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SOIL SURVEY
ON
WEST SIDE OF LAKE NEWELL, ALBERTA
AND
INTERPRETATION FOR RECREATIONAL USE

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CONTENTS

	PAGE
Preface	1
Acknowledgements	1
Summary	1
Introduction	2
Size and location	2
Physiography and surficial deposits	2
Climate	4
Vegetation	4
Soils	4
Map Unit 1	9
Map Unit 2	11
Map Unit 3	11
Map Unit 4	12
Special Features	15
Miscellaneous Symbols	17
Soil Interpretations	17
References	33

MAPS

Soil Map on East Side of Lake Newell, Alberta	pocket
Landform Map on East Side of Lake Newell, Alberta	pocket
Soil Limitations for Recreation on East Side of Lake Newell, Alberta	pocket

LIST OF FIGURES

Figure 1. Map showing location of study area	3
Figure 2. Map showing soil zones of Alberta	16

LIST OF TABLES

Table 1. Key to the Soils	5
Table 2. Chemical Analyses of Selected Map Units	18
Table 3. Physical Analyses of Selected Map Units	19
Table 4. Soil Limitations for Fully Services Campgrounds	21
Table 5. Soil Limitations for Picnic Areas	22
Table 6. Soil Limitations for Lawns and Landscaping	23
Table 7. Soil Limitations for Paths	24
Table 8. Soil Limitations for Trails	25
Table 9. Soil Limitations for Buildings with Basements	26
Table 10. Soil Limitations for Buildings without Basements	27
Table 11. Soil Limitations for Septic Tank Absorption Fields	28
Table 12. Soil Limitations for Trench Type Sanitary Landfills	29
Table 13. Soil Limitations for Road Location	30
Table 14. Soil Suitability for Source of Roadfill	31
Table 15. Soil Suitability for Source of Sand or Gravel	32

PREFACE

This report is one of a series describing detailed and semi-detailed soil surveys which were conducted in the following Alberta Provincial Parks during the summer of 1974: Chain Lakes, Winagami Lake, Gregoire Lake, Long Lake and Cross Lake. Also included were areas in the vicinities of Lake Newell, the Wildcat Hills and Pinehurst Lake. The total area surveyed was approximately 11 900 ha.

A general guidebook has been prepared to accompany soil survey reports written for Alberta Provincial Parks and recreation areas (Greenlee, 1981). It includes general discussions of the following: soil formation; the Canadian soil classification system; soil characteristics and other factors that affect the use of soils for recreational and related purposes; Luvisolic, Organic, and Solonetzic soils; soil erosion; methodology; soil and landform maps that accompany the soil survey reports; an explanation of soil interpretations and guidelines for developing them; chemical and physical properties of soils; and the landform classification system used by Canadian soil pedologists. Also included is a glossary. Specific results and interpretations for the areas covered by this study are presented in the ensuing report.

ACKNOWLEDGMENTS

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Mrs. Kathy Gates typed and assisted in compiling and proof reading the report. Mrs. J. Diask drafted the soil, landform and soil limitations for recreation maps, while Mr. J. Beres determined the physical properties of the soils. The soil chemical analyses were determined by the Alberta Soil and Feed Testing Laboratory.

Able field assistance was given by Mr. E. Marchuk.

Special acknowledgment is given to the Park Rangers, as well as other park employees, who cooperated by allowing soil investigations to be conducted throughout the parks, and also invariably offered assistance.

SUMMARY

The mapped area comprises about 2500 ha, and is located about 8 km west and 8 km south of Brooks. Surficial deposits throughout the study area consist of moderately fine textured till. The climate for this region has been classified as dry steppe or semiarid; with cold winters, warm to hot summers, large annual temperature ranges, and meager undependable rainfall. The mapped area is situated in the grasslands region, where trembling aspen forms groves or bluffs around wet depressions, and several other species of poplar are usually found along rivers.

Only four map units were recognized in the study area. The key profile types are Orthic Brown Chernozems, Brown Solodized Solonetz, Brown Solods, Solodized Solonetz eroded phase, and Orthic Luvis Gleysols. These are distributed over the landscape in relation to landform, parent material, and drainage. Map units consist of single soil series, and catenas; and their distribution is shown on the soil map.

Soil interpretations of each map unit are made for fully serviced campgrounds, picnic areas, lawns and landscaping, paths, trails, buildings (with and without basements), septic tank absorption fields, trench type sanitary landfills, road location, source of roadfill, and source of sand or gravel.

The Chernozemic and Solod soils of Map Units 1, 3 and 4 are the most favourable for recreational development in the study area. The Solod soils are insignificant in extent, but the Chernozemic soils are dominant throughout most of the southern half. Also a narrow band extends along the lake shore in the northern half, and a fairly large patch is found in the northwestern corner. Most soils in the study area have only moderate limitations for road construction when found on suitable topography, and a source of sand or gravel was not found. Careful study of the soil map and Tables 4 to 15 inclusive (soil limitation and suitability tables) will reveal areas suitable for particular uses.

A soil survey properly interpreted can be one of the most useful tools management has in making a proper design for a recreational area. However, all soil differences which occur in the field cannot be shown on the soil map. Thus for design and construction of specific recreational facilities, an on-site investigation is usually required.

INTRODUCTION

SIZE AND LOCATION

The mapped area comprises about 2500 ha; and is located about 8 km west and 8 km south of Brooks (figure 1), which in turn is 185 km southeast of Calgary along the Trans Canada Highway (number 1). The study area is adjacent to Lake Newell on the western side; and includes the west halves of sections 3, 10, 15, 26 and 35; parts of the southeast quarter of section 3, the east half of section 15, the west half of section 23, and the northeast quarter of section 35; and sections 16, 21, 22, 27, 28, 33 and 34; township 17; range 15; west of the fourth meridian.

PHYSIOGRAPHY AND SURFICIAL DEPOSITS

The study area lies in the Eastern Alberta Plains Division of the Interior Plains Physiographic Region (Government and the University of Alberta, 1969), and the land surface is characterized by relatively smooth ground moraine. The bedrock has been classified as the nonmarine Upper Cretaceous Oldman Formation (Green, 1972). The average elevation in the study area is about 790 m, and the land surface slopes very gradually from west to east toward Lake Newell. The mapped area may be drained partially into Lake Newell, an artificial reservoir, but drainage is mainly internal into the numerous small shallow depressions found throughout.

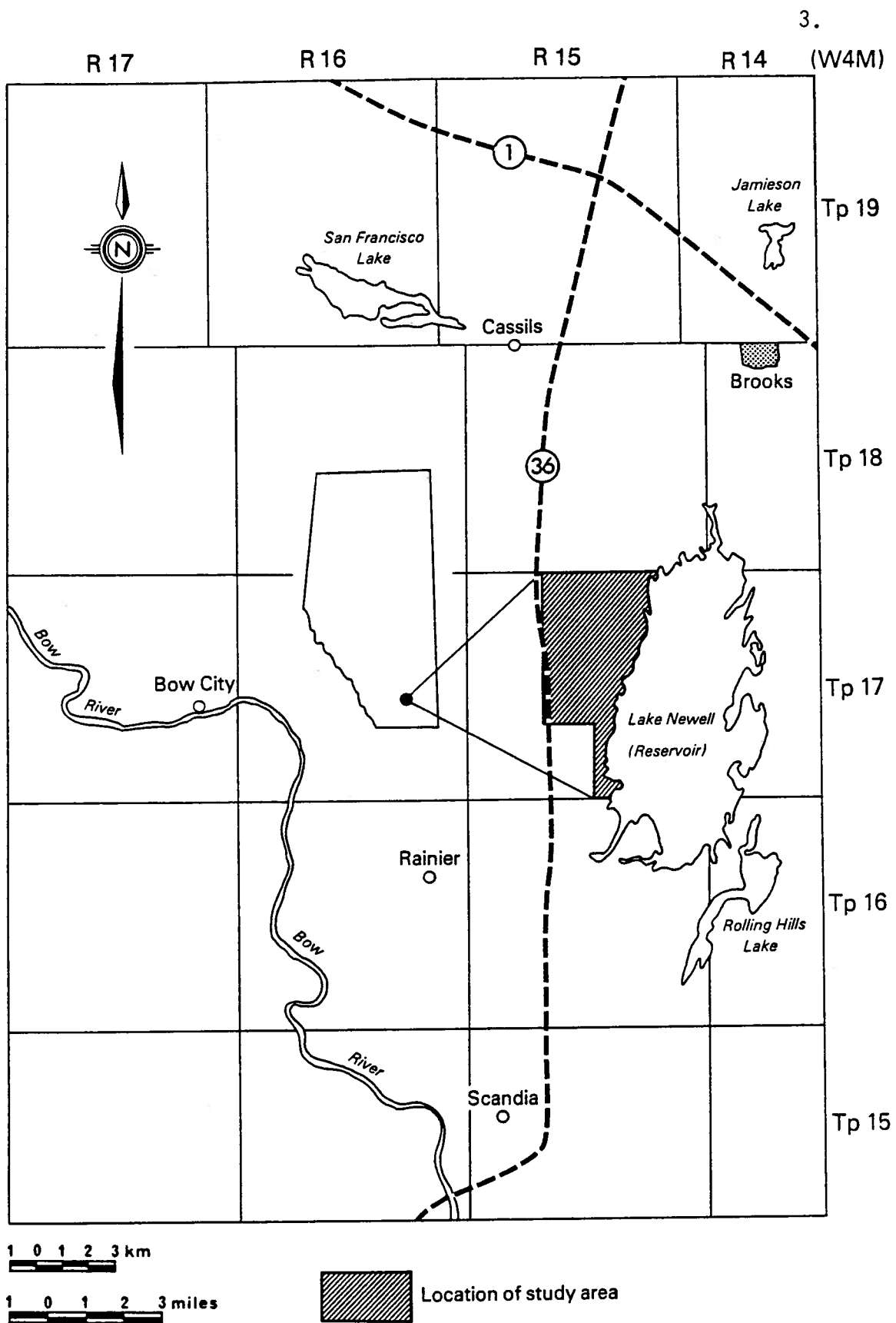


Figure 1. Map showing location of study area.

