estimated from information published by the Portland Cement Association (PCA, 1962), pp. 23-25.

8/ P.I. means plasticity index.

9/ Frost heave only applies where frost penetrates to the assumed depth of the footings and the soil is moist. The potential frost action classes are taken from the United States Army Corps of Engineers (1962), pp. 5-8.

10/ Rate one class better for buildings without basements.

11/ Rate one class better if the bedrock is soft enough so that it can be dug with light power equipment such as backhoes.

TABLE 25

Guide for assessing soil suitability for local roads and streets

This guide applies to soils to be evaluated for construction and maintenance of local roads and streets. These are improved roads and streets having some kind of all-weather surfacing, commonly asphalt or concrete, and are expected to carry automobile traffic all year. They consist of: (1) the underlying local soil material (either cut or fill) called the subgrade; (2) the base material of gravel, crushed rock, or lime or soil cement stabilized soil called the subbase; and (3) the actual road surface or pavement, either flexible or rigid. They also are graded to shed water and have ordinary provisions for drainage. With the probable exception of the hardened surface layer, the roads and streets are built mainly from the soil at hand, and cuts and fills are limited, usually less than 2 meters. Excluded from consideration in this guide are highways designed for fast-moving, heavy trucks.

Properties that affect design and construction of roads and streets are: (1) those that affect the load supporting capacity and stability of the subgrade, and (2) those that affect the workability and amount of cut and fill. The AASHO and Unified Classification give an indication of the traffic supporting capacity. Wetness and flooding affect stability. Slope, depth of hardrock, stoniness, rockiness, and wetness affect the ease of excavation and the amount of cut and fill to reach an even grade.

Symbol[2]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	Wetness[3]	Very rapidly, rapidly, well and moderately well drained	Imperfectly drained	Poorly and very poorly drained	Permanently wet soils
i	Flooding	None	Infrequent (once in 5 years)	Occasional (once in 2-4 years)	Frequent (every year)
t	Slope	0-9%	9-15%	15-30%	>30%
d	Depth to Bedrock[4]	>100 cm	50-100 cm	<50 cm	
a	Subgrade[5]				
	a. AASHO group index[6]	0-4	5-8	>8	
	b. Unified soil classes	GW, GP, SW, SP, SM, GC[7] and SC[7]	CL (with P.I.[8] <15) and ML	CL (with P.I.[8] of 15 or more), CH and MH	OH, OL and Pt
f	Susceptibility to Frost Heave[9]	Low (F1, F2)	Moderate (F3)	High (F4)	
p	Stoniness[3]	Stones >2 m apart (Class 0 to 2)	Stones 0.5-2 m apart (Class 3)	Stones 0.1-0.5 m apart (Class 4)	Stones <0.1 m apart (Class 5)
r	Rockiness[3]	Rock exposures >100 m apart and cover <2% of the surface	Rock exposures 30-100 m apart and cover 2-10% of the surface	Rock exposures <30 m apart and cover >10% of the surface	Rock exposures too frequent to permit location of roads and streets

1/ These guidelines, with some adjustment of slope and rockiness limits, will also be useful for assessing soils for use as parking lots.

2/ Symbols are used to indicate the nature of the limitation.

3/ For an explanation of stoniness, rockiness and soil drainage classes, see the Canada Soil Information System (Canada Soil Survey Committee, 1978).

4/ Rate one class better if the bedrock is soft enough so that it can be dug with light power equipment and is rippable by machinery.

5/ This item estimates the strength of soil materials as it applies to roadbeds. When available, AASHO Group Index values from laboratory tests were used; otherwise, the estimated Unified classes were used. The limitations were estimated assuming that the roads would be surfaced. On unsurfaced roads, rapidly drained, very sandy, poorly graded soils may cause washboard or rough roads.

6/ Group index values were estimated from information published by the Portland Cement Association (PCA, 1962) pp. 23-25.

7/ Downgrade to moderate if content of fines (less than 200 mesh) is greater than about 30 percent.

8/ P.I. means plasticity index.

9/ Frost heave is important where frost penetrates below the paved or hardened surface layer and moisture transportable by capillary movement is sufficient to form ice lenses at the freezing point. The susceptibility classes are taken from the United States Army Corps of Engineers (1962) pp. 5-8.

TABLE 26

Guide for assessing soil suitability for trench-type sanitary landfills

The term cover material includes soil materials used to put a daily and final covering layer on refuse in area-type sanitary landfills. This cover material may be derived from the area of the landfill or may be brought in from surrounding areas.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
u	Moist Consistence[2]	Very friable, friable	Loose, firm	Very firm	Cemented
s	Texture[2],[3]	SL, L, SiL, SCL	SiCL, CL, SC, LS	SiC, C	Muck, peat, sand, gravel
d	Depth to bedrock[4]	>150 cm	100-150 cm	50-100 cm	<50 cm
c	Coarse fragments[2]	<15%	15-35%	>35%	
p	Stoniness[2]	Stones >10 m apart (Class 0 and 1)	Stones 2-10 m apart (Class 2)	Stones 0.1-2 m apart (Class 3 and 4)	Stones < 0.1 m apart (Class 5)
t	Slope	<9%	9-15%	15-30%	>30%
w	Wetness[2]	Not class determining if better than poorly drained		Poorly drained	Very poorly drained or permanently wet soils

[1] The symbols are used to indicate the nature of the limitation.

[2] For an explanation of consistence, texture, coarse fragments, stoniness and soil drainage classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[3] Soils having a high proportion of non-expansive clays may be given a suitability rating one class better than is shown for them in this table.

