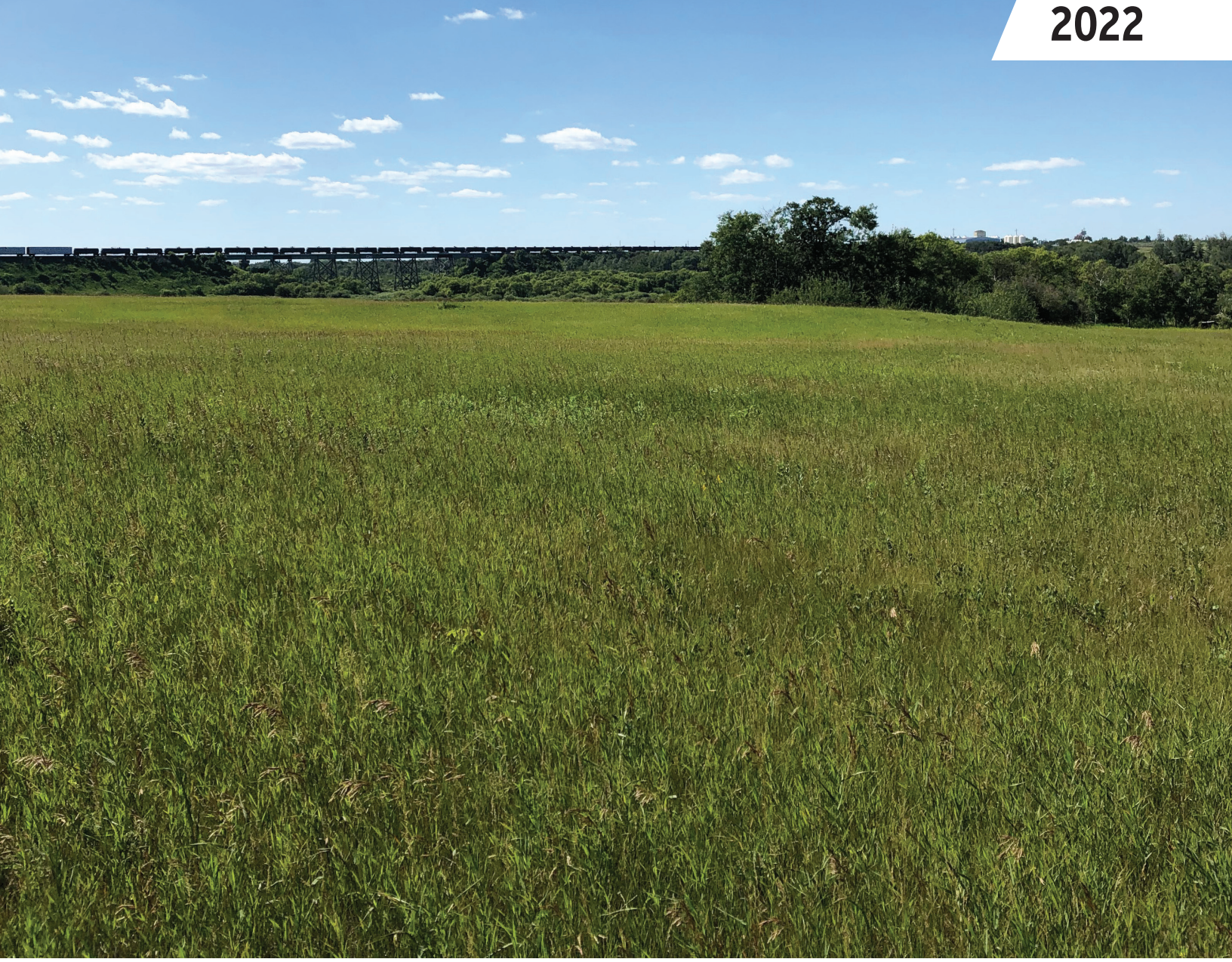
Soils of The Municipality of Riverdale

Report Series No. D98

2022



Manitoba

SOILS OF THE MUNICIPALITY OF RIVERDALE

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Part 1 General Description of the Study Area

1.1 Location and Extent

The Rural Municipality (RM) of Riverdale is located in the south - western part of Manitoba and covers approximately 58,211 hectares (143,843 acres) of land within Townships (TWP) 12 and 11 in Ranges (RGE) 20, 21, and 22 west of the Principal Meridian. The communities of Rivers and Wheatland are located within the study area. The study area contains recreational spaces such as Rivers Provincial Park located along the shores of Lake Wahtopanah (also known as the Rivers Reservoir). The RM of Riverdale borders five other municipalities: Oakview (formally known as Blanshard and Saskatchewan) to the north, Elton to the east, Whitehead to the south, and Wallace-Woodworth to the west (Figure 1).

The RM of Riverdale has an average annual temperature of 2.2 C and an average annual precipitation of 474 millimetres (mm). The study area has a total of 1,630 growing degree days (GDD) above 5 C and an average of 119 frost-free days (Environment Canada 2021).

This report contains soil resource information and maps at a scale of 1:20,000 for an area that was previously surveyed at the 1:126,720 scale in the Reconnaissance Soil Survey of the Rossburn and Virden Map Sheet Areas, Report No. 6 (Ehrlich et al. 1956). Previously surveyed soils at 1:20,000 scale for part of the RM in the Soils of the Brandon Region Study Area, Report No. 30 (Michalyna et al., 1976) is also included in this report.

1.2 Geology

The underlying bedrock in the RM of Riverdale consists of shale of the Riding mountain formation Millwood member which formed during the Cretaceous Period and consists of soft green bentonitec shale (Ehrlich et al. 1956, Corkery 1996).

Though the RM of Riverdale is entirely underlain by shales from the Cretaceous period the surface deposits contain material from many other rock formations such as sandstones, shales and evaporites from the Jurassic, limestone and dolostones from the Devonian, Silurian and Ordovician period and acidic intrusive rocks from the Pre-Cambrian era. These deposits were transported from the continental ice sheet that once completely covered Manitoba (Ehrlich et al. 1956).

1.3 Physiography and Surface Deposits

The study area lies within three ecodistricts – the Hamiota (753), Stockton (758) and the Shilo (757) (Figure 2) within the Aspen Parkland Ecoregion (EGSW 1995 and Smith et al. 1998), which were previously referred to as the Newdale Till Plain (Hamiota) and the Lake Souris Basin (Stockton and Shilo) (Ehrlich et al. 1956). All areas are within the commonly known Grassland Transition Ecoclimatic Region – sub region 2 (Gt2).

The Hamiota ecodistrict area that lies within the RM of Riverdale has a landscape that is an undulating to a hummocky and kettled glacial till plain also known as the Newdale Till Plain. Most of this area is characterized by the Newdale soil smooth phase (Ehrlich et al., 1956, Smith et al. 1998). The surface deposits in the Newdale Till Plain area are moderately to strongly calcareous, loam to clay loam textured glacial till of shale, limestone and granitic rock origin. Some deposits consist of coarser outwash materials of sand and gravel in the area surrounding the Little Saskatchewan River (Figure 2).