Surficial deposits throughout the study area consist of moderately fine textured till, which ranges from 15 to 30 m thick (Stalker, 1965, In: Ozoray and Lytviak, 1974).

CLIMATE

The climate for this region has been classified by Trewartha and Horn (1980) as dry steppe or semiarid. It has cold winters, warm to hot summers, large annual temperature ranges; and meager undependable rainfall.

Records for 1951 through 1980 from a weather station about 11 km northeast of the study area and at an elevation of 758 m, show the following values (Environment Canada, 1982): a mean annual temperature of 3.8°C. July is the warmest month with a mean temperature of 18.6°C, and January is the coldest with a mean temperature of -14.2°C. The mean annual precipitation is 335 mm, and 71% falls as rain. The average frost free period is 116 days.

VEGETATION

The mapped area is situated in the grasslands region, as classified by Hosie (1969). Trembling aspen forms groves or bluffs around wet depressions, and several other species of poplar are usually found along rivers and in moist locations with willows and some white spruce. The vegetation type in the study area is the needle-and-thread/blue grama type, as classified by Wroe et al. (1979). In this type, needle-and-thread and blue grama have the highest ground cover, although other grasses may dominate locally. Needle-and-thread is abundant on deep loam soils, while thread-leaved sedge is abundant on eroded sites and hillsides.

Specifically in the study area, the vegetation throughout consists of native grass, with patches of cactus and sagebrush. Since the Outdoor Recreation Planning Branch of Alberta Recreation and Parks carries out biological studies of provincial parks and recreation areas, the vegetation is not discussed extensively in this report. However, some of the more common plant species observed growing on different soils are indicated as part of the map unit descriptions, and these are listed as follows (Moss, 1959; Cormack, 1967): native grass (various species), prickly pear cactus (Opuntia, spp), cushion cactus (Mamillaria vivipara), sagebrush (Artemisia cana), and pasture sagewort (Artemisia frigida).

SOILS

Only four map units were recognized in the study area. The soils of two were classified in the Solonetzic Order, and one in each of the Chernozemic and Gleysolic Orders of the Canadian soil classification system (Canada Soil Survey Committee, 1978). The system is outlined in Greenlee (1981). Pertinent features of the map units are outlined in table 1.

Soils of the Solonetzic Order are well to imperfectly drained mineral soils having Solonetzic B horizons and saline C horizons. A Solonetzic B is characterized by a columnar (round or flat-topped) or prismatic macrostructure that can usually be broken into a blocky mesostructure.

Table 1. Key to the Soils.

Map Unit	Classification	Parent Material	Surface Texture	Slope (class & gradient)	Surface Stoniness	Drainage	Comments and Limitations
1	Orthic Brown Chernozem - 70% Brown Solod - 20% Solodized Solonetz, eroded phase - 10%	moderately fine textured till	loam	b, c, d, e (70.5 to 15%)	1 to 2	well drained	(1) The Solod and Solonetz soils occur on lower slopes, and in low flat patches. (2) The Chernozemic soils occur on knolls, and on upper and mid slopes. Slight to severe limitations for the Chernozems and Solods, fair source of roadfill, unsuitable as a source of sand or gravel - surface stoniness, excessive slopes, erosion hazard, high clay content, slow permeability, susceptibility to frost heave, moderate shrink-swell potential. Slight to severe limitations for the Solodized Solonetz soils, eroded phase, fair source of roadfill, unsuitable as a source of sand or gravel-Solonetzic soil, slow permeability, slippery or sticky when wet, surface stoniness, excessive slopes, surface soil salinity, lack of Ah horizon, possible concrete corrosion hazard (soluble sulfate), high clay content, susceptibility to frost heave, moderate shrink-swell potential.
2	Orthic Luvic Gleysol	moderately fine textured till	loam	a (0 to 0.5%)	1 to 2	poor	Water ponds on the surface of these soils during spring snow-melt, and after summer rainfalls. Severe to very severe limitations, poor source of roadfill, unsuitable as a source of sand or gravel-seasonally high groundwater table or surface ponding, high clay content, slow permeability, surface stoniness, surface soil salinity, thin or no Ah horizon, possible concrete corrosion hazard (soluble sulfate), susceptibility to frost heave, groundwater contamination hazard, moderate shrink-swell potential.

Table 1. Key to the Soils. (continued)

Map Unit	Classification	Parent Material	Surface Texture	Slope (class & gradient)	Surface Stoniness	Drainage	Comments and Limitations
3	Brown Solod	moderately fine textured till	loam	c (≥2 to 5%)	1	well drained	Slight to severe limitations, fair source of roadfill, unsuitable as a source of sand or gravel - possible concrete corrosion hazard (soluble sulfate), high clay content, susceptibility to frost heave, slow permeability, moderate shrink-swell potential.
4	Solodized Solonetz, eroded phase - 40% Brown Solodized Solonetz 20% Brown Solod - 20% Orthic Brown Chernozem - 20%	moderately fine textured till	loam to silt loam	b, c, d, e, f (≥0.5 to 30%)	1 to 3	well drained	(1) The eroded Solodized Solonetz soils occur on lower slopes, and in low flat patches where water from spring snow-melt and summer rainfall ponds; the Solodized Solonetz soils occur on mid to lower slopes; the Solod soils occur on upper and mid slopes; the Chernozems occur only on knolls. (2) Map Unit 4 soils are highly variable; soils of the different great groups and the eroded phase are commonly intermixed over distances of only a few metres. Slight to severe limitations, fair source of roadfill, unsuitable as a source of sand or gravel. (1) For the Chernozems and Solods - surface stoniness, excessive slopes, erosion hazard, high clay content, susceptibility to frost heave, slow permeability, moderate shrink-swell potential. (2) For the Solodized Solonetz soils- Solonetzic soil, high clay content, slow permeability, surface stoniness, excessive slopes, erosion hazard, possible concrete corrosion hazard (soluble sulfate), susceptibility to frost heave, moderate shrink-swell potential. (3) For the Solodized Solonetz soils, eroded phase-Solonetzic soil, high clay content, slippery or sticky when wet, slow permeability, surface stoniness, excessive slopes, erosion hazard, surface soil salinity, lack of Ah horizon, possible concrete corrosion hazard, susceptibility to frost heave, moderate shrink-swell potential.

These blocks, which have hard to very hard consistence when dry and are relatively impermeable, usually show dark surface stains or coatings. Chemically, the Solonetzic B horizons show evidence of alkalization and have ratios of exchangeable calcium to exchangeable sodium of 10 or less, which is significantly lower than that for other, non-Solonetzic B horizons. The C horizons are generally saline and usually show an accumulation of salts.

Solonetzic soils are further divided into three major divisions, the Solonetz, Solodized Solonetz, and Solod Great Groups. Solonetz and Solodized Solonetz soils have Solonetzic B horizons that are essentially intact and have not undergone significant breakdown. Generally, an abrupt break appears between the A and B horizons, and the A horizon is usually thin in relation to the B. Solodized Solonetz soils are characterized by the presence of an acidic Ae horizon, which is lacking in Solonetz soils. Solod soils are characterized by a greater development of this acidic Ae horizon and an AB transitional horizon in which the former Solonetzic B structure is in the process of physical disintegration. A horizons are generally thicker in relation to B horizons than in associated Solonetz and Solodized Solonetz soils. The contact between the AB and Solonetzic B horizons is not well defined, and the remnant B horizons are more easily broken into darkly stained aggregates than in Solonetz and Solodized Solonetz soils.

Structural limitations of Solonetzic B horizons, which tend to become sticky and plastic when wet and very hard when dry, restrict moisture penetration and root development. Rainwater usually remains at or near the surface, and much is lost by evaporation. Because of the proximity of saline and alkaline subsoils, periodic salinization of surface horizons occurs when these soils are irrigated. This presents further limitations to healthy plant growth and to water availability. Consequently, Solonetzic soils are usually distinctly inferior in productivity to other associated soils. Another limitation of Solonetzic soils is their high erodibility, due to unstable soil aggregates caused by high sodium contents. In Solod soils, the limitations of structure and salinity are moderate in comparison to those for Solonetz and Solodized Solonetz soils. Solods, although somewhat inferior, more closely approach associated non-Solonetzic soils in general productivity. Management problems in the cultivation of Solonetzic soils involve the timely use of tillage equipment to conserve moisture, and to prevent caking of surface clods and dessication of the underlying B horizon.

