OPEN FILE REPORT 1983-24

DETAILED SOIL SURVEY
of
THE CALMAR, THORSBY, WARBURG, BRETON, and DRAYTON VALLEY AREAS

by

M. Scheelar
ALBERTA RESEARCH COUNCIL

Alberta Institute of Pedology
M-79-2

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

ACKNOWLEDGEMENTS

Mrs. Pal Foster typed and assisted in compiling and proof reading the report. Mr. J.D. Lindsay edited the report. Mr. Zdenek Widtman and Mrs. Jarka Dlask drafted the final soils maps and legends. Messrs. J. Beres, A. Schwarzer, and W. McKean determined the chemical and physical properties of the soils. Field assistance was given by Mr. T. Jensen. Special acknowledgement is given to the landowners who cooperated by allowing soil investigations to be conducted on their land.

ABSTRACT

A detailed soil survey was conducted in 1978 in the vicinity of the towns of Calmar, Thorsby, Warburg, Breton and Drayton Valley. The purpose of this survey is to supply soils information which constitutes a major portion of the physical inventory of land resources upon which land use planning is based. The area is within the jurisdiction of the Edmonton Regional Planning Commission.

Twenty-eight soil units, four undifferentiated land units, and three phases of soil units were mapped. These soils represent the Luvisolic, Chernozemic, Solonetzic, Gleysolic and Organic Orders in the Canadian System of Soil Classification.

Well to imperfectly drained soils developed on tills of the Paskapoo Formation and the Horseshoe Canyon Formation origin have, for the most part, moderate limitations for most engineering and recreational uses. However some moderately well to imperfectly drained soils developed on fine to very fine textured clays have severe limitations for most uses due to slow permeability, high shrink-swell potential and undesirable surface soil textures. Poorly and very poorly drained soils have severe limitations for all uses due to a seasonal high water table.

A major portion of the soils around these towns are Luvisolic soils which have been assigned soil capability for agriculture ratings of 3 or 4 depending on climate, drainage and the tendency for crusting to occur at the surface. Soils in the vicinity of Thorsby and Calmar are mainly Chernozemic and have been given soil capability for agriculture ratings of 1, 2 or 3 depending on climate and drainage. Poorly drained soils have been given ratings of 3 and 4.

SECTION I

INTRODUCTION

Soils are one of our most important natural resources. Man bases his activities on soils and depends on their productivity. They are the natural medium for the growth of plants; their properties and life serve to stabilize waste and purify water; and they serve as foundations for buildings, roads and all other man-made, land based structures. Mounting pressure upon land is constantly making soils more and more valuable.

Soils have been subject to grave abuse and misuse through improper land use development. Serious health, safety and pollution problems have been created by failure to consider the capabilities and limitations of soils during the planning and design stages of rural or urban development projects (Bauer, K.W. 1973). Such problems include malfunctioning septic tank sewage disposal systems, surface and groundwater pollution, flood damage, soil erosion, soil slumping, and footing and foundation failures. Knowledge of the soils and their ability to sustain development not only helps to avoid such problems but can also contribute to reducing development costs.

A need exists, therefore, in any planning program for a detailed soil survey which delineates the geographical location of various kinds of soils; identifies their chemical and engineering properties; and interprets their properties for the uses which are planned in an area.

USE OF THE REPORT

This report consists of a written text and map. The written part includes introductory and background information on soils, soil mapping and soil interpretations in the first section, and descriptions of the soils, analytical results, and interpretations for various uses in the second section.

The soils map is presented on an aerial photo-mosaic base. The photo base aids in identification and location of areas; however the linear and spatial distortion inherent in a photomosaic must be appreciated. The

soil-landscape units delineated on the map are described briefly in the map legend and in greater detail in the written report. The map and the report should be used together.

SOILS

Soil Formation

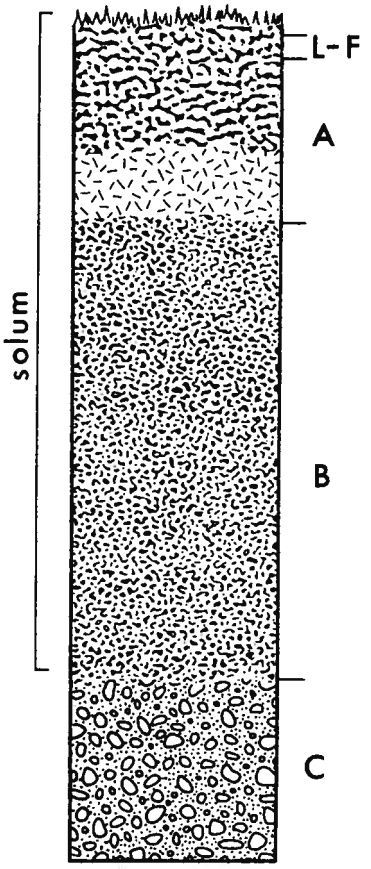
Soil is a three dimensional natural body of unconsolidated matter on the immediate surface of the earth that has been subjected to, and influenced by, the genetic and environmental factors of parent material, climate, biotic influences and topography all acting over a period of time to produce a product that differs in physical, chemical, biological and morphological properties and characteristics from the material of which it was derived and is capable of supporting the growth of land plants (Lavkulich, L.M. 1969).

Soil formation is defined in terms of degree of expression of a given set of properties; it is considered to be composed of two overlapping steps, 1) the accumulation of parent materials; and 2) the differentiation of horizons within the profile. The latter is attributed to additions, removals, transfers and transformations within the soil system.

These horizons differ from one another in such properties as colour, texture, structure, consistence and chemical and biological activity. The major horizons are designated O for organic layers developed mainly from mosses, rushes and woody materials; L, F and H for organic layers developed mainly from leaves, twigs, wood materials and a minor component of mosses; and A, B and C for mineral horizons. Subdivisions of the master horizons are denoted by suffix letters appended to the master horizon symbols (see Figure 1, Appendix I, and glossary).

Soil Texture

Soil texture is described according to United States Department of Agriculture (USDA) Textural Classification which is outlined in Figure 2.



Organic layer which may be subdivided into L, F, H or Of, Om, and Oh.

A mineral horizon at or near the surface. It may be a dark coloured horizon in which there is an accumulation of humus (Ah), or a light coloured horizon from which clay, iron, and humus have been leached (Ae).

Mineral horizon that (i) may be altered to give a change in colour or structure (Bm); or (ii) may have an enrichment of clay (Bt); or (iii) may have significant amounts of exchangeable Na and exhibit a columnar structure with pronounced stainings (Bn).

Mineral horizon comparatively unaffected by the soil forming process operative in the A and B horizons except for the process of gleying (Cg) or the accumulation of carbonates and soluble salts (Cca, Csa, Ck, Cs, Csk).

Figure 1. Diagram of a Soil Profile.

Soil Separates (Particle Size) on which textural classes are based:

Separates	Diameter in Millimetres
Very Coarse Sand (VCS)	2.0 to 1.0
Coarse Sand (CS)	1.0 to 0.5
Medium Sand (MS) Sand (S)	0.5 to 0.25
Fine Sand (FS)	0.25 to 0.10
Very Fine Sand (VFS)	0.10 to 0.05
Silt (Si)	0.05 to 0.002
Clay (C)	less than 0.002

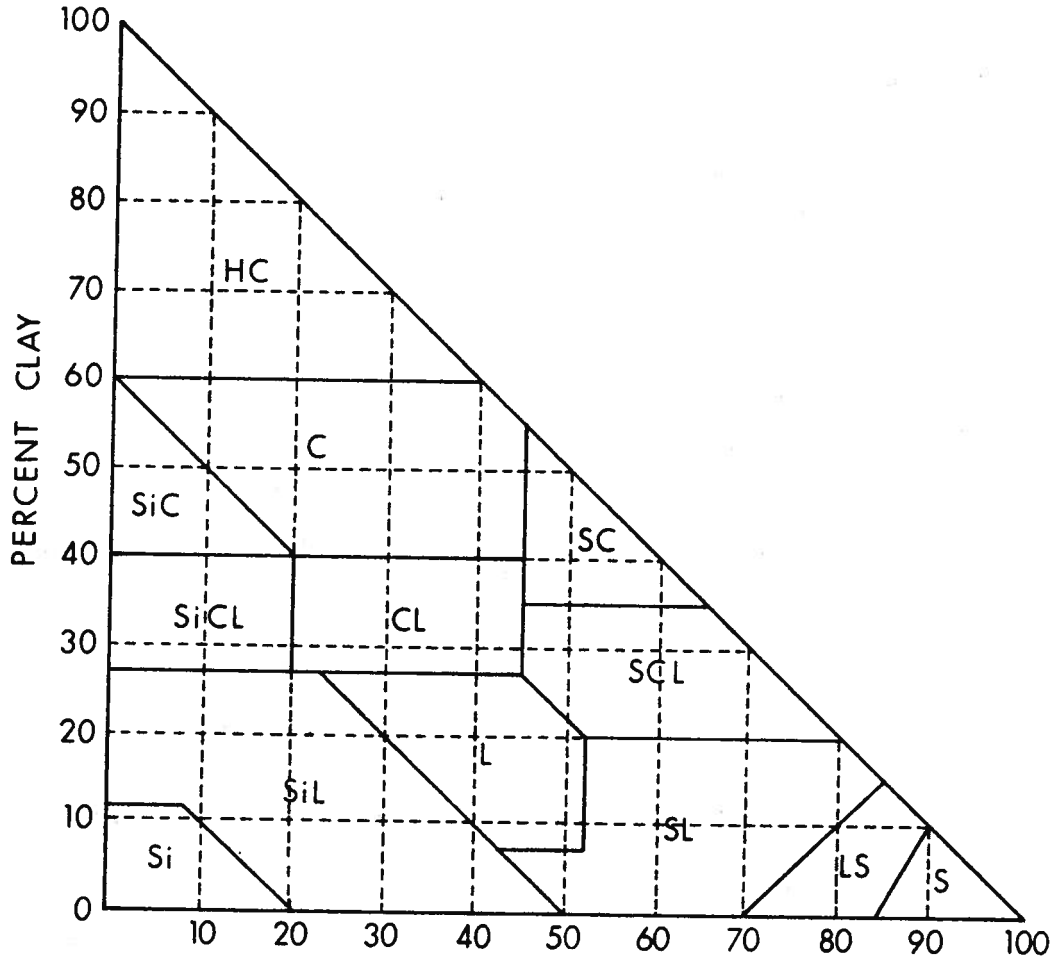


Figure 2. Soil Textural Classes. Percentage of clay and sand in the main textural classes of soils; the remainder of each class is silt.

The soil textural classes are grouped according to the Canada Soil Survey Committee as follows:

Very coarse textured: sands, loamy sands

Moderately coarse textured: sandy loam, fine sandy loam

Medium textured: very fine sandy loam, loam, silt loam, silt

Moderately fine textured: sandy clay loam, clay loam, silty clay loam

Fine textured: sandy clay, silty clay, clay (40 to 60% clay)

Very fine textured: heavy clay (more than 60% clay).

The gravelly class names are added to the textural class names according to the following rule:

% gravel by volume	
less than 20	use textural class only
20 to 50	gravelly and texture
50 to 90	very gravelly and texture
more than 90 in surface 20 cm	cobble land type.

Soil Drainage Classes (Canada Soil Survey Committee 1976)

Soil drainage classes are defined in terms of a) actual moisture content in excess of field moisture capacity; and b) the extent of the period during which such excess water is present in the plant root zone.

Rapidly drained:	soil moisture content seldom exceeds field capacity in any horizon except immediately after water additions.
Well drained:	soil moisture content does not normally exceed field capacity in any horizon except possibly the C, for a significant part of the year.
Moderately well drained:	soil moisture in excess of field capacity remains for a small but significant period of the year.
Imperfectly drained:	soil moisture in excess of field capacity remains in subsurface horizons for moderately long periods of time during the year.

TABLE 1. TYPES AND CLASSES OF SOIL STRUCTURE

Type	Kind	Class	Size mm
1. Structureless: no observable aggregation or no definite orderly arrangement around natural lines of weakness.	A. Single grain structure: loose, incoherent mass of individual particles as in sands.		
	B. Amorphous (massive) structure: a coherent mass showing no evidence of any distinct arrangement of soil particles.		
2. Blocklike: soil particles are arranged around a point and bounded by flat or rounded surfaces.	A. Blocky (angular blocky): faces rectangular and flattened, vertices sharply angular.	Fine blocky	<10
		Medium blocky	10–20
		Coarse blocky	20–50
		Very coarse blocky	>50
	B. Subangular blocky: faces subrectangular, vertices mostly oblique, or subrounded.	Fine subangular blocky	<10
		Medium subangular blocky	10–20
		Coarse subangular blocky	20–50
		Very coarse subangular blocky	>50
	C. Granular: spheroidal and characterized by rounded vertices.	Fine granular	<2
		Medium granular	2–5
		Coarse granular	5–10
3. Platelike: soil particles are arranged around a horizontal plane and generally bounded by relatively flat horizontal surfaces.	A. Platy structure: horizontal planes more or less developed.	Fine platy	<2
		Medium platy	2–5
		Coarse platy	>5
4. Prismlike: soil particles are arranged around a vertical axis and bounded by relatively flat vertical surfaces.	A. Prismatic structure: vertical faces well-defined, and edges sharp.	Fine prismatic	<20
		Medium prismatic	20–50
		Coarse prismatic	50–100
		Very coarse prismatic	>100
	B. Columnar structure: vertical edges near top of columns are not sharp. (Columns may be flat-topped, round-topped, or irregular).	Fine columnar	<20
		Medium columnar	20–50
		Coarse columnar	50–100
		Very coarse columnar	>100

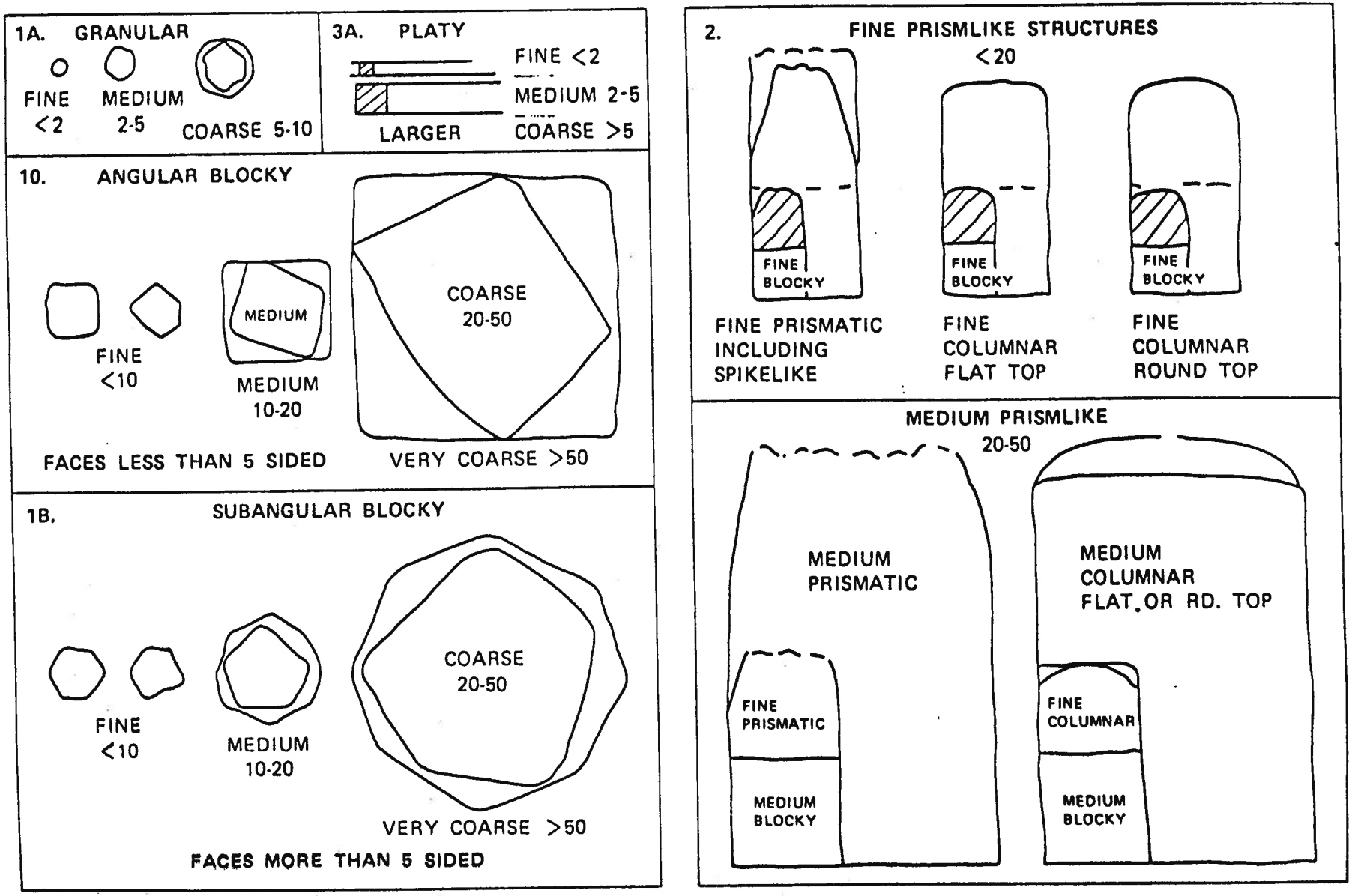


Figure 3. Types, kinds, and classes of soil structure.