[4] Thickness of material excluding topsoil, which will be stockpiled (see guide for topsoil).

TABLE 27

Guide for assessing soil suitability for area-type sanitary landfills

The trench-type sanitary landfill is a sanitary landfill, in which dry garbage and trash is buried daily in an open trench and covered with a layer of soil material. Suitability of the site is dependent upon the potential for pollution of water sources through groundwater contact with the refuse, or leachate arising from the site. Those properties affecting ease of excavation of the site must be supplemented with geological and hydrological knowledge to provide subsurface soil and groundwater data to a depth of at least 3 to 4.5 m, a common depth of landfills.

Symbol[2/]	Items Affecting Use	Degree of Soil Suitability			
		Good - G[3/]	Fair - F	Poor - P	Very Poor - V
h	Depth to Seasonal High Water Table	Not class determining if more than 180 cm		100-180 cm	<100 cm
w	Wetness[4/]	Not class determining if better than imperfectly drained		Imperfectly drained	Poorly and very poorly drained or permanently wet soils
i	Flooding	None	Rare	Occasional	Frequent
k	Permeability[5/]	<5 cm/hr	<5 cm/hr	5-15 cm/hr	>15 cm/hr
t	Slope	0-15%	15-30%	30-45%	>45%
s	Soil Texture[4/,6/] (dominant to a depth of 150 cm)	SL, L, SiL, SCL	SiCL[7/], CL, SC, LS	SiC, C	Muck, peat, gravel, sand
d	Depth to Hard Bedrock Rippable	>150 cm >150 cm	>150 cm 100-150 cm	100-150 cm 100-150 cm	<100 cm <100 cm
p	Stoniness[4/]	Stones >10 m apart (Class 0 and 1)	Stones 2-10 m apart (Class 2)	Stones 0.1-2 m apart (Class 3 and 4)	Stones <0.1 m apart (Class 5)
r	Nature of Bedrock	Impermeable			Highly permeable, fractured, easily soluble

1/ Based on soil depth (120 cm) commonly investigated in making soil surveys.

2/ The symbols are used to indicate the nature of the limitation.

3/ If probability is high that the soil material to a depth of 3 to 4.5 m will not alter a rating of good or fair, indicate this by an appropriate footnote, such as "Probably good to a depth of 3.5 m", or "Probably fair to a depth of 3.5 m".

4/ For an explanation of stoniness, texture and soil drainage classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

5/ Reflects ability of soil to retard movement of leachate from the landfills; may not reflect a limitation in arid and semiarid areas.

6/ Reflects ease of digging and moving (workability) and trafficability in the immediate area of the trench where there may not be surfaced roads.

7/ Soils high in expansive clays may need to be given a suitability rating of poor.

TABLE 28

Guide for assessing soil suitability as cover material for area-type sanitary landfills

In the area-type sanitary landfill refuse is placed on the surface of the soil in successive layers. The daily and final cover material generally must be imported. A final cover of soil material at least 60 cm thick is placed over the fill when it is completed.

The soil under the proposed site should be investigated so as to determine the probability that leachates from the landfill can penetrate the soil and thereby pollute water supplies.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
h	Depth to Seasonal Water Table[2]	>150 cm	150-100 cm	50-100 cm	<50 cm
w	Wetness[2],[3]	Rapid to moderately well drained	Imperfectly drained	Poorly drained	Very poorly drained or permanently wet soils
i	Flooding	None	Rare	Occasional	Frequent
k	Permeability[4],[5]	Not class determining if less than 5 cm/hr		5-15 cm/hr	>15 cm/hr
t	Slope	0-9%	9-15%	15-30%	>30%

[1] The symbols are used to indicate the nature of the limitation.

[2] Reflects influence of wetness on operation of equipment.

[3] For an explanation of drainage, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[4] Reflects ability of the soil to retard movement of leachate from landfills; may not reflect a limitation in arid and semiarid areas.

[5] Due to possible groundwater contamination, impermeable bedrock is considered poor and permeable bedrock is rated very poor for area-type sanitary landfills.

TABLE 29

Guide for assessing soil suitability for reservoirs and sewage lagoons

Factors affecting the ability of undisturbed soils to impound water or sewage and prevent seepage are considered for evaluating soils on their suitability for reservoir and lagoon areas. This evaluation considers soil both as a vessel for the impounded area and as material for the enclosing embankment. As the impounded liquids could be potential sources of contamination of nearby water supplies, e.g. sewage lagoons, the landscape position of the reservoir as it affects risk of flooding must also be considered.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
h	Depth to Water Table[2]	>150 cm	100-150 cm	50-100 cm	<50 cm
i	Flooding[3]	None	None	Subject to infrequent flooding (once in 50 years)	Subject to frequent high level flooding
k	Soil Permeability	0-0.5 cm/hr	0.5-5 cm/hr	5-15 cm/hr	>15 cm/hr
t	Slope	0-2%	2-5%	5-9%	>9%
o	Organic Matter	<2%	2-10%	10-30%	>30%
c	Coarse Fragments[4] <25 cm in diameter, % by volume	<20%	20-35%	>35%	
p	Stoniness[4], >25 cm diameter, percent of surface area	<3% (Class 0, 1 and 2)	3-15% (Class 3)	15-50% (Class 4)	>50% (Class 5)
d	Depth to Bedrock[5]	>150 cm	100-150 cm	50-100 cm	<50 cm
j	Thickness of Slowly Permeable Layer	>100 cm	50-100 cm	50-25 cm	<25 cm
a	Subgrade Unified Soil Classes	GC, SC, CL, & CH	GM, ML, SM & MH	SW & SP	OL, OH & Pt GP, GW

1/ The symbols are used to indicate the nature of the limitation.