Well drained Brown Solonetzic soils developed on moderately fine textured till are found throughout most of the northern half of the study area.

Soils of the Chernozemic Order are well to imperfectly drained mineral soils of good structure, with very high natural fertility and productive capacity. They are characterized by dark coloured surface virgin (Ah or Ahe) or cultivated (Ap) horizons, darkened by the accumulation of organic matter (humus) from the decomposition of grasses and forbs representative of grassland communities or of grassland-forest communities with associated shrubs and forbs. The A horizon is commonly referred to as "topsoil" and ranges from 10 to 25 cm in thickness. In some regions it is much thicker. Chernozemic soils are further divided into four major divisions, the Brown,

Dark Brown, Black and Dark Gray Great Groups. These are distinguished by measureable differences in colour of the A horizons, which together with other associated features of depth, organic matter content, and structure reflect significant differences in the climates and vegetation under which they have developed, and which continue to influence and distinguish their characteristics and relative use capabilities.

In general, Brown Chernozemic soils have A horizons that are lower in organic matter content, lighter in colour and thinner than those of the other Chernozemic Great Groups; and are found in southern and south-eastern Alberta. Black Chernozemic soils have A horizons that are higher in organic matter content, darker in colour and thicker than those of the other great groups; and are found in central and east-central Alberta. Dark Brown Chernozemic soils have A horizons with characteristics intermediate between those of the Browns and the Blacks, and are found in south-central and east-central Alberta. Dark Gray Chernozemic soils have A horizons with variable colours, thicknesses and modifications of structural pattern indicative of degradation of the typical Chernozemic A horizon. Under virgin conditions, the Dark Grays usually have leaf mats (L-H horizons) overlying the mineral soil, and degradation of the A horizons frequently causes a banded or "salt and pepper" effect. The organic matter content varies with the degree of degradation, from high accumulations in slightly degraded soils, comparable to that of Blacks, to significantly lower amounts in the more strongly degraded types. These latter types are integrated to Dark Gray Luvisolic soils of the Luvisolic Order. Dark Gray Chernozemics are found primarily in transitional areas of grassland and forest in north-central Alberta and in the Peace River region.

Well drained Brown Chernozemic soils developed on moderately fine textured till occur throughout most of the southern half of the study area. Also a narrow band extends along the lake shore in the northern half, and a fairly large patch is found in the northwestern corner.

Soils of the Gleysolic order are poorly drained mineral soils whose profiles reflect the influence of waterlogging for significant periods. Water saturation causes reducing conditions due to a lack of aeration. These conditions result in gleyed horizons having dull gray to olive, greenish or bluish-gray moist colours, frequently accompanied by prominent, usually rust-coloured mottles resulting from localized oxidation and reduction of hydrated iron oxides.

Numerous small patches, and occasional fairly large patches of Gleysolic soils occur in depressions throughout the study area. One large patch occurs in the northwestern corner.

Very minor differences exist among some map units. However, the differences are usually significant with regard to a particular recreational or engineering use, and thus justify separation of different map units. They are described in chronological order, and horizon thicknesses represent averages. Thicknesses of comparative horizons in identical soil profiles often vary as much as 10 to 40 percent from the norm at different points in the landscape.

The dominant plant species are listed using common names. These are very general lists, and not purported to be complete.

Map Unit 1

Classification: Orthic Brown Chernozem - 70%
Brown Solod - 20%
Solodized Solonetz, eroded phase - 10%

Parent material: moderately fine textured till.

Landform: hummocky morainal (Mh), level morainal (Ml), undulating morainal (Mu).

Slope: gently undulating to moderately rolling (70.5 to 15%).

Surface stoniness: slightly to moderately stony (1 to 2).

Drainage: well drained

Vegetation: grass, prickly pear cactus, cushion cactus, sagebrush, pasture sagewort.

Profile description: Orthic Brown Chernozem

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Ah	7-13	loam	granular	very friable, moist
Bm	10-18	clay loam	prismatic, breaking to subangular blocky	friable, moist
Cca	70-80	clay loam	subangular blocky	friable, moist, slightly hard to hard dry

Brown Solod

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Ah	10-13	loam	granular	very friable, moist
Ahe	10-25	loam	platy	very friable, moist
Bnt	40-45	clay loam	prismatic, breaking to blocky	friable, moist; very hard, dry
Cca	10-40	clay loam	subangular blocky	slightly hard, dry

Solodized Solonetz, eroded phase

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Ae	1-3	silt loam	platy	soft, dry
Bnt	15-35	clay loam	columnar, breaking to blocky	firm, moist; hard dry
Bnts	10	clay loam	columnar, breaking to blocky	firm moist, hard, dry
Ccasa	55-85	clay loam	subangular blocky	slightly hard, dry

Comments: (1) The Solod and Solonetz soils occur on lower slopes, and in low flat patches. The eroded portions are nearly devoid of vegetation, having only a sparse grass cover. Water, from spring snow-melt and summer rainfall, ponds in these patches.

(2) The Chernozemic soils occur on knolls, and on upper and mid slopes. Occasional pockets of slightly coarser textured profiles occur, where the Bm and Cca horizons are loams. These Bm horizons range from 40 to 65 cm thick, and clay loam textures commence about 10 to 15 cm below the upper limits of the Cca horizons.

Limitations:

- (1) For the Chernozems and Solods: Slight to severe-severe for septic tank absorption fields; moderate on suitable topography for buildings with basements, trench type sanitary landfills, and road location; slight on suitable topography for all other uses; fair source of roadfill; unsuitable as a source of sand or gravel because of unsuitable textures. Other limitations include surface stoniness, excessive slopes, erosion hazard, high clay content, slow permeability, susceptibility to frost heave, and moderate shrink-swell potential.
- (2) For the Solodized Solonetz soils, eroded phase: Slight to severe-slight on suitable topography for buildings without basements, moderate for buildings with basements, trench type sanitary landfills, and road location; severe for all other uses; fair source of roadfill; unsuitable as a source of sand or gravel because of unsuitable textures. Other limitations include Solonetzic soil, slow permeability, slippery or sticky when wet, surface stoniness, excessive slopes, surface soil salinity, lack of Ah horizon, possible concrete corrosion hazard (soluble sulfate), high clay content, susceptibility to frost heave, and moderate shrink-swell potential.

Map Unit 2

Classification: Orthic Luvis Gleysol

Parent material: moderately fine textured till

Landform: level morainal (M1)

Slope: nearly level (0 to 0.5%)

Surface stoniness: slightly to moderately stony (1 to 2)

Drainage: poor

Vegetation: grass

Profile description: Orthic Luvis Gleysol

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
L-H	0-3	moss and root litter		
Ah	0-3	loam	granular	very friable, moist
Aeg	2-25	loam	platy	very friable, moist
Btg	32+ to 55+	clay loam	blocky	firm, moist; hard, dry

Comments: (1) The exact depth to lime was not determined, but is greater than 60 cm.

(2) Water ponds on the surface of these soils during spring snow-melt, and after summer rainfalls. The upper soil profile is often moist to a depth of about 40 cm, and dry below this depth.

Limitations: Severe to very severe - very severe for septic tank absorption fields, and trench type sanitary landfills; severe for all other uses; poor source of roadfill; unsuitable as a source of sand or gravel due to unsuitable textures. Other limitations include seasonally high groundwater table or surface ponding, high clay content, slow permeability, surface stoniness, surface soil salinity, thin or no Ah horizon, possible concrete corrosion hazard (soluble sulfate), susceptibility to frost heave, groundwater contamination hazard, and moderate shrink-swell potential.

Map Unit 3

Classification: Brown Solod

Parent material: moderately fine textured till.

Landform: undulating morainal (Mu).

Slope: Undulating (>2 to 5%).

Surface stoniness: slightly stony (1)

Drainage: well drained

Vegetation: grass

Profile description: Brown Solod

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Ah	15	loam	granular	very friable, moist
Ahe	10	loam	platy	very friable, moist
Bnt	10	clay loam	blocky	hard, dry
Bnts	10	clay loam	blocky	hard, dry
Ccas	55	clay loam	subangular blocky	slightly hard, dry

Limitations: Slight to severe - severe for septic tank absorption fields; moderate for buildings with basements, trench type sanitary landfills, and road location; slight for all other uses; fair source of roadfill; unsuitable as a source of sand or gravel because of unsuitable textures. Other limitations include possible concrete corrosion hazard (soluble sulfate), high clay content, susceptibility to frost heave, slow permeability, and moderate shrink-swell potential.

Map Unit 4

Classification: Solodized Solonetz, eroded phase - 40%

Brown Solodized Solonetz - 20%

Brown Solod - 20%

Orthic Brown Chernozem - 20%

Parent material: moderately fine textured till.

Landform: hummocky morainal (Mh), level morainal (Ml), undulating morainal (Mu).

