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DETAILED SOIL SURVEY

of

THE ST. ALBERT AREA

L.J. Knapik, P.Ag.

and

C.F. Veauvy

Soils Division
ALBERTA RESEARCH COUNCIL

Alberta
RESEARCH COUNCIL

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SOIL MAP IN REAR POCKET

ADDENDUM - FIELD INVESTIGATION LOG

(Under Separate Cover)

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PREFACE

This report is one of a series describing detailed soil surveys of relatively small areas. These reports are intended to provide soils information to facilitate land use planning at the community level. This survey was requested by the Planning Division of the Town of St. Albert.

Detailed surveys provide basic data on soil characteristics and distribution at a scale useful for local planning. Interpretations of soil data are made regarding soil features affecting engineering uses, recreational development, and soil capability for agriculture.

The report consists of a map at a scale of 1:10,000 relative factor (1 inch = 833 feet) and a written text which describes the soils, soil mapping methods and the guidelines for the use ratings.

INTRODUCTION

Soil is one of our most important natural resources. Man bases his activities on soils and depends on their productivity. Misuse of land can have drastic environmental, economic and social effects. Soil surveys provide baseline data on the soil resources of an area. This information is essential to land characterization and evaluation which is the natural basis for effective land use and land management policies.

Soils vary widely in their properties and as such their suitability or limitations for different uses also varies. A soil with low agricultural capability may be suitable for road construction and a soil that is unsuitable for road location due perhaps to periodic flooding hazard or high water table may be excellent pasture land. However soils often are suitable for several uses. For example, well drained, level soils that have a high capability for agriculture also are excellent locations for airports, highways and urban development. Soil surveys provide the planner with information useful for making decisions based on predicted soil performance and soil suitability for multiple uses.

USE OF THE REPORT

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

The soil 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 photo mosaic 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.

The user must appreciate the non-homogeneity of soils however, and even though the map is at a scale allowing fairly detailed separation of soils, on site investigations for small site-specific uses are still required.

Location and Extent of Area

The study area consists of approximately 16 square miles located mainly to the east, north and west of the present town of St. Albert in the M.D. of Sturgeon, with a small area south of the town in the County of Parkland. These are areas of possible future large scale residential development. The land is presently being used primarily for agricultural production.

Physiography of the Area

Surficial geology of the area has been described and mapped by Bayrock and Hughes (1962). The area lies within the basin of Glacial Lake Edmonton and is an undulating to gently rolling plain dissected by the Sturgeon River valley. Most of the area lies between 2240 and 2260 feet above sea level with the river valley being about 100 feet deep and 1 to $1\frac{1}{2}$ miles wide.

Surficial geological deposits consist of lacustrine clays overlying lacustrine silts and occasionally sands at greater depths. Glacial till underlies the lacustrine deposits in most of the plains area which results in a subdued morainal topography. Modern fluvial deposits occur on the floodplain of the Sturgeon River.

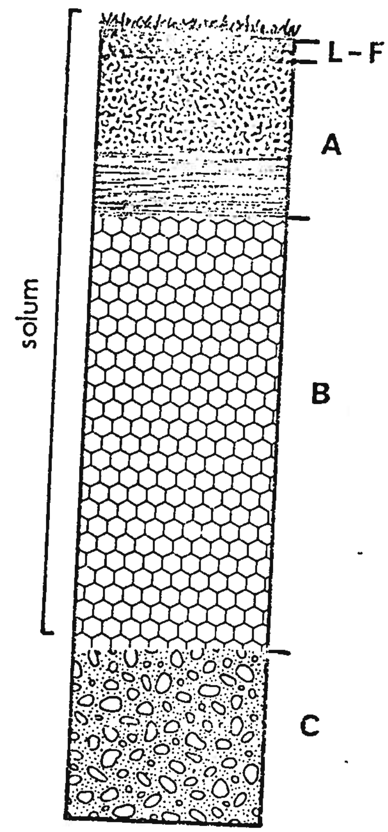
THE SOILS

Soil Formation

Soils are natural bodies present on the earth's surface that are an integral part of the environment. Soils display variation both vertically and horizontally and by examining these variations soil individuals may be recognized. Soils have evolved from their geological parent material through the action of a combination of soil forming processes, which are controlled by environmental parameters or "soil forming factors". These soil forming factors are commonly listed as being the parent material, climate, biotic agents and topography all acting through time. The variations in relative importance or dominance of one or more of the soil forming processes such as addition and removal of organic matter, translocation of clays or iron and aluminum, and chemical and physical transformations result in the formation of horizons or layers of various kinds within the soil body. These horizons differ from one another in such properties as color, texture, structure, consistence, and chemical and biological activity. The major, or master 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, woody materials, and a minor component of mosses; and A, B and C for mineral horizons. Subdivisions of the master horizons are denoted by suffix letter appended to the master horizon symbol (see Figure 1, Table 12 and glossary).

Through observation of soil characteristics it is possible to identify and map different soil types.

FIGURE 1. DIAGRAM OF A SOIL PROFILE



-- 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 colored horizon in which there is an accumulation of humus (Ah), or a light colored horizon from which clay, iron, and humus have been leached (Ae).

-- Mineral horizon that (1) may be altered to give a change in color or structure (Bm), or (2) may have an enrichment of clay (Bt).

-- Mineral horizon comparatively unaffected by the soil forming process operative in the A and B horizons except for the process of gleying (Cg).

Soil Classification

The soils have been classified according to the System of Soil Classification for Canada (Canada Soil Survey Committee, 1974). This scheme classifies the soils in their natural state and thus indicates relationships between soils and their environment.

These relationships are often important for assessing limitations of soils for various uses. The classification system is described briefly in Table 12.

Soil Texture

Throughout the report reference is made to soil texture and to soil drainage classes. Soil texture is according to the United States Department of Agriculture (USDA) textural classification which is described below. The soil drainage classes, according to the Canada Soil Survey Committee (1974) are outlined following the textural classification.

Soil Separates (Particle Size) on which Textural Classes are Based.

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

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 - 60% clay).

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

Soil Drainage Classes

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.