2/ If the floor of the lagoon has nearly impermeable material at least 50 cm thick, disregard depth to water table.

3/ Disregard flooding if it is not likely to enter or damage the lagoon (flood waters have low velocity and depth less than 150 cm).

4/ For an explanation of coarse fragments and stoniness classes, see the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

5/ Surface exposures of non rippable rock are rated very poor. If underlying bedrock is impermeable, rating should be one class better.

TABLE 30

Guide for assessing soil suitability for septic tank absorption fields

This guide applies to soils to be used as an absorption and filtering medium for effluent from septic tank systems. A subsurface tile system laid in such a way that effluent from the septic tank is distributed reasonably uniformly into the natural soil is assumed when applying this guide. A rating of poor need not mean that a septic system should not be installed in the given soil, but rather, may suggest the difficulty, in terms of installation and maintenance, which can be expected.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
k	Permeability[2]	Rapid to moderately rapid	Moderate	Slow	Very slow
	Percolation Rate[3] (Auger hole method)	About 8-18 min/cm[3]	18-24 min/cm	Slower than 24 min/cm	
h	Depth to Seasonal Water Table[4]	>150 cm[5]	100-150 cm	50-100 cm	<50 cm
i	Flooding	Not subject to flooding	Not subject to flooding	Subject to occasional flooding (once in 5 years)	Floods every year
t	Slope	0-9%	9-15%	15-30%	>30%
d	Depth to Hard Rock, bedrock or other impervious materials	>150 cm	100-150 cm[6]	50-100 cm	<50 cm

[1] The symbols are used to indicate the nature of the limitation.

[2] The suitability ratings should be related to the permeability of soil layers at and below depth of the tile line.

[3] Soils having a percolation rate less than about 8 min/cm are likely to present a pollution hazard to adjacent waters. This hazard must be noted, but the degree of hazard must, in each case, be assessed by examining the proximity of the proposed installation to water bodies, water table, and related features. The symbol g is used to indicate this condition. Refer to U.S. Dept. of Health, Education and Welfare (1969) for details of this procedure.

[4] Seasonal means for more than one month. It may, with caution, be possible to make some adjustment for the severity of a water table limitation in those cases where seasonal use of the facility does not coincide with the period of high water table.

[5] A seasonal water table should be at least 100 cm below the bottom of the trench at all times for soils rated Good (U.S. Dept. of Health, Education and Welfare, 1969). The depths used to water table are based on an assumed tile depth of 50 cm. Where relief permits, the effective depth above a water table or rock can be increased by adding appropriate amounts of fill.

[6] Where the slope is greater than 9%, a depth to bedrock of 100-150 cm is assessed as poor.

TABLE 31

Guide for assessing soil suitability for playgrounds

This guide applies to soils to be used intensively for playgrounds for baseball, football, badminton, and for other similar organized games. These areas are subject to intensive foot traffic. A nearly level surface, good drainage, and a soil texture and consistence that gives a firm surface generally are required. The most desirable soils are free of rock outcrops and coarse fragments.

Soil suitability for growing and maintaining vegetation is not a part of this guide, except as influenced by moisture, but is an important item to consider in the final evaluation of site.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	Wetness[2]	Rapidly, well and moderately well drained soils with no ponding or seepage. Water table below 75 cm during season of use.	Moderately well drained soils subject to occasional seepage or ponding of short duration and imperfectly drained soils. Water table below 50 cm during season of use.	Imperfectly drained soils subject to seepage or ponding, and poorly drained soils. Water table above 50 cm during season of use.	Very poorly drained and permanently wet soils.
i	Flooding	None during season of use.	Occasional flooding. May flood once every 2-3 years during season of use.	Floods every year during season of use.	Prolonged flooding during season of use.
k	Permeability	Very rapid to moderate.	Moderately slow and slow.	Very slow.	
t	Slope	0-2%	2-5%	5-9%	>9%
d	Depth to Bedrock	>100 cm	50-100 cm[3]	<50 cm[3]	
c	Coarse fragments on surface[2]	Relatively free of coarse fragments.	<20% coarse fragments.	>20% coarse fragments.	
p	Stoniness[2]	Stones >10 m apart. (Class 0 to 1)	Stones 2-10 m apart. (Class 2)	Stones 0.1-2 m apart. (Class 3, 4)	Stones <0.1 m apart. (Class 5)
r	Rockiness[2]	Rock exposures >100 m apart and cover <2% of the surface.	Rock exposures 30-100 m apart and cover about 2-10% of the surface.	Rock exposures <30 m apart and cover >10% of the surface.	Rock outcrops too frequent to permit playground location.
s	Surface Soil Texture[2],[4]	SL, FSL, VFSL, L	SiL, CL, SCL, SiCL, LS	SC, SiC, C[5]; S, Si	Peaty soils; S and LS subject to blowing.
q	Depth to Sand or Gravel[6]	>100 cm	50-100 cm	<50 cm	
m	Useful Moisture[7]	Water storage capacity[8] >15.0 cm and/or adequate rainfall and/or low evapotranspiration.	Water storage capacity[8] 7.5-15 cm and/or moderate rainfall and/or moderate evapotranspiration.	Water storage capacity[8] <7.5 cm and/or low rainfall and/or high evapotranspiration.	