Slope: gently undulating to strongly rolling (≥ 0.5 to 30%)

Surface stoniness: slightly to very stony (1 to 3).

Drainage: well drained

Vegetation: grass, pasture sagewort, prickly pear cactus, cushion cactus; patches of sagebrush.

Profile description: Solodized Solonetz, eroded phase.

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Ae	1-3	silt loam	platy	soft, dry
Bnt	15-35	clay loam	columnar, breaking to blocky	firm, moist; hard, dry
Bnts	10	clay loam	columnar,	firm, moist;

			breaking to blocky	hard, dry
Ccasa	55-85	clay loam	subangular blocky	slightly hard, dry

Brown Solodized Solonetz

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Ah	10-13	loam	granular	very friable, moist
Ahe	5	fine sandy loam	platy	very friable, moist
Ae	5	fine sandy loam	platy	very friable, moist
Bnt	10-20	clay loam	columnar, breaking to blocky	friable to firm, moist; slightly hard to hard, dry
Cca	55-75	clay loam	subangular blocky to blocky	slightly hard to hard, dry

Brown Solod

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Ah	15	loam	granular	very friable, moist
Ahe	10-35	loam to fine sandy loam	platy	very friable, moist; soft, dry
Bnt	10-25	clay loam	columnar, breaking to blocky	slightly hard to hard, dry
Cca	25-50	loam to clay loam	subangular blocky	slightly hard, dry

Orthic Brown Chernozem

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Ah	7-13	loam	granular	very friable, moist
Bm	10-18	clay loam	prismatic, breaking to subangular blocky	friable, moist
Cca	70-80	clay loam	subangular blocky	friable, moist; slightly hard to hard, dry

Comments: (1) Soils of this map unit belong primarily to the Solonetzic Order. The eroded Solodized Solonetz soils occur on lower slopes, and in low flat patches where water from spring snow-melt and summer rainfall ponds. These portions are nearly devoid of vegetation, having only a sparse grass cover. The Solodized Solonetz soils occur on mid to lower slopes, and the Solod soils occur on upper and mid slopes. The Chernozemic soils occur only on knolls.

(2) Map Unit 4 soils are highly variable; soils of the different great groups and the eroded phase are commonly intermixed over distances of only a few metres.

(3) The Bnt horizons of the Solodized Solonetz soils have well developed round tops.

(4) Where textures of the upper Cca horizons in the Solod soils are loams, these usually grade to clay loams only a few centimetres deeper.

Limitations:

1. For the Chernozems and Solods: Slight to severe - severe for septic tank absorption fields; moderate on suitable topography for buildings with basements, trench type sanitary landfills, and road location; slight on suitable topography for all other uses; fair source of roadfill; unsuitable as a source of sand or gravel because of unsuitable textures. Other limitations include surface stoniness, excessive slopes, erosion hazard, high clay content, susceptibility to frost heave, slow permeability, and moderate shrink-swell potential.
2. For the Solodized Solonetz soils: Slight to severe - slight on suitable topography for buildings without basements; severe for septic tank absorption fields; moderate on suitable topography for all other uses; fair source of roadfill; unsuitable as a source of sand or gravel because of unsuitable textures. Other limitations include Solonetzic soil, high clay content, slow permeability, surface stoniness, excessive slopes, erosion hazard, possible concrete corrosion hazard

(soluble sulfate), susceptibility to frost heave, and moderate shrink-swell potential.

3. For the Solodized Solonetz soils, eroded phase: Slight to severe—slight on suitable topography for buildings without basements; moderate on suitable topography for buildings with basements, trench type sanitary landfills, and road location; severe for all other uses; fair source of roadfill; unsuitable as a source of sand or gravel because of unsuitable textures. Other limitations include Solonetzic soil, high clay content, slippery or sticky when wet, slow permeability, surface stoniness, excessive slopes, erosion hazard, surface soil salinity, lack of Ah horizon, possible concrete corrosion hazard (soluble sulfate), susceptibility to frost heave, and moderate shrink-swell potential.

Special Features

The soils in Alberta have been classified into broad general zones (figure 2) as established by Alberta Soil Survey during the normal course of soil surveys, and correlated with temperature and precipitation records. Annual precipitation amounts change gradually from one soil zone to another, and are not abrupt changes at the point where a zone boundary has been located. Thus a zone boundary is a broad transitional belt, which can be many kilometres across. Topsoil colours reflect this gradual change. For example, in the centre of the Brown Soil Zone (annual precipitation about 30 to 33 cm), topsoil colours are brown. Similarly in the centre of the Dark Brown Soil Zone (annual precipitation about 38 cm), topsoil colours are dark brown. Between these two zones, topsoil colours are brown to dark brown, and annual precipitation is about 35 cm. The boundary between the two soil zones has been placed approximately at that mid-point.

Zonal soils are soils with well developed soil characteristics that reflect the zonal or normal influences of climate and living organisms, mainly vegetation, as active factors of soil genesis. Examples are Brown, Dark Brown, or Black soils of the Brown, Dark Brown, or Black Soil Zones respectively. Intrazonal soils are soils with morphology that reflects the influence of some local factor of relief, parent material, or age; rather than of climate and vegetation. An example is Solonetzic soils, which develop as a result of salinization. This may originate internally from a saline parent material, or from saturation by external saline waters. Solonetzic soils are found across many soil zones (figure 2). Azonal soils are soils without distinct genetic horizons, and are represented by Regosolic soils in Canada. These occur across all the soil zones in the province.

The study area is situated in the brown soil zone (figure 2). Zonally normal Brown Chernozemic soils are common throughout most of the southern half; and intrazonal Solonetzic soils are common throughout most of the northern half. Numerous patches of intrazonal Gleysolic soils occur throughout as well. Soils in the study area can be considered typical, both locally and regionally (Kjearsgaard et al., 1983).

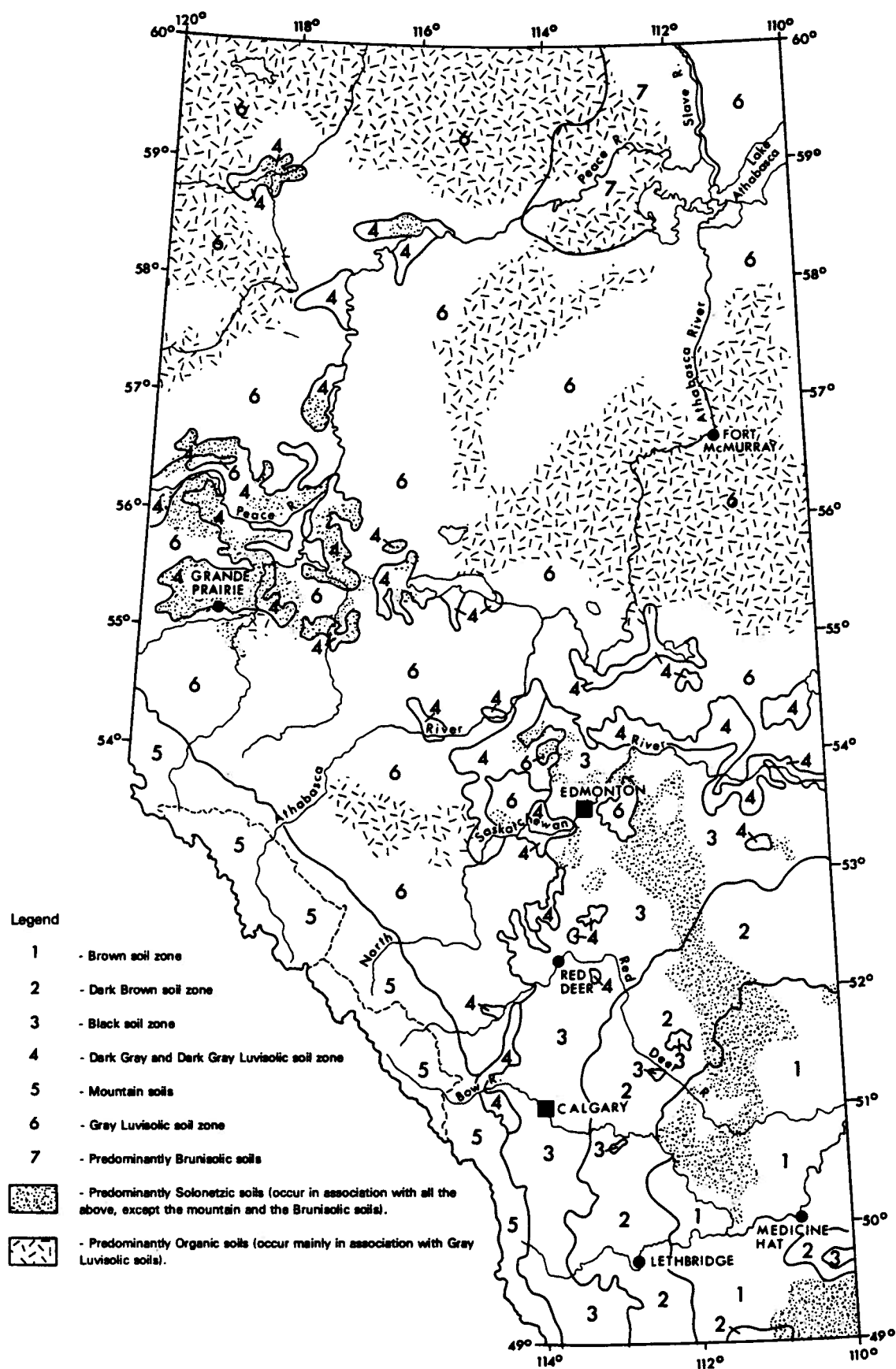


Figure 2. Map showing soil zones of Alberta (from Soil Group Map of Alberta, Alberta Institute of Pedology, undated).