Poorly drained:	soil moisture in excess of field capacity remains in all horizons for a large part of the year.
Very poorly drained:	free water remains at or within 12 inches (30 cm) of the surface most of the year.

Landform Classification

A local landform is considered to be comprised of a unique assemblage of slopes which are constantly repeated in nature and which generally owe their unique forms to the composition and mode of origin of a surficial deposit (Acton 1975).

In Alberta, the need has been recognized for a descriptive landform system to be used in soil surveys. In the past we tried to use the soil series to describe landforms and materials. This approach was fairly successful because series were established as a major criterion and because materials usually reflect landform. However, landform had to be interpreted from one's knowledge of the soils and soil combinations.

We now have a landform system as indicated in Appendix III, devised by Acton (1975) and adopted by the Canada Soil Survey Committee in 1976. The use of this system will help us 1) to indicate landforms for a map unit without having to interpret them from the soils; and 2) to indicate the soil types associated with various landforms.

Landforms are considered to represent two basic attributes: materials and surface expression.

The materials category recognizes four groups of material: unconsolidated mineral, organic, consolidated mineral and ice. For further explanation refer to Appendix III.

Soil Classification

The Canadian System of Soil Classification (CSSC 1976) is a hierarchal system in which the classes are based upon properties of real bodies of soil. These properties reflect processes of soil genesis and environmental factors and may or may not have significant application to land use. The system, however, does permit us to: assign soils to taxa at various levels of generalization; organize the knowledge about soils

in such a way that relationships between factors of the environment and soil development can be seen; define the kinds of soils that occur within units on soil maps; provide a basis for evaluating mapped areas of soils for a variety of uses. A brief summary of the classification system is given in Appendix II.

Taxa at the order level are based on properties of the profile that reflect the nature of the soil environment and the effects of the dominant soil forming processes.

Great groups are soil taxa formed by the subdivision of each order and are based on properties that reflect differences in strengths of dominant processes or a major contribution of a process in addition to the dominant one - e.g. Luvic Gleysols.

Subgroups are soil taxa formed by the subdivision of each great group and are differentiated on the basis of kind and arrangement of horizons that indicate conformity or non-conformity to the central concept of the great groups - i.e. intergrades toward soils of another order, e.g. Brunisolic Gray Luvisol.

A taxonomic unit in the classification has specified limits of variation and should be thought of as consisting of 1) a single modal profile representing the most usual condition of each property; 2) many other closely related profiles that vary from the modal profile within precisely defined limits. In Alberta, a number of soil series have been established that represent soil subgroups on a certain type of parent material. These soil series are taxonomic units in that they have horizons that are similar in differentiating characteristics and arrangement in the profile.

Soil Mapping

The purpose of mapping is to divide the landforms into units which differ from one another in some aspect. In the past, certain combinations of soil series were used to describe a soil landscape. The soil unit is now the basis for describing the landscape. It consists of one or more soil subgroups or series of which one is dominant and others are

described as either significant or inclusions. If less than 15 percent of certain soil subgroups occur in the landscape they are considered as inclusions.

The soil unit is named after the dominant taxonomic unit or series - e.g. FLU (Falun). Significant variations in other soils with respect to some interpretive aspect is recognized by using numerals after the symbol, e.g. FLU 2 has greater than 15 percent Gleysols and FLU 3 has greater than 30 percent Gleysols. If there is no significant variation from the dominant taxonomic unit, no subdivision is made - e.g. AGS 2 (Eluviated and Orthic Black) with 40 percent Orthic Dark Gray would remain as AGS 2, since all three of these subgroups show the same response to the same management.

More than 15 percent of a parent material different than the dominant type is also indicated - e.g. 25 percent exposed till outcropping in a lacustrine area would be indicated as (MMO-AGS) 1 or 2.

The use of undifferentiated land units such as RB and AV is restricted to landscapes where interpretations are made solely on the basis of landforms. If certain taxonomic units are dominant, these areas must be given a soil unit name.

A soil phase is defined as a subdivision of a taxonomic unit based on soil characteristics or combinations thereof which are considered to be potentially significant to man's use or management of the land. Thus, wherever soil phases represent greater than 15 percent of an area they are indicated as phases of soil units - e.g. FLU 2 (er.).

Map scale in relation to detail of investigation is a very important factor in soil mapping. One square centimeter is considered to be approximately the smallest area that can be shown on a map. At a scale of 1:10,000, 1 cm^2 represents 1 hectare (2.5 acres); at a map scale of 1:500,000 1 cm^2 represents 2,500 hectares (6,200 acres). For a detailed soil survey at a scale of 1:15,000 the mapper will not map areas less than 2 hectares (5 acres) in size.

The notations on the soil map are mapping units and consist of symbols, numbers and letters. For example: $\frac{\text{FLU 3 (er.)}}{d - e}$ - the symbol

FLU represent the dominant soil subgroup or soil series in the mapping unit; the digit 3 represents the significant variations in the mapping unit; (er.) represents a high percentage of the eroded phase of the dominant soil subgroup; and the letters 'd - e' indicate the range in topographic classes. The topographic classes are as follows:

	Simple Topography Single slopes (regular surface)	Slope (%)		Complex Topography Multiple slopes (irregular surface)
A	depressional to level	0 to 0.5	a	nearly level
B	very gently sloping	0.5+ to 2	b	gently undulating
C	gently sloping	2+ to 5	c	undulating
D	moderately sloping	5+ to 9	d	gently rolling
E	strongly sloping	9+ to 15	e	moderately rolling
F	steeply sloping	15+ to 30	f	strongly rolling
G	very steeply sloping	30 to 60	g	hilly
H	extremely sloping	over 60	h	very hilly

The soils were mapped in the field by making observations at selected sites using a shovel or auger. These point observations were extrapolated over areas of various extent through the use of aerial photograph interpretation and field checking. The principal soils were sampled to depths of 1 metre for chemical and engineering properties.

Engineering Properties of the Soils

1. Atterberg Limits

In soil mechanics, plasticity is defined as that property of a material which allows it to be deformed rapidly, without rupture, without rebound, and without volume change (Means and Parcher 1964).

Tests have been devised to determine the moisture content of a soil at which it changes from one major physical condition to another (PCA Soil Primer 1961). These tests conducted on the material passing the No. 40 sieve (0.42 mm) have been used as key factors in classifying soils for structural purposes.

The tests used for estimating plasticity are plastic limit, liquid limit, and plasticity index. The plastic limit is the moisture content at which the soil passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the soil passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid and plastic limits. These three are known as Atterberg limits.

The plasticity index gives the range in moisture content at which a soil is in a plastic condition. A small plasticity index, such as 5, indicates that a small change in moisture content will change the soil from a semisolid to a liquid condition. A large plasticity index, such as 20, shows that a considerable amount of water can be added before a soil changes to a liquid condition.

2. Textural Classification

(a) AASHO Classification System (PCA Soil Primer 1962)

The American Association of State Highway Officials systems is an engineering property classification based on field performance of highways. In the AASHO system the sieve analyses and the Atterberg limits are used to separate the soil material into seven basic groups, A-1 to A-7. The best soils for road subgrades are classified as A-1, the poorest as A-7.

In recent years these seven basic groups have been divided into subgroups with a group index that was devised to approximate within group evaluations. Group indices range from 0 for the best subgrade material to 20 for the poorest.

(b) Unified Soil Classification System (PCA Soil Primer 1962).

In this system, the soils are identified according to their sieve analyses and Atterberg limits, and are grouped according to their performance as engineering construction materials. Soil materials are divided into coarse grained soils, fine grained soils and highly organic soils. The coarse grained soils are subdivided into eight classes; the fine grained into six classes; and there is one class of highly organic soils.

Coarse grained soils are those that have 50% or less of material passing the number 200 sieve; fine grained soils have more than 50% of

material passing the number 200 sieve. The letters G, S, C, M, W, P, L and H stand for gravel, sand, clay, silt, well graded, poorly graded, low liquid limit and high liquid limit, respectively.

The designation CL for example, indicates inorganic clays of low liquid limit; SW indicates well graded sand; and SC indicates clayey sands.

(c) United States Department of Agriculture Classification System

This system is defined on page 6 in section 1 of this report. A comparison of the different systems is given in the PCA Soil Primer.

SOIL AND LAND USE

The soils of the area have been interpreted for limitations to roads, buildings with basements, sewage lagoons, septic tank absorption fields, trench-type sanitary landfills, shallow excavations, camp areas, picnic areas and playing fields; and for suitability as a source of gravel, roadfill and topsoil. The guidelines in Tables 2 to 14 were used to derive these interpretations. The soils have also been assigned capability ratings for agriculture in order to evaluate the area in terms of potential agricultural production.

These interpretations not only consider such soil properties as texture, depth to water table and depth to consolidated bedrock which affect many of the designated uses, but also topography and flooding hazard.

Soil interpretations are included so that soils information may be more easily understood. They should be treated as predictions of performance of soils, not as recommendations for the uses of soils. Many other factors are involved in the recommended uses of soils. The interpretations are, however, valuable tools that can be used to assist the planner. Through their use, the planner can predict the type and degree of problems likely to be encountered, and plan the kind and amount of on-site investigations needed to determine corrective measures. Because soil boundaries are not precise, soil interpretations do not eliminate the need for on-site investigations. They will, however, aid in planning these investigations, to reduce the amount needed and minimize the cost. For each use, the soils are rated in terms of degree - slight, moderate or severe; or in terms of suitability as a source of material - good, fair or poor.

A slight soil limitation is the rating given soils that have properties favourable for the use. Good performance and low maintenance can be expected.

A moderate soil limitation is the rating given soils that have properties moderately favourable for the use. This limitation can be overcome or modified by planning, design, or maintenance.

A severe soil limitation is the rating given soils that have one or more properties that are seriously unfavourable for the use. This limitation generally requires major soil reclamation, special design or intensive maintenance. In most situations, it is difficult and costly to alter the soil or to design a structure so as to compensate for the severe degree of limitation, and using these soils without employing corrective measures could result in failure.

The decision as to whether or not a soil will be utilized for a specific use, regardless of the soil limitation is beyond the scope of this report.

Table 2. Guides for Assessing Soil Limitations for Road Location.

Properties that affect design and construction of roads are (i) those that affect the load supporting capacity and stability of the subgrade; and (ii) those that affect the workability and amount of cut and fill. The AASHO and Unified Classification, and the shrink-swell potential give an indication of the traffic supporting capacity. Wetness and flooding affect stability. Slope, depth of bedrock, stoniness, rockiness, and wetness affect the ease of excavation and the amount of cut and fill to reach an even grade.

Soil limitation ratings do not substitute for basic soil data or for on-site investigations.

Item Affecting Use	Degree of Soil Limitation		
	None to Slight	Moderate	Severe
Soil Drainage Class[1]	Rapidly, well and moderately well drained	Imperfectly drained	Poorly and very poorly drained
Flooding	None	Once in 5 yrs.	More than once in 5 yrs.
Slope	0 to 9% (AD)	9 to 15% (E)	> 15% (> E)
Depth to Bedrock	> 100 cm	50 to 100 cm	< 50 cm
Subgrade[2]			
a) AASHO Group Index[3]	0 to 4	5 to 8	> 8
b) Unified Soil Classes	GW, GP, SW, GM, SM, and GC[4], and SC[4]	CL (with PI[5] < 15), ML, SP	CL (with PI[5] 15 or more) CH, MH, OH, OL, Pt
Shrink-swell Potential[6]	Low (PI[5] < 15)	Moderate (PI[5] 10 to 15)	High (PI[5] >20)
Susceptibility to Frost Heave[7]	Low (F1, F2)	Moderate (F3)	High (F4) (silty & peaty soils)
Stoniness	Stones >1.5m apart	Stones 0.5-1.5m apart	Stones <0.5m apart
Consolidated Bedrock Exposures	Rock exposures >90m apart and cover < 2% of the surface	Rock exposures 30 to 90m apart and cover 2 to 10% of the surface	Rock exposures <30m apart and cover > 10% of the surface

1 For an explanation of soil drainage classes see page 7.

2 This item estimates the strength of a soil as it applied to roadbeds. When available, AASHO Group Index values from laboratory tests were used; otherwise the estimated Unified classes were used. On unsurfaced roads, rapidly drained, very sand, poorly graded soils may cause washboard or rough roads.

3 Group Index values were estimated from information published by the Portland Cement Assn. 1962, pp. 23 to 25.

4 Downgrade to moderate if content of fines (less than 200 mesh) is greater than about 30%.

5 PI means plasticity index.

6 Inherent swelling capacity is estimated as low when the plasticity index is less than 15, medium when the plasticity index is 10 to 15, and high when the plasticity index is greater than 20 (Terzaghi and Peck 1967). Gravelly and stony soils may not exhibit shrink-swell as estimated by the plasticity index because of dilution of the fines with coarse fragments. In these situations decrease a severe limitation to moderate and a moderate limitation to slight.

7 Frost heave is important where frost penetrates below the 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. See also Table 3.

Table 3. Frost Design Soil Classification.

Frost Group	Kind of Soil	% by weight finer than 0.02 mm	Unified Soil Classification System Soil Texture Type
F1	Gravelly soils	3-10	GW, GP, GW-GM, GP-GM
	Gravelly soils	10-20	GM, GW-GM, GP-GM
F2	Sands	3-15	SW, SP, SM, SW-SM, SP-SM
	Gravelly soils	> 20	GM, GC
F3	Sands (except very fine silty sands)	> 15	SM,SC
	Clays PI 12		CL, CH
	All silts		ML, MH
F4	Very fine silty sands	> 15	SM
	Clays PI 12		CL, CL-ML
	Varved clays and other fine grained bonded sediments		CL and ML; CL, ML, and SM; CL, CH and ML; CL, CH, CL and SM

Potential frost action refers to the probable effects on structures, resulting from the freezing of soil material and its subsequent thawing. The action not only pertains to the heaving of soil as freezing progresses but also to the excessive wetting and loss of soil strength during thaw. Damage to structures from frost action results not from the freezing of the soil itself, but from the formation of ice lenses in the soil. In turn, the formation of ice lenses depends on the capacity of the soil to deliver water to a stationary or slowly moving freezing front. Thus poorly drained soils with a high water content are more subject to frost action than well drained soils.

Table 4. Guides for Assessing Soil Limitations for Permanent Buildings

This guide provides ratings for undisturbed soils evaluated for single storey buildings and other structures with similar foundation requirements. The emphasis for rating soils for buildings is on foundations; but soil slope, and susceptibility to flooding and other hydrological conditions, such as seasonal wetness, that have effects beyond those related exclusively to foundations are considered. Also considered are soil properties, particularly depth to bedrock, which influence excavation and construction costs, both for the building itself and for the installation of utility lines. Excluded are limitations for soil corrosivity, landscaping and septic tank absorption fields. On-site investigations are needed for specific placement of buildings and utility lines, and for detailed design of foundations. All ratings are for undisturbed soils based on information gained from observations to a depth of 4 to 6 feet.

Item Affecting Use	Degree of Soil Limitation		
	None to Slight	Moderate [2]	Severe
Wetness [3]	With Basements: Rapidly drained and well drained Without Basements: 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 & very poorly drained
Depth to Seasonal Water Table (seasonal means 1 month or more)	With Basements: Below 150 cm Without Basements: Below 75 cm	With Basements: Below 75 cm Without Basements: Below 75 cm	With Basements: Above 75 cm Without Basements: Above 60 cm
Flooding	None	None	Subject to Flooding
Slope[4]	0 to 9% (AD)	9 to 15% (E)	More than 15% (E)
Shrink-swell Potential	Low	Moderate	High
Unified Soil Group[5]	GW, GP, SW, SP, GM, GC, SM, SC	ML, CL	CH, MH, OL, OH, Pt.
Potential Frost Action[6]	Low (F1, F2)	Moderate (F3)	High (F4)
Stoniness	Stones > 8m apart	Stones 1.5 to 8m apart	Stones < 1.5m apart
Potential Concrete Corrosion	0.00 to 0.10% sulphate	0.10 to 0.50% sulphate	> 0.50% sulphate
Depth to Bedrock	With Basements: > 150 cm Without Basements: > 100 cm	With Basements: 100 to 150 cm Without Basements: 50 to 100 cm	With Basements: < 100 cm Without Basements: < 50 cm

1 By reducing the slope limits by one-half, this table can be used for evaluating soil limitations for buildings with large floor areas but with foundation requirements not exceeding those of ordinary 3-storey dwellings.