The Stockton and Shilo ecodistricts both fall within the Lake Souris Basin that borders the Newdale Till Plain to the north (Ehrlich et al., 1956, Smith et al. 1998). The Stockton ecodistrict consists of level to hummocky topography of lacustrine deposits. The Assiniboine River runs through the Stockton

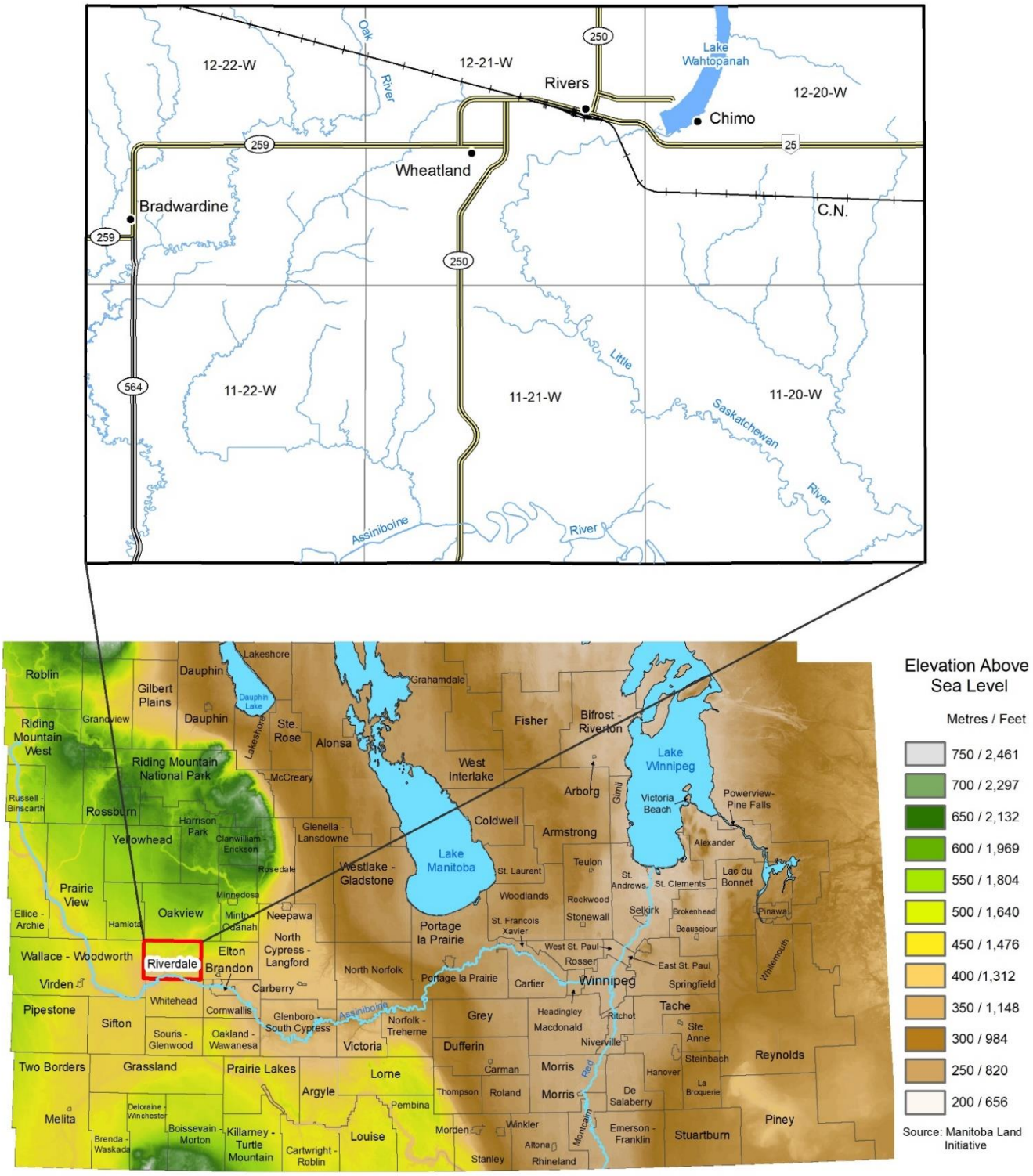


Figure 1: Location of the Study Area: The Rural Municipality of Riverdale

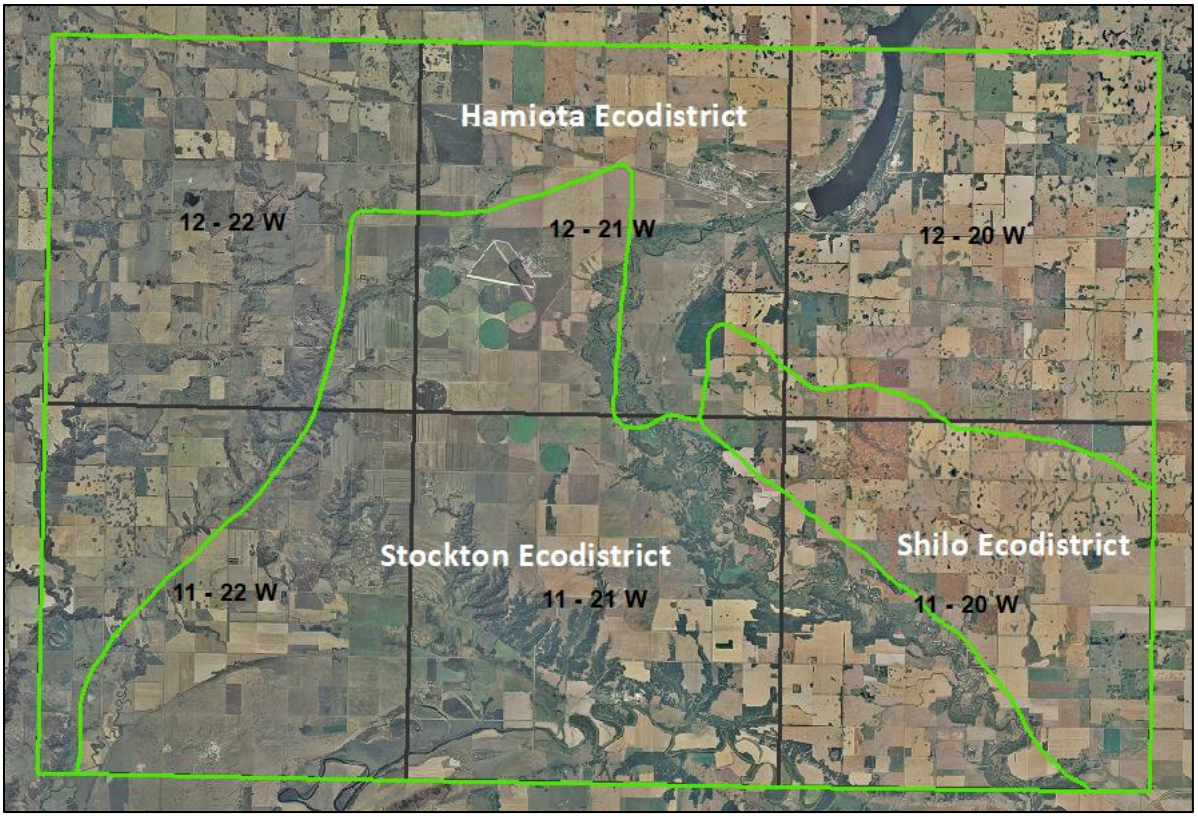


Figure 2: Ecodistricts of the Rural Municipality of Riverdale

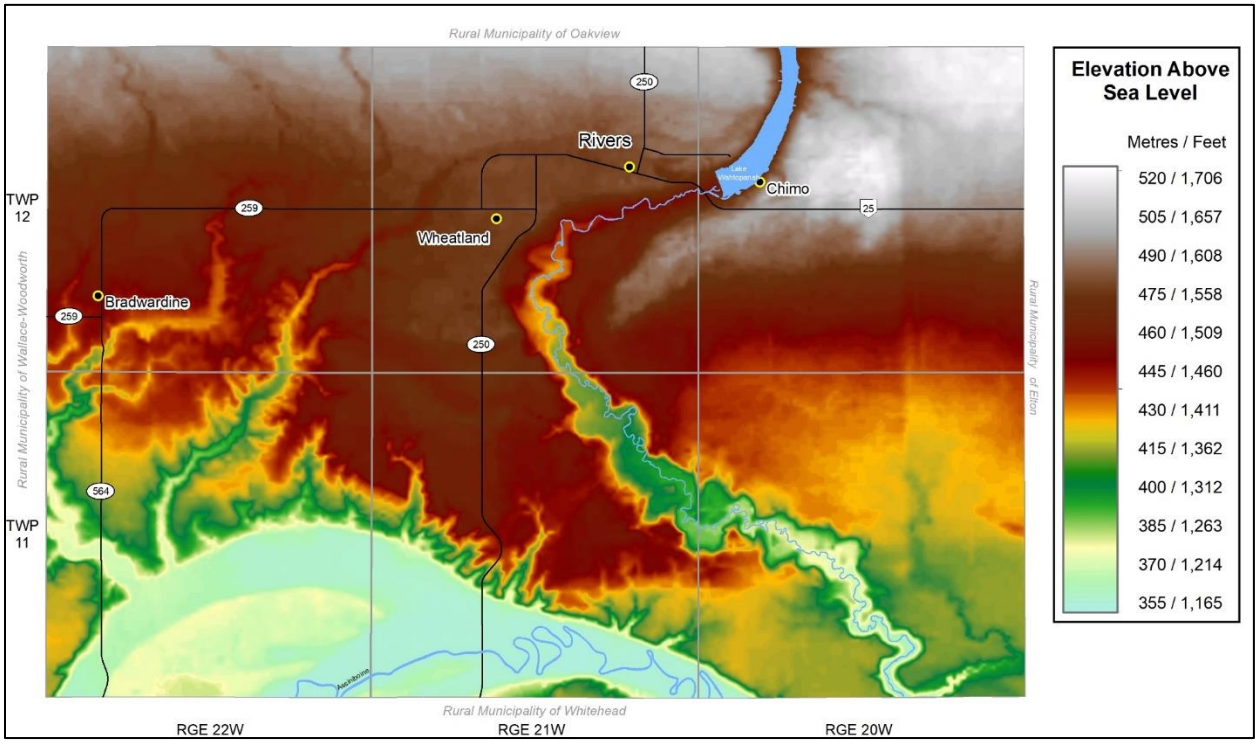


Figure 3. Elevation Above Sea Level of the RM of Riverdale

ecodistrict which overtime has formed an incised deep valley. Lacustrine deposits range in texture from fine to moderately coarse (Ehrlich et al., 1956, Smith et al. 1998).

The Shilo ecodistrict consists of fine to coarse sand deposits from the Assiniboine Delta, but the portion that falls within the study area consists of clay loam to loam deposits over moderately coarse deposits (Smith et al. 1998).

1.4 Drainage and Relief

The study area lies within the Assiniboine River basin and spans across three watershed districts; Birdtail Creek and Oak River Watershed, the Little Saskatchewan watershed and a small portion of the Central Assiniboine Watershed (Ehrlich et al., 1956). The Assiniboine River is the largest water course that runs through the RM followed by the Little Saskatchewan River.