Special features of soils in the study area are, first the high natural fertility of the Chernozemic soils, and second the inherent properties of Solonetzic soils. Ah horizons of the Brown Chernozemic soils have relatively high organic matter contents and natural fertility levels. Even though the Ah horizons are thin as compared to other Chernozemic soils, the Brown Chernozemics compare favourably in productive capacity with some of the best agricultural soils in the Province, when adequate water is provided. Also the Ah horizons are well aggregated, and resilient to compaction. Solonetzic soils are characterized by an abrupt break between the A and B horizons, and the B horizon has a columnar structure. The B horizon, when found at or near the soil surface, is commonly referred to as "gumbo". It is very hard when dry, and sticky and plastic when wet. Also it has very low permeability and water ponds on the surface during spring snow-melt and after summer rains. Plant growth is very difficult to establish and maintain because this B horizon is almost impermeable for the roots.

MISCELLANEOUS SYMBOLS

BP

This symbol indicates a borrow pit, excavated adjacent to Highway 36 during road construction activities. These often contain some water during and after periods of high runoff.

DL

This symbol indicates disturbed land, where the soil solum has been removed by construction activities, exposing the C horizon or soil parent material at the surface. The soil characteristics are generally similar to properties of C horizons in adjacent soils.

S

This symbol indicates seepage adjacent to the lake shore, where water reaches the soil surface through capillary movement and evaporates, leaving salt deposits on the surface. These are indicated by white salt crusts or by the presence of salt-tolerant vegetation.

SOIL INTERPRETATIONS

An explanation of soil interpretations and definitions of the soil limitation and suitability ratings are given in Greenlee (1981). The results of soil chemical and physical analyses are given in tables 2 and 3.

The Chernozemic and Solod soils of Map Units 1, 3 and 4 are the most favourable for recreational development in the study area. The Solod soils comprise only a minor component throughout; however, the Chernozemic soils are dominant throughout most of the southern half. Also a narrow band extends along the lake shore in the northern half, and a fairly large patch is found in the northwestern corner. The Solodized Solonetz soils - eroded phase, which are dominant throughout most of the northern half, have severe limitations, and the Solodized Solonetz soils, also common in this portion, have moderate limitations. Limitations include Solonetzic soil, slow permeability, slippery or sticky when wet, surface stoniness, and excessive

*this symbol is not
used on the map
thus descrip-
tion should
be deleted
Rutherford
20 Oct 85*

TABLE 2. CHEMICAL ANALYSIS OF SELECTED MAP UNITS¹

MAP UNIT	DEPTH CM	pH H ₂ O	2 EC	3 Na	3 SO ₄	3 OM	3 CaCO ₃
1	0 - 15	8.2	6.1	H+	H-	L	-
	150 - 165	8.1	3.7	H+	H+	L	L-
1	0 - 15	6.6	0.2	L-	-	L	-
	15 - 30	9.0	0.4	H	-	L	H+
	75 - 90	7.9	0.2	H	-	L	-
1	0 - 15	8.0	7.0	H+	H+	L	-
3	0 - 15	7.5	0.5	H+	-	L	-
	15 - 30	7.3	0.2	L	-	L	-
4	0 - 15	7.3	0.7	H+	-	L	-
	15 - 30	8.0	0.5	H+	-	L	-
	60 - 75	9.1	1.2	H+	L-	L	H+

¹ Chemical Analyses done by Alberta Soil and Feed Testing Laboratory.

² EC - Electrical conductivity, millimhos/cm, ³These tests are rated into 4 categories: High (H), Medium (M), Low (L), and none (-). The degree within each category is indicated by a + or - sign. The tests for OM (organic matter) and CaCO₃ (free lime) are visual estimates only.

Table 3. Physical Analyses of Selected Map Units (1)

Map Unit	Depth cm	Field Moisture %	Mechanical Analysis											Liquid Limit	Plasticity Index	Optimum Moisture % (2)	Maximum Dry Density lb/ft. ³ (2)	Classification		
			Percentage Passing Sieve							Percentage Smaller Than								AASHO	Unified	USDA
			1 inch	3/4 inch	5/8 inch	#4 (4.7 mm.)	#10 (2.0 mm.)	#40 (0.42 mm.)	#200 (0.074 mm.)	0.05 mm.	0.005 mm.	0.002 mm.	0.001 mm.							
1	90-120	8	100	100	100	100	100	95	64	63	43	34	30	32	14	17	107.5	A-6(8)	CL	CL
4	60-90	7	87	87	86	85	85	83	60	55	34	28	23	36	17	19	105.0	A-6(8)	CL	CL - SCL

(1) Map Units developed on similar parent material: 1, 2, 3, and 4

(2) These values are obtained from charts worked out by the Highways Testing Laboratory, Alberta Transportation.

slopes. Map Unit 2 soils, which occur in depressions throughout the study area, have severe limitations for recreational development because of seasonally high groundwater tables or surface ponding.

Most soils in the study area have only moderate limitations for road construction when found on suitable topography, due to moderate shrink-swell potentials, and susceptibility to frost heave. Map Unit 2 soils have severe limitations because of seasonally high groundwater tables or surface ponding. A source of sand or gravel was not found in the study area.

Specific limitations and suitabilities of the various soils for selected uses are shown in tables 4 to 15 inclusive. The ratings were determined on the basis of morphological, physical and chemical properties of the soils, as well as steepness of slope. The principal limiting properties are indicated, and are generally listed in decreasing order of importance. In tables 4 to 13 inclusive, the soil limitations for various uses have been designated as none to slight, moderate, severe and very severe. In tables 14 and 15, the suitability of soils as sources of roadfill and as sources of sand and gravel respectively, have been designated as good, fair, poor, and very poor.

TABLE 4. SOIL LIMITATIONS FOR FULLY SERVICED CAMPGROUNDS

MAP SYMBOL ¹			DEGREE OF LIMITATION ²		MAP SYMBOL	DEGREE OF LIMITATION		MAP SYMBOL	DEGREE OF LIMITATION							
3	1/b1	1/c1	1/d1	SL	3	4/b1	4/c1	4/d1	SL	4	4/b1	4/c1	4/d1	S-Solz, Sl Perm, Slip		
	1/c2			M-Stony		4/c2			4/d2		M-Stony	4/c2			4/d2	S-Solz, Sl Perm, Stony
	1/e1			M-Slope, Er		4/e2			M-Slope, Er, Stony		4/e2			M-Slope, Slope, Sl Perm		
4	1/b1	1/c1	1/d1	S-Solz, Sl Perm, Slip	4/f3			S-Slope, Stony, Er	4/f3			S-Slope, Solz, Stony				
	1/c2			S-Solz, Sl Perm, Stony	5	4/b1	4/c1	4/d1	M-Solz, Sl Perm							
	1/e1			S-Solz, Slope, Sl Perm		4/c2			4/d2	M-Solz, Sl Perm, Stony						
	2/a1			S-Wet, Sl Perm		4/e2			M-Slope, Solz, Sl Perm							
	2/a2			S-Wet, Sl Perm, Stony	4/f3			S-Slope, Er, Stony								
	3/c1			SL												

1. For explanation, see Soil Map
2. SL-None to slight, M-Moderate, S-Severe, VS-Very severe
3. These ratings are for the Chernozems and Solods
4. These ratings are for the Solodized Solonetz soils, eroded phase
5. These ratings are for the Solodized Solonetz soils

Abbreviations

BR - Shallow depth to bedrock
 Clay - High clay content
 Er - Erosion hazard
 Flood - Flooding hazard (overflow)
 Org - Organic soil
 Org Surf - Organic surface layer > 15 cm thick

Sandy - Sandy surface texture
 Slip - Slippery or sticky when wet
 Slope - Excessive slope
 Sl Perm - Slow permeability
 Solz - Solonetzic soil
 Stony - Surface stoniness
 Wet - Seasonally high groundwater table or surface ponding