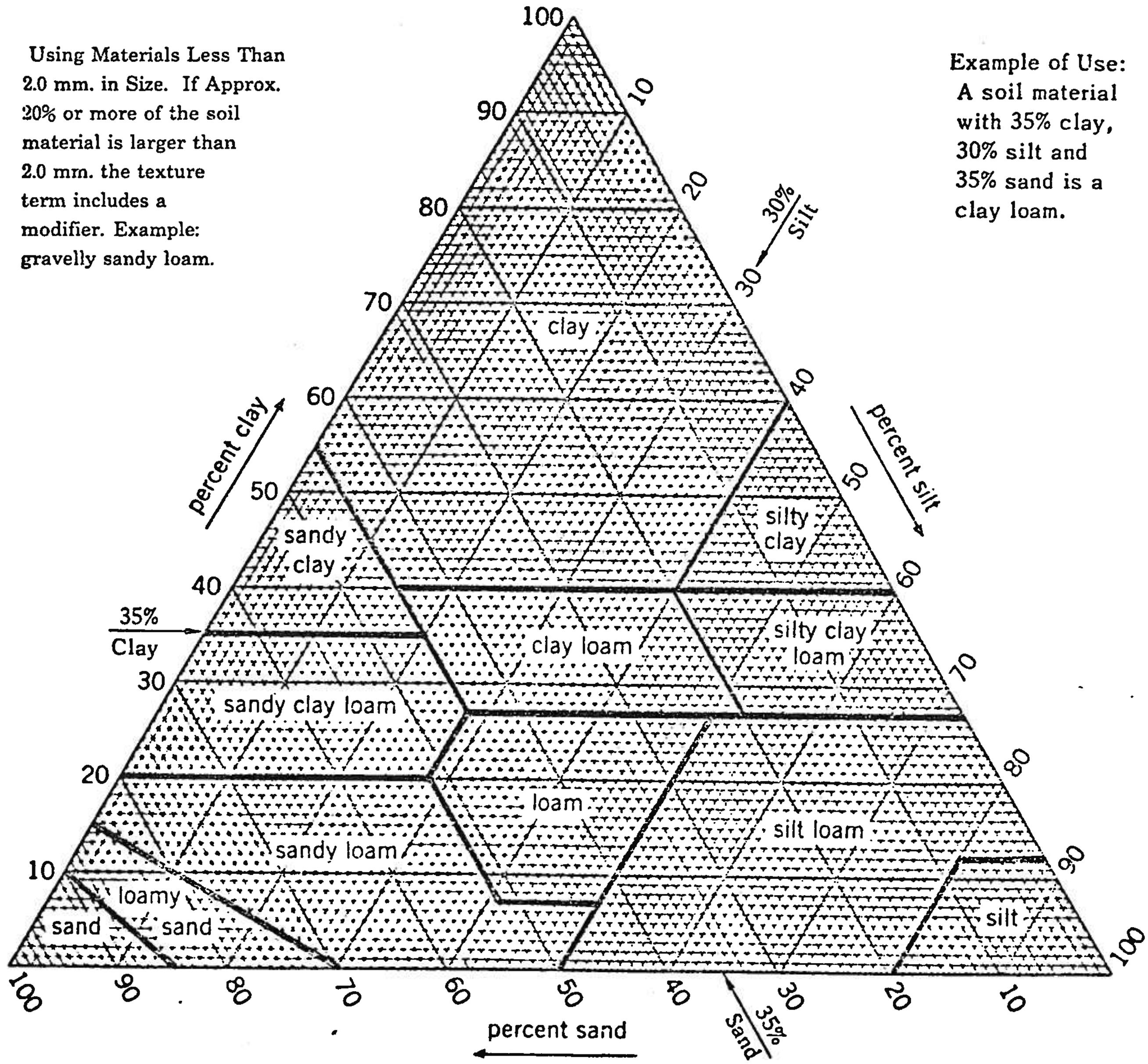
Well drained - soil moisture content does not normally exceed field capacity in any horizon except possibly the C, for a significant part of the year.

Moderately well drained - soil moisture in excess of field capacity remains for a small but significant period of the year.

GUIDE FOR USDA SOIL TEXTURAL CLASSIFICATION.

Using Materials Less Than 2.0 mm. in Size. If Approx. 20% or more of the soil material is larger than 2.0 mm. the texture term includes a modifier. Example: gravelly sandy loam.

Example of Use: A soil material with 35% clay, 30% silt and 35% sand is a clay loam.



Imperfectly drained - soil moisture in excess of field capacity remains in subsurface horizons for moderately long periods during the year.

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 of the surface most of the year.

Specific reference to surface drainage may be designated in terms of run-off and described as very rapid, rapid, medium, slow, very slow or ponded. Similarly, specific reference to the characteristics of horizons within the profile may be designated in terms of perviousness and described as rapidly, moderately or slowly pervious.

Soil Mapping

When mapping soils the fieldman examines the soil at points in the landscape to characterize landscape units. Since soil is a continuum, and adjacent soils seldom have sharp boundaries, soil units are defined as having a certain range of properties. These soil units are based on geologic materials and landforms, soil development, and soil moisture conditions. The soil and land attributes recognized in mapping are important for various land uses.

The soil units recognized are named after the dominant soil series. For example areas labelled Malmo soils are dominantly Eluviated Black Chernozems developed on fine textured lacustrine materials (i.e. Malmo series). Many of the soil names used in this report also appear on the reconnaissance soil survey map of the Edmonton Sheet (Bowser, et al, 1962). These names have been retained so that users can extrapolate interpretations of soil performance (on a general basis) to areas outside the detailed survey area using the reconnaissance soil map. Some of the soil names are new and describe soils not recognized at the broader reconnaissance level of mapping.

The notations on the soil map identify a soil unit and topography class. For example:

$$\frac{\text{MMO 2}}{\text{b}}$$

identifies an area of predominantly Malmo (MMO) soils - Eluviated Blacks on fine textured lacustrine materials on b class topography (0 to 2% slopes). The number 2 signifies Malmo soil unit 2 which includes a significant proportion (10 to 30% of area) of imperfectly drained gleyed Eluviated Black soils (see legend on soil map). The topography classes are essentially those used by the Canada Soil Survey Committee which are as follows.

% Slope	Topographic Class
0 - 2	b
2 - 5	c
5 - 9	d
9 - 15	e
15 - 30	f

The soils were mapped in the field by making observations at selected sites using available exposures or digging with a shovel or coring with a truck-mounted coring machine. These point observations are extrapolated to an area basis through the use of aerial photograph interpretation and field checking. The principal soils were sampled to depths of 9 feet for physical, chemical and engineering analysis.

Some landowners refused access to parts of the proposed survey area and in many areas access was gained only after crops were harvested. The boundaries of the proposed area were altered north of Big Lake due to these factors.

SOILS OF THE ST. ALBERT AREA

Black Chernozemic soils with thick Ah horizons are predominant in the area. Surface horizons are typically medium to moderately fine textured with the underlying lacustrine materials being very fine to fine textured in the upper 2 to 5 feet and medium textured below. The soils are generally moderately well drained with occasional sloughs occurring in depressional areas. Somewhat poorly drained soils interspersed with numerous sloughs occur in the northwest and southeast portions of the area.

In the area east of Big Lake the soils are under tree cover, or have been cleared relatively recently. In this area the soils do not have thick, black, Ah horizons. Such soils are classified as Gray Luvisolic due to their gray surface horizon.

Gleysolic and Regosolic soils subject to flooding occur on the floodplain of the Sturgeon River.

TABLE 1. KEY TO THE SOILS OF THE ST. ALBERT AREA

I. Soils developed on very fine textured lacustrine sediments greater than 1 meter in depth.

Moderately well drained
1. Malmo Association (Eluviated Black)

Imperfectly to poorly drained
1. Volmer Association (gleyed Eluviated Black)

Poorly to very poorly drained
1. Hercules Association (Humic Gleysol)

II. Soils developed on very fine textured lacustrine sediments overlying medium textured lacustrine sediments at depths of less than 1.5 meter (0.3 to 1.5 m).