2 Some soils rated as having moderate or severe limitations may be good sites for an aesthetic or use standpoint.

3 For an explanation of soil drainage classes see page

4 Reduce slope limits by one-half for those soils subject to hillside slippage.

5 This item estimates the strength of the soil, that is its ability to withstand applied loads.

6 The potential frost action classes are taken from the US Army Corps of Engineers (1962),pp.5-8. See also Table 3.

Table 5. Guides for Assessing Soil Limitations for Sewage Lagoons

A sewage lagoon (aerobic) is a shallow lake used to hold sewage for the time required for bacterial decomposition. Soils have two functions, (i) as an impounding vessel; and (ii) as material for the impounding embankment. When the lagoon is properly constructed it must be capable of holding water with minimum seepage.

Item Affecting Use	Degree of Soil Limitation		
	Slight	Moderate	Severe
Depth to Water Table[1] (seasonal or year round)	> 150 cm	100 to 150 cm	< 100 cm
Flooding[2]	None	None	Subject to flooding
Depth to Consolidated Bedrock	> 150 cm	100 to 150 cm	< 100 cm
Slope	< 2%	2 to 9%	> 9%
Organic Matter[4]	< 2%	2 to 15%	> 15%
Unified Soil Group[3]	GC, SC, CL, CH	GM, ML, SM, MH	GP, GW, SW, SP[5], OL, OH, Pt.

1 If the floor of the lagoon is nearly impermeable material at least 60 cm thick, disregard depth to watertable.

2 Disregard flooding if it is not likely to enter to damage the lagoon (low velocity and depth less than five feet).

3 Rated mainly for the floor of the lagoon.

4 Organic matter promotes growth of aquatic plants which are detrimental to the proper functioning of the lagoon.

5 Coarse textures constitute a possibility of groundwater contamination if floor of lagoon is not lined with impermeable material.

The guides in Table 6 apply to soils used as absorption fields for septic tank effluent. A rating of severe need not mean that a septic tank system should not be installed but rather it indicates the difficulty and cost to be expected in installation and maintenance.

Permeability ratings are for soil layers at and below the depth of the tile line. Soils having a permeability rate greater than about 12 cm/hr or percolation rate less than about 8 min/cm are likely to present a pollution hazard to adjacent waters (Alberta Dept. of Manpower and Labour 1972). The degree of hazard must, however, be assessed by examining the proximity of the proposed installation to water bodies or the water table.

A seasonal water table, i.e. one persisting for more than one month, should be at least 120 cm below the bottom of the trench for soils having a slight to moderate limitation (U.S. Dept. of Health, Education and Welfare 1969). 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.

The typical homeowner regards a soil absorption system as satisfactory as long as it can receive all the wastewater being generated without overflowing in the house itself (hydraulic failure). Soil absorption systems which are adequate hydraulically may fail by a) delivering excessive numbers of potentially pathogenic bacterial and viruses to private or public water supplies; b) causing increased nitrogen and phosphorus inputs in ground or surface water supplies, which may in turn enhance eutrophication of surface water or cause potentially toxic nitrate levels in drinking water supplies (M.T. Beatty and J. Bouma 1973).

Failures due to inadequate removal of pathogens, nitrogen and phosphorus occur when there is inadequate soil (due to lack of thickness or to coarse texture) between a soil absorption system and highly porous materials such as creviced bedrock or gravel (Bouma *et al.* 1972). Failure due to excessive buildup of nitrogen or phosphorus in ground and surface waters may occur when there are too many homesites per unit area, even though the individual systems may each be functioning adequately to remove pathogens and absorb the liquid waste (Walker *et al.* 1973a, 1973b).

Table 6. Guides for Assessing Soil Limitations for Septic Tank Absorption Fields.

Item Affecting Use	Degree of Soil Limitation		
	Slight	Moderate	Severe
Permeability Class	Moderately Rapid (approx.4 to 12 cm/hr)	Moderate (approx. 2 to 4 cm/hr)	Slow (less than 2 cm/hr)
Percolation rate[1]	Approx. 8 to 18 min/cm	18 to 24 min/cm	Slower than 24 min/cm
Depth to Seasonal Water Table	> 180 cm	120 to 180 cm	< 120 cm
Flooding Hazard	Not subject to flooding	Not subject to flooding	Subject to flooding
Slope	0 to 9%	9 to 15%	15 to 30%
Depth to Bedrock or Other Impervious Materials	> 180 cm	120 to 180 cm	< 120 cm

[1] Field percolation test results are reliable only if the moisture is at or near field capacity when the test is run. In fact, nearly impermeable soils on which absorption fields have failed can give high percolation test results after periods of drought.

Table 7. Guides for Assessing Soil Limitations for Trench-Type Sanitary Landfills.

The trench-type sanitary landfill is a dug trench in which refuse is placed and covered daily with a layer of soil material. The daily depth of cover should be at least 15 cm and the final depth of top layer at least 60 cm. Because trenches are five meters or more deep, geological investigation is needed to determine the potential for pollution of groundwater as well as to ascertain the design. The presence of hard, non-rippable bedrock or gravelly strata in or immediately underlying the trench bottom is undesirable from the standpoints of excavation and potential pollution of groundwater.

Item Affecting Use	Degree of Soil Limitation		
	Slight	Moderate	Severe
Depth to Seasonal Water Table	(not class determining if more than 180 cm)		< 180 cm
Soil Drainage Class	Rapidly, well and moderately well drained	Imperfectly drained	Poorly and very poorly drained
Flooding	None	Rare	Occasional
Permeability	< 5 cm/hr	< 5 cm/hr	> 5 cm/hr
Slope	0 to 15%	15 to 25%	> 25%
Soil Texture[1] (dominant to a depth of 150 cm)	Sandy loam, loam, silt loam, sandy clay loam	Silty clay loam, clay loam, sandy clay, loamy sand	Silty clay, clay, muck, peat, gravel, sand
Depth to Hard, Non-rippable Bedrock	> 180 cm	> 180 cm	< 180 cm
Stoniness Class	Slightly stony	Moderately stony	Very to excessively stony
Rockiness Class	None	None	Slight to extremely rocky

[1] Soil texture reflects ease of digging and moving and trafficability in the area.

Table 8. Guides for Assessing Soil Limitations for Shallow Excavations.

Shallow excavations are those that require digging or trenching to a depth of less than 2 meters for pipelines, sewer lines, utility lines and basements. Desirable soil properties are: good drainage, good workability, moderate resistance to sloughing, gentle slopes, absence of rock outcrops or large stones, and freedom from flooding. Additional interpretations concerning shrink-swell potential and corrosivity are needed for ultimate uses of the excavation. Texture is used as an index to workability and sidewall stability. If the bedrock is soft enough so that it can be dug out with ordinary handtools or light equipment, reduce ratings from severe to moderate.

Item Affecting Use	Degree of Limitation		
	Slight	Moderate	Severe
Soil Drainage Class	Rapidly and well drained	Moderately well drained	Imperfectly to very poorly drained
Depth to Seasonal Water Table	Below 150 cm	75 to 150 cm	Above 75 cm
Flooding	None	Rare	Occasional
Slope	0 to 8%	8 to 15%	> 15%
Texture of Soil to Depth of Excavation	Fine sandy loam, sandy loam, silt loam, silty clay loam, sandy clay loam	Silt, clay loam, sandy clay, all gravelly types	Clay, silty clay, loamy sand, organic soils, all very gravelly types
Depth to Bedrock	> 150 cm	100 to 150 cm	< 100 cm
Stoniness Class	Slightly stony	Moderately stony	Very stony
Rockiness Class	None	Slightly rocky	Moderately to very rocky

Table 9. Guides for Assessing Soil Limitations for Camp Areas

This guide applies to soils to be used intensively for trailers and tents and the accompanying activities of outdoor living. It is assumed that little site preparation will be done other than shaping and levelling campsites and parking areas. The soil should be suitable for heavy foot traffic and for limited vehicular traffic. [1] Soil suitability for growing and maintaining vegetation is not part of this guide, except as influenced by moisture, but is an important item to consider in the final evaluation of the site.

Item Affecting Use	Degree of Limitation		
	None to Slight	Moderate	Severe
Wetness	Rapidly, well and moderately well drained soils. Water table below 75 cm during season of use	Moderately well and imperfectly drained soils. Water table below 50 cm during season of use	Imperfectly, poorly, and very poorly drained soils. Water table above 50 cm during season of use
Flooding	None	None during season of use	Floods during season of use
Permeability	Very rapid to moderate	Moderately slow to slow	Very slow
Slope	0 to 9% (AD)	9 to 15% (E)	>15 % (> E)
Surface Soil Texture[2]	SL, FSL, VFSL, L	SiL, CL, SCL, SiCL, LS and sand other than loose sand	SC, SiC, C, loose sand subject to severe blowing, organic soils
Coarse Fragments[3] on surface	0 to 20%[4]	20 to 50%	> 50%
Stoniness (stony)	Stones >8m apart	Stones 8 to 1.5m apart	Stones <1.5m apart
Rockiness (rock)	No rock exposures	Rock exposures > 9m apart and cover < 25% of the area	Rock exposures <9m[5] apart and cover > 25% of the surface

[1] For information specific to roads and parking lots see Table 2.

[2] Surface soil texture influences soil ratings as it affects foot trafficability, dust, soil permeability and erosion hazard.

[3] Coarse fragments include both gravels and cobbles. Gravels 2 to 80 mm, Cobbles 80 to 250 mm, Stones >250 mm.

[4] Some gravelly soils may be rated as slight if content of gravel exceeds 20% by only a small margin providing (i) the gravel is imbedded in the soil matrix; or (ii) the fragments are less than 20 mm in size.

[5] Very shallow soils are rated as having a severe soil limitation for rockiness or stoniness. See also definitions of rockiness and stoniness in the Canadian System of Soil Classification (Canada Soil Survey Committee 1976) pp. 139 to 140.

Table 10. Guides for Assessing Soil Limitations 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 access roads.[1] Soil suitability for growing and maintaining vegetation is not part of this guide, except as influenced by moisture, but is an important item to consider in the final evaluation of the site.

Item Affecting Use	Degree of Soil Limitation		
	None to Slight	Moderate	Severe
Wetness	Rapidly, well and moderately well drained soils. Water table below 50 cm during season of use	Moderately well and imperfectly drained soils. Water table during season of use may be less than 50 cm for short periods	Poorly and very poorly drained soils. Water table above 50 cm and often near the surface for a month or more during season of use
Flooding	None during season of use	May flood once a year for short period during season of use	Floods more than once a year during season of use
Slope	0 to 9% (AD)	9 to 15% (E)	>15% (> E)
Surface Soil Texture[2]	SL, FSL, VFSL, L	SiL, CL, SCL, SiCL, LS, and sand other than loose sand	SC, SiC, C, loose sand subject to severe blowing, organic soils
Coarse Fragments[3] on Surface	0 to 20%[4]	20 to 50%	>50%
Stoniness[3]	Stones >1.5 m apart	Stones 0.5 to 1.5 m apart	Stones< 0.5m apart
Rockiness	Rock exposures roughly 30 to 90 or more meters apart and cover <10% of the surface	Rock exposures 10 to 30 metres apart and cover about 10% to 25% of the surface	Rock exposures <10 meters apart and cover >25% of the surface

[1] For information specific to roads or parking lots see Table 2.

[2] Surface soil texture influences soil ratings as it affects foot trafficability, dust, soil permeability, and erosion hazard.

[3] See also definitions for gravel, rockiness and stoniness in the Canadian System of Soil Classification (Canada Soil Survey Committee 1976), pp. 139 to 140. Coarse fragments include both gravels and cobbles. Gravels 2 to 80 mm, Cobbles 80 to 250 mm, Stones more than 250 mm.

[4] Some gravelly soils may be rated as slight if the content of gravel exceeds 20% by only a small margin providing (i) the gravel is embedded in the soil matrix; or (ii) the fragments are less than 20 mm in size.

Table 11. Guides for Assessing Soil Limitations for Playing Fields (Montgomery & Edminster 1966)

This guide applies to soils considered for intensive use as playing fields for organized games such as baseball or football. Soil suitability for growing and maintaining vegetation is not a direct consideration in this guide, but is an important item to consider.

Item Affecting Use	Degree of Limitation		
	Slight	Moderate	Severe
Flooding	None during season of use	Subject to occasional flooding. Not more than once in 3 yrs.	Subject to more than occasional flooding
Wetness	Rapidly to moderately well drained	Imperfectly drained soils subject to occasional ponding	Poorly and very poorly drained
Depth to Water Table	> 75 cm during season of use	50 to 75 cm during season of use	< 50 cm during season of use
Permeability	Very rapid to moderate (50 cm/hr to 15 mm/hr)	Moderately slow (15 to 5 mm)	Slow and very slow (< 5 mm/hr)
Slope	0 to 2%	2 to 5%	> 5%
Surface Texture	SL, FSL, VFSL, L	CL, SCL, SiCL, SiL, LS and S other than loose sand	SC, SiC, C, loose sand, organic
Depth to Bedrock	> 100 cm	60 to 100 cm	< 50 cm
Surface Stoniness	Slightly stony	Moderately stony	Very to excessively stony

Table 12. Suitability Ratings of Soils as Sources of Gravel.

The main purpose of these ratings is to indicate local sources of gravel. The ratings are based on the probability that soils contain sizeable quantities of gravel.

Item Affecting Use	Degree of Soil Suitability		
	Good	Fair	Poor
Unified Soil Group	GW, GP	GP-GM, GW-GM	GM, GP-GC, GW-GC (all other groups unsuited)
Flooding	None or occasional		Frequent or constant
Wetness	Better than poorly drained[1]		
Depth of Overburden	< 60 cm	60 to 150 cm	> 150 cm

[1] See page 7 for an explanation of drainage classes.

Table 13. Suitability Ratings of Soils as Sources of Roadfill.

The ratings in this table indicate the performance of a soil after it is placed in a road embankment and also the degree of difficulty in excavating the fill material. Ratings of the material are the same as for road location (Table 3) however ratings of factors governing excavation differ.

Item Affecting Use	Degree of Suitability[1]		
	Good	Fair	Poor
Soil Drainage Class	Rapidly to moderately well drained[2]	Imperfectly drained	Poorly and very poorly drained
Engineering Groups			
a) Unified Group	GW, GP, GC, SW, SP, SM, SC	ML, CL (with PI[3] >15)	CH, MH, OL, OH, Pt., and CL (with PI[3] >15)
b) AASHO Group Index	0 to 4	5 to 8	> 8
Stoniness	None to moderately stony	Very stony	Exceedingly stony
Depth to Consolidated Bedrock	> 2 m	1 to 2 m	< 1 m
Slope	0 to 15%	15 to 30%	> 30%

1 A rating of unsuited (U) is applied to land units, such as bedrock (R), where no conventional fill material is present.

2 See page 7 for an explanation of drainage classes.

3 PI means plasticity index.

Table 14. Suitability Ratings of Soils as Source of Topsoil.

Topsoil, for these ratings, refers essentially to Ah horizon material. In some cases the B, and even C horizon materials could be used for dressing disturbed land. These ratings are intended for use by engineers, landscapers, planners and others who make decisions about selecting, stockpiling and using topsoil. These ratings are based on quality of topsoil and ease of excavation. In addition to the Good, Fair and Poor ratings described below, an Unsuited (U) rating is used.