1/ The symbols are used to indicate the nature of the limitation.

2/ See also definitions for coarse fragments, rockiness, stoniness, textural and soil drainage classes in the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).
Coarse fragments for the purpose of this table include gravels and cobbles.

3/ Downgrade to a very poor suitability rating if the slope is greater than 5%.

4/ Surface soil texture influences soil ratings as it affects foot trafficability, surface wetness, dust, and maintenance. Adverse soil textures may be partially or completely overcome with the addition of topsoil.

5/ Moderately well and well drained SC, SiC and C soils may be rated fair.

6/ Depth to sand or gravel is considered a limitation in that levelling operations may expose sand or gravel, thereby bringing about adverse surface textures and undesirable amounts of coarse fragments. The addition of topsoil after the levelling process would overcome this limitation.

7/ This item attempts to evaluate the adequacy of moisture for vegetative growth. It incorporates the concept of supply through rainfall, loss through evapotranspiration, and storage within the rooting zone. In soils where the water table is within rooting depth for a significant portion of the year, water storage capacity may not significantly influence vegetation growth.

8/ Consult glossary for definitions of terms used.

TABLE 32

Guide for assessing soil suitability for picnic areas

This guide applies to soils considered for intensive use as park-type picnic areas. It is assumed that most vehicular traffic will be confined to the access roads. Soil suitability for growing and maintaining vegetation is not a part of this guide, except as influenced by moisture, but is an important item to consider in the final evaluation of site.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	Wetness[2]	Very rapidly, rapidly, well and moderately well drained soils not subject to seepage or ponding. Water table below 50 cm during season of use.	Moderately well drained soils subject to occasional seepage or ponding and imperfectly drained soils not subject to ponding or seepage. Water Table above 50 cm for short periods during season of use.	Imperfectly drained soils subject to seepage or ponding. Poorly drained soils. Water table above 50 cm and often near surface for a month or more during season of use.	Very poorly drained and permanently wet soils.
i	Flooding	None during season of use.	May flood 1 or 2 times per year for short periods during season of use.	Floods more than 2 times during season of use.	Prolonged flooding during season of use.
t	Slope	0-9%	9-15%	15-30%	>30%
s	Surface Soil Texture[2],[3]	SL, FSL, VFSL, L	SiL, CL, SCL, SiCL, LS, and sand other than loose sand.	SC, SiC, C[4]; Si	Peaty soils; loose sand subject to blowing.
c	Coarse Fragments on Surface[2]	0-20%	20-50%	>50%	
p	Stoniness[2]	Stones >2 m apart (Class 0 to 2)	Stones 1-2 m apart (Class 3)	Stones 0.1-1 m apart (Class 4)	Stones <0.1 m apart (Class 5)
r	Rockiness[2],[5],[6]	Rock exposures roughly 30-100 or more m apart and cover <10% of the surface.	Rock exposures roughly 10-30 m apart and cover 10-25% of the surface.	Rock exposures <10 m apart and cover >25% of the surface.	Rock exposures too frequent to permit location of picnic areas.
m	Useful Moisture[7]	Water storage capacity[8] >15 cm and/or adequate rainfall and/or low evapotranspiration.	Water storage capacity[8] 7.5-15 cm and/or moderate rainfall and/or moderate evapotranspiration.	Water storage capacity[8] <7.5 cm and/or low rainfall and/or high evapotranspiration.	

[1] The symbols are used to indicate the nature of the limitation.

[2] See also definitions for coarse fragments, rockiness, stoniness, textural and soil drainage classes in the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978). Coarse fragments for the purpose of this table, include gravels and cobbles. Some gravelly soils may be rated as having a slight limitation if the content of gravel exceeds 20% by only a small margin providing (a) the gravel is embedded in the soil matrix, or (b) the fragments are less than 2 cm in size.

[3] Surface soil texture influences soil ratings as it affects foot trafficability, dust and soil permeability.

[4] Moderately well and well drained SC, SiC and C soils may be rated fair.

[5] Very shallow soils are rated as having severe or very severe limitations for stoniness or rockiness.

[6] The nature and topography of the bedrock exposures may significantly alter these ratings. As such, on-site investigations will be necessary in map units containing bedrock when these are considered as possible sites.

[7] This item attempts to evaluate the adequacy of moisture for vegetative growth. It incorporates the concept of supply through rainfall, loss through evapotranspiration, and storage within the rooting zone. In soils where the water table is within rooting depth for a significant portion of the year, water storage capacity may not significantly influence vegetation growth.

[8] Consult glossary for definitions of terms used.

TABLE 33

Guide for assessing soil suitability for camp area

This guide applies to soils to be used intensively for tents and camp trailers and the accompanying activities of outdoor living. It is assumed that little site preparation will be done other than shaping and levelling for campsites and parking areas. The soil should be suitable for heavy foot traffic by humans and limited vehicular traffic. Soil suitability for growing and maintaining vegetation is not a part of this guide, but is an important item to consider in the final evaluation of site.

Back country campsites differ in design, setting and management but require similar soil attributes. These guides should apply to evaluations for back country campsites but depending on the nature of the facility the interpreter may wish to adjust the criteria defining a given degree of limitation to reflect the changed requirement. For example, small tentsites may allow rock exposures greater than 10 m apart to be considered a slight limitation.