Drainage in the study area is facilitated by the many incised streams and tributaries that flow into the Assiniboine and the Little Saskatchewan Rivers. The Assiniboine River enters the RM in TWP 11- RGE 22 W flowing east and exits in the south western corner of TWP 11- RGE 20 W. The Little Saskatchewan River enters the study area through Lake Wahtopanah and flows in a southerly direction where it eventually connects to the Assiniboine River in the RM of Whitehead. In the undulating till plain area drainage is local in nature (Figure 1, 2 and 3). Runoff water from the knolls accumulates in the depressional areas and the removal of water from the catchments is either through evapotranspiration or seepage (Ehrlich et al., 1956).

The elevation of the study area ranges from 520 metres above sea level (A.S.L) in the north – north eastern part of the study area to approximately 355 metres A.S.L in the southern area around and in the Assiniboine River Valley resulting in a general slope gradient of 0.6 per cent (Figure 3). Most of the landscape consists of undulating topography with areas of hummocky terrain. Great relief is generally confined to the deeply incised channels of the Assiniboine and Little Saskatchewan Rivers.

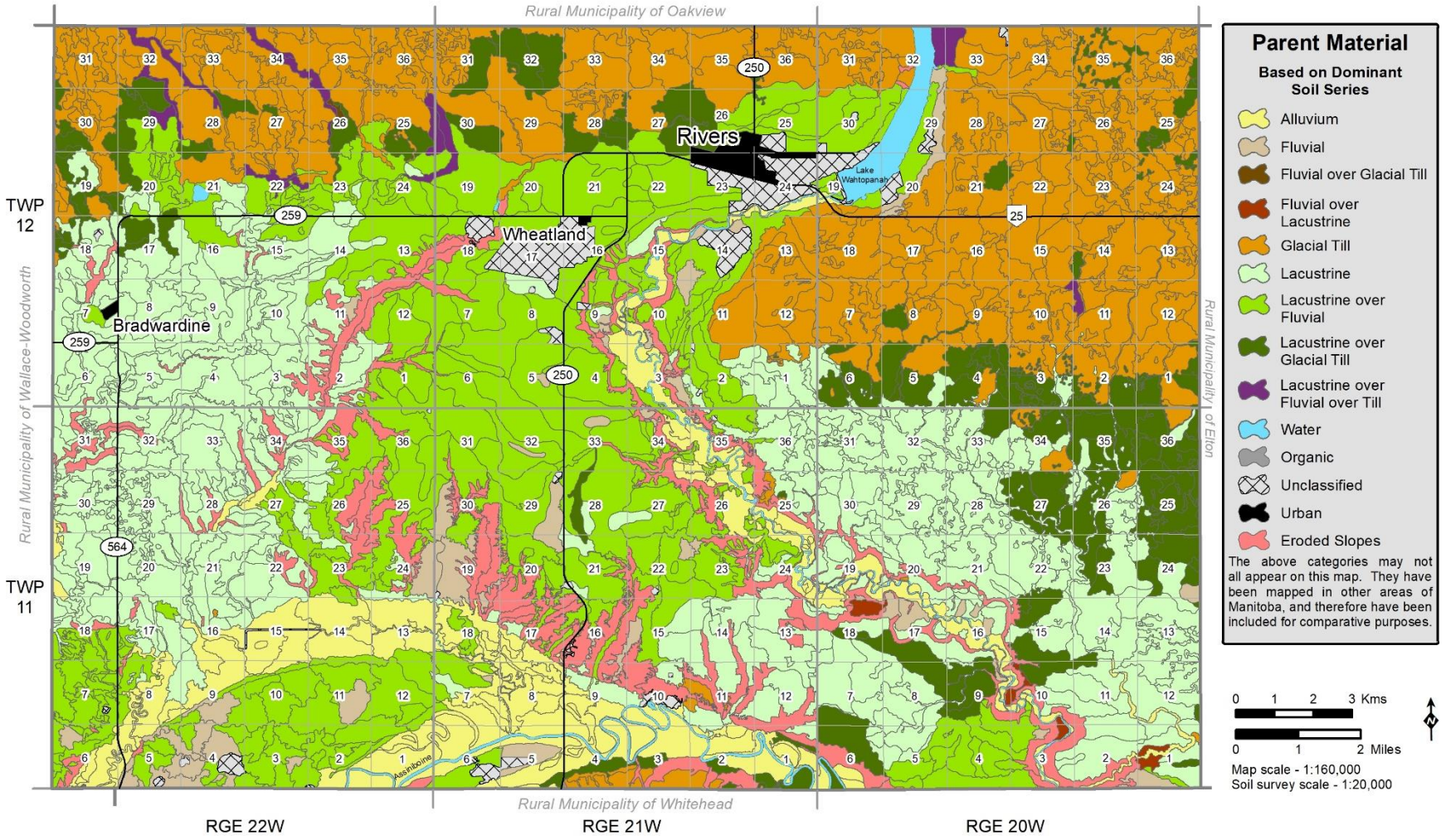
1.5 Vegetation

Natural vegetation varies within the area due to many factors such as drainage, soil texture and topography, but is characteristically of the aspen parkland region (Smith et al. 1998).