Item Affecting Use	Degree of Suitability[1]		
	Good	Fair	Poor
Texture	SL, FSL, VFSL, L, SiL	CL, SCL, SiCL	LS, S, SC, SiC, C, Organic
Depth of Topsoil	> 15 cm	8 to 15 cm	< 8 cm
Flooding	None	May flood occasionally	Frequently or constantly flooded
Wetness	(Drainage class not determining if better than poorly drained)		Poorly and very poorly drained
Coarse Fragments (% by volume)	< 3%	3 to 15%	> 15%
Slope	< 9%	9 to 15%	> 15%
Stoniness	None to slightly stony	Moderately stony	Very to excessively stony
Salinity of Topsoil	E.C.[2] = 0 to 1[3]	E.C. = 1 to 3	E.C. > 3
Permeability of Upper Subsoil	Moderate	Slow	Very slow

1 A rating of unsuited (U) is used for soil and land units that do not have topsoil present

2 E.C. = electrical conductivity of a saturation extract in mmhos/cm.

3 These are the limits suggested by the Alberta Soil & Feed Testing Laboratory when considering lawn growth.

Soil Capability for Agriculture

These ratings are compiled using the publication entitled Soil Capability Classification for Agriculture (The Canada Land Inventory 1972). In this system, mineral soils are grouped into seven classes according to their potentialities and limitations for agricultural use. Organic soils with over 40 cm of peat at their surfaces have no established criteria in the system and are designated as O. The first three classes of mineral soils are capable of sustained production of common cultivated crops; the fourth class is considered marginal; the fifth and sixth are capable of use only for pasture and hay, and the seventh has no potential for agricultural use. It must be emphasized that soils within a capability class are similar only with respect to degree or intensity of limitation and not the kind of limitation. The assignment of a soil area to a capability class is not rigid and is subject to change as new information about climate, soils, crop varieties and management practices become available.

Soil Capability Classes

Class 1 - these soils have no significant limitations to use for crops.

Class 2 - these soils have moderate limitations that restrict the range of crops or require moderate conservation practices.

Class 3 - these soils have moderately severe limitations that restrict the range of crops or require special conservation practices.

Class 4 - these soils have severe limitations that restrict the range of crops or require special conservation practices or both.

Class 5 - these soils have very severe limitations that restrict their capability to producing perennial forage crops and improvement practices are feasible.

Class 6 - these soils are capable only of producing perennial forage crops and improvement practices are not feasible.

Class 7 - these soils or land types have no capability for arable culture or permanent pasture.

In western Canada, climate is considered to be the primary factor influencing agricultural production. It affects the range of crops that can be grown to maturity and the timing of seeding and harvesting. The degree of climatic limitation is used to establish the starting point in applying the soil capability system. For example, in Climatic Area 3H, the highest capability rating would be 3C with favourable soil and landscape conditions (Brocke 1977). The map compiled by Bowser in 1967 entitled the Agro-Climatic Areas of Alberta was used for determining the climate areas. Bowser described these areas as follows:

Climate 1 - Areas where the amount of precipitation has usually been adequate and the frost-free period long enough to permit the growing of all dryland crops that are typical to the Prairie Region of western Canada.

Climate 2A - Areas where the amount of precipitation in approximately 50 percent of the years has been a limiting factor to crop growth. The frost-free period has usually been long enough for wheat to mature without frost damage.

Climate 2H - Areas where the amount of precipitation has usually been adequate but where wheat has suffered some frost damage in approximately 30 percent of the years.

Climate 3A - Areas where the amount of precipitation has usually been a severe limiting factor to crop growth. Wheat is rarely damaged by frost.

Climate 3H - Areas where the amount of precipitation has usually been adequate but where it is not considered practical to grow wheat because of the frequency of damaging frost.

Climate 5H - Areas where the frost-free period has been so short that it is not considered practical to grow any cereal crops.

The subclass is a grouping of soils with the same kind of limitation. Fourteen different kinds of limitations are recognized. The limiting effects of climate are considered first since they affect the initial capability class.

Soil Capability Subclasses

Climatic Limitations

A - moisture deficiency due to insufficient precipitation

H - heat deficiency expressed in terms of the length of the frost-free period.

Soil Limitations

D - undesirable soil structure

F - low inherent fertility status

M - low available moisture holding capacity

N - excessive soil salinity

S - unfavourable soil characteristics, used in a collective sense where two or more of the above are present.

Landscape Limitations

E - erosion damage

I - inundation

P - excessive stoniness

R - shallowness to consolidated bedrock

T - adverse topography

W - excessive moisture

X - cumulative effect of two or more of the above which singly are not severe enough to affect the rating.

When two limitations apply to one capability class they are denoted in order of their importance. For example, 3^{T}_{D} indicates an area of Class 3 soils with limitations due primarily to adverse topography (T) and secondly to undesirable soil structure (D).

Areas consisting of more than one capability class are symbolized as complexes indicating the proportion of each class out of a total of 10. For example:

$$4^{T^{5}}_{D}\ 3^{3}_{D}\ O^{2}\ .$$

Table 15. Key to the Soils of the Calmar, Thorsby, Warburg, Breton and Drayton Valley Areas.

Soil Name	Soil Unit	Dominant Soil Subgroup (>40%)	Significant Soil Subgroup (15-40%)	Description of Parent Material	Landform Description
Angus Ridge (C)*	AGS 2	Eluviated Black	Gleyed Eluviated Black 15-30% Humic Gleysols	moderately fine textured till (Horseshoe Canyon origin)	undulating
	AGS 6	Gleyed Eluviated Black	15-30% Humic Gleysols		
Benalto (W)	BNL 1	Dark Gray Luvisol		medium textured till (Paskapoo origin)	level to rolling
	BNL 4	Gleyed Dark Gray Luvisol	15-30% Humic Gleysols		
Breton (B)(W)	BRT 1	Orthic Gray Luvisol			
	BRT 2	Orthic Gray Luvisol	Gleyed Gray Luvisol 15-30% Humic Gleysols		
	BRT 4	Gleyed Gray Luvisol	15-30% Humic Gleysols		
Camrose (T)	CAM 6	Gleyed Black Solodized Solonetz	Gleyed Alkaline Solonetz Rego Humic Gleysols(sal.)	moderately fine textured till (Horseshoe Canyon origin)	undulating
Cooking Lake (T)	COA 2	Orthic Gray Luvisol	Gleyed Gray Luvisol 15-30% Humic Gleysol		
Demay (B)(W)	DMY 1	Orthic Luvic Gleysol		medium textured till (Paskapoo origin)	level
Eaglesham (C)(T)(B)(D)	EGL 1	Typic Mesisol	Terric Mesisol	mesic sedge peat	horizontal fen
Falun (T)	FLU 1	Orthic Dark Gray		moderately fine textured till (unknown origin)	level to undulating
	FLU 2	Orthic Dark Gray	Gleyed Dark Gray 15-30% Humic Gleysols		
	FLU 6	Gleyed Dark Gray	15-30% Humic Gleysols		
Hubalta (D)	HUB 2	Orthic Gray Luvisol	Gleyed Gray Luvisol 15-30% Humic Gleysols	moderately fine textured till (unknown origin)	undulating
Kenzie (B)	KNZ 1	Typic Mesisol	Terric Mesisol	mesic moss peat	bowl bog
Macola (B) (T)	MCO 2	Dark Gray Luvisol	Gleyed Dark Gray Luvisol 15-30% Humic Gleysols	fine and very fine textured glaciolacustrine and glaciolacustrine over till	level to undulating and undulating blanket
	MCO 6	Gleyed Dark Gray Luvisol	15-30% Humic Gleysols		
Malmo (C)	MMO 1	Eluviated Black	Orthic Black		
	MMO 6	Gleyed Eluviated Black	15-30% Humic Gleysols		
Maywood (D)	MWD 2	Orthic Gray Luvisol	Gleyed Gray Luvisol 15-30% Humic Gleysols		
	MWD 6	Gleyed Gray Luvisol	15-30% Humic Gleysols		
Modeste (W)(B)(T)	MOD 1	Orthic Gray Luvisol		weathered sandstone and siltstone (Paskapoo Formation origin)	undulating to rolling

Onoway (C)(B)(T)(W)	OWY 1	Orthic Humic Gleysol	Humic Luvic Gleysol	moderately fine and medium textured till	level
Peace Hills (C)	PHS 1	Orthic Black		moderately coarse textured glaciofluvial	undulating
Raven (T)(B)(D)	RVN 1	Orthic Humic Gleysol	Humic Luvic Gleysols	fine and very fine textured glaciolacustrine	level
Redwater (T)	RDW 1	Orthic Dark Gray		moderately coarse textured terrace	undulating
Uncas (T)	UCS 2	Dark Gray Luvisol	Gleyed Dark Gray Luvisol 15-30% Humic Gleysols	moderately fine textured till (Horseshoe Canyon origin)	undulating

* Towns and villages where these soil units are mapped: (C) Calmar, (T) Thorsby, (W) Warburg, (B) Breton, and (D) Drayton Valley.

Undifferentiated Land Units:

AV - modern floodplains; RB - rough broken scarps along stream courses; DL - disturbed land; W - water

Phases:

st - stony; sal. - saline; pty - peaty.

Table 16. Engineering and Chemical Soil Data of Representative Soil Samples of the Area

Soil Name	Horizon	Depth from Surface (cm)	pH	%N	%C	$\%CaCO_3$	Exchangeable Cations (%) Na+	Ca++	Elect. Cond. mmhos/cm	SO_4%	Grain Size Analysis % passing sieve #10	#40	#200	% smaller than .05mm	.002mm	Atterberg Limits LL	PL	PI	Textural Classification AASHO	Unified	USDA
Hubalta	Ae	0-15	5.9	0.05	0.47																
(Drayton	Bt	15-60	4.8				1	72			100	100	85	82	64	58	27	31	A-7-6(20)	CH	HvC
Valley)	BC	60-90	4.8				1	72			92	89	74	72	40	54	26	28	A-7-6(18)	CH	CL-C
	Ck	90+	7.0			2.1			0.5	0.0	98	95	77	73	36	36	18	18	A6(11)	CL	CL
Breton	Ae	0-20	5.7	0.04	0.39																
(Breton)	Bt	20-70	5.1				1	80			100	94	59	64	30	35	21	14	A6(7)	CL	CL
	BC	70-125	5.6				1	85			99	95	69	59	27	31	17	14	A6(7)	CL	L-CL
	Ck	125+	7.2			4.2			0.6	0.0	99	92	62	64	29	33	20	13	A6(8)	CL	CL
gleyed	Ahe	0-15	6.4	0.36	4.07																
Falun	Btg	23-68	6.0				1	76			100	98	70	65	38	39	21	18	A6(10)	CL	CL
(Thorsby)	BCg	68-93	7.0				1	77			98	89	55	67	38	38	22	16	A6(6)	CL	CL
	Ckg	93+	8.0			3.9			0.5	0.0	95	84	46	58	34	29	16	13	A6(4)	CL	CL
gleyed	Bng	10-50	7.1				8	52													
Camrose	Cskg	50+	7.8						8.5	0.7	98	83	52	66	40	32	16	16	A6(6)	CL	CL-C
(Thorsby)																					
Maywood	Ap	0-10	5.6	0.15	0.89																
(Drayton	Bt	10-50	5.0				2	46			100	99	97	89	70	73	38	35	A7-5(20)	CH	HvC
Valley)	BC	50-75	5.8				2	49			98	94	81	81	62	51	28	23	A7-6(15)	CH	HvC
	Ck	75+	7.2			3.0			0.8	0.0	97	94	77	74	55	51	21	30	A7-6(18)	CH	HvC
gleyed	Ap	0-30	6.5	0.45	5.21																
Malmo	Btjg	30-90	7.0				2	50			100	99	88	95	45	60	30	30	A7-6(20)	CH-MH	SiC
(Calmar)	Ckg	90+	7.7			5.5			0.6	0.0	100	99	86	90	42	57	28	29	A7-6(19)	CH	
Modeste	Ae	0-15	5.3	0.07	0.62																
(Breton)	Bt	15-65	5.5				2	78			98	86	21	26	14	NL	NP		A2-4(0)	SM	SL
	C	65+	6.3			0.0			0.1	0.0	89	90	13	16	10	NL	NP		A2-4(0)	SM	LS

SECTION II

Location and Extent

The following areas are described in this report:

1) 1035 hectares (2,560 acres) in the vicinity of Calmar in Township 49, Ranges 26 and 27 west of the 4th meridian. Calmar is 24 km (15 miles) south and 18 km (11 miles) west of Edmonton via highways 2 and 39.

2) 1035 hectares (2,560 acres) in the vicinity of Thorsby in Township 49, Range 1 west of the 5th meridian. Thorsby is 24 km (15 miles) south and 37 km (22 miles) west of Edmonton via highways 2 and 39.

3) 1300 hectares (3,200 acres) in the vicinity of Warburg in Townships 48 and 49, Range 3 west of the 5th meridian. Warburg is 24 km (15 miles) south and 56 km (34 miles) west of Edmonton via highways 2 and 39.

4) 1550 hectares (3,840 acres) in the vicinity of Breton in townships 47 and 48, Range 4 west of the 5th meridian. Breton is 24 km (15 miles) south, 66 km (40 miles) west and 10 km (6 miles) south of Edmonton via highways 2, 39 and 12.

5) 2270 hectares (5,600 acres) in the vicinity of Drayton Valley in Township 49, Range 7 west of the 5th meridian. Drayton Valley is 24 km (15 miles) south and 116 km (73 miles) west of Edmonton via highways 2, 39 and 57.

Bedrock and Surficial Geology

Near the town of Calmar, the uppermost geological formation is the Horseshoe Canyon Formation which consists of grey, feldspathic sandstone; gray bentonitic mudstone and carbonaceous shale; concretionary ironstone beds with scattered coal and bentonite beds of variable

thickness (R. Green 1972). The uppermost formation at Thorsby is the Scollard member of the Paskapoo Formation which consists of gray, feldspathic sandstone, dark grey bentonitic mudstone and thick coal beds. In the vicinity of the towns of Drayton Valley, Breton and Warburg, the Paskapoo Formation is the uppermost formation. Exposures of the Paskapoo are found in the Breton and Warburg areas. This formation consists of gray to greenish gray, thick bedded, calcareous cherty sandstone; gray and green siltstone and mudstone; minor conglomerate, thin limestone, coal and tuff beds. The Paskapoo Formation is Tertiary and Upper Cretaceous while the Horseshoe Canyon is Upper Cretaceous in age.

The entire area was covered by the continental ice sheet. Till (material laid down by a glacier) has been deposited as undulating or rolling morainal landforms near each of the towns mentioned. The till overlying the Horseshoe Canyon Formation and most of the Paskapoo Formation is very similar in texture to the formations over which they were deposited. Brown, moderately fine textured till overlies the Horseshoe Canyon Formation. Yellowish brown medium to moderately fine textured till overlies the Paskapoo Formation. In the vicinity of Drayton Valley, however, the till does not seem to have much relation to the underlying Paskapoo Formation; it is finer textured than the brown till overlying the Horseshoe Canyon Formation (Lindsay *et al.* 1968).

Fine and very fine textured deposits of proglacial Lake Edmonton overlie the till in the Calmar area. Moderately fine and fine textured deposits were also laid down on undulating glaciolacustrine landforms in the Drayton Valley area. Minor glaciolacustrine areas also occur in the Breton and Thorsby areas.

Elevations range from 725 m at Calmar to 850 m at Breton.

The area is drained by the North Saskatchewan River drainage system. Much of the area in the vicinity of Calmar, Thorsby and Warburg is characterized by a relatively high groundwater level.

The Soils

The dominance of one or more soil forming processes results in the formation of soil horizons that may differ from one another in many properties. These processes reflect the influence of the soil forming factors - parent material, climate, drainage, vegetation and biotic agents and are the primary basis of the Canadian classification of soils at the higher levels of categorization (Canada Soil Survey Committee 1976). At Calmar and Thorsby the development of Chernozemic soils is the dominant process, and at Warburg, Breton and Drayton Valley the development of Luvisolic soils is the dominant process.

Luvisolic soils are characterized by Ae and Bt horizons as described in Appendix I. They are well to imperfectly drained soils that have developed in areas of forest cover where the climate is relatively cool and moist. In areas of Luvisolic soils there is sufficient leaf litter to promote the process of leaching. Leaching is attributed to the action of organic acids that cause the translocation of clay size particles into the Bt horizon. Dark Gray Luvisols differ from Gray Luvisols in having Ah or Ahe horizons greater than 5 cm thick. These occur in areas where forest cover has invaded former grassland areas or vice versa. Gleyed Gray Luvisols are the dominant subgroup in these areas due to a high groundwater table. These soils differ from the well drained members in having distinct mottles and dull gray colors within 50 cm of the surface.

Chernozemic soils are characterized by surface horizons that are darker in color than their subsurface horizons due to the accumulation of organic matter from the decomposition of xerophytic and mesophytic grasses and forbs. They are well to imperfectly drained soils that have developed in areas of grassland and transitional grassland-forest vegetation where the climate is relatively warm and dry. Black Chernozems have developed under grassland and Dark Gray Chernozems under transitional vegetation. Dark Gray Chernozems have leaf mats overlying Ahe horizons (see Appendix I) that have spots and bands of light gray color and a weak platy structure. Gleyed Dark Gray and Gleyed Black Chernozems

are the most common subgroups of Chernozemic soils in this area. These occur at Calmar and Thorsby. They differ from the well drained members in having distinct mottles and dull gray colors within 50 cm of the surface.