Symbol[1]	Items Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	Wetness[2]	Very rapidly, rapidly, well and moderately well drained soils with no seepage or ponding. Water table below 75 cm during season of use.	Moderately well drained soils subject to occasional seepage or ponding and imperfectly drained soils with no seepage or ponding. Water table below 50 cm during season of use.	Imperfectly drained soils subject to seepage or ponding and poorly drained soils. Water table above 50 cm during season of use.	Very poorly drained and permanently wet soils.
i	Flooding	None	Very occasional flooding during season of use. Once in 5-10 years.	Occasional flooding during season of use. Once in 2-4 years.	Flooding during every season of use.
k	Permeability	Very rapid to moderate inclusive.	Moderately slow and slow.	Very slow.	
t	Slope	0-9%	9-15%	15-30%	>30%
s	Surface Soil Texture[2,3]	SL, FSL, VFSL, L	SiL, SCL, CL, SiCL, LS, and sand other than loose sand.	SC, SiC, C[4]; Si	Peaty soils; loose sand subject to blowing.
c	Coarse Fragments on Surface[2,5]	0-20%	20-50%	>50%	
p	Stoniness[2,6]	Stones >10 m apart (Class 0 and 1)	Stones 2-10 m apart (Class 2)	Stones 0.1-2 m apart (Class 3 and 4)	Stones < 0.1 m apart (Class 5)
r	Rockiness[2,6]	No rock exposures	Rock exposures >10 m apart and cover <25% of the area.	Rock exposures <10 m apart and cover >25% of the area.	Rock exposures too frequent to permit campground location.

[1] The symbols are used to indicate the nature of the limitation.

[2] See also definitions for coarse fragments, rockiness, stoniness, textural and soil drainage classes in the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

[3] Surface soil texture influences soil ratings as it affects foot trafficability, dust, and soil permeability.

[4] Moderately well and well drained SC, SiC and C soils may be rated fair.

[5] Coarse fragments for the purpose of this table include gravels and cobbles. Some gravelly soils may be rated as having slight limitations if the content of gravel exceeds 20% by only a small margin, providing (a) the gravel is embedded in the soil matrix, or (b) the fragments are less than 2 cm in size.

[6] Very shallow soils are rated as having a limitation for rockiness and/or stoniness.

TABLE 34

Guide for assessing soil suitability for paths and trails

It is assumed that the trails will be built at least 45 cm wide and that obstructions such as cobbles and stones will be removed during construction. It is also assumed that a dry, stable tread is desirable and that muddy, dusty, worn or eroded trail treads are undesirable. Hiking and riding trails are not treated separately, but as the design requirements for riding trails are more stringent, a given limitation will be more difficult to overcome. Poor or very poor suitability does not indicate that a trail cannot or should not be built. It does, however, suggest higher design requirements and maintenance to overcome the limitations.

Symbol[1]	Items[2] Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
s	Texture[3],[4]	SL, FSL, VFSL, LS, L	SiL, CL, SiCL, SCL	SC, SiC, C[5]; Sand, Si	Peaty soils; loose sand subject to blowing
c	Coarse Fragment Content[4],[6]	0-20%	20-50%	>50%	
p	Stoniness[4]	Stones >2 m apart (Class 0 to 2)	Stones 1-2 m apart (Class 3)	Stones 0.1-1 m apart (Class 4)	Stones <0.1 m apart (Class 5)
w	Wetness[4]	Very rapidly, rapidly well, and moderately well drained soils. Water table below 50 cm during season of use.	Moderately well drained soils subject to occasional seepage and ponding and imperfectly drained soils. Water table may be above 50 cm for short periods during season of use.	Poorly and very poorly drained soils. Water table above 50 cm and often near surface for a month or more during season of use.	Permanently wet soils.
r	Rockiness[4],[7]	Rock exposures >30 m apart and cover <10% of the surface.	Rock exposures 10-30 m apart and cover 10-25% of the surface.	Rock exposures <10 m apart and cover >25% of the surface.	Rock exposures too frequent to permit location of paths and trails.
t	Slope[8]	0-15%	15-30%	30-60%	>60%
i	Flooding	Not subject to flooding during season of use.	Floods 1 or 2 times during season of use.	Floods more than 2 times during season of use.	Subject to prolonged flooding during season of use.

1/ The symbols are used to indicate the nature of the limitation.

2/ The items affecting use listed in this table are those which have been shown to cause significant differences in trail response. Elevation, aspect, position on slope, and snow avalanching may have slight affects or influence trail management and should be considered in the final site evaluation. Items such as vegetation, fauna, and scenic value are not considered in the guidelines (Epp, 1977).

3/ Texture refers to the soil texture which will form the tread texture. This is the surface texture on level areas but may be a subsurface texture on slopes. Textural classes are based on the less than 2 mm soil fraction. Texture influences soil ratings as it influences foot trafficability, dust, design or maintenance of trails, and erosion hazards.

4/ See also definitions for coarse fragments, rockiness, stoniness, textural and soil drainage classes in the Manual for Describing Soils in the Field (Canada Soil Survey Committee, 1978).

5/ Moderately well and well drained SC, SiC and C soils may be rated fair.

6/ Coarse fragments for the purpose of this table, include gravels and cobbles. Gravels tend to cause unstable footing when present in high amounts, and are also associated with increased erosion. Cobbles (and stones) must be removed from the trail tread, increasing construction and maintenance difficulties. Some gravelly soils may be rated as having a slight limitation if the content of gravel exceeds 20% by only a small margin providing (a) the gravel is embedded in the soil matrix or (b) the fragments are less than 2 cm in size.