Moderately well drained
1. St. Albert (Eluviated Black)
2. Cannell (Orthic Gray Luvisol)

III. Soils developed on medium textured lacustrine sediments.

Well to moderately well drained
1. Ponoka (Eluviated Black)

IV. Soils developed on moderately fine textured glacial till.

Moderately well drained
1. Angus Ridge (Eluviated Black)

V. Soils developed on moderately coarse to very coarse textured materials.

Well drained
1. Peace Hills (Eluviated Black)

VI. Soils developed on medium to very fine textured modern fluvial deposits.

Very Poorly to imperfectly drained
1. Sturgeon (Rego Humic Gleysol)

VII. Soils developed on organic (peat) deposits.

Very poorly drained
1. Organic (Terric Humic Mesisol)

ANGUS RIDGE SOILS

These are well to moderately well drained Eluviated Black Chernozems developed on moderately fine textured glacial till. They occur on ridge tops in the northwest and southeast corners of the mapped area where the till is not covered by lacustrine materials. Topography is generally rolling and the soils are slightly stony. Surface runoff is medium to rapid, increasing with slope, and the soils are moderately pervious.

General Profile Description *

Horizon	Depth	Color	Texture
Ah	0 - 20 cm	black	loam
Ahe	20 - 25	dark gray	loam
Bt	25 - 50	dark yellowish brown	clay loam
BC	50 - 60	dark grayish brown	clay loam
Ck	60+	dark grayish brown	clay loam

CANNELL SOILS

The Cannell soils are predominantly well to moderately well drained Orthic Gray Luvisols developed on fine textured lacustrine sediments (clays), overlying medium textured lacustrine sediments (silts). Depth to the silty layer varies from 50 cm. to 2 m. Surface runoff varies from slow in level areas, to rapid in strongly sloping areas. The soils are generally slowly pervious.

General Profile Description

Horizon	Depth	Color	Texture
Ap	0 - 15 cm	grayish brown	loam
Ae	15 - 20	gray	loam
Bt	20 - 45	yellowish brown	clay
BC	45 - 50	dark grayish brown	clay
Ck	50 - 75	dark grayish brown	clay
IICk	75+	yellowish brown	silt loam

* See Soil Survey of Edmonton Sheet for more detailed description.

Soil unit CNN 1 is made up of approximately 60% Orthic Gray Luvisols and 40% Dark Gray Luvisols. CNN 2 consists of Orthic and Dark Gray Luvisols with Humic Gleysols and sloughs in depressional areas. These soils occur in the area east of Big Lake under tree cover and in cultivated areas that have been cleared relatively recently. Much of the A horizon has been eroded from the cultivated soils where they occur on slopes of 5 to 15%. The Cannell soils do not have a deep Ah (topsoil) horizon like the Chernozemic soils of the Malmo, Ponoka and St. Albert series.

HERCULES SOILS

The Hercules soils are poorly drained Humic Gleysols developed on fine to very fine textured lacustrine materials. These soils occur in depressional areas associated with the Malmo, Volmer and St. Albert soils. Surface runoff is ponded and the soils are slowly pervious.

General Profile Description *

Horizon	Depth	Color	Texture
Ah	0 - 10 cm	black	silty clay loam - clay
Bg	10 - 30	dark grayish brown	clay
Cskg	30+	dark gray	clay

Many of the Hercules soils are flooded for a significant portion of the growing season and have therefore been mapped as sloughs (map symbol ⩛). Water level in the sloughs fluctuates annually and seasonally and when the water table is beneath the surface these areas can be considered to be Hercules soils (Rego Humic Gleysols). The C horizons have abundant sulfate crystals (mostly calcium sulfate) and are moderately calcareous. These soils are limited for use due to wetness and high water table.

* See Lindsay and Scheelar (1962) for detailed description of Hercules (Orthic Humic Gleysol).

MALMO SOILS

The Malmo soils are predominantly Eluviated Black Chernozems developed on fine to very fine textured lacustrine materials (see Malmo series in Soil Survey of Edmonton Sheet). These are moderately well drained soils that occur on the level to undulating plains north of St. Albert, and are common throughout the Lake Edmonton basin. Surface runoff is slow; and the soils are slowly pervious due to the high clay content.

General Profile Description *

Horizon	Depth	Color	Texture
Ah	0 - 25 cm	black	loam - silty clay loam
Ahe	25 - 29	dark gray	loam - silty clay loam
Bt	29 - 75	dark brown	clay - heavy clay
BC	75 - 100	dark grayish brown	clay
Ck	100+	dark grayish brown	clay

Soil unit Malmo 1 (MMO 1) consists of Eluviated Black and significant amounts of Orthic Black Chernozems while MMO 2 includes the above soils with 20 to 30% imperfectly drained gleyed Eluviated Blacks.

These soils are similar to the St. Albert soils except for thickness of clay sediments overlying silts. The Malmo soils have a greater depth of clay, generally greater than 1 meter, whereas the soils named St. Albert have approximately 40 to 60 cm (occasionally as much as 150 cm) of clay overlying silt.

ORGANIC SOILS

The organic soils have not been given a soil name. They only occur along the east side of Big Lake. These are very poorly drained soils developed on organic (peat) deposits.

* See Soil Survey of Edmonton Sheet for more detailed description.

General Profile Description

Layer	Depth	Color	Texture
Of	0 - 20 cm	brown	(organic)
marl	20 - 25	light gray	
Om	25 - 90	dark brown	(organic)
Oh	90 - 120	black	(organic)
Cg	120+	gray	silt loam

The peat materials are moderately to well decomposed sedge and moss-derived materials. Mineral soil occurs at depths of 1 to 2 m. The soils are classified as predominantly Terric Humic Mesisols.

PEACE HILLS SOILS

Peace Hills soils are well drained Eluviated Black Chernozems developed on moderately coarse to coarse textured materials (sands). These soils are of very limited extent in the area, being located in two areas of the northwest sector. The Peace Hills soils mapped in the NW $\frac{1}{4}$, Section 20, Township 54, range 25, west of the 4th meridian may represent a beach ridge of glacial Lake Edmonton. Surface runoff is rapid and the soils are rapidly pervious.

General Profile Description *

Horizon	Depth	Color	Texture
Ahe	0 - 30 cm	very dark gray	loam
Bm	30 - 55	yellowish brown	sandy loam
C	55+	yellowish brown	loamy sand - sand

Depth of sand is greater than 3 m (limit of coring machine used).

* See Soil Survey of Edmonton Sheet for more detailed description.

PONOKA SOILS

The Ponoka soils are predominantly well drained Eluviated Black Chernozems developed on medium to moderately fine textured lacustrine materials. Surface runoff is medium to rapid and the soils are moderately pervious.

General Profile Description *

Horizon	Depth	Color	Texture
Ah	0 - 45 cm	black	loam
Ahe	45 - 50	very dark grayish brown	loam
Bt	50 - 70	dark yellowish brown	clay loam
II BC	70 - 125	brownish yellow	silt loam
III Ck	125+	light yellowish brown	very fine sand

These soils have very deep (40 to 50 cm) Ah horizons which, combined with medium textures and free drainage, make them the most suitable agricultural soils in the area. Soil unit POK 1 consists mainly of Eluviated Blacks with occasional Orthic Black profiles, and POK 2 describes areas of mostly Eluviated Blacks with up to 20% Humic Gleysols. Ponoka soils were mapped mainly on the level to undulating plains north and east of St. Albert.