Drainage is a very important consideration that has a great influence on soil development in this area. In addition to the Gleyed Luvisols and Chernozems already mentioned soils of the Gleysolic and Organic Orders occur not only in mappable areas but also as significant soils in other soil units.

Soils of the Gleysolic Order are developed in areas where soil moisture is in excess of field capacity and remains in all horizons for a large part of the year. Natural vegetation consists of willows, sedges and balsam poplar. They are characterized by very dull colors and strong mottling to the surface and may have organic surface horizons less than 40 cm thick.

Soils of the Organic Order are developed in areas where free water remains at or within 30 cm of the surface most of the year. These soils have organic surface horizons more than 40 cm thick. They are classified according to the vegetation type (moss peat or fen peat); degree of decomposition (fibric, mesic or humic), (see Appendix II); and depth to mineral soil (Terric or Typic). Terric refers to Organic soils having mineral matter within 120 cm of the surface. Typic refers to Organic soils having no mineral matter above 120 cm, and which have dominantly mesic or humic layers below the 40 cm depth. Vegetation consists of willows, sedges, mosses, black spruce, tamarack and Labrador tea. Soils of the Organic Order occur as mappable areas at Breton, Drayton Valley and Thorsby.

A relatively small area of soils of the Solonetzic Order occurs at Thorsby. For these soils, the type of parent material has a greater influence on the type of soil formed than the zonal controls of climate and vegetation. These soils have developed where the soil's parent material has been influenced by the accumulation of soluble salts in groundwater discharge areas. Different soil subgroups of Solonetzic soils often occur in these areas in very complex patterns of distribution according to the

effect of topography and depth to the water table on the solodization process. Solodization is the gradual breakdown of the solonetzic Bn horizon (see Appendix I) to form Ae and AB horizons that are somewhat more permeable to plant roots and more acidic than Solonetzic soils.

Twenty-eight soil units have been mapped in the five soil areas. The key to the soils of the area (Table 15) and the soil unit descriptions indicate the classification, texture, pH, structure, drainage, range in topographic classes and landform for each soil unit. For explanations of soil texture, drainage, topography and types and classes of soil structure, see Section I of this report. Appendices I, II, and III present the definitions of soil horizon symbols, the Canadian Soil Classification System and the Landform Mapping System. Four undifferentiated land units were mapped; modern floodplains, rough broken scarps, disturbed land, and open water. Saline, stony and peaty phases of soil units were also mapped.

General Soil Interpretations

Soil interpretations for selected uses for each of the mapping units are indicated in conjunction with the soil unit description. These interpretations indicate slight, moderate and severe limitations or good, fair or poor suitabilities for selected uses along with the limiting properties that cause them. The guides for engineering uses are those designated by the USDA Soil Conservation Service (1971). The guides for recreational uses are by Montgomery and Edminster (1966). Agricultural Capability ratings are those designated by Canada Land Inventory (1965). It should be noted that whenever a limiting property constitutes a severe limitation for a designated use, other less important limiting properties are ignored.

The most important limiting property throughout much of the mapped area is relatively shallow depths to a seasonal water table. Very poorly drained soils such as Eaglesham and Kenzie soils, and poorly drained soils such as Demay, Onoway and Raven have severe to very severe limitations for all engineering, recreational and agricultural uses. Imperfectly drained soils such as gleyed Macola, Breton, Benalto and

Malmo soils that constitute a major portion of the areas surveyed have moderate limitations for all uses due to this limiting property.

The fine to very fine textured clays of the Malmo, Macola and Maywood soil parent materials have severe limitations due to texture and shrink-swell potential for road location, permanent buildings with basements, septic tank absorption fields, trench-type sanitary landfills, and shallow excavations.

When referring to soil interpretations for each soil unit it should be noted that where a rating is given as moderate to severe (2) the severe limitation refers to Humic Gleysols that are significant soils in the soil unit. This will also be indicated in the Limiting Properties section as D (2).

According to the Soil Capability for Agriculture reports for Edmonton (83 H) and Wabamun Lake (83 G) (Canada Land Inventory), the areas in the vicinity of these five towns or villages are in three different agro-climatic areas. Calmar is in Climate 1, Thorsby, Breton and Warburg are in Climate 2H, and Drayton Valley is in Climate 3H. The best soils in these areas are designated by their climates and other soil units are downgraded according to whatever soil and landscape limitations are indicated on pages 32 and 34.

Soil Unit: AGS 2 (ANGUS RIDGE)
Soil Classification: Eluviated Black, Gleyed Eluviated Black, 15-30% Humic Gleysols
Landform: undulating
Parent Material: moderately fine textured till (Horseshoe Canyon origin)
Topography: gently undulating
Drainage: well to poorly drained
Profile Description of an Eluviated Black soil:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Ah	35	6.0-7.0	L	fgr	S
Ae	5	5.5-6.5	L-SiL	m2pl	SH
AB	20	5.5-6.5	CL	f2sbk	H
Bt	20	5.0-6.0	CL	m2sbk	H
Ck	80+	7.0-8.0	CL	am	-

Comments: The thickness of the Ah horizon varies from 25 to 50 cm. Comments re: Humic Gleysols - may include other subgroups at the Gleysolic order. Only about 100 hectares mapped in the Calmar area.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	M-V[2]	T,D[2],PFA[2]
Perm.Bldg.with basements	3 & 4	M-V[2]	T,D[2],PFA[2]
Sewage lagoons	5	M-V[2]	TOP,D[2]
Septic tank absorption fields	6	M-V[2]	P,PR,D[2]
Trench-type sanitary landfills	7	M-V[2]	T,D[2]
Shallow excavations	8	M-V[2]	T,D[2]
Camp areas	9	M-V[2]	SO,P,D[2]
Picnic areas	10	M-V[2]	SO,D[2]
Playing fields	11	V	SO,D[2]
Suitability as a source of:		Degree of Suitability[1]	Limiting Properties[1]
Gravel	12	U	T
Roadfill	13	F-P[2]	T,D[2]
Topsoil	14	G	
Soil Capability for Agriculture (see page 32)		$1^{8}_{3}W^{2}$	

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock.

[2] Refers to Humic Gleysols (a significant soil).

Soil Unit: AGS 6 (ANGUS RIDGE)
Soil Classification: Gleyed Eluviated Black, 15-30% Humic Gleysols
Landform: level
Parent Material: moderately fine textured till (Horseshoe Canyon origin)
Topography: nearly level
Drainage: imperfectly to poorly drained

Profile Description of a Gleyed Eluviated Black soil:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Ah	35	6.0-7.0	L	fgr	S
Ae	5	5.5-6.5	L	m2pl	SH
Bt	20	5.0-6.5	CL-C	m2sbk	H
Btg	20	5.0-6.5	CL	m2sbk	H
BCg	30	6.0-6.5	CL	f1sbk	SH
Ckg	110+	7.0-8.0	CL	am	-

Comments: B & C horizons moderately gleyed and mottled. Only 10 hectares mapped in Calmar area. Same comments AGS 2 in regard to Humic Gleysols.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	M-V[2]	T,D,D[2],PFA[2]
Perm.Bldg.with basements	3 & 4	V	D,PFA
Sewage lagoons	5	M-V[2]	TOP,D,D[2]
Septic tank absorption fields	6	V	T,D,D[2]
Trench-type sanitary landfills	7	M-V[2]	T,D,D[2]
Shallow excavations	8	V	T,D,D[2]
Camp areas	9	M-V[2]	SO,D,P,D[2]
Picnic areas	10	M-V[2]	SO,D,D[2]
Playing fields	11	M-V[2]	SO,D,D[2]
		Degree of Suitability[1]	Limiting Properties[1]
Suitability as a source of:			
Gravel	12	U	T
Roadfill	13	F-P[2]	T,D[2]
Topsoil	14	G	

Soil Capability for Agriculture (see page 32) $1^{8}3W^{2}$

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock.

[2] Refers to Humic Gleysols (a significant soil).

Soil Unit: BNL 1 (BENALTO)
Soil Classification: Dark Gray Luvisol
Landform: undulating to rolling
Parent Material: medium textured till (Paskapoo origin)
Topography: gently sloping
Drainage: well drained
Profile Description of a Dark Gray Luvisol:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Ah	10	6.0-6.5	SiL	fgr	S
Ahe	10	5.5-6.5	SiL	f1pl	S
Ae	10	5.0-6.0	SiL	c3pl	SH
Bt	30	5.0-6.0	CL	c3sbk	H
BC	60	5.5-6.5	L	m2sbk	H
Ck	120+	7.0-8.0	L	am	-

Comments:

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	M	T
Perm.Bldg.with basements	3 & 4	M	T
Sewage lagoons	5	M	TOP
Septic tank absorption fields	6	M	P,PR
Trench-type sanitary landfills	7	M	T
Shallow excavations	8	M	T
Camp areas	9	M	ST,SO
Picnic areas	10	M	ST,SO
Playing fields	11	V	TOP
Suitability as a source of:		Degree of Suitability[1]	Limiting Properties[1]
Gravel	12	U	T
Roadfill	13	F	T
Topsoil	14	P	DT

Soil Capability for Agriculture (see page 32) 3D

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; DT-depth of topsoil.

Soil Unit: BNL 4 (BENALTO)

Soil Classification: Gleyed Dark Gray Luvisol, 15-30% Humic Gleysols

Landform: level

Parent Material: medium textured till (Paskapoo origin)

Topography: nearly level

Drainage: imperfectly to poorly drained

Profile Description of a Gleyed Dark Gray Luvisol:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Ahe	8	5.5-6.5	L	f1pl	S
Ae	8	5.5-6.5	L	m3pl	SH
Btg	30	5.0-6.0	CL	m3sbk	H
BCg	30	5.5-6.5	L-CL	m1sbk	SH
Ckg	76+	7.0-8.0	L-CL	am	-

Comments: B and C horizons are moderately gleyed and mottled. Most of the area is under hay crops or pasture and is difficult to assess the depth of Ahe. Same comments re Humic Gleysols.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	M-V[2]	T,D,D[2]
Perm.Bldg.with basements	3 & 4	V	D
Sewage lagoons	5	M-V[2]	D,D[2],OM[2]
Septic tank absorption fields	6	M-V[2]	P,PR,D,D[2]
Trench-type sanitary landfills	7	M-V[2]	T,D,D[2]
Shallow excavations	8	V	D
Camp areas	9	M-V[2]	ST,SO,D,D[2]
Picnic areas	10	M-V[2]	ST,SO,D,D[2]
Playing fields	11	M-V[2]	T,SO,D,D[2]
Suitability as a source of:		Degree of Suitability[1]	Limiting Properties[1]
Gravel	12	U	T
Roadfill	13	F-P[2]	T,D,D[2]
Topsoil	14	P	DT

Soil Capability for Agriculture (see page 32) 3D[8]3W[2]

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; OM-organic matter; DT-depth of topsoil.

[2] Refers to Humic Gleysols (a significant soil).

Soil Unit: BRT 1 (BRETON)
Soil Classification: Orthic Gray Luvisol
Landform: rolling
Parent Material: medium textured till (Paskapoo origin)
Topography: gently rolling to strongly rolling
Drainage: well drained

Profile Description of an Orthic Gray Luvisol:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
L-H	8	5.5-6.5	-	-	-
Ae	10	5.5-6.5	L	m3pl	S
AB	15	5.0-6.5	L	f3sbk	SH
Bt	50	5.0-6.0	CL-L	c3sbk	H
Ck	75+	7.0-8.0	L-CL	am	-

Comments:
Small area of Brt 1 mapped in southeast corner of Warburg area on rolling topography.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	M	T
Perm. Bldg. with basements	3 & 4	M	T
Sewage lagoons	5	M	TOP
Septic tank absorption fields	6	M-V	P, PR, TOP
Trench-type sanitary landfills	7	M	T
Shallow excavations	8	M	T
Camp areas	9	M	ST, SO
Picnic areas	10	M	ST, SO
Playing fields	11	V	TOP
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	T
Roadfill	13	F	T
Topsoil	14	P	DT
Soil Capability for Agriculture (see page 32)		3D	

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; DT-depth of topsoil.

Soil Unit: BRT 2 (BRETON)

Soil Classification: Orthic Gray Luvisol, Gleyed Gray Luvisol, 15-30% Humic Gleysols

Landform: undulating

Parent Material: medium textured till (Paskapoo origin)

Topography: gently undulating

Drainage: well to poorly drained

Profile Description of an Orthic Gray Luvisol:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
LH	5	5.5-6.5	-	-	-
Ah	24	5.5-6.5	SiL	f2pl	S
Ae	8	5.0-6.5	L	m2pl	SH
Bt1	26	5.0-6.0	CL-L	m3sbk	H
Bt2	27	5.0-6.0	CL-L	c3bk	H
BC	95+	5.0-6.0	L-CL	m2sbk	H

Comments: C horizons of Breton soils tend to be coarser in texture in Warburg area. Humic Gleysols may include Humic Luvic Gleysols, Orthic Humic Gleysols, and peaty phases.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	M-V[2]	T,D[2], PFA[2]
Perm.Bldg.with basements	3 & 4	M-V[2]	T,D[2], PFA[2]
Sewage lagoons	5	M-V[2]	TOP,D[2],OM[2]
Septic tank absorption fields	6	M-V[2]	P,PR,D[2]
Trench-type sanitary landfills	7	M-V[2]	T,D[2]
Shallow excavations	8	M-V[2]	T,D[2]
Camp areas	9	M-V[2]	ST,SO,D[2]
Picnic areas	10	M-V[2]	ST,SO,D[2]
Playing fields	11	M-V[2]	
Suitability as a source of:		Degree of Suitability[1]	Limiting Properties[1]
Gravel	12	U	T
Roadfill	13	F-P[2]	T,D[2]
Topsoil	14	P	DT

Soil Capability for Agriculture (see page 32) $3D^{8}3W^{2}$

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; OM-organic matter;DT-depth of topsoil.

[2] Refers to Humic Gleysols (a significant soil).

Soil Unit: BRT 4 (BRETON)
Soil Classification: Gleyed Gray Luvisol, 15-30% Humic Gleysols
Landform: undulating
Parent Material: medium textured till (Paskapoo origin)
Topography: gently undulating
Drainage: imperfectly to poorly drained
Profile Description of a Gleyed Gray Luvisol:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Ap	15	5.5-6.5	L	f2gr	S
Ae	8	5.5-6.5	L	m3pl	SH
Btg1	30	5.0-6.5	CL-L	c3bk	H
Btg2	50	5.0-6.0	CL-L	m2sbk	H
BCg	25	5.5-6.5	L-CL	f1sbk	SH
Ckg	128+	7.0-8.0	L-CL	am	-

Comments: B and C horizons are moderately gleyed and mottled. Humic Gleysols may include Humic Luvic Gleysols, Orthic Humic Gleysols and peaty phases.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	M-V[2]	T,D,D[2],PFA[2]
Perm.Bldg.with basements	3 & 4	V	D
Sewage lagoons	5	M-V[2]	D,D[2],OM[2]
Septic tank absorption fields	6	M-V[2]	P,PR,D,D[2]
Trench-type sanitary landfills	7	M-V[2]	T,D,D[2]
Shallow excavations	8	V	D
Camp areas	9	M-V[2]	SO,D,D[2]
Picnic areas	10	M-V[2]	SO,D,D[2]
Playing fields	11		
Suitability as a source of:		Degree of Suitability[1]	Limiting Properties[1]
Gravel	12	U	T
Roadfill	13	F-P[2]	T,D,D[2]
Topsoil	14	P	DT
Soil Capability for Agriculture (see page 32)		$3D^{8}3W^{2}$	

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; OM-organic matter;DT-depth of topsoil.

[2] Refers to Humic Gleysols (a significant soil).

Soil Unit: CAM 6 (CAMROSE)

Soil Classification: Gleyed Black Solodized Solonetz, Gleyed Alkaline Solonetz, Rego Humic Gleysols(saline)

Landform: undulating

Parent Material: moderately fine textured till (Horseshoe Canyon origin)

Topography: gently undulating

Drainage: imperfectly to poorly drained

Profile Description of a Gleyed Black Solodized Solonetz soil:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Ah	15	5.5-6.5	L	fgr	SH
Aeg	10	5.5-6.5	SiL	m3pl	H
Bntg	30	5.0-6.5	CL	c3bk	VH
BCg	30	6.0-7.0	CL	m2sbk	H
IICskg	85+	7.0-8.0	CL	am	-

Comments: IICskg is not consolidated but is hard to break with a shovel due to surface crust. B & C horizons moderately gleyed and mottled.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	M-V[2]	T,D[2],PFA[2]
Perm.Bldg.with basements	3 & 4	V	D,PCC
Sewage lagoons	5	M-V[2]	D,D[2],OM[2]
Septic tank absorption fields	6	V	P,PR,D[2]
Trench-type sanitary landfills	7	M-V[2]	T,D[2]
Shallow excavations	8	V	D
Camp areas	9	V	P,D[2]
Picnic areas	10	M-V[2]	SO,D[2]
Playing fields	11	V	P,D[2]
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	T
Roadfill	13	F-P[2]	T,D,D[2]
Topsoil	14	P	P

Soil Capability for Agriculture (see page 32) $4^{D8}_{W}\ 5^{W2}_{N}$

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; OM-organic matter.