TABLE 5. SOIL LIMITATIONS FOR PICNIC AREAS

MAP SYMBOL ¹	DEGREE OF LIMITATION ²	MAP SYMBOL	DEGREE OF LIMITATION	MAP SYMBOL	DEGREE OF LIMITATION
³ 1/b1 1/c1 1/c2 1/d1	SL	4/e2	M-Slope, Er	4/f3	S-Slope, Solz, Sl Perm
1/e1	M-Slope, Er	4/f3	S-Slope, Er, Stony		
⁴ 1/b1 1/c1 1/c2 1/d1	S-Solz, Sl Perm, Slip	⁵ 4/b1 4/c1 4/d1 4/c2 4/d2	M-Solz, Sl Perm		
1/e1	S-Solz, Slope, Sl Perm	4/e2	M-Slope, Solz, Sl Perm		
2/a1 2/a2	S-Wet, Sl Perm	4/f3	S-Slope, Er, Solz		
3/c1	SL	⁴ 4/b1 4/c1 4/d1 4/c2 4/d2	S-Solz, Sl Perm, Slip		
³ 4/b1 4/c1 4/d1 4/c2 4/d2	SL	4/e2	S-Slope, Solz, Sl Perm		

1. For explanation, see Soil Map
2. SL-None to slight, M-Moderate, S-Severe, VS-Very severe
3. These ratings are for the Chernozems and Solods
4. These ratings are for the Solodized Solonetz soils, eroded phase
5. These ratings are for the Solodized Solonetz soils

Abbreviations

BR - Shallow depth to bedrock
 Clay - High clay content
 Er - Erosion hazard
 Org - Organic soil
 Org Surf - Organic surface layer > 15 cm thick
 Sandy - Sandy surface texture

Slip - Slippery or sticky when wet
 Slope - Excessive slope
 Sl Perm - Slow permeability
 Solz - Solonetzic soil
 Stony - Surface stoniness
 Wet - Seasonally high groundwater table or surface ponding

TABLE 6. SOIL LIMITATIONS FOR LAWNS AND LANDSCAPING

MAP SYMBOL ¹	DEGREE OF LIMITATION ²	MAP SYMBOL	DEGREE OF LIMITATION	MAP SYMBOL	DEGREE OF LIMITATION
³ 1/b1 1/c1 1/d1	SL	4/c2 4/d2	M-Stony	⁴ 4/b1 4/c1 4/d1	S-Solz, Saline, Thin Ah
1/c2	M-Stony	4/e2	M-Slope, Er, Stony	4/c2 4/d2 4/e2	
1/e1	M-Slope, Er	4/f3	S-Slope, Stony, Er	4/f3	S-Slope, Er, Solz
⁴ 1/b1 1/c1	S-Solz, Saline, Thin Ah	⁵ 4/b1 4/c1 4/d1	M-Solz, Sl Perm		
1/c2 1/d1		4/c2 4/d2	M-Solz, Sl Perm, Stony		
1/e1		4/e2	M-Slope, Solz, Sl Perm		
2/a1 2/a2	S-Wet, Saline, Thin Ah	4/f3	S-Slope, Er, Stony		
3/c1	SL				
³ 4/b1 4/c1 4/d1	SL				

1. For explanation, see Soil Map

2. SL-None to slight, M-Moderate, S-Severe, VS-Very severe

3. These ratings are for the Chernozems and Solods

4. These ratings are for the Solodized Solonetz soils, eroded phase

5. These ratings are for the Solodized Solonetz soils

Abbreviations

BR - Shallow depth to bedrock

Clay - High clay content

Er - Erosion hazard

Flood - Flooding hazard (overflow)

Lime - High lime content (soil nutrient imbalance)

Org - Organic soil

Org Surf - Organic surface layer > 15 cm thick

R Perm - Rapid permeability (droughtiness)

Saline - Surface soil salinity

Sandy - Sandy surface texture

Slope - Excessive slope

Sl Perm - Slow permeability

Solz - Solonetzic soil

Stony - Surface stoniness

Thin Ah - Thin or no Ah horizon

Wet - Seasonally high groundwater table or surface ponding

TABLE 7. SOIL LIMITATIONS FOR PATHS

MAP SYMBOL ¹				DEGREE OF LIMITATION ²	MAP SYMBOL				DEGREE OF LIMITATION	MAP SYMBOL				DEGREE OF LIMITATION
3	1/b1	1/c1	1/d1	SL	4/c2	4/d2	M-Stony	4/e2	S-Solz, Slope, Slip					
	1/c2			M-Stony	4/e2	M-Slope, Er, Stony	4/f3	S-Slope, Er, Stony						
	1/e1			M-Slope, Er	4/f3	S-Slope, Stony, Er								
4	1/b1	1/c1	1/d1	S-Solz, Slip	5	4/b1	4/c1	4/d1	M-Solz					
	1/c2			S-Solz, Slip, Stony		4/c2	4/d2	M-Solz, Stony						
	1/e1			S-Solz, Slope, Slip		4/e2	M-Slope, Solz, Er							
	2/a1			S-Wet	4/f3	S-Slope, Er, Stony								
	2/a2			S-Wet, Stony	4	4/b1	4/c1	4/d1	S-Solz, Slip					
	3/c1			SL		4/c2	4/d2	S-Solz, Slip, Stony						
3	4/b1	4/c1	4/d1	SL										

1. For explanation, see Soil Map

2. SL-None to slight, M-Moderate, S-Severe, VS-Very severe

3. These ratings are for the Chernozems and Solods

4. These ratings are for the Solodized Solonetz soils, eroded phase

5. These ratings are for the Solodized Solonetz soils

Abbreviations

Clay - High clay content

Er - Erosion hazard

Flood - Flooding hazard (overflow)

Org - Organic soil

Org Surf - Organic surface layer >15 cm thick

Sandy - Sandy surface texture

Slip - Slippery or sticky when wet

Slope - Excessive slope

Solz - Solonetzic soil

Stony - Surface stoniness

Wet - Seasonally high groundwater table or surface ponding

TABLE 8. SOIL LIMITATIONS FOR TRAILS

MAP SYMBOL ¹	DEGREE OF LIMITATION ²	MAP SYMBOL	DEGREE OF LIMITATION	MAP SYMBOL	DEGREE OF LIMITATION
³ 1/b1 1/c1 1/d1 1/c2 1/e1	SL	4/f3	M-Slope, Solz, Er		
⁴ 1/b1 1/c1 1/d1 1/c2 1/e1	S-Solz, Slip	⁴ 4/b1 4/c1 4/d1 4/c2 4/d2 4/e2	S-Solz, Slip		
2/a1 2/a2	S-Wet	4/f3	S-Solz, Slope, Slip		
3/c1	SL				
³ 4/b1 4/c1 4/d1 4/c2 4/d2 4/e2	SL				
4/f3	M-Slope, Stony, Er				
⁵ 4/b1 4/c1 4/d1 4/c2 4/d2 4/e2	M-Solz				

1. For explanation, see Soil Map

2. SL-None to slight, M-Moderate, S-Severe, VS-Very severe

3. These ratings are for the Chernozems and Solods

4. These ratings are for the Solodized Solonetz soils, eroded phase

5. These ratings are for the Solodized Solonetz soils

Abbreviations

Clay - High clay content

Er - Erosion hazard

Flood - Flooding hazard (overflow)

Org - Organic soil

Org Surf - Organic surface layer > 15 cm thick

Sandy - Sandy surface texture

Slip - Slippery or sticky when wet

Slope - Excessive slope

Solz - Solonetzic soil

Stony - Surface stoniness

Wet - Seasonally high groundwater table or surface ponding

TABLE 9. SOIL LIMITATIONS FOR BUILDINGS WITH BASEMENTS

MAP SYMBOL ¹	DEGREE OF LIMITATION ²	MAP SYMBOL	DEGREE OF LIMITATION	MAP SYMBOL	DEGREE OF LIMITATION
³ 1/b1 1/c1 1/d1	M-Frost	4/e2	M-Slope, Frost, Stony		
1/c2	M-Frost, Stony	4/f3	S-Slope, Stony, Frost		
1/e1	M-Slope, Frost	⁴ 4/b1 4/c1 4/d1	M-Sulfate, Frost		
⁴ 1/b1 1/c1 1/d1	M-Sulfate, Frost	4/c2 4/d2	M-Sulfate, Frost, Stony		
1/c2	M-Sulfate, Frost, Stony	4/e2	M-Slope, Sulfate, Frost		
1/e1	M-Slope, Sulfate, Frost	4/f3	S-Slope, Stony, Sulfate		
2/a1 2/a2	S-Wet, Sulfate, Frost				
3/c1	M-Sulfate, Frost				
³ 4/b1 4/c1 4/d1	M-Frost				
4/c2 4/d2	M-Frost, Stony				

1. For explanation, see Soil Map

2. SL-None to slight, M-Moderate, S-Severe, VS-Very severe

3. These ratings are for the Chernozems

4. These ratings are for the Solods and Solodized Solonetz soils, including the eroded phase

Abbreviations

BR - Shallow depth to bedrock

Clay - High clay content

Flood - Flooding hazard (overflow)

Frost - Susceptibility to frost heave

M Sh-Sw - Moderate shrink - swell potential

Org - Organic soil

Sh-Sw - High shrink - swell potential

Slope - Excessive slope

Stony - Surface stoniness

Sulfate - Possible concrete corrosion hazard (soluble sulfate)