ST. ALBERT SOILS

The St. Albert soils are mainly moderately well drained Eluviated Black Chernozems developed on fine textured lacustrine materials (clays) overlying medium textured lacustrine materials (silts, silt loams) at depths of 40 to 60 cm. Occasionally the clays extend to depths of 150 cm. These soils were included in the Malmo series in the reconnaissance survey of the Edmonton Sheet. Surface runoff is slow and the soils are slowly pervious.

* See Soil Survey of Edmonton Sheet for more detailed description.

General Profile Description

Horizon	Depth	Color	Texture
Ah	0 - 25 cm	black	loam - silty clay loam
Ahe	25 - 29	dark gray	loam
Bt	29 - 50	dark brown	clay
II BC	50 - 70	yellowish brown	silt loam - silty clay loam
II Ck	70+	yellowish brown	silt loam

St. Albert 1 (STA 1) soil unit is made up of Eluviated Black with significant amounts of Orthic Black Chernozems. STA 2 consists of predominantly Eluviated Blacks with 20 to 30% gleyed Eluviated Blacks and Humic Gleysols which occupy depressional areas.

STURGEON SOILS

The Sturgeon soils are very poorly to poorly drained Rego Humic Gleysols developed on fine to medium textured fluvial deposits on the floodplain of the Sturgeon River. Many of these soils are flooded annually and all have a high flooding hazard.

General Profile Description

Horizon	Depth	Color	Texture
Ah	0 - 15 cm	black	silt loam
Ckg	15+	dark gray	silty clay

The STG 1 soil unit consists of Rego Humic Gleysols in the lower parts of the floodplain which flood frequently and are wet throughout the year. The STG 2 unit is predominantly Rego Humic Gleysols with inclusions of somewhat better drained gleyed Orthic Regosols and gleyed Rego Blacks. The STG 2 soils occur at slightly higher elevations in the floodplain and flood only during high runoff years.

VOLMER SOILS

These soils are essentially the imperfectly and poorly drained equivalents of the Malmo and St. Albert soils, being gleyed Eluviated Blacks developed on very fine textured lacustrine materials. Depths of clay over silts varies from 40 cm to 3 m. These soils are found on the level to gently undulating plains in the northwest and southeast portions of the area. Numerous sloughs (map symbol ıllı) are found in association with these soils.

Surface runoff is very slow and the soils are slowly pervious. Ponding on the surface is a feature common to these soils.

General Profile Description

Horizon	Depth	Color	Texture
Ap	0 - 20 cm	black	clay loam
Btg	20 - 40	dark grayish brown	clay
Cskg	40 - 100	dark grayish brown	clay - silty clay loam
II Cskg	100+	yellowish brown	silt loam

Soil unit VMR 1 is predominantly gleyed Eluviated Blacks with up to 30% Humic Gleysols and minor amounts of Eluviated Blacks. Numerous sloughs occur with these soil areas. Soils of the VMR 2 unit are generally better drained with a negligible amount of Gleysols and fewer sloughs. Sulfate crystals are abundant in the C horizons of these soils. The water table occurs at depths of 1 to 3 m. Solodic Black Chernozems occur as minor inclusions in some of the areas mapped as Volmer soils.

SOIL AND LAND USE

Soil is our most important continuing natural resource. Man depends on soils for food production; for watershed; as a physical site on which to live, work and enjoy recreational pursuits; for building materials; and as a place to dispose of garbage and sewage. Misuse of our soil resource can result in drastic economic, social and environmental consequences.

It is obvious that flood prone soils are unsuitable for housing, that poorly drained soils are unsuited to septic tank absorption fields, and that steeply sloping soils are unsuited to football fields. Somewhat less obvious is the fact that prime agricultural land is being converted to urban and other non-agricultural uses at a fairly rapid rate. This irreversible decision to remove first class farmland from crop production has very important economic and social effects.

Sound land use planning must be based on a knowledge of soil properties, soil performance and soil distribution.

Soil Capability for Agriculture

The soils have been rated for agricultural capability according to the Canada Land Inventory guidelines (Canada Dept. of Forestry, 1965). In this classification the mineral soils have been grouped into seven classes on the basis of their limitations for dryland farming. The ratings are based on climatic and soil characteristics.

Soil ratings for the general area, based on interpretation of the reconnaissance soil survey data have already been published (Kjearsgaard, 1967). As the present survey is at a much larger map scale, soils are separated at a more detailed level and more detailed ratings can be made. The soil map units recognized in this detailed soil survey are rated for agricultural capability in Table 11.

The St. Albert area is located within Agro-climatic Area 1 (Bowser, 1967) where the amount of precipitation has usually been adequate and the frost-free period long enough to permit growing of cereal and forage crops. The average frost-free period is 100 days and precipitation averages about 16 to 18 inches.

Soil Capability Classes

Class 1	Soils in this class have no significant limitations in use for crops.
Class 2	Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices.
Class 3	Soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practices.
Class 4	Soils in this class have severe limitations that restrict the range of crops or require special conservation practices or both.
Class 5	Soils in this class have very severe limitations that restrict their capability to producing perennial forage crops, and improvement practices are feasible.
Class 6	Soils in this class are capable only of producing perennial forage crops, and improvement practices are not feasible.
Class 7	Soils in this class have no capability for arable culture or permanent pasture.

The Angus Ridge, Malmo, Ponoka and St. Albert soils are rated as Class 1 for Agriculture where they occur on level to undulating topography. These are among the most productive soils in Alberta. The Ponoka soils, with a deep Ah, medium texture, and free drainage are the most suitable for crop production.

Peace Hills soils are rated Class 2 (2M) due to their sandy textures and limited moisture storage capacity. Volmer 1 soils also rated Class 2 (2W) but the limitation is due to wetness caused by ponded runoff water. These soil areas are also somewhat difficult to farm due to the presence of numerous sloughs.

The Cannell soils are rated 3D on undulating topography. These soils do not have a deep, black Ah horizon but rather a gray Ae horizon which tends to crust and inhibit seedling emergence.

Hercules soils are rated 4W due to wetness. Ponded runoff water often limits the growing season of these soils.

The Sturgeon 1 soils are rated $5 \frac{W}{T} 6$ I. This is a combination rating of classes 5 and 6, and indicates some of these soils may be suitable for improved pasture but are wet and dissected by stream channels (T - pattern), and some of the area is inundated (I) by overflow, limiting the grazing period to less than 10 weeks.

The sloughs have been rated 6 I 7W as cattle may graze on the "slough grass" late in the season or during dry years on the slough margins. Water bodies, however, are fairly permanent in the lower parts of the sloughs.

Soils and Urban Development

In selecting sites for housing, schools, parks, shopping centres, sewage disposal and other community developments, soil suitability must be considered so as to avoid costly errors and to prevent waste, abuse and loss of valuable agricultural soils.

Both the report and the map contain information of use to engineers and land use planners. A pedological soil classification, which describes the soil in its natural setting, describes not only the soil material but also the effects of soil climate, drainage, permeability and topography. When planning the construction of roads, airports, residential and other developments which are based on the soil this information can be very useful in predicting performance. Highway engineers make use of soil maps in planning materials investigations and for predicting subgrade and pavement performance (Allemeier, 1973). Detailed soil survey have been used for planning development around several towns in Alberta including Stony Plain, Leduc and Morinville, as well as towns in the southern part of the province (Alberta Soil Survey library). A recent soil survey in the Mill Woods area of Edmonton indicated areas where concrete corosion due to sulfate attack was a potential problem (Lindsay, et al, 1973).