Thus vegetation on well to moderately well-drained areas consists of grasslands entailing species of mixed grass prairie on the slopes and knolls. Shrubs such as the prairie rose, snowberry, and silverberry are common. North facing slopes are generally more tree covered and can consist of bur oak, balsam poplar and trembling aspen (Ehrlich et al., 1956, Smith et al. 1998). The flood plains surrounding the Assiniboine River Valley have deciduous forest communities of white elm, green ash, Manitoba maple, and balsam poplar (Ehrlich et al., 1956, Smith et al. 1998).

In depressional, kettled, poorly drained sites vegetation consists of aquatic species surrounded by sedges, slough grass, and rushes. Willows and red-osier dogwood may be dominant surrounded by trembling aspen and balsam poplar may also occur (Ehrlich et al., 1956, Smith et al. 1998).

The natural vegetation in the RM of Riverdale has for a large part been replaced with cultivated fields for the production of annual crops and tame pasture, or hay fields for livestock production. Many aggregate extraction pits also occur in the area due to the large extent of coarse textured deposits found within the study area.



Map 1 . Parent Material Map for the RM of Riverdale

1.6 Soils

The RM of Riverdale is located in the transitional area between the Lake Souris Basin (Stockton and Shilo Ecodistrict) and the Newdale Till Plain (Hamiota Ecodistrict). The study area is also located in an area with two major river systems resulting in a variety of parent materials such as lacustrine, fluvial and glacial till (Table 1). Over time these deposits developed into the soils we see today (Table 2 and 3).

Table 1. Soil Parent Material in the Rural Municipality of Riverdale

Parent material (0 to 100 cm)	Total area		% of RM
	ha	ac	
Alluvium	4,395	10,860	7.55
Lacustrine	15,706	38,811	26.97
Lacustrine over fluvial	12,879	31,825	22.11
Lacustrine over fluvial over till	368	909	0.63
Lacustrine over glacial till	4,884	12,067	8.4
Fluvial	1,496	3,695	2.57
Fluvial over lacustrine and Fluvial over till	103	256	0.18
Glacial till	12,848	31,747	22.05
Water body, eroded slope, marsh, urban and unclassified	5,532	13,671	9.51
Total	**58,211**	**143,843**	**100**

The historical dominant vegetation of grasses in the area has resulted in the development of soils that are classified as Chernozems according to the Canadian System of Soil Classification. Some exceptions occur in the areas surrounding the Assiniboine and Little Saskatchewan Rivers where flooding events occur resulting in Cumulic Regosol soils and soils that developed in depressional areas with poor drainage forming Gleysolic soils.

Deep lacustrine deposits are one of the dominant parent materials found in the RM of Riverdale covering approximately 27 per cent of the study area and are distributed in TWP 12 RGE 22W and TWP 11 RGE 22, 21 and 20W (Table 1 and Figure 4). The most commonly observed soil association within the study area is the moderately fine clay loam Carroll Association, which includes the Carroll, Ramada, Rempel, Charman, Gregg, Prodan and Tadpole Soil Series accounting for approximately 12 per cent of the lacustrine deposits. Medium textured (Loam) lacustrine deposits (Durnan, Fairland, Traverse, Torcan, Taggart and Vordas) are the next most common (Table 1, 2 and 3). Moderately coarse to coarse textured lacustrine deposits of the Prosser and Stockton Association, and fine lacustrine deposits of the Harding Association are also present within the study area (Figure 4 and Tables 1, 2 and 3).

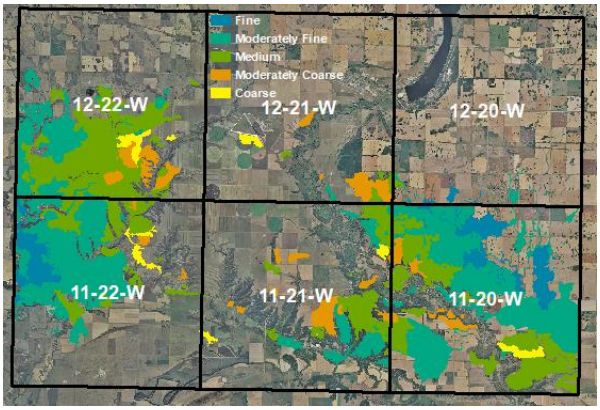


Figure 4. Lacustrine Sediments Distribution and their Associated Texture Groups in the RM of Riverdale

Glacial till deposits cover approximately 22 per cent of the RM and are located along the northern edge and north east corner of the study area with small pockets in the southern portion (Table 1, Map 1, and Figure 5). The dominant soil association with glacial till parent material is the Newdale Association which includes the Rufford, Newdale, Cordova, Moore Park, Angusville, Lavinia, Varcoe and Drokan soil series and account

for almost all the glacial till deposits within the study area (Table 2 and 3). The remainder of soils developed from glacial till are also clay loam to loam in texture, but are extremely calcareous and are within the Hilton association (Hilton and Bermont series).

Soils developed from lacustrine over glacial till deposits account for 8.4 per cent of the study area and are located along the edges and low lying areas where glacial till parent material was observed. (Table 1, Map 1 and Figure 5). The moderately fine clay loam textured Beresford soil association (Clementi, Kleysen, Chambers, Cobfield, Beresford and Vodroff soil series) (Table 2 and 3) make up 7.5 per cent of this land area. Finer (clay) and coarser (loamy very fine sand and fine sandy loam) textured lacustrine over glacial till deposits occur in small pockets in the study area.

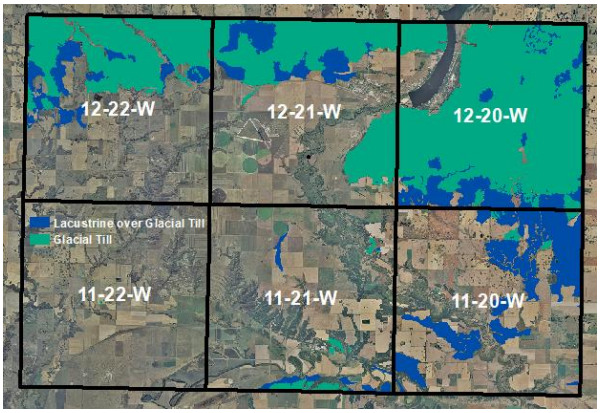


Figure 5. Glacial Till and Lacustrine over Glacial Till Distribution in the RM of Riverdale

Lacustrine over fluvial and fluvial deposits cover almost 25 per cent of the study area (Table 1, Map 1, and Figure 6). These deposits are mainly located in the outwash plain of the Assiniboine and Little Saskatchewan Rivers. The texture of the lacustrine deposits that overlay the sand and gravel range from medium loamy to moderately fine clayey (Croyon and Druxman soil series), to loamy sands and fine to medium sands (Wheatland and Hughes soil series) (Table 2 and 3). The moderately coarse loamy sand lacustrine over fluvial deposits of the Miniota Association cover the most land area (Table 2).

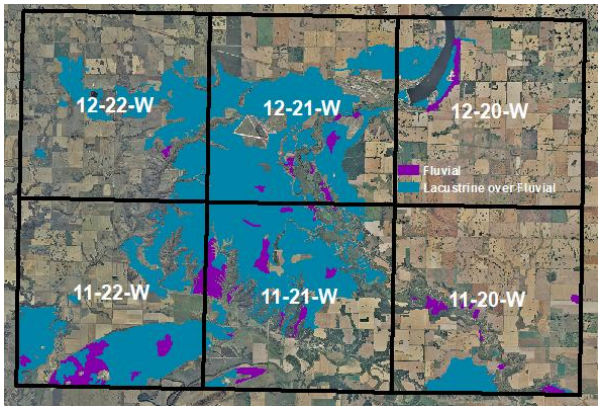


Figure 6. Lacustrine over Fluvial and Fluvial Deposits in the RM of Riverdale

Soils developed from alluvial deposits generally occur in the Assiniboine and Little Saskatchewan Rivers river beds, valleys and terraces. Soil textures in alluvial deposits around the Little Saskatchewan River are medium to moderately fine of the Levine and Basker soil series (Map 1, Figure 7, Table 2 and Table 3). Alluvial soils surrounding the Assiniboine River vary from medium to fine including the soil series mentioned above and the Assiniboine, Kerran, and small areas of the Kornell soil series dominated by shale deposits were also observed.