Wet - Seasonally high groundwater table or surface ponding

TABLE 10. SOIL LIMITATIONS FOR BUILDING WITHOUT BASEMENTS

MAP SYMBOL ¹	DEGREE OF LIMITATION ²	MAP SYMBOL	DEGREE OF LIMITATION	MAP SYMBOL	DEGREE OF LIMITATION
1/b1 1/c1 1/d1	SL				
1/c2	M-Stony				
1/e1	M-Slope				
2/a1	S-Wet				
2/a2	S-Wet, Stony				
3/c1	SL				
4/b1 4/c1 4/d1	SL				
4/c2 4/d2	M-Stony				
4/e2	M-Slope, Stony				
4/f3	S-Slope, Stony				

1. For explanation, see Soil Map

2. SL-None to slight, M-Moderate, S-Severe, VS-Very severe

Abbreviations

BR - Shallow depth to bedrock
 Flood - Flooding hazard (overflow)
 Org - Organic soil

Slope - Excessive slope
 Stony - Surface stoniness
 Wet - Seasonally high groundwater table or surface ponding

TABLE 11. SOIL LIMITATIONS FOR SEPTIC TANK ABSORPTION FIELDS

MAP SYMBOL ¹	DEGREE OF LIMITATION ²	MAP SYMBOL	DEGREE OF LIMITATION	MAP SYMBOL	DEGREE OF LIMITATION
1/b1 1/c1 1/c2 1/d1	S-Sl Perm, Clay				
1/e1	S-Sl Perm, Clay, Slope				
2/a1 2/a2	VS-Wet, GW, Sl Perm				
3/c1	S-Sl Perm, Clay				
4/b1 4/c1 4/d1 4/c2 4/d2	S-Sl Perm, Clay				
4/e2	S-Sl Perm, Clay, Slope				
4/f3	S-Slope, Sl Perm, Clay				

1. For explanation, see Soil Map

2. SL-None to slight, M-Moderate, S-Severe, VS-Very severe

Abbreviations

BR - Shallow depth to bedrock

Clay - High clay content

Flood - Flooding hazard (overflow)

GW - Groundwater contamination hazard

Org - Organic soil

R Perm - Rapid permeability

Slope - Excessive slope

Sl Perm - Slow permeability

Wet - Seasonally high groundwater table or surface ponding

TABLE 12. SOIL LIMITATIONS FOR TRENCH TYPE SANITARY LANDFILLS

MAP SYMBOL ¹	DEGREE OF LIMITATION ²	MAP SYMBOL	DEGREE OF LIMITATION	MAP SYMBOL	DEGREE OF LIMITATION
³ 1/b1 1/c1 1/d1 1/e1	M-Clay	⁴ 4/b1 4/c1 4/d1	M-Clay, Slip		
1/c2	M-Clay, Stony	4/c2 4/d2 4/e2	M-Clay, Slip, Stony		
		4/f3	S-Stony, Clay, Slope		
⁴ 1/b1 1/c1 1/d1 1/e1	M-Clay, Slip				
1/c2	M-Clay, Slip, Stony				
2/a1 2/a2	VS-Wet, GW, Clay				
3/c1	M-Clay				
⁵ 4/b1 4/c1 4/d1	M-Clay				
4/c2 4/d2 4/e2	M-Clay, Stony				
4/f3	S-Stony, Clay, Slope				

1. For explanation, see Soil Map
2. SL-None to slight, M-Moderate, S-Severe, VS-Very severe
3. These ratings are for the Chernozems and Solods
4. These ratings are for the Solodized Solonetz soils, eroded phase
5. These ratings are for the Chernozems, Solods, and Solodized Solonetz soils

Abbreviations

BR - Shallow depth to bedrock
 Clay - High clay content
 Flood - Flooding hazard (overflow)
 GW - Groundwater contamination hazard
 Org - Organic soil

R Perm - Rapid permeability
 Slip - Slippery or sticky when wet
 Slope - Excessive slope
 Stony - Surface stoniness
 Text - Unsuitable texture
 Wet - Seasonally high groundwater table or surface ponding

TABLE 13. SOIL LIMITATIONS FOR ROAD LOCATION

MAP SYMBOL ¹	DEGREE OF LIMITATION ²	MAP SYMBOL	DEGREE OF LIMITATION	MAP SYMBOL	DEGREE OF LIMITATION
1/b1 1/c1	M-M Sh-Sw, Frost				
1/c2 1/d1					
1/e1	M-Slope, M Sh-Sw, Frost				
2/a1 2/a2	S-Wet, M Sh-Sw, Frost				
3/c1	M-M Sh-Sw, Frost				
4/b1 4/c1 4/d1	M-M Sh-Sw, Frost				
4/c2 4/d2					
4/e2	M-Slope, M Sh-Sw, Frost				
4/f3	S-Slope, M Sh-Sw, Stony				

1. For explanation, see Soil Map

2. SL-None to slight, M-Moderate, S-Severe, VS-Very severe

Abbreviations

BR - Shallow depth to bedrock

Clay - High clay content

Er - Erosion hazard

Flood - Flooding hazard (overflow)

Frost - susceptibility to frost heave

M Sh-Sw - Moderate shrink - swell potential

Org - Organic soil

Sh-Sw - High shrink - swell potential

Slope - Excessive slope

Stony - Surface stoniness

Wet - Seasonally high groundwater table or surface ponding

TABLE 14. SOIL SUITABILITY FOR SOURCE OF ROADFILL

MAP SYMBOL ¹	DEGREE OF SUITABILITY ²	MAP SYMBOL	DEGREE OF SUITABILITY	MAP SYMBOL	DEGREE OF SUITABILITY
1/b1 1/c1 1/c2 1/d1 1/e1	F-M Sh-Sw, Frost				
2/a1 2/a2	P-Wet, M Sh-Sw, Frost				
3/c1	F-M Sh-Sw, Frost				
4/b1 4/c1 4/d1 4/c2 4/d2 4/e2 4/f3	F-M Sh-Sw, Frost F-Slope, M Sh-Sw, Stony				

1. For explanation, see Soil Map

2. G-Good, F-Fair, P-Poor, VP-Very poor

Abbreviations

BR - Shallow depth to bedrock

Clay - High clay content

Er - Erosion hazard

Flood - Flooding hazard (overflow)

Frost - Susceptibility to frost heave

M Sch-Sw - Moderate shrink - swell potential

Org - Organic soil

Sh-Sw - High shrink - swell potential

Slope - Excessive slope

Stony - Surface stoniness

Wet - Seasonally high groundwater table or surface ponding

TABLE 15. SOIL SUITABILITY FOR SOURCE OF SAND OR GRAVEL

MAP SYMBOL ¹	DEGREE OF SUITABILITY ²	MAP SYMBOL	DEGREE OF SUITABILITY	MAP SYMBOL	DEGREE OF SUITABILITY
1/b1 1/c1 1/c2 1/d1 1/e1	VP-Text				
2/a1 2/a2	VP-Text, Wet				
3/c1	VP-Text				
4/b1 4/c1 4/d1 4/c2 4/d2 4/e2 4/f3	VP-Text				

1. For explanation, see Soil Map
 2. G-Good, F-Fair, P-Poor, VP-Very poor

Abbreviations

Flood - Flooding hazard (overflow)
 OB - Excessive overburden
 Org - Organic soil

Text - Unsuitable texture
 Thin - Thin deposit of sand or gravel
 Wet - Seasonally high groundwater table or surface ponding

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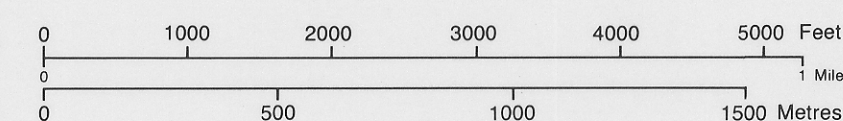
LEGEND:

- M - Morainal
- Mh - hummocky morainal
- MI - level morainal
- Mu - undulating morainal

- - landform line
- - - - - boundary of mapped area
- ↖ - direction of slope
- BP - borrow pit
- S - seepage



Scale 1:16 000 (approx.)