7/ The type of rock outcrop (flat lying vs cliffs), and the orientation of the structure (linear cliffs vs massive blocks) can greatly alter the degree of the limitation. Each site with a Rockiness limitation based on the percent rock outcrop above should be evaluated on its own merits and the degree of limitation should then be modified appropriately if necessary.

8/ Slope in this context refers to the slope of the ground surface, not the slope of the tread.

Appendix F

GUIDES FOR ASSESSING SOIL SUITABILITY FOR AGRICULTURAL LAND USE

Definitions of the Agricultural Capability Classes

Class 1

Soils in this class have no important limitations for crop use. The soils have level or gently sloping topography; they are deep, well to imperfectly drained and have moderate water holding capacity. The soils are naturally well supplied with plant nutrients, easily maintained in good tilth and fertility; soils are moderately high to high in productivity for a wide range of cereal and special crops.

Class 2

Soils in this class have moderate limitations that reduce the choice of crops or require moderate conservation practices. The soils have good water holding capacity and are either naturally well supplied with plant nutrients or are highly responsive to inputs of fertilizer. They are moderate to high in productivity for a fairly wide range of crops. The limitations are not severe and good soil management and cropping practices can be applied without serious difficulty.

Class 3

Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices. The limitations in Class 3 are more severe than those in Class 2 and conservation practices are more difficult to apply and maintain. The limitations affect the timing and ease of tillage, planting and harvesting, the choice of crops and maintenance of conservation practices. The limitations include one or more of the following: moderate climatic limitation, erosion, structure or permeability, low fertility, topography, overflow, wetness, low water holding capacity or slowness in release of water to plants, stoniness and depth of soil to consolidated bedrock. Under good management, these soils are fair to moderately high in productivity for a fairly wide range of field crops.

Class 4

Soils in this class have severe limitations that restrict the choice of crops or require special conservation practices or both. These soils have such limitations that they are only suited for a few crops, or the yield for a range of crops may be low, or the risk of crop failure is high. The limita-

tions may seriously affect such farm practices as the timing and ease of tillage, planting and harvesting, and the application and maintenance of conservation practices. These soils are low to medium in productivity for a narrow range of crops but may have higher productivity for a specially adapted crop. The limitations include the adverse effects of one or more of the following: climate, accumulative undesirable soil characteristics, low fertility, deficiencies in the storage capacity or release of soil moisture to plants, structure or permeability, salinity, erosion, topography, overflow, wetness, stoniness, and depth of soil to consolidated bedrock.

Class 5

Soils in this class have very severe limitations that restrict their capability to producing perennial forage crops, and improvement practices are feasible. These soils have such serious soil, climatic or other limitations that they are not capable of use for sustained production of annual field crops. However, they may be improved by the use of farm machinery for the production of native or tame species of perennial forage plants. Feasible improvement practices include clearing of bush, cultivation, seeding, fertilizing and water control.

Some soils in Class 5 can be used for cultivated field crops provided unusually intensive management is used. Some of these soils are also adapted to special crops requiring soil conditions unlike those needed by the common crops.

Class 6

Soils in this class are capable only of producing perennial forage crops and improvement practices are not feasible. Class 6 soils have some natural sustained grazing capacity for farm animals, but have such serious soil, climatic or other limitations as to make impractical the application of improvement practices that can be carried out on Class 5 soils. Soils may be placed in this class because their physical nature prevents the use of farm machinery, or because the soils are not responsive to improvement practices, or because stock watering facilities are inadequate.

Class 7

Soils in this class have no capability for arable culture or permanent pasture because of extremely severe limitations. Bodies of water too small to delineate on the map are included in this class. These soils may or may not have a high capability for forestry, wildlife and recreation.

TABLE 35

Land Classification Standards for Irrigation Suitability

Land Characteristics	Subclass	Class 1 - Very Good	Class 2 - Good	Class 3 - Fair	Class 4 - Poor
SOILS	S				
Texture					
very coarse textured very fine textured	v h	Fine sandy loams to clay loams	Loamy fine sand to light clay	Sand to permeable clay	Gravel to clay
Water holding capacity					
low available moisture capacity	q	40 to 60 sat. % >15cm storage in 1.2m <10cm/hr. hydraulic cond.	35 to 65 sat. % >12.5cm storage in 1.2m <12.5cm/hr. hydraulic cond.	25 to 75 sat. % >7.5cm storage in 1.2m <17.5cm/hr. hydraulic cond.	<25 or >75 sat. % <7.5cm storage in 1.2m >17.5cm/hr. hydraulic cond.
Geological Deposit					
shallow deposit over sand or gravel	k	.9m or more of fine sandy loam or heavier	.6m or more of fine sandy loam or heavier, or .75m plus of loamy fine sand or sandy loam	.5m or more of sandy loam or heavier, or .6m plus of loamy sand	<.5m of sandy loam or heavier, or .6m of loamy sand or sand
shallow deposit over impervious substrata	b	>3m of permeable material	>2m of permeable material	>1m of permeable material	<1m of permeable material
Salinity and Alkalinity[1,2]	a	<4 ms/cm in 0-.6m <8 ms/cm below .6m <6 S.A.R.	<4 ms/cm in 0-.6m <12 ms/cm below .6m <8 S.A.R.	<8 ms/cm in 0-.6m <15 ms/cm below .6m <12 S.A.R.	>8 ms/cm in 0-.6m >15 ms/cm below .6m >12 S.A.R.
EXTERNAL FEATURES					
Stones - rock clearing	r	None to light clearing	Light to medium clearing	Light to heavy clearing	Excessively stony
Topography	T				
Slope excess gradient	g	<1% and 0.1% in general gradient (0-3% slope)	<3% in general gradient (3-5% slope)	<5% in general gradient (5-10% slope)	>5% in general* gradient (>10% slope)**
DRAINAGE	D				
restricted outlet		No problem anticipated	Moderate drainage problem anticipated but may be improved at relatively low cost	Moderate to severe drainage problem anticipated but may be improved by expensive but feasible measures	Drainage improvement not considered feasible
water table		below 2.4m most of year	could be above 1.5m for a short period, then recedes to 2.4m or lower	within 1.5m most of year	within 1m most of year

* Criteria for gravity (flood) irrigation requirements.