Several terms, such as soil, texture, structure, and consistence differ in usage between pedology and engineering. The pedological meanings are intended in this report and many of the terms are defined in the glossary.

Engineering Properties of the Soils

Engineering properties including particle size distribution, Atterberg limits, and the Unified and AASHO (American Association of State Highway Officials) classifications are reported for the major soils (Table 2). These data are derived from laboratory testing of samples representative of the soil units. The philosophy of pedology is involved here in extrapolating from a site to an area. These data are not intended to be site specific and do not substitute for on-site inspection and soil testing but do provide a basis for area planning and further soil investigation.

The soil materials in the St. Albert area consist of fines with very little sand and no gravel. There are two distinct types of materials (not including the topsoil).

1. Clayey materials - The Hercules, Malmo and Volmer soils especially have very high liquid limits and a high plasticity index (Table 2). These soils are classified as CH (highly plastic clays) in the Unified System and as A-7-5(20) or A-7-6(20) in the AASHO system. These soils are characterized by high volume change with moisture changes, low bearing value when wet, and elasticity makes compaction difficult.

2. Silty materials - The Cannell, St. Albert and Ponoka soils have silts at depth or to the surface (Ponoka) which are classified ML in the Unified System and in groups A-4 to A-6 in the AASHO classification (Table 2). These soils have small amounts of sand-sized material and relatively small amounts of clay. Such soils lose stability when wet and are highly susceptible to frost action. They are difficult to compact due to poor gradation and a narrow moisture content range, and have low bearing capacity. Field moisture content of these soils is near the liquid limit.

3. Sandy materials - The Peace Hills soils are developed on sands and the Ponoka soils may have sands underlying or interbedded with the silts. These materials are classified in the SM or SP groups of the Unified System and most of the sand is very fine. There is a sand pit in NW7-54-25-W4 and a sand deposit in SW 18-54-25-W4.

Other soil features such as flooding, wetness, depth to water table and depth of clays over silts are discussed in the soil description section of this report.

TABLE 2. SOIL PROPERTIES SIGNIFICANT TO ENGINEERING.

Soil Name	Sample Site #	Sample Depth	Sieve Analysis % passing #10	#40	#200	Percent smaller than .05	005	.002	Liquid Limit	P.I.	Classification Unified	AASHO	e.c.* mmhos/cm
Hercules[1] (=Malmo)	3-10	4-6'	100	99.9	98.0	92	85	70	77	41	CH	A7-5(20)	3.8
		6-8'	100	99.9	94.8	86	80	73	78	45	CH	A7-5(20)	
	1-27	1-3'	100	100	95.9	87	82	73	75	42	CH	A7-5(20)	
Ponoka	4-13	4-6'	100	99.9	99.4	93	37	27	36	13	CL	A6(9)	
		6-8'	100	99.9	97.9	92	27	19	33	8	ML	A4(8)	
		8-10'	99.9	98.8	94.8	86	28	23	33	9	ML	A4(8)	
	1-23	0-10"	99.9	99.8	96.9	87	46	27	58	20	MH	A7-5(16)	
		10-30"	100	99.8	99.4	94	66	46	51	24	CL-CH	A7-6(13)	
		30-50"	99.8	98.4	91.7	86	46	32	39	17	CL	A6(11)	
		55-60"	99.9	98.6	81.6	78	45	29	39	17	CL	A6(11)	
	1-24	3-4'	100	99.9	96.0	76	64	48	65	33	CH-MH	A7-5(20)	0.4
	1-25	5-7'	99.9	99.7	98.2	93	36	26	38	14	CL	A-6(9)	
	1-26	4-6'	100	99.9	97.1	90	60	37	47	21	CL-CH	A6(13)	0.4
St.Albert	2-3	2-4'	100	99.9	98.2	92	82	61	66	34	CH	A7-5(20)	
		6-8'	100	99.9	98.3	92	66	40	42	12	ML	A7(9)	
	4-3	2-4'	100	99.9	99.9	93	28	24	35	10	ML	A4-6(8)	2.7
	4-4	4-6'	100	99.9	95.7	91	73	54	57	31	CH	A7-6(20)	
	4-17	2-3'	100	99.8	99.1	92	50	36	43	19	CL	A7-6(12)	5.4
	4-19	4-6'	99.8	98.7	94.1	84	25	20	32	8	ML	A4(8)	
	4-20	4-6'	100	100	97.8	95	30	22	35	10	ML	A4-6(8)	1.0
	5-38	1-3'	99.9	99.3	86.5	80	73	64	60	31	CH	A7-6(20)	
		5-7'	99.9	99.3	96.2	93	41	27	39	15	CL	A6(10)	
Volmer	5-39	2-4'	100	99.8	98.9	92	87	75	79	43	CH	A7-5(20)	
		4-6'	100	99.9	92.4	88	73	53	60	31	CH	A7-6(20)	
	5-42	3-4'	100	99.6	90.3	86	79	67	65	36	CH	A7-5(20)	3.4
Cannell	3-11	4-6'	100	99.9	99.8	93	37	26	37	13	CL	A6(9)	

1. Hercules materials are very similar to Malmo materials

* e.c. - electrical conductivity

The soils have been evaluated for limitations to roads and buildings, and as to suitability as a source of roadfill, sand and topsoil (Table 11). The soils have also been assigned ARDA capability ratings for agriculture (Table 11).

These evaluations consider such soil properties as texture - which affects stability and bearing strength for roads and foundations, shrink-swell, risk of frost heaving, and rate of infiltration and internal drainage; soil moisture conditions - which affect location of buildings, roads and services; topography - which affects drainage and site location; and flooding hazard - which affects location of buildings and roads.

The guidelines used in rating the soil limitations are outlined in Tables 3 to 10. These interpretations follow fairly closely the Guide for Interpreting Engineering Uses of Soils published by the United States Department of Agriculture, Soil Conservation Service. Some modifications are made for local conditions.

Soil interpretations are included so that soils information may be more easily understood. These interpretations should be treated as evaluations of performance, not as recommendations for the use of soils. Many other factors are involved in the recommended use of soils. Also, because soil boundaries are not precise, soil survey interpretations do not eliminate on-site investigations. They are, however, intended as an aid in planning further investigations, to reduce the amount of investigation and minimize the cost.

For each use, the soils are rated in terms of degree of limitation - 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 generally 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 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 but using these soils without employing corrective measures could result in failure.

Varying degrees of severity exist. Soils that are flooded annually have very severe limitations for housing; whereas a heavy clay soil that has high shrink-swell potential may be less severe but at the same time problems may arise with respect to foundations.

Soil Interpretations for Recreational Uses

The growing demand for outdoor recreation is placing increasing demands on land for public recreational use. There are many factors that determine the recreational potential of an area, one of which is the soil.

Soils that flood periodically, or soils that are wet most of the summer have severe limitations for playing fields, camping areas, picnic sites and trails. Many of the soils in this area have very high clay content in the layers underlying the topsoil. If the topsoil is removed these soils will be very sticky when wet and will dry out slowly after a rain.

Slope affects the use of soils for recreation. Steeply sloping areas have severe limitations for most uses but are often desirable for hiking trails and scenic value.