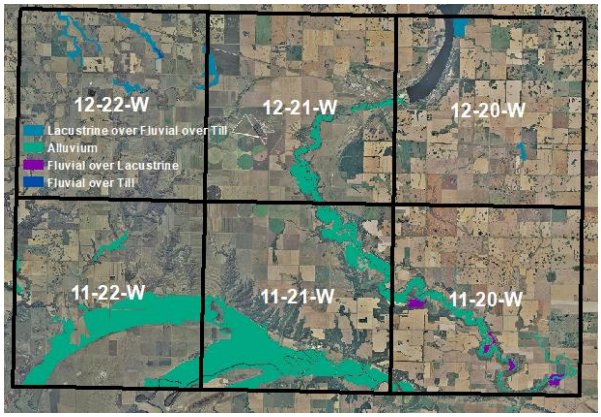


Figure 7. Alluvium and Lacustrine over Fluvial over Glacial Till Deposits in the RM of Riverdale

Part 2. Methodology

2.1 Mapping and Map Scale

Detailed soil mapping at a 1:20,000 scale [approx. five centimetres (cm) equals one kilometre (km)] was completed for the Rural Municipality of Riverdale. Soil profiles were examined to a depth of one metre at sites approximately 170 metres apart along traverses that were spaced approximately 800 metres apart. The direction of each traverse was determined on the basis of enhancing the information that could be derived from the range of soil-landscape variation in each section. Additional soil inspections occurred in complex soil areas to help locate boundaries between different soil series or variable soil phases. This method of surveying provided up to 32 inspections per section of land, or a soil inspection density of one site per 10 hectares (25 acres).

Based on all soil and landscape information collected during field inspections, the boundaries delineating various soil series are digitized using Geographic Information Systems (GIS) and three-dimensional viewing software – Summit Lite. This allows higher positional accuracy of soil polygons and contrast features. In the areas where previous soil surveys were done, some of the old soil polylines were revised based on new images and updated information.

2.2 Map Units

The information from soil inspection sites forms the basis for delineating soil boundaries on a map. Each geographic area enclosed by these soil boundaries is referred to as a soil polygon. Each soil polygon is named according to the soil series that are present in the polygon.

A soil series is defined as a naturally occurring soil body, so that any profile within that body has a similar number and arrangement of horizons whose colour, texture, structure, consistence, reaction and composition are within a narrowly defined range. If a soil has properties that vary slightly from the prescribed range of the series, a soil series **variant** is established.

A soil polygon can contain up to three named soil series. The collective name or label of a soil polygon is referred to as a map unit.

A map unit represents portions of the soil landscape that have characteristics and properties varying within narrow limits that are determined by the intensity of the survey. The map unit contains one or more soils or non-soils plus a certain proportion of unnamed and un-described inclusions. Map units are delineated on the basis of the types and relative proportions of their soils or non-soils, as well as on the basis of external criteria, such as slope, stoniness, erosion or salinity. Examples of a non-soil include water or bedrock.

2.3 Simple and Compound Map Units

There are two major types of map units: simple and compound. The difference between a simple and compound map is the proportion and contrast of their components.

A **Simple Map Unit** contains predominantly one soil or non-soil. The predominant component comprises at least 65 per cent, with up to 35 per cent of non-limiting, similar components (components that are alike in most properties and behaviour), or up to 25 per cent of non-limiting, dissimilar components (components that do not affect management of the map unit, but have a significant number of properties that vary from the predominant component), or up to 15 per cent of limiting, dissimilar components (components which have many contrasting properties and usually affect management differently).

A **Compound Map Unit** contains predominantly more than one soil or non-soil (or a combination of both). The proportions of the two major components may vary, from one considerably exceeding the other, to both being approximately equal. Complementary to the definition of a single map unit, the

proportions of components vary according to their areal extent and contrasting characteristics, as they may affect soil management or use. If other components are similar and non-limiting, no single component represents more than 65 per cent; or if other components are dissimilar and non-limiting, no single component represents 75 per cent or more; or if other components are dissimilar and limiting, no single component represents 85 per cent or more.

For the purpose of describing compound map units, components are considered dominant if they occupy over 40 per cent of the unit. They are considered significant between 15 and 40 per cent, and minor if they occupy less than 15 per cent. Minor components are described only if they are highly contrasting.

2.4 Phases

It is often desirable to indicate a condition or quality of soil property or landscape feature that deviates significantly from the normal definition of map units, using a map unit symbol. These variations or phases of soil properties and landscape features, varying from delineation to delineation, significantly affect soil behaviour and land management or use.

Soil properties that are commonly used as phase criteria include texture, depth, surface peat, salinity and physical disruption. Properties of land that are used include slope, wind and water erosion, stoniness, rockiness and altered drainage.

The four properties are erosion, slope class, degree of stoniness and salinity. The degree or magnitude of each is designated in Figure 9. The convention used to indicate these features in the map symbol is as follows:

If none of the above properties are observed to be significant, the map symbol representing the normal or unaffected soil series is used alone without modifiers (example in Figure 9).

If one or more phase features are recognized, the appropriate letter or number is placed below the soil series symbol in one of four designated locations in the map unit symbol. The designated order is erosion, slope class, stoniness and salinity. If a particular feature is not observed to be significant, an x is used in its appropriate designated location in the map symbol (Figure 9).

A simple map unit in Figure 9 can be interpreted as a Carvey soil (peaty variant) that has no erosion (x), is nearly level (b), and has no stones (x) or salinity (x).

An example of a compound unit (Figure 9) is as follows: 50 per cent consists of Newdale (NDL^5) series has no erosion (x), has very gently sloping topography (c), is moderately stony at the surface (2), and has no salinity (x), 30 per cent Varcoe (VRC^3) series that is slightly eroded (1), very gently sloping (c), has no stones (x) and is non-saline (x), and 20 per cent Drokan (DRO^2) series having no erosion (x), is nearly level in topography (b), has no stones (x) and no salinity (x) (Figure 9). If all the phases and features have an x designation, the four (x) phases are not shown in the map symbol (e.g. Miniota (MXI) in Figure 9).

2.5 Sampling and Analyzing

Over 400 soil surface and subsurface samples were collected and analyzed for texture (particle size), pH, organic carbon, electrical conductivity (EC) and calcium carbonate content. Soil cation exchangeable capacity (CEC) was also determined in detailed soil profile samples. The brief methodologies of lab analyses used to determine soil characteristics are:

- calcium carbonate: Calcimeter using 1M HCl
- CEC: Ammonia electrode
- EC: Saturated paste
- pH: 2:1 water to soil ratio
- organic carbon: Walkley-Black method
- particle size: Pipette method

Soil series maps contain labels similar to those shown in the pale brown boxes below. A description of each kind of label is indicated below.