** Estimated adjustments to slope criteria for overhead or sprinkler type irrigation methods.

[1] If sufficient gypsum is present in the soil, the S.A.R. may be lowered by leaching the soil (a very slow process), and the hydraulic conductivity may then improve.

[2] The degree of salinity may vary widely within short distances, and there may be no clear indication of the area occupied by each salinity class. Unless a very detailed mapping and sampling program is carried out, it is impossible to estimate the acreage occupied by each salinity class.

Appendix G

SOIL LEGEND FOR SWAN RIVER TOWNSITE AREA

Map Symbol	Soil Name	Surface Texture	Soil Drainage	Surficial Geology		Soil Classification	
				Soil Parent Material	Landform	Subgroup	Phase
ASZ	Agassiz Series	Coarse sand and fine gravel	Good	Strongly calcareous sandy to gravelly lacustrine beach deposits	Gently sloping lacustrine beach ridge	Orthic Black	
BAM	Balmoral Series	Clay loam	Poor	Strongly to very strongly calcareous fine loamy lacustrine sediments	Level to depressional lacustrine plain	Rego Humic Gleysol	Carbonated
BAMp	Balmoral Series, peaty phase	Clay loam	Poor	15 to 40 cm of mesic peat overlying strongly to very strongly calcareous fine loamy lacustrine sediments	Level to depressional lacustrine plain	Rego Humic Gleysol	Carbonated peaty
BEV	Bell River Series	Fine sand	Imperfect	Moderately to strongly calcareous coarse loamy to sandy stratified fluvial deposits	Level to gently undulating fluvial plain	Gleyed Cumulic Regosol	
BAX	Banks Series	Very fine sandy loam	Good	20 to 100 cm of strongly to very strongly calcareous coarse loamy lacustrine sediments overlying very strongly calcareous loamy till	Lacustrine veneer overlying level moraine	Orthic Dark Gray	
CGD	Craigsford Series	Very fine sandy loam	Imperfect	20 to 100 cm of strongly to very strongly calcareous coarse loamy lacustrine sediments overlying very strongly calcareous loamy till	Lacustrine veneer overlying level moraine	Gleyed Rego Black	
DRB	Durban Series	Very fine sandy loam	Good	Strongly to very strongly calcareous coarse loamy lacustrine sediments	Level to very gently sloping lacustrine plain	Orthic Black	
DTT	Dutton Series	Clay loam	Good	Moderately to strongly calcareous fine loamy lacustrine sediments	Level to very gently sloping lacustrine plain	Orthic Black	
DTT 2	Dutton Series, gravel substrate variant	Clay loam	Good	20 to 100 cm of moderately to strongly calcareous fine loamy lacustrine sediments overlying moderately calcareous gravel deposits	Lacustrine veneer overlying level glaciofluvial deposits	Orthic Black	
DVD	Davidson Series	Loamy fine sand	Good	Moderately to strongly calcareous sandy to coarse loamy lacustrine sediments	Level to gently sloping lacustrine plain	Orthic Dark Gray	
ERX	Eroded Slopes Complex	Very fine sandy loam to silt loam	Good	Moderately to strongly calcareous loamy lacustrine sediments	Very strongly sloping eroded gullies and valley side walls	Chernozemic and Regosolic	
ETT	Ethelbert Series	Loamy fine sand	Good	20 to 100 cm of moderately to strongly calcareous sandy to coarse loamy lacustrine sediments overlying very strongly calcareous loamy till	Lacustrine veneer overlying level to gently sloping moraine	Orthic Black	
FOY	Foley Series	Very fine sandy loam	Poor	Strongly to very strongly calcareous coarse loamy lacustrine sediments	Level to depressional lacustrine plain	Rego Humic Gleysol	Carbonated
GBT	Gilbert Series	Loamy fine sand	Good	Moderately to strongly calcareous sandy to coarse loamy lacustrine sediments	Level to gently sloping lacustrine plain	Orthic Black	
GBT 1	Gilbert Series, loamy substrate variant	Loamy fine sand	Good	20 to 100 cm of moderately to strongly calcareous sandy to coarse loamy lacustrine sediments overlying loamy lacustrine sediments	Level to gently sloping lacustrine plain	Orthic Black	
GBT 2	Gilbert Series, gravel substrate variant	Loamy fine sand	Good	20 to 100 cm of moderately to strongly calcareous sandy to coarse loamy lacustrine sediments overlying moderately calcareous gravel deposits	Lacustrine veneer overlying level glaciofluvial deposits	Orthic Black	
HAU	Haute Series	Humic peat	Very poor	40 to 160 cm of humic to mesic forest peat grading to humic fen peat overlying loamy to clayey sediments	Level to depressional mesic swamp	Terric Humisol	
HAY	Heatley Series	Loam	Imperfect	20 to 100 cm of moderately to strongly calcareous fine loamy to coarse loamy stratified fluvial deposits overlying gravel deposits	Level to gently sloping fluvial plain	Gleyed Cumulic Regosol	
HMD	Homestead Series	Loam	Imperfect	Moderately to strongly calcareous fine loamy to coarse loamy stratified fluvial deposits	Level to gently sloping fluvial plain	Gleyed Cumulic Regosol	
LSW	Lenswood Series	Loamy fine sand	Imperfect	Moderately to strongly calcareous sandy to coarse loamy lacustrine sediments	Level to very gently sloping lacustrine plain	Gleyed Rego Black	
LSW 1	Lenswood Series, loamy substrate variant	Loamy fine sand	Imperfect	20 to 100 cm of moderately to strongly calcareous sandy to coarse loamy lacustrine sediments overlying loamy lacustrine sediments	Level to very gently sloping lacustrine plain	Gleyed Rego Black	
LSW 2	Lenswood Series, gravel substrate variant	Loamy fine sand	Imperfect	20 to 100 cm of moderately to strongly calcareous sandy to coarse loamy lacustrine sediments overlying moderately calcareous gravel deposits	Lacustrine veneer overlying level glaciofluvial deposits	Gleyed Rego Black	