The soils of the St. Albert area have been evaluated as sites for playing fields, camp areas, picnic areas and trails in Table 11, using the guidelines shown in Tables 7, 8, 9 and 10. These ratings are based on interpretations of soil performance and are not to be taken as recommendations for use.

TABLE 3. GUIDES FOR ASSESSING SOIL LIMITATIONS FOR 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 hydrologic conditions, such as seasonal wetness, that have effects beyond those related exclusively to foundations are considered. Also considered are soil properties, 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 9 feet.

Item Affecting Use	Degree of Soil Limitation		
	NONE TO SLIGHT	MODERATE	SEVERE
Wetness[1]	Rapidly, well and moderately well drained.	Imperfectly drained.	Poorly and very poorly drained.
Depth to seasonal water table	More than 6 ft.	4 to 6 ft.	Less than 4 ft.
Flooding	None	None	Subject to flooding.
Slope	0 - 9% (a-d)	9 - 15% (e)	More than 15% (>e).
Materials a. USDA TEXTURE b. Unified group c. Shrink-swell potential	 SL, LS, SCL GW, GP, SW, SP GM, GC, SM, SC Low	 L, CL, SiCL, SiL ML, CL Moderate	 C, HC, SiC CH, MH, OL, OH, Pt. High
Sulfate[2] attack on concrete	Slight 0 - 0.2%	Considerable 0.2 - 0.5%	Severe More than 0.5%

1. Excess soil moisture is estimated by the soil drainage classes. See page for explanation.

2. % water-soluble sulfate from saturation extract.

TABLE 4. GUIDES FOR ASSESSING SOIL LIMITATIONS FOR ROADS

Properties that affect design and construction of roads are (1) those that affect the load supporting capacity and stability of the subgrade; and (2) those that affect the workability and amount of cut and fill. The AASHO and Unified Classification, and the shrink-swell potential give an indication of the traffic supporting capacity. Wetness and flooding affect stability. Slope 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
Wetness[1]	Rapidly, well and moderately well drained.	Imperfectly drained.	Poorly and very poorly drained.
Flooding	None	Less than once in 5 years.	More than once in 5 years.
Slope	0 - 9% (a - d)	9 - 15% (e)	More than 15% (> e)
Materials			
a. Unified group	GW, GP, GM, GC, SW, SM, SC	CL with P.I. less than 15, ML, SP	CL with P.I. 15 or more CH, MH, OL, OH, Pt
b. AASHO group index	0 - 4	5 - 8	more than 8
c. USDA texture	LS, SL, SCL	L, CL, SiCL, SiL	C, HC, SiC
Shrink-swell[2] potential	Low	Moderate	High
Susceptibility to[3] frost heave	Low	Moderate	High

1. Soil moisture conditions are estimated using soil drainage classes defined on page

2. Shrink-swell potential is estimated from amount and kinds of clay in the soil.

3. Susceptibility to frost heave is estimated from soil texture and soil wetness.

TABLE 5. 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 4), however ratings of factors governing excavation differ.

Item Affecting Use	Degree of Suitability[1] GOOD	FAIR	POOR
Wetness	Rapidly to moderately well drained[2]	Imperfectly drained	Poorly and very poorly drained
Engineering Groups			
Unified Group	GW,GP,GC,SW, SP,SM,SC	ML,CL with P.I. less than 15	CH,MH,OL,OH, Pt, and CL with P.I. more than 15
AASHO Group Index	0 - 4	5 - 8	greater than 8
Slope	0 - 15%	15 - 30%	more than 30%

1. A rating of unsuitable (U) is used for organic soil materials.

2. See page for an explanation of soil drainage classes.

TABLE 6. SUITABILITY RATINGS OF SOILS AS SOURCES 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	more than 6 in.	3 - 6 in.	less than 3 in.
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)	less than 3%	3 - 15 %	more than 15%
Slope	less than 9%	9 - 15 %	more than 15%
Stoniness	none to slightly stony	moderately stony	very to excessively stony
Salinity of topsoil	E.C.[2] 0 - 1[3]	E.C. 1 - 3	E.C. more than 3
Permeability of upper topsoil	moderate	slow	very slow

1. A rating of unsuitable (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.

TABLE 7. GUIDES FOR ASSESSING SOIL LIMITATIONS FOR PLAYING FIELDS

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 Soil Limitation		
	SLIGHT	MODERATE	SEVERE
Flooding	none during season of use	subject to occasional flooding. Not more than once in 3 years	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	more than 30 inches during season of use	more than 20 inches during season of use	less than 20 inches during season of use
Permeability	very rapid to moderate (20 in/hr to 0.6 in/hr)	moderately slow (0.6 to 0.2 in/hr)	slow and very slow (less than 0.2 in/hr)
Slope	0 - 2%	2 - 5%	more than 5%
Surface Texture	SL, FSL, VFSL, L	CL, SCL, SiCL, SiL, LS and S other than loose sand	SC, SiC, C, loose sand, organic

TABLE 8. 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 for campsites and parking areas. The soils should be suitable for heavy foot traffic and for limited vehicular traffic[1]. Soil suitability for growing and maintaining vegetation is not a part of this guide, except as influenced by moisture, but is an important item to consider in the final evaluation of site.

Item Affecting Use	Degree of Soil Limitation		
	NONE TO SLIGHT	MODERATE	SEVERE
Wetness	Rapidly, well and moderately well drained soils. Water table below 30" during season of use	Moderately well and imperfectly drained soils. Water table below 20" during season of use	Imperfectly, poorly and very poorly drained soils. Water table above 20" during season of use
Flooding	None	None during season of use	Floods during season of use
Permeability	Very rapid to moderate	Moderately slow and slow	Very slow
Slope	0 - 9% (AD)	9 to 15% (E)	Greater than 15% (greater than 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

1. For information specific to roads and parking lots see Table 4.

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

TABLE 9. 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 a part of this guide, except as influenced by moisture, but is an important item to consider in the final evaluation of site.

Items Affecting Use	Degree of Limitation		
	NONE TO SLIGHT	MODERATE	SEVERE
Wetness	Rapidly, well and moderately well drained soils. Water table below 20" during season of use	Moderately well and imperfectly drained soils. Water table during season of use may be less than 20" for short periods	Poorly and very poorly drained soils. Water table above 20" 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 - 9% (AD)	9 to 15% (E)	Greater than 15% (greater than 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

1. For information specific to roads or parking lots see Table 4.

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

TABLE 10. GUIDES FOR ASSESSING SOIL LIMITATION FOR TRAILS

This guide applies to soils to be used for trails assuming no hard surfacing. It is assumed that these areas will be used as they occur in nature and that little or no soil will be moved (excavated or filled). The steeper the slope upon which a trail is to be built the more soil that will have to be moved to obtain a level tread and the more miles of trail needed to cover a given horizontal distance. Severe limitation does not indicate a trail cannot or should not be built. It does suggest higher design requirements, higher cost of construction and maintenance, and often greater potential for environmental impact. Soil features that affect trafficability, dust, design and maintenance of trails are given special emphasis.