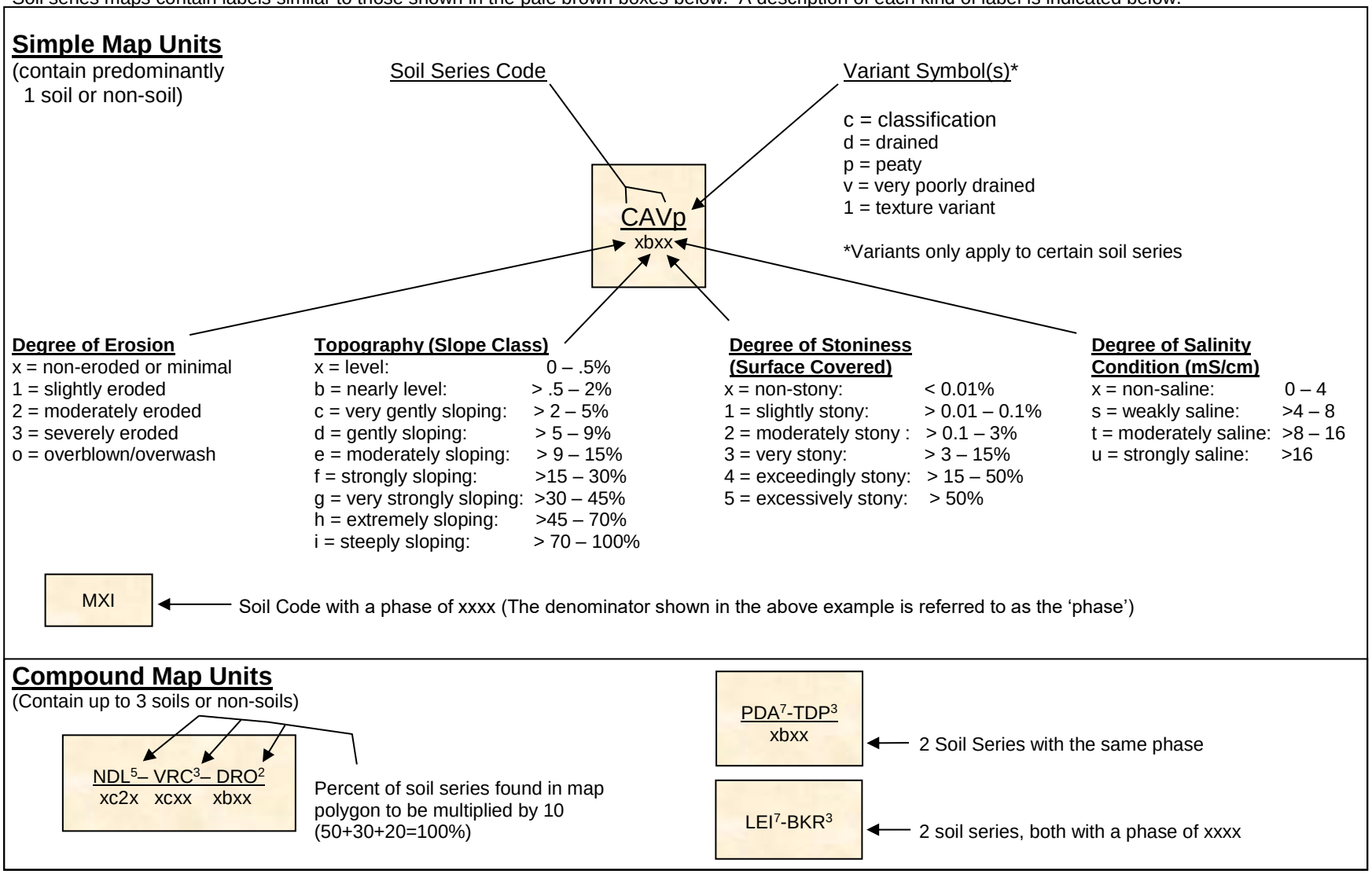


Figure 8: Map Unit Symbol

Part 3 Development and Classification

3.1 Introduction

This section of the report describes the main characteristics of the soils and their relationship to the factors of soil development. Soil development is related to the regional climate and the degree of leaching, translocation and accumulation of soluble and colloidal fractions of the soil. Soil drainage also plays a significant role in soil development. Soils in the RM of Riverdale have developed under a cool sub humid boreal climate (Grassland Transition Ecoclimatic Region), which provides sufficient moisture and heat for development of aspen-oak groves, tall prairie grasses and associated herbs. Consequently, the majority of soils in the area are Chernozemic soils.

3.2 Classification

Soils in the study area are classified according to the *Canadian System of Soil Classification* (SCWG, 1998). This system is hierarchical, employing five levels of generalization or categories of classification. Beginning with the most generalized, these categories are the order, great group, subgroup, family (association) and series. The classification is based on measurable soil properties that can be observed in the field, or can be inferred from other properties observable in the field. The properties selected as criteria for the higher categories are the result of soil genesis or of factors that affect soil genesis. Properties used to differentiate soils at the lower levels of family and series affect management. The five levels of generalization are defined as follows:

Order – Soil orders are defined on the basis of soil properties of the pedon that reflect the nature of the soil environment and the effects of the dominant soil-forming process. An example is a Chernozem, in which soils with dark coloured surface horizons developed under sub-humid climate and dominantly grassland environments.

Great Group – Each order is subdivided into great groups, based on differences in the strength of dominant processes or a major contribution of a process, in addition to a dominant one. Such processes result in particular kinds, arrangements and degrees of expressions of pedogenic horizons. An example is a Luvic Gleysol, in which the dominant process is considered to be gleying, but clay translocation is also a major process.

Subgroup – Subgroups are subdivisions of great groups, and are defined according to the kind and arrangement of horizons that indicate the conformity to the central concept of the great group (e.g., Orthic Luvic Gleysol, these soils have the general properties of the Gleysolic order and properties of the Luvic great group, with an organic or mineral-organic surface horizons).

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

Series – The series consists of soils that formed in a particular kind of material and have horizons with colour, texture, structure, consistency, thickness, reaction and chemical composition that are similar in differentiating characteristics and in arrangement in the soil profile.

The classification of soils in the study area in relation to parent material, texture and drainage is listed in Table 2. The proportion of soils in terms of land area and surface texture in the RM of Riverdale is shown in Table 3. Each individual soil series is described in detail in Appendix 2.

Table 2. Relationship between Soil Series, Drainage, Parent Material and Classification (Grassland transition subregion 2, Gt2-North)

Drainage	Soil Classification	Till (L, CL, SCL)			Lacustrine over Till			
		Loamy Extremely calcareous Till (L, CL, SiCL)	Loamy Mixed, Calc.	Loamy Or CL, SiCL) (shaly)	(FS, LFS) over Mixed Till or Extr. Calc.Till	(LVFS, FSL) over Mixed Till or Extr. Calc.Till	Fine Loamy (CL, SiCL) over Mixed Till	Clayey (SiC, C) over Mixed Till
Well to Mod. Well	Orthic Regosol	Madill (MXH)					Roddan (ROD)	
	Orthic Black Chernozem	Hilton (HIT)	Newdale (NDL)	Lenore (LNO)	Kirkness (KKS)	Lockhart (LKH)	Clementi (CLN)	Everton (EVO)
	Calc. Black Chernozem	Woodfield (WDF)	Cordova (CVA)				Kleysen (KYS)	
	Rego Black Chernozem	Bermont (BMN)	Rufford (RUF)				Chambers (CBS)	
	Orthic Dark Gray Chernozem							
Imperfectly	Gleyed Black Chernozem		Moore Park (MPK)				Cobfield (CBF)	Justice (JUC)
	Gl. Eluv. Black Chernozem		Angusville (ANL)					
	Gl. Calc. Black Chernozem		Lavinia (LAV)					
	Gl. Rego Black Chernozem	Barwood (BWO)	Varcoe (VRC)		Killeen (KLL)	Lindstrom (LDM)	Beresford (BSF)	Forrest (FRT)
	Gl. Dark Gray Chernozem		Petlura (PTU)					
Poorly	Orthic Gleysol		Hamiota (HMI)					
	Rego Humic Gleysol	Hickson (HKS)	Drokan (DRO)			Lonery (LOE)	Vodroff (VFF)	Fenton (FET)
	Humic Luvic Gleysol		Penrith (PEN)					

Soil texture abbreviations: C = clay, Co = coarse, F = fine, H = heavy, L = loam(y), M = medium, S = sand(y), Si = silt(y), and V = very.