[2] Refers to Humic Gleysols (a significant soil).

Soil Unit: COA 2 (Cooking Lake)
Soil Classification: Orthic Gray Luvisol, Gleyed Gray Luvisol, 15-30% Humic Gleysols
Landform: undulating
Parent Material: moderately fine textured till (Horseshoe Canyon origin)
Topography: gently undulating to undulating
Drainage: well to poorly drained
Profile Description of an Orthic Gray Luvisol:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
L-F	6	5.5-6.5	-	-	-
Ahe	3	5.5-6.5	SiL	f1gr	S
Ae	9	5.0-6.0	SiL	f2pl	SH
AB	6	4.5-5.5	CL	m3sbk	SH
Bt1	20	4.5-5.5	CL	c3bk	H
Bt2	30	6.0-7.0	CL	c3sbk	H
Ck	68+	7.0-8.0	CL	m2sbk	-

Comments: Humic Gleysols may include Humic Luvic Gleysols, Orthic Humic Gleysols, and peaty phases.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	M-V[2]	T,D[2],PFA[2]
Perm.Bldg.with basements	3 & 4	M-V[2]	T,D[2],PFA[2]
Sewage lagoons	5	M-V[2]	TOP,D[2],OM[2]
Septic tank absorption fields	6	M-V[2]	P,PR,D[2]
Trench-type sanitary landfills	7	M-V[2]	T,D[2]
Shallow excavations	8	M-V[2]	T,D[2]
Camp areas	9	M-V[2]	ST,SO,P,D[2]
Picnic areas	10	M-V[2]	ST,SO,D[2]
Playing fields	11	V	ST,SO,TOP,D[2]
Suitability as a source of:		Degree of Suitability[1]	Limiting Properties[1]
Gravel	12	U	T
Roadfill	13	F-P[2]	T,D[2]
Topsoil	14	P	DT
Soil Capability for Agriculture (see page 32)		3D[8]3W[2]	

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; OM-organic matter, DT-depth of topsoil.

[2] Refers to Humic Gleysols (a significant soil).

Soil Unit: DMY 1 (DEMAY)
Soil Classification: Orthic Luvic Gleysol
Landform: level
Parent Material: medium textured till (Paskapoo origin)
Topography: depressional
Drainage: poorly drained
Profile Description of an Orthic Luvic Gleysol:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Om	10	5.5-6.5	-	-	-
Aeg	15	5.5-6.5	L	m3pl	H
ABg	15	5.5-6.5	SCL	m3sbk	H
Btg	60	5.0-6.0	CL	c3bk	H
Ckg	90+	7.0-8.0	CL	am	-

Comments: May be inclusions of peaty phases (less than 15%)

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	V	D
Perm.Bldg.with basements	3 & 4	V	D
Sewage lagoons	5	V	D, OM
Septic tank absorption fields	6	V	D
Trench-type sanitary landfills	7	V	D
Shallow excavations	8	V	D
Camp areas	9	V	D
Picnic areas	10	V	D
Playing fields	11	V	D
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	T
Roadfill	13	P	D
Topsoil	14	P	D
Soil Capability for Agriculture (see page 32)		3W	

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; OM-organic matter.

Soil Unit: EGL 1 (EAGLESHAM)
Soil Classification: Typic Mesisol, Terric Mesisol
Landform: horizontal
Parent Material: mesic sedge peat
Topography: depressional
Drainage: very poorly drained
Profile Description of a Terric Mesisol:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Of	15	5.0-6.0			
Om1	20	5.0-6.0			
Oh1	10	5.0-6.0			
Om2	15	5.0-6.0			
Oh2	15	5.0-6.0			
Ckg	75+	7.0-8.0	CL	am	-

Comments: Of layer consists of undecomposed rushes, reeds and sedge grasses.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	V	D
Perm.Bldg.with basements	3 & 4	V	D
Sewage lagoons	5	V	D,OM
Septic tank absorption fields	6	V	D
Trench-type sanitary landfills	7	V	D
Shallow excavations	8	V	D
Camp areas	9	V	D
Picnic areas	10	V	D
Playing fields	11	V	D
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	T
Roadfill	13	P	D
Topsoil	14	P	D
Soil Capability for Agriculture (see page 32)		O	

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock, OM - organic matter.

Soil Unit: FLU 1 (FALUN)
Soil Classification: Orthic Dark Gray
Landform: undulating
Parent Material: moderately fine textured till (Horseshoe Canyon origin)
Topography: undulating
Drainage: well drained
Profile Description of an Orthic Dark Gray soil:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Ahe	15	6.0-7.0	L	m1gr	S
Bm	30	5.5-6.5	CL	m2bl	SH
Ck	45+	7.0-8.0	CL	am	-

Comments: A small area occurs east of Thorsby.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	M	T
Perm.Bldg.with basements	3 & 4	M	T
Sewage lagoons	5	M	TOP
Septic tank absorption fields	6	M	P, PR
Trench-type sanitary landfills	7	M	T
Shallow excavations	8	M	T
Camp areas	9	M	SO,P
Picnic areas	10	M	SO
Playing fields	11	M	SO, TOP
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	T
Roadfill	13	F	T
Topsoil	14	F	SO,DT
Soil Capability for Agriculture (see page 32)		2H	

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; DT-depth of topsoil.

Soil Unit: FLU 2 (FALUN)
Soil Classification: Orthic Dark Gray, Gleyed Dark Gray, 15-30% Humic Gleysols
Landform: undulating
Parent Material: moderately fine textured till (Horseshoe Canyon origin)
Topography: gently undulating
Drainage: well to poorly drained
Profile Description of an Orthic Dark Gray soil:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
L-H	3	5.5-6.5	-	-	-
Ahe	20	5.5-6.5	L	m1gr	S
AB	15	5.0-6.5	CL	m2sbk	SH
Bt	50	5.0-6.5	CL	c3sbk	H
Ck	85+	7.0-8.0	CL	am	-

Comments: A small area occurs east of Thorsby. Humic Gleysols include Orthic Humic Gleysols, Humic Luvic Gleysols and peaty phases.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	M-V[2]	T,D[2],PFA[2]
Perm.Bldg.with basements	3 & 4	M-V[2]	T,D[2],PFA[2]
Sewage lagoons	5	M-V[2]	TOP,D[2],OM[2]
Septic tank absorption fields	6	M-V[2]	P,PR,D[2]
Trench-type sanitary landfills	7	M-V[2]	T,D[2]
Shallow excavations	8	M-V[2]	T,D[2]
Camp areas	9	M-V[2]	SO,P,D[2]
Picnic areas	10	M-V[2]	SO,D[2]
Playing fields	11	V	SO,D[2]
Suitability as a source of:		Degree of Suitability[1]	Limiting Properties[1]
Gravel	12	U	T
Roadfill	13	F-P[2]	T,D[2]
Topsoil	14	F	SO,DT
Soil Capability for Agriculture (see page 32)		$2H^8_3W^2$	

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; OM-organic matter; DT-depth of topsoil.

[2] Refers to Humic Gleysols (a significant soil).

Soil Unit: FLU 6 (FALUN)

Soil Classification: Gleyed Dark Gray, 15-30% Humic Gleysols

Landform: level

Parent Material: moderately fine textured till (Horseshoe Canyon origin)

Topography: nearly level

Drainage: imperfectly to poorly drained

Profile Description of a Gleyed Dark Gray soil:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Ap	15	5.5-6.5	L	f2gr	S
ABgj	10	5.5-6.5	CL	f1sbk	SH
Btgj	15	5.0-6.0	CL	m3sbk	H
BCg	25	5.5-6.5	CL	f2sbk	H
Ckg	65+	7.0-8.0	CL	am	-

Comments: This soil unit occupies much of the area south of Thorsby. Caused by seasonal high water table due to seepage from other areas. Humic Gleysols may include Orthic Humic Gleysols, Humic Luvic Gleysols and peaty phases.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	M-V[2]	T,D,D[2], PFA[2]
Perm.Bldg.with basements	3 & 4	V	D
Sewage lagoons	5	M-V[2]	D, D[2],OM[2]
Septic tank absorption fields	6	M-V[2]	P,PR,D,D[2]
Trench-type sanitary landfills	7	M-V[2]	T,D,D[2]
Shallow excavations	8	V	D
Camp areas	9	M-V[2]	SO,P,D,D[2]
Picnic areas	10	M-V[2]	SO,D,D[2]
Playing fields	11	M-V[2]	SO,D,D[2]
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	T
Roadfill	13	F-P[2]	T,D,D[2]
Topsoil	14	F	SO,DT

Soil Capability for Agriculture (see page 32) $2H^{8}_{3}W^{2}$

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; OM-organic matter; DT-depth of topsoil.

[2] Refers to Humic Gleysols (a significant soil).

Soil Unit: HUB 2 (HUBALTA)
Soil Classification: Orthic Gray Luvisol, Gleyed Gray Luvisol, 15-30% Humic Gleysols
Landform: undulating
Parent Material: fine textured till (unknown origin)
Topography: gently undulating
Drainage: well to poorly drained
Profile Description of an Orthic Gray Luvisol:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
L-H	8	-	-	-	-
Ae	25	5.5-6.5	SiL	m3pl	SH
AB	8	5.0-6.0	SiC	f2sbk	H
Bt	20	4.5-5.5	C	c3bk	H
BC	75	4.5-5.5	CL	m2sbk	H
Ck	136+	7.0-8.0	CL	am	-

Comments: There does not seem to be any relation between this till and the underlying Paskapoo formation. Humic Gleysols include Humic Luvic Gleysols, Orthic Humic Gleysols and peaty phases.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	V	T,O[2], PFA[2]
Perm.Bldg.with basements	3 & 4	V	T,D
Sewage lagoons	5	M-V[2]	TOP,D[2],OM[2]
Septic tank absorption fields	6	V	P,PR,D[2]
Trench-type sanitary landfills	7	V	T,D[2]
Shallow excavations	8	V	T,D[2]
Camp areas	9	V	P,D[2]
Picnic areas	10	M-V[2]	ST,SO,D[2]
Playing fields	11	V	P, D[2]
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	T
Roadfill	13	P	T,D[2]
Topsoil	14	P	DT
Soil Capability for Agriculture (see page 32)		4D[8]4W[2]	

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; OM-organic matter; DT-depth of topsoil.

[2] Refers to Humic Gleysols (a significant soil).

Soil Unit: KNZ 1 (KENZIE)
Soil Classification: Typic Mesisol, Terric Mesisol
Landform: bowl bog
Parent Material: mesic moss peat
Topography: depressional
Drainage: very poorly drained
Profile Description of a Typic Mesisol:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Of	20	4.5-6.0			
Om1	60	4.5-6.0			
Om2	60	4.5-6.0			
Oh	140+	4.5-6.0			

Comments: The thickness of each layer is variable, but material from 20 to 140 cm depth is dominantly mesic. Of consists of undecomposed sphagnum moss.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	V	D
Perm.Bldg.with basements	3 & 4	V	D
Sewage lagoons	5	V	D,OM
Septic tank absorption fields	6	V	D
Trench-type sanitary landfills	7	V	D
Shallow excavations	8	V	D
Camp areas	9	V	D
Picnic areas	10	V	D
Playing fields	11	V	D
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	
Roadfill	13	U	
Topsoil	14	U	
Soil Capability for Agriculture (see page 32)		O	

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; OM-organic matter.

Soil Unit: MCO 6 (MACOLA)
Soil Classification: Gleyed Dark Gray Luvisol, 15-30% Humic Gleysols
Landform: level blanket
Parent Material: fine to very fine textured glaciolacustrine
Topography: nearly level
Drainage: imperfectly to poorly drained

Profile Description of a Gleyed Dark Gray Luvisol:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Ap	15	5.5-6.5	SiL	f1pl	S
Ae	8	4.5-5.5	SiL	m3pl	SH
AB	5	4.5-5.5	SiC	m2sbk	SH
Btg	20	4.5-5.5	C	c3bk	H
BCg	90	5.0-6.5	C	f1sbk	H
IICkg	138+	7.0-8.0	CL	am	-

Comments: Humic Gleysols include Humic Luvic Gleysols, Orthic Humic Gleysols, and peaty phases. Depth to till varies from 50cm to 3 m.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	V	T,D[2],PFA[2]
Perm.Bldg.with basements	3 & 4	V	T,D,PFA
Sewage lagoons	5	M-V[2]	TOP,D,D[2],OM[2]
Septic tank absorption fields	6	V	P,PR,D,D[2]
Trench-type sanitary landfills	7	V	T,D[2]
Shallow excavations	8	V	T,D[2]
Camp areas	9	V	P,D[2]
Picnic areas	10	M-V[2]	T,D[2]
Playing fields	11	V	P,D[2]
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	T
Roadfill	13	P	T,D[2]
Topsoil	14	P	DT
Soil Capability for Agriculture (see page 32)		$3D^8{}_3W^2$ and $4D^8{}_4W^2$	

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; OM-organic matter; DT-depth of topsoil.

[2] Refers to Humic Gleysols (a significant soil).

Soil Unit: MOD 1 (MODESTE)
Soil Classification: Orthic Gray Luvisol
Landform: undulating
Parent Material: weathered sandstone and siltstone
Topography: gently undulating to gently rolling
Drainage: well drained
Profile Description of an Orthic Gray Luvisol:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
L-H	3	5.0-6.0	-	-	-
Ae	15	5.0-6.0	SL	f1pl	SH
AB	15	5.0-6.0	SL	f1sbk	SH
Bt	45	5.0-6.0	SCL	f2sbk	SH
C	75+	5.0-6.5	LS	sg	-

Comments: Fragments of weathered bedrock are found within the profile. Textural variation is from coarse to medium textured in these profiles. Lime can sometimes be seen in the C horizon along root channels.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	S-M	T
Perm.Bldg.with basements	3 & 4	S-M	T
Sewage lagoons	5	M-V	T
Septic tank absorption fields	6	S-M	TOP
Trench-type sanitary landfills	7	S	
Shallow excavations	8	S	
Camp areas	9	S	
Picnic areas	10	S	
Playing fields	11	M-V	TOP
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	T
Roadfill	13	G	
Topsoil	14	P	DT

Soil Capability for Agriculture (see page 32) 3M

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; DT-depth of topsoil.

Soil Unit: MMO 1 (MALMO)
Soil Classification: Eluviated Black, Orthic Black
Landform: undulating
Parent Material: fine and very fine textured glaciolacustrine
Topography: gently undulating
Drainage: moderately well drained
Profile Description of an Eluviated Black soil:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Ap	30	5.5-6.5	SiL	f1sbk	S
Ae	8	5.0-6.0	SiL	m3pl	SH
Bt1	50	5.0-6.0	C	c3bk	H
Bt2	25	5.5-6.5	C	m2sbk	H
Ccag	113+	7.0-8.0	C	am	-

Comments: Small areas mapped on slight elevations in Calmar area.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	V	T
Perm.Bldg.with basements	3 & 4	V	T
Sewage lagoons	5	M	TOP
Septic tank absorption fields	6	V	P,PR
Trench-type sanitary landfills	7	V	T
Shallow excavations	8	V	T
Camp areas	9	M	P, ST
Picnic areas	10	M	ST
Playing fields	11	M	P, ST
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	T
Roadfill	13	P	T
Topsoil	14	G	
Soil Capability for Agriculture (see page 32)		1	

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock.

Soil Unit: MMO 6 (MALMO)
Soil Classification: Gleyed Eluviated Black, 15-30% Humic Gleysols
Landform: level
Parent Material: fine to very fine textured glaciolacustrine
Topography: nearly level
Drainage: imperfectly to poorly drained
Profile Description of a Gleyed Eluviated Black soil:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Ap	45	5.5-6.5	SiL	f1sbk	S
Ae	5	5.5-6.5	SiL	m3pl	SH
Btg1	15	5.0-6.0	C	c3bk	H
Btg2	40	6.0-6.5	C	m2sbk	H
Ckg	105+	7.0-8.0	C	am	-

Comments: B and C horizons moderately gleyed and mottled. Humic Gleysols include Humic Luvic Gleysols, Orthic Humic Gleysols, and peaty phases. This soil unit comprises the major portion of the Calmar area.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	V	T,D[2],PFA[2]
Perm.Bldg.with basements	3 & 4	V	T,D,PFA
Sewage lagoons	5	M-V[2]	D,D[2],OM[2]
Septic tank absorption fields	6	V	P,PR,D,D[2]
Trench-type sanitary landfills	7	V	T,D[2]
Shallow excavations	8	V	T,D[2]
Camp areas	9	M-V[2]	ST,P,D,D[2]
Picnic areas	10	M-V[2]	ST,D,D[2]
Playing fields	11	M-V[2]	ST,P,D,D[2]
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	T
Roadfill	13	P	T,D[2]
Topsoil	14	G	
Soil Capability for Agriculture (see page 32)		2W[8]3W[2]	

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; OM-organic matter.