Items Affecting Use	Degree of Soil Limitation		
	NONE TO SLIGHT	MODERATE	SEVERE
Wetness	Rapidly, well and moderately well drained soils. Water table below 20" during season of use	Imperfectly drained soils. Water table during season of use may be above 20" for short periods	Poorly and very poorly drained soils. Water table above 20" and often near surface for month or more during season of use.
Flooding	Does not flood	May flood but not during season of use	Floods during season of use
Slope[1]	0 to 15% (a-e)	15 to 30% (f)	Greater than 30% (greater than f)
Surface soil texture	SL,FSL,VFSL,L	SiL,CL,SCL,SiCL,LS	SC,SiC,C, sand,peaty and organic soils

1. Slope in this context refers to the slope of the ground surface, not the slope of the tread of the trail.

TABLE 11. SOIL LIMITATIONS AND SUITABILITY FOR SELECTED USES.

Soil Map Unit	Degree of Limitation[1] for: Buildings with Basements	Roads	Playing Fields	Camp Areas	Picnic Areas	Trails	Suitability[2] as a Source of: Roadfill	Sand	Topsoil	Capability[3] for Agriculture
AGS/c	S	S	M3	S	S	S	G	U	G	1
AGS/d	S	S	V3	S	S	S	G	U	G	2T
CNN 1/c	M6	V6	M3	S	S	S	P6	U	P9	3D
CNN 1/d	M6	V6	V3	S	S	S	P6	U	P9	4TD
CNN 1/e	V3,6	V3,6	V3	M3	M3	S	P6	U	P9	5TD
CNN 2/d	M6,7	M6,7	V3,7	S	S	S	P6	U	P9	4TD
CNN 2/e	V3,6	V3,6	V3	M3	M3	S	P6	U	P9	5TD
HRC/b	V2,4,7	V2,4,7	V7	V7	V7	V7	P4	U	P7	4W
MMO 2/bc	M-V4,7	V4,7	S-M3	S	S	S	P4	U	G	1
MMO 2-STA2/c	M-V4,6,7	V4,6,7	M3	S	S	S	P4	U	G	1
O-HRCp/b	V2,8	V2,8	V2,8	V2,8	V2,8	V2,8	U	U	U	0
PHS/c	S	S	M3	S	S	S	G	F-G	G	2M
PHS/d	S	S	V3	S	S	S	G	F-G	G	3TM
POK 1/b-c	S-M5	M-V5	S-M3	S	S	S	P5	U[4]	G	1
POK 1/d	S-M5	M-V5	V3	S	S	S	P5	U	G	2T
POK 1/e	M3,5	V3,5	V3	M3	M3	S	P3,5	U	P-F3,9	3T
POK 1/f	V3	V3	V3	V3	V3	M3	P3	U	P3,9	4T
POK 1-AGS/c	S-M5	M5	V3	S	S	S	P5-G	U	G	1
POK 1-STA 1/b-c	M5,6	M-V5,6	S-M3	S	S	S	P5,6	U	G	1
POK 1-STA 1/d	S-M5	M-V5	V3	S	S	S	P5	U	G	2T
STA 1/b-c	M-V6	V6	S-M3	S	S	S	P6	U	G	1
STA 1/d	M-V6	V6	V3	S	S	S	P6	U	G	2T
STA 1/e-f	V3,6	V3,6	V3	V3	V3	M3	P3,6	U	P3,9	4T
STA 1-AGS/c	M-V6	M-V6	M3	S	S	S	P6-G	U	G	1
STA 1-AGS/d	M-V6	M-V6	V3	S	S	S	P6-G	U	G	2T
STA 1-AGS/e	V3,6	V3,6	V3	M3	M3	S	P3,6	U	P3,9	3T
STA 1-MMO 1/b-c	M-V4,6	V4,6	S	S	S	S	P4,6	U	G	1
STA 1-POK 1/b-c	M-V5,6	V5,6	M3	S	S	S	P5,6	U	G	1
STA 1-POK 1/d	M-V5,6	V5,6	V3	S	S	S	P5,6	U	G	2T

(continued....)

TABLE 11. (cont..)

Soil Map Unit	Buildings with Basements	Roads	Playing Fields	Camp Areas	Picnic Areas	Trails	Suitability[2] as a Source of Roadfill	Sand	Topsoil	Capability[3] for Agriculture
	Degree of Limitation[1] for:									
STA 1-POK 1/e	V3,6	V3,6	V3	M3	M3	S	P3,6	U	P3,9	3T
STA 2/b-c	M-V6,7	V6,7	S	S	S	S	P6,7	U	G	1
STA 2/d-e	V3,6	V3,6	V3	M3	M3	S	P3,6	U	F3	3T
STA 2-MMO 2/b-c	M-V6,7	V4,6,7	S	S	S	S	P6,7	U	G	1
STG 1/b	V1,2,7	V1,2,7	V1,7	V1,2,7	V1,7	V1,7	P1,2,7	U	U-P1,7	6I
STG 1-STG 2/b	V1,2,7	V1,2,7	V1,7	V1,2,7	V1,7	V1,7	P1,2,7	U	U-P1,7	6I 5W
STG 2/b-c	V1,2	V1,2	V1,7	V1,2,7	V1,7	M-V1,7	P1,2,7	U	P1,7	5W
VMR 1/b-c	V2,4,7	V2,4,7	V7	V7	V7	M-V7	P2,4,7	U	F7	2W
VMR 2/b-c	V2,4,7	V2,4,7	M7	M7	M7	S-M7	P2,4	U	G-F7	1

1. Limitation Classes: S - None to Slight, M - Moderate, V - Severe

2. Suitability Classes: P - Poor, F - Fair, G - Good, U - Unsuited

3. Classes according to Canada Land Inventory Soil Capability for Agriculture

4. Ponoka soils may have sand layers at depths greater than 2 m

LIMITING SOIL PROPERTIES

1. Flooding Hazard
2. High groundwater table
3. Excessive slope
4. Highly plastic clays, high shrink-swell
5. High silt content, low bearing capacity, frost action potential
6. Highly plastic clays overlying silts
7. Wetness (ponded runoff water, high subsoil moisture)
8. Organic (peat) soil
9. Thin Ah (topsoil) horizon

TABLE 12. CANADIAN SOIL CLASSIFICATION SYSTEM

ORDER	GREAT GROUP	DISTINGUISHING CHARACTERISTICS
1. Chernozemic (Developed under grassland and transitional grassland-forest communities)	Brown Dark Brown Black Dark Gray	Light Brown Ah horizon Dark Brown Ah horizon Black Ah horizon Have L-H surface horizons typical of forest vegetation
2. Solonetzic (Columnar or prismatic B horizon and a saline C horizon; Ca/Na ratio of B horizon is less than 10)	Solonetz Solodized Solonetz Solod	Ah horizon Bnt horizon Ah — Ae — Bnt Ah — Ae — AB — Bnt
3. Luvisolic (Developed in forest areas: accumulation of clay in the B horizon)	Gray Brown Luvisol	(L-H)—Ah — Ae — Bt Mull-like Ah horizon
	Gray Luvisol	L-H — (Ah) — Ae — Bt
4. Podzolic (Accumulation of Fe+Al and/or organic matter in the B horizon)	Humic Podzol	Bh > 4" which contains >1% O.C. <0.3% Fe
	Ferro-Humic Podzol	Bhf > 4" which contains > 5% O.C. >0.6% Fe+Al
	Humo Ferric Podzol	Bf > 2" which contains <5% O.C. >0.6% Fe+Al
5. Brunisolic (Generally weakly developed B horizons)	Melanic Brunisol Eutric Brunisol Sombric Brunisol Dystric Brunisol	Ah 2", Bm 2"; pH > 5.5 Ah 2", Bm 2"; pH > 5.5 Ah 2", Bm 2"; pH < 5.5 Ah 2", Bm 2"; pH < 5.5
6. Regosolic (Weakly developed or young soils; no B horizon)	Regosol	(L-H)—Ah — C; no B horizon
7. Gleysolic (Poorly drained and show mottling and gleying)	Humic Gleysol Gleysol Luvic Gleysol	Ah > 3" Ah < 3" Have Aeg and Btg horizons
8. Organic (Contains 30% organic matter; are 24" in depth if dominantly fibric or 16" if dominantly mesic or humic)	Fibrisol Mesisol Humisol	Large amount of well preserved fiber Partially decomposed fiber Well decomposed fiber (Black)