Table 2. Relationship between Soil Series, Drainage, Parent Material and Classification (Grassland transition subregion 2, Gt2) (cont'd)

Drainage	Soil Classification	Lacustrine over Outwash			Fluvial	Lacustrine over Fluvial over Till	Fluvial over Till	Alluvium	
		MS, FS, LS over (CoS, MS)	(VFS, LVFS, SL, FSL) over (S & Gravel)	(L, SiL CL, SiCL) over (S + Gravel)	Sand and Gravel	(L, SiL, SiCL, CL) over (S & Gravel) Over (L, CL, SiCL)	(S & Gravel) over (L, CL, SiCL)	(VFSL, L, SiL, CL, SiCL)	(SiC, C)
Well to Mod. Well	Cumulic Regosol						Axford* (AXF)	Mowbray (MOW)	Manson (MXD)
	Orthic BL Chernozem	Wheatland (WHL)	Miniota (MXI)	Croyon (CYN)	Dorset (DOT)	Jaymar (JAY)			
	Calc. BL Chernozem				Marringhurst (MRH)	Dogand (DGA)	Chater (CXW)		
	Rego BL Chernozem		Ashmore (AHO)	Zarnet (ZRT)	Floors (FLS)				
Imperfectly	Gleyed Cumulic Regosol							Levine (LEI)	Assiniboine (ASB)
	Gleyed BL Chernozem	Hughes (HGH)	Wytonville (WVI)	Druxman (DXM)	Dexter (DXT)				
	Gleyed El. Bl. Chernozem					Longdens (LGD)			
	Gleyed Rego Bl. Chernozem	Gendzel (GDZ)	Kilmury (KUY)	Capell (CXT)	Mansfield (MFI)	Melland (MXT)	Barager (BAA) Boswell* (BSW)		
Poorly	Rego Humic Gleysol	Lowroy (LOW)	Bornett (BOR)	Carvey (CAV) Carvey, peaty (CAVp)	Fortina (FTN) Fortina, peaty (FTNp)	Marsden (MDN)		Basker (BKR) Basker, peaty (BKRp)	Kerran (KRN) Kornell (KOL)

***Fluvial over Lacustrine**

Table 2. Relationship between Soil Series, Drainage, Parent Material and Classification (Grassland transition subregion 2, Gt2) (cont'd)

Drainage	Soil Classification	Eolian	Lacustrine							
		Coarse (FS, LFS)	Coarse (FS, LFS)	Mod. coarse (VFS, LVFS, FSL)	Medium (VFSL, L, SiL)	Mod. Fine (CL, SiCL)	Fine (SiC, C)	(VFSL, L, SiL) over (FS, LFS, VFS, LVFS)	(CL, SiCL) over (FS, LFS, VFS, LVFS)	(SiC, C) over (FS, LFS, VFS, LVFS)
Well to Mod. Well	Orthic Regosol	Shilox (SHX)	Arizona (AIZ)	Brownridge (BWD)	Knolls (KLS)	Barren (BAE)				
	Orthic BL Chernozem		Stockton (SCK)	Prosser (PSE)	Fairland (FND)	Ramada (RAM)	Janick (JIK)	Glenboro (GBO)	Wellwood (WWD)	
	Calc. BL Chernozem				Traverse (TAV)	Rempel (RMP)				
	Rego BL Chernozem		Cactus (CCS)	Porple (POR)	Durnan (DRN)	Carroll (CXF)	Bankton (BAO)			
	Orthic Dark Gray Chern.		Dobbin (DOB)	Halstead (HAT)	Pollen (POL)	Firdale (FIR)				
Imperfectly	Gleyed Regosol	Onahan (ONH)								
	Gleyed BL Solonetz									Oliver (OIV)
	Gleyed BL Chernozem		Lavenham (LVH)	Gateside (GTD)	Torcan (TOC)	Charman (CXV)	Harding (HRG)	Petrel (PTR)	Oberon (OBR)	
	Gleyed El. Bl. Chernozem					Gregg (GRG)				
	Gleyed Rego Bl. Chernozem		Hummerston (HMO)	Pleasant (PLE)	Taggart (TGR)	Prodan (PDA)	Sigmund (SGO)	Grover (GRO)	Crookdale (CKD)	
	Gl. D.Gray Chernozem			Bone (BNE)		Danlin (DLN)				
Poorly	Rego Humic Gleysol	Mockry (MKY)	Sewell (SEE)	Poolex (POX)	Vordas (VDS)	Tadpole (TDP)	Lowton (LWN)	Grayson (GYS)	Sutton (SXP)	Landseer (LSR)
Very poorly	Terric Mesisol		Perillo (PER)[@]							
	Typic Mesisol		Xavier (XVI)[@]							

@ PER & XVI are organic soils. They were also found in the Grassland Transition, subregion 4 (Gt4) and Low Boreal subhumid subregion 2 (LBs2) from previous soil survey reports.

Table 3. Soil Series, Drainage, and Surface Texture in the RM of Riverdale

Soil Name	Soil Symbol	Soil Drainage	Surface Texture	Textural Group of Soil Profile	Total area		% of RM
					ha	ac	
Eroded Slopes	$ER	--	--	--	3,443	8,509	5.92
Marsh	$MH	--	--	--	314	775	0.54
Unclassified	$UL	--	--	--	995	2,458	1.71
Urban	$UR	--	--	--	193	477	0.33
Water	$ZZ	--	--	--	587	1,452	1.01
Angusville	ANL	Imperfect	Loam to clay loam	Medium to moderately fine	11	28	0.02
Arizona	AIZ	Rapid	Fine sand to loamy fine sand	Coarse	35	87	0.06
Ashmore	AHO	Well	Very fine sand to fine sand loam	Moderately coarse over very coarse	141	348	0.24
Assiniboine	ASB	Imperfect	Clay	Fine	1,316	3,252	2.26
Axford	AXF	Well	Medium sandy loam to loamy medium sand	Coarse to moderately coarse	39	97	0.07
Bankton	BAO	Well	Clay	Fine	316	780	0.54
Barren	BAE	Rapid	Clay loam	Moderately fine	131	323	0.22
Barwood	BWO	Imperfect	Loam to clay loam	Medium to moderately fine	20	50	0.03
Basker	BKR	Poor	Loam to clay loam	Medium to moderately fine	1,302	3,217	2.24
Beresford	BSF	Imperfect	Clay loam	Moderately fine	1,483	3,665	2.55
Bermont	BMN	Well	Loam to clay loam	Medium to moderately fine	20	48	0.03
Bornett	BOR	Poor	Very fine sand to fine sandy loam	Moderately coarse over very coarse	268	661	0.46
Boswell	BSW	Imperfect	Medium sandy loam to loamy medium sand	Coarse to moderately coarse	55	136	0.09
Brownridge	BWD	Rapid	Very fine sand to fine sand loam	Moderately coarse	89	220	0.15
Cactus	CCS	Well	Loamy fine sand to fine sand	Coarse	129	319	0.22
Capell	CXT	Imperfect	Loam to clay loam	Medium to moderately fine over very coarse	386	955	0.66
Carroll	CXF	Well	Clay loam	Moderately fine	1,675	4,138	2.88
Carvey	CAV	Poor	Loam to clay loam	Medium to moderately fine	84	208	0.14
Chambers	CBS	Well	Clay loam	Moderately fine	842	2,081	1.45
Charman	CXV	Imperfect	Clay loam	Moderately fine over coarse	670	1,657	1.15
Chater	CXW	Well	Sand and gravel	Very coarse	9	23	0.02
Clementi	CLN	Well	Clay loam	Moderately fine	805	1,988	1.38
Cobfield	CBF	Imperfect	Clay loam	Moderately fine	552	1,363	0.95
Cordova	CVA	Well	Loam to clay loam	Medium to moderately fine	624	1,541	1.07
Crookdale	CKD	Imperfect	Clay loam	Moderately fine	42	103	0.07

Table 3. Soil Series, Drainage, and Surface Texture in the RM of Riverdale (cont'd)