[2] Refers to Humic Gleysols (a significant soil).

Soil Unit: MWD 6 (MAYWOOD)

Soil Classification: Gleyed Gray Luvisol, 15-30% Humic Gleysols

Landform: level

Parent Material: fine to very fine textured glaciolacustrine

Topography: nearly level

Drainage: imperfectly to poorly drained

Profile Description of a Gleyed Gray Luvisol:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Ap	10	5.5-6.5	SiL	f1sbk	SH
Ae	10	5.0-6.0	SiL	m3pl	SH
Btg	30	4.5-6.0	HvC	c3bk	H
BCg	60	5.0-6.5	HvC	m2sbk	H
Ckg	110+	7.0-8.0	HvC	am	-

Comments: Humic Gleysols include Humic Luvic Gleysols, Orthic Humic Gleysols, and peaty phases.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	V	T,D,D[2],PFA[2]
Perm.Bldg.with basements	3 & 4	V	T,D,PFA
Sewage lagoons	5	M-V[2]	D,D[2],OM[2]
Septic tank absorption fields	6	V	P,PR,D,D[2]
Trench-type sanitary landfills	7	V	T,D[2]
Shallow excavations	8	V	T,D[2]
Camp areas	9	V	P,D[2]
Picnic areas	10	M-V[2]	T,D,D[2]
Playing fields	11	V	P,D[2]
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	T
Roadfill	13	P	T,D[2]
Topsoil	14	P	DT
Soil Capability for Agriculture (see page 32)		$4D^8 4W^2$	

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; OM-organic matter; DT-depth of topsoil.

[2] Refers to Humic Gleysols (a significant soil).

Soil Unit: MWD 2 (MAYWOOD)

Soil Classification: Orthic Gray Luvisol, Gleyed Gray Luvisol, 15-30% Humic Gleysols

Landform: undulating

Parent Material: fine to very fine textured glaciolacustrine

Topography: gently undulating

Drainage: moderately well to poorly drained

Profile Description of an Orthic Gray Luvisol:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
L-H	3	-	-	-	-
Ae	10	5.5-6.5	SiCL	m3pl	SH
AB	10	5.0-6.0	SiC	m2sbk	SH
Bt	25	4.5-6.0	HVC	c3bk	H
BC	20	5.0-6.0	HVC	m1sbk	H
Ck	65+	7.0-8.0	HVC	am	-

Comments: This soil unit comprises a major portion of the Drayton Valley area. Humic Gleysols include Humic Luvic Gleysols, Orthic Humic Gleysols, and peaty phases.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	V	T,D[2],PFA[2]
Perm.Bldg.with basements	3 & 4	V	T,D[2],PFA[2]
Sewage lagoons	5	M-V[2]	TOP,D[2],OM[2]
Septic tank absorption fields	6	V	P,PR,D[2]
Trench-type sanitary landfills	7	V	T,D[2]
Shallow excavations	8	V	T,D[2]
Camp areas	9	V	P,D[2]
Picnic areas	10	M-V[2]	T,D[2]
Playing fields	11	V	P,D[2]
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	T
Roadfill	13	P	T,D[2]
Topsoil	14	P	DT

Soil Capability for Agriculture (see page 32) 4D[8] 4W[2]

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; OM-organic matter; DT-depth of topsoil.

[2] Refers to Humic Gleysols (a significant soil).

Soil Unit: OWY 1 (ONOWAY)
Soil Classification: Orthic Humic Gleysol, Humic Luvic Gleysol
Landform: level
Parent Material: medium and moderately fine textured till
Topography: depressional
Drainage: poorly drained
Profile Description of an Orthic Humic Gleysol:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Apg	20	6.0-7.0	L	f1sbk	SH
Bg	30	6.0-7.0	CL	f2sbk	H
BCg	30	6.0-7.0	CL	f1sbk	H
Ckg	80+	7.0-8.0	CL	am	-

Comments: Much of the area south of Thorsby is strongly gleyed and mottled even on slight undulations in the topography and has a seasonal high water table. Inclusions of peaty phases occur.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	V	D
Perm.Bldg.with basements	3 & 4	V	D
Sewage lagoons	5	V	D,OM
Septic tank absorption fields	6	V	D
Trench-type sanitary landfills	7	V	D
Shallow excavations	8	V	D
Camp areas	9	V	D
Picnic areas	10	V	D
Playing fields	11	V	D
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	T
Roadfill	13	P	D
Topsoil	14	P	D
Soil Capability for Agriculture (see page 32)		3W and 4W	

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; OM-organic matter.

Soil Unit: PHS 1 (Peace Hills)
Soil Classification: Orthic Black
Landform: undulating
Parent Material: moderately coarse textured glaciofluvial
Topography: gently undulating
Drainage: well drained
Profile Description of an Orthic Black soil:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Ah	40	6.0-7.0	FSL	fgr	S
Bm	30	5.5-6.5	L	f1sbk	SH
Ck	70+	7.0-8.0	FSL	am	-

Comments: A small area of this soil unit was mapped in the Calmar area.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	S	
Perm.Bldg.with basements	3 & 4	S	
Sewage lagoons	5	M	T
Septic tank absorption fields	6	S	
Trench-type sanitary landfills	7	S	
Shallow excavations	8	S	
Camp areas	9	S	
Picnic areas	10	S	
Playing fields	11	S	
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	T
Roadfill	13	G	
Topsoil	14	G	
Soil Capability for Agriculture (see page 32)		2M	

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock.

Soil Unit: RDW 1 (REDWATER)
Soil Classification: Orthic Dark Gray
Landform: undulating
Parent Material: moderately coarse textured terrace
Topography: undulating
Drainage: well drained
Profile Description of an Orthic Dark Gray soil:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Ahe	15	5.5-6.5	FSL	fgr	S
Bm	60	6.0-7.0	SL	f1sbk	S
C	75+	6.0-7.0	LS	sg	L

Comments: These soils normally have undulating glaciolacustrine landforms but upper terraces of Weed Creek in the Thorsby area have soil development similar to Chernozems.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	S	
Perm.Bldg.with basements	3 & 4	S	
Sewage lagoons	5	M	T
Septic tank absorption fields	6	S	
Trench-type sanitary landfills	7	S	
Shallow excavations	8	S	
Camp areas	9	S	
Picnic areas	10	S	
Playing fields	11	M-V	TOP
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	T
Roadfill	13	G	
Topsoil	14	F	DT
Soil Capability for Agriculture (see page 32)		3M	

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; DT-depth of topsoil.

Soil Unit: RVN 1 (RAVEN)
Soil Classification: Orthic Humic Gleysol, Humic Luvic Gleysol
Landform: level
Parent Material: fine and very fine textured glaciolacustrine
Topography: depressional
Drainage: poorly drained
Profile Description of an Orthic Humic Gleysol:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
Om	15	5.5-6.5	-	-	-
Ah	15	5.5-7.0	L	f1sbk	H
Bg	30	5.0-6.5	HvC	m3sbk	H
Ckg	60+	7.0-8.0	HvC	-	-

Comments: Fairly large areas of this soil unit occur in the Breton and Drayton Valley areas. Inclusions of peaty phases occur.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	V	D
Perm.Bldg.with basements	3 & 4	V	D
Sewage lagoons	5	V	D,OM
Septic tank absorption fields	6	V	D
Trench-type sanitary landfills	7	V	D
Shallow excavations	8	V	D
Camp areas	9	V	D
Picnic areas	10	V	D
Playing fields	11	V	D
Suitability as a source of:		**Degree of Suitability[1]**	**Limiting Properties[1]**
Gravel	12	U	T
Roadfill	13	P	D
Topsoil	14	P	D

Soil Capability for Agriculture (see page 32) 3W

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; OM-organic matter.

Soil Unit: UCS 2 (UNCAS)

Soil Classification: Dark Gray Luvisol, Gleyed Dark Gray Luvisol, 15-30% Humic Gleysols

Landform: undulating

Parent Material: moderately fine textured till (Horseshoe Canyon origin)

Topography: gently undulating

Drainage: well to poorly drained

Profile Description of a Dark Gray Luvisol:

Horizon[1]	Thickness (cm)	pH	USDA Texture[1]	Structure[1]	Dry Consistence[1]
L-H	8	-	-	-	-
Ahe	8	5.5-6.5	L	f2gr	S
Ae	8	5.5-6.5	L-SiL	m3pl	SH
AB	8	5.0-6.0	CL-L	m2sbk	H
Bt	50	4.5-5.5	CL	c3bk	H
Ck	74+	7.0-8.0	CL	am	-

Comments: This soil unit may have inclusions of Orthic Gray Luvisol. Humic Gleysols include Orthic Humic Gleysols, Humic Luvic Gleysols, and peaty phases.

Limitation for:	Table:	Degree of Limitation[1]	Limiting Properties[1]
Road location	2 & 3	M-V[2]	T,D[2],PFA[2]
Perm.Bldg.with basements	3 & 4	M-V[2]	T,D[2],PFA[2]
Sewage lagoons	5	M-V[2]	TOP,D[2],OM[2]
Septic tank absorption fields	6	M-V[2]	P,PR,D[2]
Trench-type sanitary landfills	7	M-V[2]	T,D[2]
Shallow excavations	8	M-V[2]	T,D[2]
Camp areas	9	M-V[2]	ST,SO,P,D[2]
Picnic areas	10	M-V[2]	ST,SO,D[2]
Playing fields	11	V	TOP,ST,SO,D[2]
Suitability as a source of:		Degree of Suitability[1]	Limiting Properties[1]
Gravel	12	U	T
Roadfill	13	F-P[2]	T,D[2]
Topsoil	14	P	DT

Soil Capability for Agriculture (see page 32) $3D^{8}3W^{2}$

[1] Horizon Designations: see Appendix I
Texture: see pages 5 & 6 and Table 16
Structure: see Table 2 and Figure 3
Size: f-fine; m-medium; c-coarse
Grade: 1-weak; 2-moderate; 3-strong
Type: gr-granular; pl-platy; am-amorphous; sbk-subangular blocky; bk-blocky; sg-single grain
Dry Consistence: L-loose; S-soft; SH-slightly hard; H-hard; VH-very hard
Degrees of Limitation: S-slight; M-moderate; V-severe
Degrees of Suitability: G-good; F-fair; P-poor; U-unsuited
Limiting Properties: T-texture; D-drainage; PFA-potential frost action; PCC-potential concrete corrosion, GPH-groundwater pollution hazard; P-permeability; PR-percolation rate; SO-stoniness; TOP-topography; ST-surface texture; CF-coarse fragments on surface; FL-flooding; BR-shallow depth to bedrock; OM-organic matter; DT-depth of topsoil.

[2] Refers to Humic Gleysols (a significant soil).

REFERENCES

Acton, D.J. 1975. A Landform Mapping System for Canadian Soil Surveys. Saskatchewan Institute of Pedology Publication M26.

Alberta Department of Manpower and Labour. 1972. Private sewage disposal, 5th ed. Plumbing Inspection Branch, Provincial Dept. of Manpower and Labour, Edmonton, Alberta.

Bayrock, L.A. and G.M. Hughes. 1962. Surficial geology of the Edmonton District. Alberta Research Council Prelim. Rept. 62-6.

Bauer, K.W. 1973. The use of soils data in regional planning. Geoderma 10. p. 1-26.

Beatty, M.T. and J. Bouma. 1973. Application of soil surveys to selection of sites for on-site disposal of liquid household wastes. Geoderma 10, pp. 113-122.

Bouma, J. *et al.* 1972. Soil Absorption of Septic Tank Effluent. Geological and Natural History Survey, University Extension, University of Wisconsin, Madison, Wisconsin.

Bowser, W.E. 1967. Agro-Climatic Areas of Alberta. Alberta Soil Survey, University of Alberta, Edmonton, Alberta.

Bowser, W.E., A.A. Kjearsgaard, T.W. Peters and R.E. Wells. 1962. Soil Survey of the Edmonton Sheet (83-H); Alberta Soil Survey Report No. 21.

Brocke, L.K. 1977. The Canada Land Inventory, Soil capability for agriculture in Alberta. Alberta Environment report prepared by Pedology Consultants Ltd.

Canada Land Inventory. 1965. Soil Capability Classification for Agriculture. Canada Land Inventory Report No. 2, Dept. of Forestry, Canada.

Canada Land Inventory. 1967. Soil Capability for Agriculture, Edmonton 83-H, Wabamun Lake, 83-G. Agricultural and Rural Development Act. Queen's Printer, Ottawa.

Canada Soil Survey Committee. 1976. The Canadian System of Soil Classification. Canada Dept. of Agriculture, Ottawa, Ontario.

Green, R. 1972. Geological Map of Alberta. Research Council of Alberta Map #35.

Lavkulich, L.M. 1969. Soil Dynamics in the Interpretation of Paleosols. Pedology and Quaternary Research. Symposium held at Edmonton, Alberta, May 1969.

Lindsay, J.D., W. Odynsky, T.W. Peters, and W.E. Bowser, 1968. Soil Survey of the Buck Lake (NE 83-B) and Wabamun Lake (E½ 83-G) Areas. Alberta Soil Survey Report No. 24.

Means, R.E. and J.V. Parcher. 1964. Physical properties of soils. Charles E. Merrill Books Inc. 464 pp.

Montgomery, P.H. and F.C. Edminster. 1966. Use of soil survey in planning for recreation. *In* Soil Surveys and Land Use Planning, Bartelli *et al.*(eds.), Soil Science Society of America, and American Society of Agronomy, Madison, Wisconsin. pp. 104-112.

Portland Cement Association. 1962. PCA Soil Primer, 33 West Grand Ave., Chicago, Illinois.

Swenson, E.G. 1971. Concrete in Sulphate Environment; Canadian Building Digest, Division of Building Research, National Research Council of Canada.

United States Army Corps of Engineers. 1962. Pavement design for frost conditions. E.M. 1110-1-306. pp. 5-8.

United States Department of Agriculture. 1951. Soil Survey Manual. For sale by Supt. of Documents, Government Printing Office, Washington D.C.

United States Department of Agriculture, Soil Conservation Service. 1971. Guide for Interpreting Engineering Uses of Soils.

United States Department of Health, Education and Welfare. 1969. Manual of septic tank practice. Public Health Publication No. 526, United States Superintendent of Documents, Washington D.C.

Walker, W.G. *et al.* 1973. Nitrogen transformations during subsurface disposal of septic tank effluent in sands. II Groundwater quality. Journal of Environmental Quality.

GLOSSARY

This is included to define terms commonly used in the report; it is not a comprehensive soil glossary.

***

aeolian (eolian) deposit - material deposited by wind, including both loess and dune sand.

aggregate - a group of soil particles cohering so as to behave mechanically as a unit.

alluvial deposit - material deposited by moving water.

aspect - orientation of the land surface with respect to compass direction.