TABLE 13. DEFINITION OF SOIL HORIZON SYMBOLS (after C.S.S.C.,1973)

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 are 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. The layer may be partly comminuted by soil fauna, as in moder[1], or it may be partly decomposed mat permeated by fungal hyphae, as in mor[1].

H - This is an organic layer characterized by an accumulation of decomposed 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);

[1] Bernier, B. 1968. Soils under forest. Proceedings of the 7th Meeting of the National

TABLE 13. (cont.)

(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 by hydrolysis, reduction or oxidation to give a change in color or structure from horizons above or below (Bm and Bg).

C - This is a mineral horizon or horizons comparitively unaffected by the pedogenic processes operative in A and B, excepting the process of gleying.

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 color value by 1 or more units than an underlying B horizon. It is used with A (Ae, Ahe).

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

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 IC. 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 color or structure, or both.

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

TABLE 14. CHARACTERIZATION ANALYSES OF SELECTED SOIL SAMPLES

Site	Horizon	pH[1]	Org.C[2]	O.M.[3]	$CaCO_3$[4]	Sand	Silt	Clay	E.C.[5]
3-33	Ap	6.5	2.66	4.6	-	16	48	36	0.7
1-82	Ap	6.1	5.52	9.5	-	2	39	59	-
1-37	Apk	7.2	1.08	1.9	6.8	25	52	23	4.2
2-3	Ap	5.6	5.30	9.1	-	3	48	49	-
3-29	Ap	6.4	3.30	5.7	-	6	63	31	-
3-4	Ap	6.6	3.13	5.4	-	10	52	38	1.8
4-68	Ap	6.4	10.1	17.4	-	4	37	59	-
4-70	Ah	5.9	5.33	9.2	-	3	69	28	-
	Bt	6.0	-	-	-	1	58	41	-
	IIBC	6.0	-	-	-	1	71	28	-
	IIICk	7.3	-	-	0.5	2	81	17	0.4
	IVCk	7.3	-	-	1.0	2	82	16	0.4
4-67	Ah	5.8	4.77	8.2	-	5	57	38	-
	Bt	6.3	-	-	-	9	27	64	-
	Ck	7.3	-	-	1.1	6	30	54	
	IICk	7.5	-	-	4.6	1	66	33	1.0
1-37	Ah	6.1	4.14	7.1	-	5	57	38	-
	Bm	5.5	-	-	-	1	47	52	-
	IICkg	7.1	-	-	1.1	7	67	26	1.2
1-76	Ck	7.4	-	-	2.2	1	29	70	3.8
1-38	Csk	7.5	-	-	0.5	3	51	46	2.6
1-77	Ckg	7.6	-	-	4.3	1	72	27	2.6
2-17	Ck	7.5	-	-	1.2	2	80	18	2.6
2-9	Ck	7.6	-	-	6.0	2	68	30	1.2
4-50	BC	6.4	-	-	-	2	68	30	0.3
4-29	Ck	7.3	-	-	0.9	19	28	53	0.5
1-87	Ck	7.4	-	-	0.6	35	22	43	2.4
1-89	Ck	7.7	-	-	0.4	52	40	8	0.5
4-68	Ck	6.8	-	-	-	2	39	59	3.2

1. pH of soil - 0.01 M $CaCl_2$ solution
2. % organic carbon by dry combustion
3. % organic matter
4. % $CaCO_3$ equivalent
5. % sand-, silt- and clay-sized particles by pipette analysis
6. electrical conductivity (mmho/cm) of water saturated paste extract

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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, includes 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.

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

cation-exchange capacity (C.E.C.) - 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 and 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.

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.

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 in the soil, 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.

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 subgroup modifier that indicates a bedrock contact within 50 cm (20 in.) of the soil surface.

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.

mottles - spots or blotches of different color or shades of color interspersed with the dominant color. 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.

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 of 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 the plastic limit.

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".

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.

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.

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.

watertable - the upper limit of the part of the soil or underlying rock material that is wholly saturated with water.

1975-10

SOILS OF THE ST. ALBERT AREA

LEGEND:

MATERIAL	SOIL NAME	SOIL UNIT	DOMINANT SOIL SUBGROUP	SIGNIFICANT SOIL SUBGROUP(S)
very fine textured (lacustrine)	MALMO	MMO 1	Eluviated Black	Orthic Black
		MMO 2	Eluviated Black	gleyed Eluviated Black
	VOLMER	VMR 1	gleyed Eluviated Black	Humic Gleysol Eluviated Black
		VMR 2	gleyed Eluviated Black	Eluviated Black
	HERCULES	HRC	Humic Gleysol	Rego Humic Gleysol
fine to very fine textured over medium textured (lacustrine)	ST. ALBERT	STA 1	Eluviated Black	Orthic Black
		STA 2	Eluviated Black	gleyed Eluviated Black Humic Gleysol
	CANNELL	CNN 1	Orthic Gray Luvisol	Dark Gray Luvisol
		CNN 2	Orthic Gray Luvisol	Dark Gray Luvisol Humic Gleysol
medium textured (lacustrine)	PONOKA	POK 1	Eluviated Black	Orthic Black
		POK 2	Eluviated Black	Humic Gleysol
moderately fine textured (till)	ANGUS RIDGE	AGS	Eluviated Black	Orthic Black
coarse textured (sands)	PEACE HILLS	PHS	Eluviated Black	Orthic Black
fine to medium textured (modern fluvial)	STURGEON	STG 1	Rego Humic Gleysol	
		STG 2	Rego Humic Gleysol	gleyed Orthic Regosol gleyed Rego Black
organic (peat)	ORGANIC	O	Terric Humic Mesisol	Terric Humisol

MISCELLANEOUS LAND UNITS

Sloughs

TOPOGRAPHY CLASSES

b: 0 - 2% slope
c: 2 - 5% slope
d: 5 - 9% slope
e: 9 - 15% slope
f: 15 - 30% slope

EROSION CLASSES

W1 - up to 25% of Ah removed
W2 - 25 to 75% of Ah removed

APPROXIMATE SCALE:
1:10,000

1000 0 1000 2000 3000
FEET

Photo mosaic base by Alberta Dept. of Transportation

Soil Mapping by: L. Knapik & C. Veauvy
Soils Division

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