Landform Map, West Side of Lake Newell, Alberta

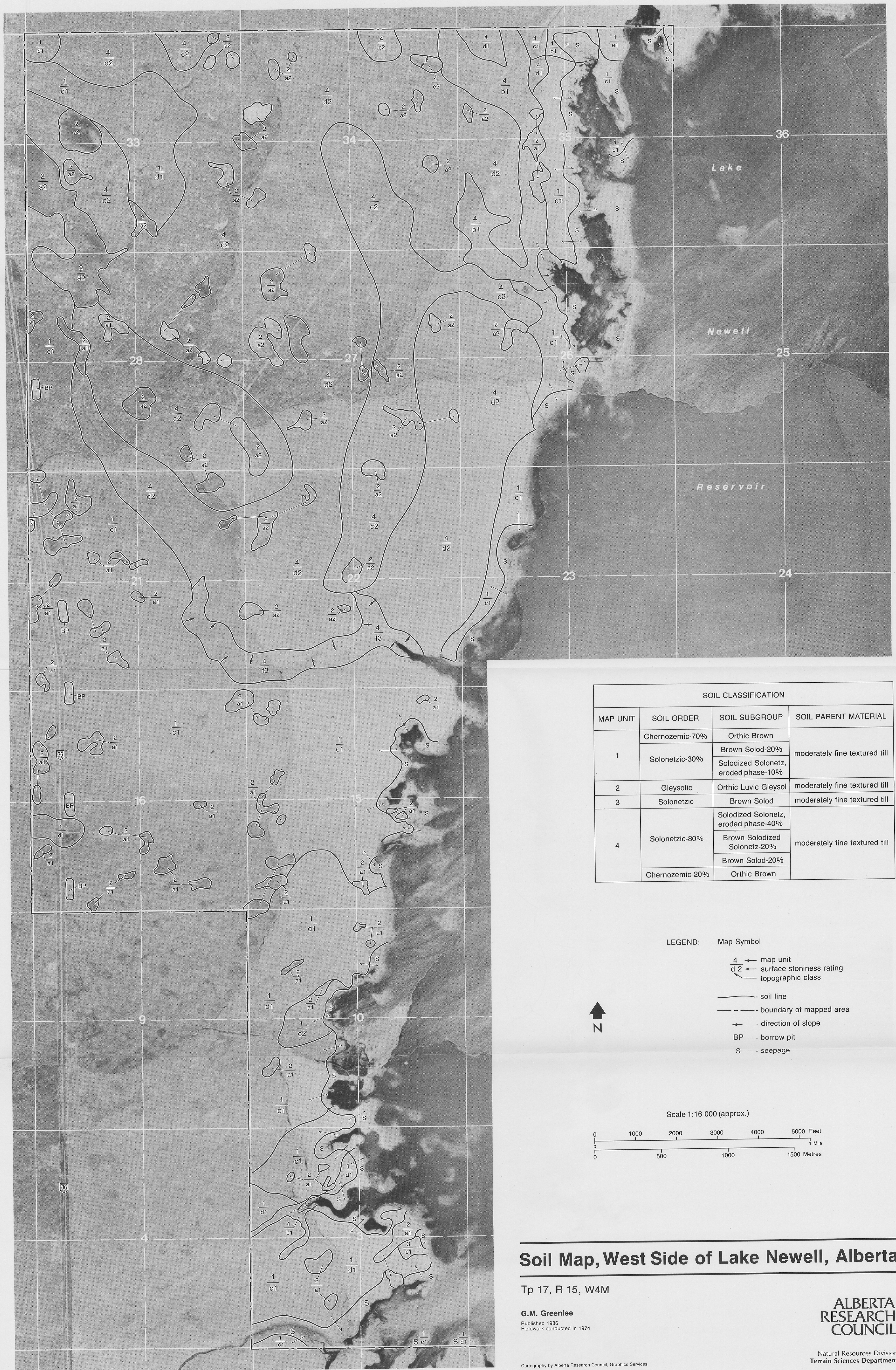
Tp 17, R 15, W4M

G.M. Greenlee
Published 1988
Fieldwork conducted in 1974

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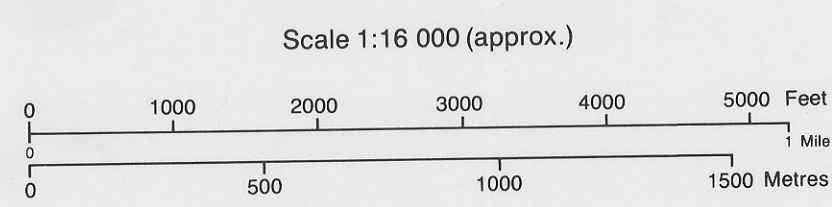
Natural Resources Division
Terrain Sciences Department

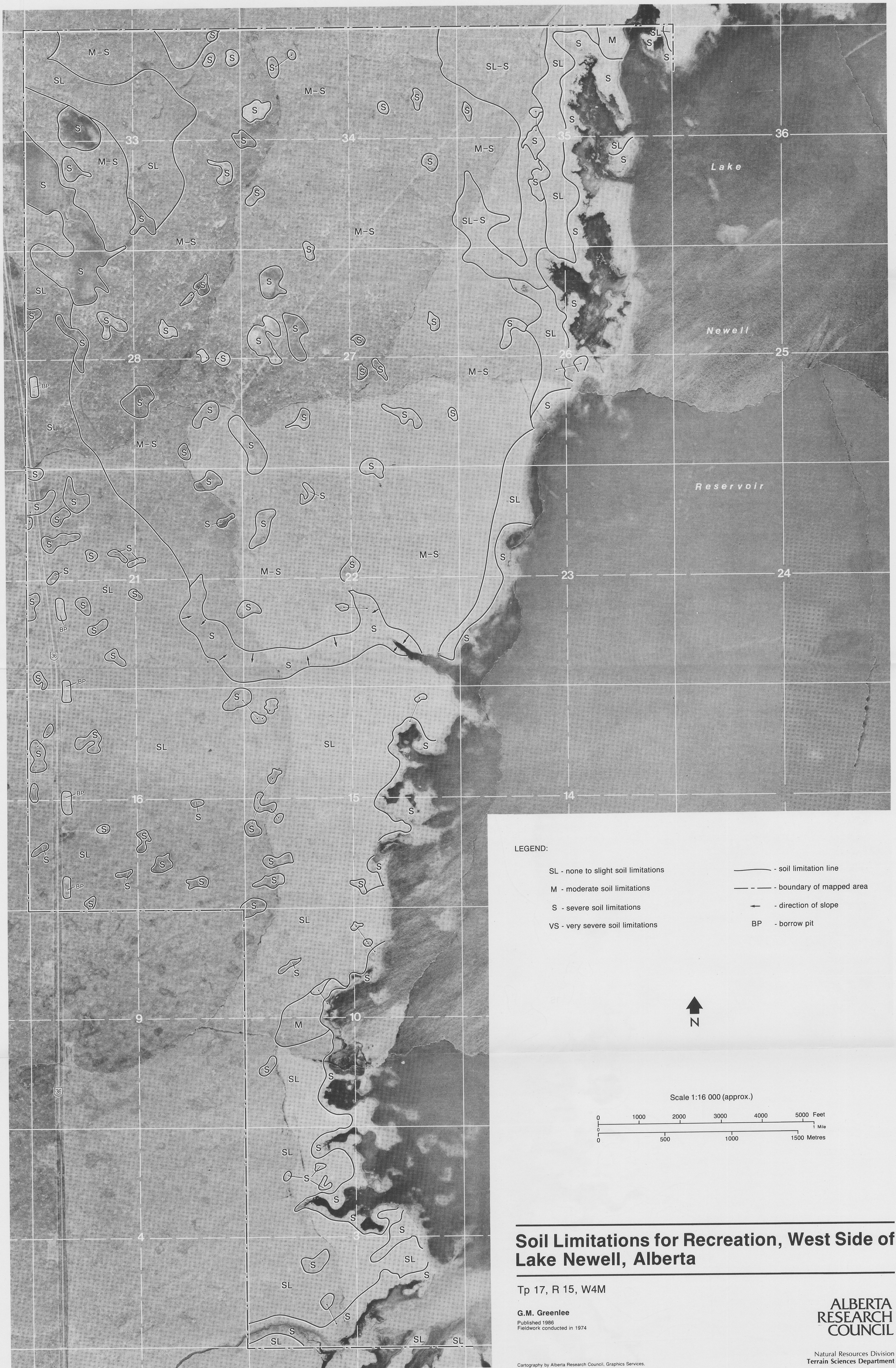
Cartography by Alberta Research Council, Graphics Services.



SOIL CLASSIFICATION			
MAP UNIT	SOIL ORDER	SOIL SUBGROUP	SOIL PARENT MATERIAL
1	Chernozemic-70%	Orthic Brown	moderately fine textured till
	Solonetzic-30%	Brown Solod-20%	
		Solodized Solonetz, eroded phase-10%	
2	Gleysolic	Orthic Luvisic Gleysol	moderately fine textured till
3	Solonetzic	Brown Solod	moderately fine textured till
4	Solonetzic-80%	Solodized Solonetz, eroded phase-40%	moderately fine textured till
		Brown Solodized Solonetz-20%	
		Brown Solod-20%	
	Chernozemic-20%	Orthic Brown	

- LEGEND: Map Symbol
- 4 ← map unit
 - d 2 ← surface stoniness rating
 - topographic class
 - soil line
 - - - boundary of mapped area
 - ← direction of slope
 - BP - borrow pit
 - S - seepage





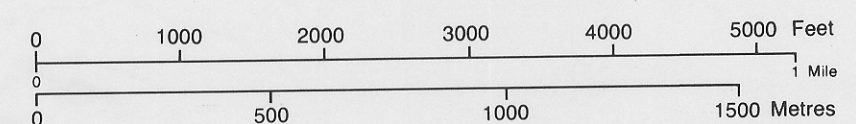
LEGEND:

SL - none to slight soil limitations
M - moderate soil limitations
S - severe soil limitations
VS - very severe soil limitations

— - soil limitation line
- - - boundary of mapped area
← - direction of slope
BP - borrow pit



Scale 1:16 000 (approx.)



Soil Limitations for Recreation, West Side of Lake Newell, Alberta

Tp 17, R 15, W4M

G.M. Greenlee
Published 1998
Fieldwork conducted in 1974

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