Atterberg limits - see plastic limit, liquid limit.

available plant nutrients - that portion of any element or compound in the soil that can be readily absorbed and assimilated by growing plants.

bearing capacity - the average load per unit area that is required to rupture a supporting soil mass.

cation - an ion carrying a positive charge of electricity. The common soil cations are calcium, magnesium, sodium, potassium and hydrogen.

cation exchange capacity (CEC) - a measure of the total amount of exchangeable cations that can be held by the soil. It is expressed in terms of milliequivalents per 100 grams of soil.

coarse fragments - rock or mineral particles greater than 2 mm in diameter.

colluvium - a heterogeneous mixture of material that has been deposited mainly by gravitational action.

creep - slow mass movement of soil material down rather steep slopes primarily under the influence of gravity, but aided by saturation with water and alternate freezing or thawing.

edaphic - (i) of or pertaining to the soil; (ii) resulting from, or influenced by, factors inherent in the soil or other substrate rather than by climatic factors.

eluviation - the removal of soil material in suspension or in solution from a layer or layers of the soil.

erosion - the wearing away of the land surface by running water, wind, or other erosive agents. It includes both normal and accelerated soil erosion. The latter is brought about by changes in the natural cover or ground conditions and includes those due to human activity.

field capacity - the percentage of water remaining in a soil after having been saturated and after free drainage has practically ceased.

fluvial deposit - accumulations of sediment (sand, gravel, silt, etc.) produced by the action of a stream or river.

glaciofluvial deposits - material moved by glaciers and subsequently deposited by streams flowing from the melting ice.

gley - gleying is a reduction process that takes place in soils that are saturated with water for long periods of time. The horizon of most intense reduction is characterized by a gray, commonly mottled appearance, which on drying shows numerous rusty brown iron stains or streaks. Those horizons in which gleying is intense are designated with the subscript 'g'.

grain size analysis - the determination of the various amounts of sand, silt, clay, gravel and cobbles in a soil sample.

groundwater - that portion of the total precipitation which at any particular time is either passing through or standing in the soil and the underlying strata and is free to move under the influence of gravity.

horizon - 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. Soil horizons may be organic or mineral.

illuviation - the process of deposition of soil material removed from one horizon to another, usually from an upper to a lower horizon in the soil profile. Illuviated compounds include silicate clay, iron and aluminum hydrous oxides, and organic matter.

infiltration - the downward entry of water into the soil.

lacustrine deposit - material deposited in lake water and later exposed either by a lowering of the water or by uplift of the land.

landforms - the various shapes of the land surface resulting from a variety of actions, such as deposition, erosion, etc.

liquid limit (upper plastic limit) - the water content at which a pat of soil, cut by a groove of standard dimensions, will flow together for a distance of 12 mm under the impact of 25 blows in a standard liquid limit apparatus.

lithic - a soil phase that indicates a consolidated bedrock contact within the control section of a soil below a depth of 10 cm (4 in).

loamy - intermediate in texture between fine-textured and coarse textured.

loess - material transported and deposited by wind and consisting of predominantly silt-sized particles.

morphology, soil - the makeup of the soil, including the texture, structure, consistence, colour, and other physical, mineralogical and biological properties of the various horizons of the soil profile.

miscellaneous land type - a mapping unit for areas of land that have little or no natural soil - e.g. rough mountainous land.

morainal - accumulations of unsorted, unstratified till deposited by direct action of glacier ice in a variety of topographic landforms.

mottles - spots or blotches of different colour or shades of colour interspersed with the dominant colour. Mottling in soils usually indicates poor aeration and drainage.

organic matter - the decomposition residues of plant material derived from; (i) plant materials deposited on the surface of the soil; and(ii) roots that decay beneath the surface of the soil.

parent material - unconsolidated mineral material or peat from which the soil profile develops.

peat - unconsolidated soil material consisting largely of undecomposed to partially decomposed organic matter accumulated under conditions of excessive moisture.

ped - a unit of soil structure such as a prism, block, or granule formed by natural processes (in contrast to a clod which is formed artificially).

pedology - those aspects of soil science involving the constitution, distribution, genesis and classification of soils.

percolation, soil water - the downward movement of water through soil. Especially the downward flow of water in saturated or nearly saturated soil at hydraulic gradients in the order of 1.0 or less.

permeability - the ease with which gases, liquids, or plant roots penetrate or pass through a bulk mass of soil or a layer of soil. Since different horizons of soil vary in permeability, the particular horizon under question should be designated.

pH - a notation used to designate the relative acidity or alkalinity of soils and other materials. A pH of 7.0 indicates neutrality, higher values indicate alkalinity, and lower values acidity.

phase, soil - a subdivision of a taxonomic class based on soil characteristics or combinations thereof which are considered to be potentially significant to man's use or management of the land.

plastic limit - water content at which a soil will just begin to crumble when rolled into a thread approximately 3 mm in diameter.

plasticity index - the numerical difference between the liquid and plastic limits.

profile - a vertical section of the soil throughout all its horizons and extending into the parent material.

relief - the elevations or inequalities of the land surface when considered collectively. Minor configurations are referred to as 'microrelief'.

residual material - unconsolidated and partly weathered mineral material accumulated by disintegration of consolidated rock in place.

saline soil - a soil containing enough soluble salts in such quantities that they interfere with the growth of most crop plants.

seepage (groundwater) - the emergence of water from the soil over an extensive area in contrast to a spring where it emerges from a local spot.

soil consistence - (i) the resistance of a soil material to deformation or rupture; (ii) the degree of cohesion or adhesion of the soil mass. Terms used for describing consistency at various soil moisture conditions are: wet soil: non-sticky, slightly sticky, sticky, very sticky. moist soil: loose, friable, firm, very firm, extremely firm. dry soil: loose, soft, hard, very hard, extremely hard. plasticity: non-plastic, slightly plastic, plastic, very plastic.

soil structure - the combination or arrangement of primary soil particles into secondary particles, units, or peds- e.g. prismatic, columnar, blocky, platy.

soil unit - a defined aggregate of soil bodies occurring together in an individual and characteristic pattern over the land surface.

solum (plural - sola) - the part of the soil profile that is above the parent material and in which the processes of soil formation are active. It comprises the A and B horizons.

terrace - a nearly level, usually narrow, plain bordering a river, lake or sea.

texture (soil) - the relative proportions of the various sized soil separates in a soil as described by the textural class names.

till - unstratified glacial drift deposited directly by ice and consisting of non-sorted clay, silt, sand and boulders.

topsoil - (i) the layer of soil moved in cultivation; (ii) the A horizon; (iii) the Ah horizon; (iv) presumably fertile soil material used to topdress roadbanks, gardens, and lawns.

undifferentiated deposit - accumulations of unconsolidated deposits where differentiation into one of the other classes of deposits is impractical.

APPENDIX I

DEFINITION OF SOIL HORIZON SYMBOLS
(after Canada Soil Survey Committee 1976)

Organic Layers

Organic layers are found at the surface of some mineral soils, and may occur at any depth beneath the surface in buried soils, or overlying geologic deposits. They contain more than 17% organic carbon by weight. Two groups of these layers are recognized.

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

Of — The fibric layer is the least decomposed of all the organic soil materials. It has large amounts of well-preserved fibre that is readily identifiable as to botanical origin.

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

Oh — The humic layer is the most highly decomposed of the organic soil materials. It has the least amount of fibre, 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.

L-F-H — These organic layers develop primarily from leaves, twigs, woody materials, and a minor component of mosses.

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

F — This is an organic layer characterized by an accumulation of partly decomposed organic matter. The original structures in part are difficult to recognize.

H — This is an organic layer characterized by an accumulation of decomposed organic matter in which the original structures are indiscernible. This material differs from the F layer by its greater humification chiefly through the action of organisms. This layer is a zoogenous humus form consisting mainly of

spherical or cylindrical droppings of microarthropods. It is frequently intermixed with mineral grains, especially near the junction with a mineral layer.

Master Mineral Horizons and Layers

Mineral horizons are those that contain less organic matter than that specified for organic layers.

A — This is a mineral horizon or horizons formed at or near the surface in the zone of 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 these (Ae).

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

1) an enrichment in silicate clay (Bt);

2) an alteration of hydrolysis, reduction, or oxidation to give a change in colour or structure from horizons above or below (Bm and Bg);

3) a prismatic or columnar structure that exhibits pronounced coatings or stainings or significant amounts of Na (Bn).

C — This is a mineral horizon or horizons comparatively unaffected by the pedogenic processes operative in A or B, and excepting the process of gleying or the accumulation of carbonates and soluble salts.

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

Lowercase Suffixes

b — A buried soil horizon.

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

g — A horizon characterized by gray colours, or prominent mottling, or both, indicative of permanent or periodic intense reduction. Chromas of the matrix are generally 1 or less.

h — A horizon enriched with organic matter. When used with A it must show one Munsell unit of value darker than the horizon below, or have 0.5% more organic matter than the 1C. It contains less than 17% organic carbon by weight.

k — Denotes the presence of carbonate as indicated by visible effervescence when dilute HCl is added.

m — A horizon slightly altered by hydrolysis, oxidation, or solution, or all three, to give a change in colour or structure, or both.

n — A horizon in which the ratio of exchangeable Ca to exchangeable Na is 10 or less. When used with B it must also have the following properties; prismatic or columnar structure, dark coatings on ped surfaces, and hard to very hard consistence when dry.

s — A horizon with salts which may be detected as crystals or veins, as surface crusts, by distressed crop growth or by presence of salt-tolerant plants. It is most commonly used with C and k.

t — A horizon enriched with silicate clay. It is used with B (Bt,Btg).

APPENDIX II

A BRIEF RESUME OF THE CANADIAN SOIL CLASSIFICATION SYSTEM
(after Canada Soil Survey Committee 1976)

Orders	Great Groups	Subgroups
Brunisolic (weakly developed B horizons)	Eutric Brunisol (Ah <5 cm, Bm > 5 cm pH >5.5)	Orthic Eutric Brunisol Eluviated Eutric Brunisol Gleyed Eutric Brunisol Gleyed Eluviated Eutric Brunisol
	Dystric Brunisol (Ah <5 cm, Bm > 5 cm pH >5.5)	Orthic Dystric Brunisol Gleyed Dystric Brunisol Gleyed Eluviated Dystric Brunisol
Chernozemic (developed under grassland and transitional grassland-forest communities)	Brown (Light Brown Ah horizon)	Orthic Brown Rego Brown Calcareous Brown Eluviated Brown Solonetzic Brown and gleyed members for each of these.
	Dark Brown (Brown Ah horizon)	Orthic, Rego, Calcareous Eluviated and Solonetzic Dark Brown and gleyed members for each of these
	Black (Black Ah horizon)	Orthic, Rego, Calcareous Eluviated and Solonetzic Black and gleyed members for each of these.
	Dark Gray (L-H surface horizon typical of forest vegetation)	Orthic, Rego, Calcareous and Solonetzic Dark Gray and gleyed members for each of these.
Gleysolic (poorly drained and show mottling and gleying)	Humic Gleysol (Ah > 8 cm)	Orthic, Rego and Fera Humic Gleysol
	Gleysol (Ah < 8 cm)	Orthic, Rego and Fera Gleysol
	Luvic Gleysol (Aeg and Btg horizons)	Orthic, Humic and Fera Luvic Gleysol

APPENDIX II (cont.)

Orders	Great Groups	Subgroups
Luvisolic (developed in forest areas; accumulation of clay in B horizon)	Gray Luvisol (the only great group recognized in western Canada)	Orthic, Dark Gray, Brunisolic Gray, Solonetzic Gray Luvisol, and gleyed members of each.
Organic (contains >17% organic carbon, are >60 cm in depth if dominantly fibric or > 40 cm if dominantly mesic or humic)	Fibrisol (large amount of well preserved fibre)	Typic, Mesic, Humic Terric Fibrisol
	Mesisol (partly decomposed fibre)	Typic, Fibric, Humic Terric Mesisol
	Humisol (well decomposed fibre)	Typic, Fibric Mesic, Terric Humisol
Regosolic (weakly developed soils)	Regosol (no Ah) Humic Regosol) (> 8 cm non-Chernozemic Ah)	Orthic and Cumulic Regosols and Humic Regosols and gleyed members of each.
Solonetzic (very hard B horizon; saline C horizon; Ca/Na ratio of B horizon 10 or less)	Solonetz (Ah, Bnt)	Brown, Dark Brown, Black and Alkaline Solonetz, Solodized Solonetz and Solod and gleyed members of each.
	Solodized Solonetz (Ah,Ae, Bnt)	
	Solod (Ah, Ae, AB, Bnt)	

APPENDIX III

LANDFORM CLASSIFICATION SYSTEM

The major portion of the landform classification system is outlined below. For a more complete description of the landform classification system, see "A Landform Mapping System for Canadian Soil Surveys" (Acton 1975); and the Canadian System of Soil Classification (CSSC 1976).

Genetic Materials

Materials are classified according to their essential properties within a general framework of their mode of formation. These groups and the classes established within these groups are presented below.

Unconsolidated Group

The unconsolidated mineral component is comprised of clastic sediments that may or may not be stratified but whose particles are not cemented together.

Bedrock - poorly consolidated and weathered bedrock whose particles are not cemented together.

Colluvial - massive to moderately well stratified, non-sorted to poorly sorted sediments with any range of particle sizes from clay to boulders that have reached their present position by direct, gravity-induced movements.

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 may be massive. These materials have been transported and deposited by wind action - e.g. dunes and loess.

Glaciofluvial - sediment generally consisting of gravel and sand with a minor fraction of silt that have been transported by streams and rivers in the glacial period.

Glaciolacustrine - sediment generally consisting of stratified fine sand, silt and clay deposited in still water in glacial times on the lake bed,or coarser material that has been deposited as a beach by wave action in glacial times.

Morainal - sediment generally consisting of material that is non-stratified and contains a heterogeneous mixture of particle sizes that have been transported beside, on, within or in front of a glacier and not modified by any intermediate agent.

Undifferentiated - sediment that cannot be classified into any of these former six categories. N.B. This definition is not one that has been recommended by Acton (1975).

Organic Component

The unconsolidated organic component consists of peat deposits containing more than 17% organic carbon 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.

Bog - Sphagnum or forest peat materials formed under an ombrotrophic environment due to the slightly elevated nature of the bog tending to be dissassociated from nutrient-rich groundwater of surrounding mineral soils.

Fen - Sedge peat materials derived primarily from sedges with inclusions of partially decayed stems and shrubs formed in an eutrophic environment due to the close association of the material with mineral rich waters. Grasses and reeds may be associated in local areas.

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 to the product of the initial mode of

origin of the materials. Surface expression also expresses the manner in which genetic materials relate to the underlying unit. The following are the definitions of terms used for surface expression:

INORGANIC MATERIALS

Apron: A relatively gentle slope at the foot of a steeper slope, and formed by materials from the steeper, upper slope. Examples: two or more coalescing fans; a simple talus slope.

Blanket: A mantle of unconsolidated materials thick enough to mask minor irregularities in the underlying unit but which still conforms to the general underlying topography. Examples: lacustrine blanket overlying hummocky moraine.

Fan: A fan-shaped form than can be likened to the segment of a cone, and possessing a perceptible gradient from the apex to the toe. Examples: alluvial fans, talus cones, some deltas.

Hummocky: A very complex sequence of slopes extending from somewhat rounded depressions or kettles of various size to irregular to conical knolls or knobs. There is a general lack of concordance between knolls or depressions. Slopes are generally between 5 degrees and 35 degrees. Examples: hummocky moraine, hummocky glaciofluvial.

Inclined: A sloping, unidirectional surface with a generally constant slope not broken by marked irregularities. Slopes are between 1 degree and 35 degrees. The form of inclined slopes is not related to the initial mode of origin of the underlying material. Examples: terrace scarps, river banks.

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 1 degree. Examples: floodplain, lake plain, some deltas.

Rolling: A very regular sequence of moderate slopes extending from rounded, sometimes confined concave depressions to broad, rounded convexities producing a wave-like pattern of moderate relief. Slope length is often one mile or greater and gradients greater than 5%. Examples: bedrock controlled ground moraine, some drumlins.

Ridged: A long, narrow elevation of the surface, usually sharp crested with steep sides. The ridges may be parallel, sub-parallel or intersecting. Examples: eskers, crevasse fillings, washboard moraines, some drumlins.

Steep: Erosional slopes, greater than 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. Examples: escarpments, river banks and lakeshore bluffs.

Terraced: Scarp face and the horizontal or gently inclined surface (tread) above it. Examples: Alluvial terrace.

Undulating: A very regular sequence of gentle slopes that extend from rounded, sometimes confined concavities to broad rounded convexities producing a wave-like pattern of low local relief. Slope length is generally less than 0.5 miles and dominant gradient of slopes from 2 to 5%. Examples: some drumlins, some ground moraine, lacustrine veneers and blanket morainal deposits.

Veneer: Unconsolidated materials too thin to mask the minor irregularities of the underlying unit surface. A veneer will range between 10 cm and 1 m in thickness and will possess no form typical of the material genesis. Examples: shallow lacustrine deposits overlying glacial till, loess cap, etc.

ORGANIC MATERIALS

Blanket: A mantle of organic materials thick enough to mask minor irregularities in the underlying unit, but which still conforms to the general underlying topography. Example: blanket bog.

Bowl: A bog or fen occupying concave shaped depressions. Example: bowl bog.

Domed: A bog or fen 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 with a stepped surface. Examples: palsa bog, peat mound, palsa fen.

Floating: A level or flat organic surface associated with very high water tables but without surface water. Example: floating fen.

Horizontal: A flat, unidirectional peat surface not broken by marked elevations and depressions. Examples: flat bog, horizontal fen.

Plateau: A bog with an elevated, flat, central area only slightly higher than the margin. Examples: peat plateau, bog plateau, polygonal peat plateau.

Ribbed: A pattern of parallel or reticulate low ridges associated with fens. Examples: string fen, net fen, water track fen.

Sloping: A unidirectional peat surface with a generally constant slope not broken by marked irregularities. Example: sloping fen.