Map Symbol	Soil Name	Surface Texture	Soil Drainage	Surficial Geology		Soil Classification	
				Soil Parent Material	Landform	Subgroup	Phase
MEH	Meharry Series	Loam	Good	Very strongly calcareous loamy till	Level to very gently sloping morainal plain	Rego Black	
MNS	Minitonas Series	Clay loam	Imperfect	20 to 100 cm of moderately to strongly calcareous fine loamy lacustrine sediments overlying very strongly calcareous loamy till	Lacustrine veneer overlying level to gently sloping moraine	Gleyed Rego Black	
MNT	Malonton Series	Fine sand	Poor	Moderately to strongly calcareous sandy to coarse loamy lacustrine sediments	Level to depressional lacustrine plain	Rego Humic Gleysol	Carbonated
NOV	Novra Series	Loam	Poor	Moderately to strongly calcareous fine loamy to coarse loamy stratified fluvial deposits	Level to depressional fluvial channels	Rego Gleysol	
ONK	Oaknook Series	Loam	Imperfect	Very strongly calcareous loamy till	Level to very gently sloping morainal plain	Gleyed Rego Black	Carbonated
PLN	Pelan Series	Fine sand	Imperfect	20 to 100 cm of moderately to strongly calcareous sandy to coarse loamy lacustrine sediments overlying very strongly calcareous loamy till	Lacustrine veneer overlying level moraine	Gleyed Dark Gray	
PMU	Pineimuta Series	Clay loam	Poor	20 to 100 cm of moderately to very strongly calcareous fine loamy lacustrine sediments overlying very strongly calcareous loamy till	Lacustrine veneer overlying level morainal plain	Rego Humic Gleysol	Carbonated
PMUp	Pineimuta Series, peaty phase	Clay loam	Poor	15 to 40 cm of mesic peat overlying 20 to 100 cm of moderately to very strongly calcareous fine loamy lacustrine sediments underlain by very strongly calcareous loamy till	Lacustrine veneer overlying level to depressional morainal plain	Rego Humic Gleysol	Carbonated peaty
PRA	Prawda Series	Fine sand	Poor	20 to 100 cm of moderately to strongly calcareous sandy to coarse loamy lacustrine sediments overlying strongly calcareous clayey sediments	Level to depressional lacustrine plain	Rego Humic Gleysol	Carbonated
RDG	Rose Ridge Series	Loam	Good	Very strongly calcareous loamy till	Very gently to strongly sloping moraine ridge	Orthic Dark Gray	
SPG	Sprague Series	Fine sand	Poor	20 to 100 cm of moderately to strongly calcareous sandy to coarse loamy lacustrine sediments overlying very strongly calcareous loamy till	Lacustrine veneer overlying level to depressional morainal plain	Rego Humic Gleysol	Carbonated
SVC	Sevick Series	Loamy fine sand	Imperfect	20 to 100 cm of moderately to strongly calcareous sandy to coarse loamy lacustrine sediments overlying very strongly calcareous loamy till	Lacustrine veneer overlying level moraine	Gleyed Rego Black	
SVK	Silver Creek Series	Fine sand	Good	Weakly to moderately calcareous sandy aeolian deposits	Gently sloping to hummocky aeolian modified lacustrine plain	Orthic Regosol	
SWF	Swanford Series	Very fine sandy loam	Imperfect	Strongly to very strongly calcareous coarse loamy lacustrine sediments	Level lacustrine plain	Gleyed Rego Black	Carbonated
SWF 1	Swanford Series, loamy substrate variant	Very fine sandy loam	Imperfect	20 to 100 cm of strongly to very strongly calcareous coarse loamy lacustrine sediments overlying strongly calcareous loamy sediments	Level lacustrine plain	Gleyed Rego Black	
SWV	Swan River Series	Clay loam	Good	Moderately to strongly calcareous fine loamy to coarse loamy stratified fluvial deposits	Level to gently sloping fluvial plain	Orthic Black	
TBN	Timberton Series	Clay loam	Good	20 to 100 cm of moderately to strongly calcareous lacustrine sediments overlying very strongly calcareous loamy till	Lacustrine veneer overlying level to very gently sloping moraine	Orthic Black	
VLY	Valley Series	Clay loam	Imperfect	Moderately to strongly calcareous fine loamy lacustrine sediments	Level to very gently sloping lacustrine plain	Gleyed Rego Black	