Soil Name	Soil Symbol	Soil Drainage	Surface Texture	Textural Group of Soil Profile	Total area		% of RM
					ha	ac	
Croyon	CYN	Well	Loam to clay loam	Medium to moderately fine over very coarse	911	2,250	1.56
Dexter	DXT	Imperfect	Sand and gravel	Very coarse	42	103	0.07
Dogand	DGA	Well	Loam to clay loam	Medium to moderately fine over coarse	48	119	0.08
Dorset	DOT	Well	Sand and gravel	Very coarse	235	582	0.40
Drokan	DRO	Poor	Loam to clay loam	Medium to moderately fine	1,434	3,542	2.46
Druxman	DXM	Imperfect	Loam to clay loam	Medium to moderately fine over very coarse	191	472	0.33
Durnan	DRN	Well	Loam	Medium	1,769	4,372	3.04
Everton	EVO	Well	Clay	Fine	45	111	0.08
Fairland	FND	Well	Loam	Medium	762	1,882	1.31
Fenton	FET	Poor	Clay	Fine	65	161	0.11
Floors	FLS	Well	Sand and gravel	Very Coarse	743	1,835	1.28
Forrest	FRT	Imperfect	Clay	Fine	230	568	0.39
Gateside	GTD	Imperfect	Fine sandy loam to very fine sand	Moderately coarse	38	93	0.06
Gendzel	GDZ	Imperfect	Medium, fine sand to loamy medium sand	Coarse over very coarse	173	428	0.30
Glenboro	GBO	Well	Very fine sandy loam to loam	Medium over coarse	411	1,017	0.71
Grayson	GYS	Poor	Very fine sandy loam to loam	Moderately coarse over coarse	119	294	0.20
Gregg	GRG	Imperfect	Clay loam	Moderately fine	2	4	0.00
Grover	GRO	Imperfect	Very fine sandy loam to loam	Medium over coarse	279	691	0.48
Hamiota	HMI	Poor	Loam to clay loam	Medium to moderately fine	7	18	0.01
Harding	HRG	Imperfect	Clay	Fine	202	500	0.35
Hilton	HIT	Well	Loam to clay loam	Medium to moderately fine	37	91	0.06
Hughes	HGH	Imperfect	Medium sand to loamy medium sand	Coarse over very coarse	173	427	0.30
Hummerston	HMO	Imperfect	Fine sand to loamy fine sand	Coarse	23	56	0.04
Janik	JIK	Well	Clay	Fine	164	405	0.28
Jaymar	JAY	Well	Loam to clay loam	Medium to moderately fine over coarse	48	118	0.08
Justice	JUC	Imperfect	Clay	Fine	121	300	0.21
Kerran	KRN	Poor	Clay	Fine	504	1,245	0.87
Kilmury	KUY	Imperfect	Very fine sand to fine sandy loam	Moderately coarse over very coarse	427	1,055	0.73
Kleysen	KYS	Well	Clay loam	Moderately fine	185	458	0.32

Table 3. Soil Series, Drainage, and Surface Texture in the RM of Riverdale (cont'd)

Soil Name	Soil Symbol	Soil Drainage	Surface Texture	Textural Group of Soil Profile	Total area		% of RM
					ha	ac	
Knolls	KLS	Rapid	Very fine sandy loam to loam	Medium	111	274	0.19
Kornell	KOL	Poor	Clay	Fine	159	393	0.27
Lavenham	LVH	Imperfect	Fine sand to loamy fine sand	Coarse	13	31	0.02
Lavinia	LAV	Imperfect	Loam to clay loam	Medium to moderately fine	511	1,263	0.88
Levine	LEI	Imperfect	Very fine sandy loam to clay loam	Medium to moderately fine	1,112	2,749	1.91
Lindstrom	LDM	Imperfect	Loamy very fine sand to fine sandy loam	Moderately coarse	44	108	0.08
Lockhart	LKH	Well	Loamy very fine sand to fine sandy loam	Moderately coarse	11	26	0.02
Lonery	LOE	Poor	Loamy very fine sand to fine sandy loam	Moderately coarse	7	16	0.01
Lowroy	LOW	Poor	Medium, fine sand to loamy medium sand	Coarse over very coarse	66	164	0.11
Lowton	LWN	Poor	Clay	Fine	376	928	0.65
Mansfield	MFI	Imperfect	Sand and gravel	Very coarse	45	111	0.08
Manson	MXD	Well	Clay	Fine	2	4	0.00
Marringhurst	MRH	Well	Sand and gravel	Very coarse	431	1,064	0.74
Marsden	MDN	Poor	Loam to clay loam		161	397	0.28
Melland	MXT	Imperfect	Loam to clay loam	Medium to moderately fine over very coarse	111	275	0.19
Miniota	MXI	Well	Very fine sand to fine sandy loam	Moderately coarse over very coarse	6,924	17,109	11.89
Moore Park	MPK	Imperfect	Loam to clay loam	Medium to moderately fine	1,061	2,622	1.82
Newdale	NDL	Well	Loam to clay loam	Medium to moderately fine	3,834	9,475	6.59
Petrel	PTR	Imperfect	Very fine sandy loam to loam	Medium over coarse	12	29	0.02
Pleasant	PLE	Imperfect	Very fine sand to fine sandy loam	Moderately coarse	177	438	0.30
Poolex	POX	Poor	Very fine sand to fine sandy loam	Moderately coarse	21	51	0.04
Porple	POR	Well	Very fine sand to fine sandy loam	Moderately coarse	495	1,224	0.85
Prodan	PDA	Imperfect	Clay loam	Moderately fine	2,059	5,089	3.54
Prosser	PSE	Well	Very fine sand to fine sandy loam	Moderately coarse	445	1,101	0.77
Ramada	RAM	Well	Clay loam	Moderately fine	1,285	3,176	2.21

Table 3. Soil Series, Drainage, and Surface Texture in the RM of Riverdale (cont'd)

Soil Name	Soil Symbol	Soil Drainage	Surface Texture	Textural Group of Soil Profile	Total area		% of RM
					ha	ac	
Rempel	RMP	Well	Clay loam	Moderately fine	202	498	0.35
Rufford	RUF	Well	Loam to clay loam	Medium to moderately fine	2,581	6,378	4.43
Sewell	SEE	Poor	Fine sand to loamy fine sand	Coarse	16	40	0.03
Sigmund	SGO	Imperfect	Clay	Fine	409	1,012	0.70
Stockton	SCK	Well	Fine sand to loamy fine sand	Coarse	212	525	0.36
Sutton	SXP	Poor	Clay loam	Moderately fine over coarse	1	3	0.00
Tadpole	TDP	Poor	Clay loam	Moderately fine	1,344	3,320	2.31
Taggart	TGR	Imperfect	Loam	Medium	631	1,559	1.08
Torcan	TOC	Imperfect	Loam	Medium	239	591	0.41
Traverse	TAV	Well	Clay loam	Moderately fine	428	1,057	0.73
Varcoe	VRC	Imperfect	Loam to clay loam	Medium to moderately fine	2,708	6,691	4.65
Vodroff	VFF	Poor	Clay loam	Moderately fine	494	1,222	0.85
Vordas	VDS	Poor	Loam	Medium	324	800	0.56
Wellwood	WWD	Well	Clay loam	Moderately fine over coarse	50	124	0.09
Wheatland	WHL	Well	Medium sand to loamy medium sand	Coarse over very coarse	2,310	5,709	3.97
Wytonville	WVI	Imperfect	Very fine sand to fine sandy loam	Moderately coarse over very coarse	756	1,869	1.30
Zarnet	ZRT	Well	Loam to clay loam	Medium to moderately fine over very coarse	69	170	0.12
Total					**58,211**	**143,843**	**100**

Part 4 Agricultural Use and Management Interpretations of Soils

4.1 Introduction

These sections provide predictions for the performance or soil suitability ratings for various land uses, based on soil and landscape characteristics, laboratory data and soil behaviour under specified conditions of land use and management. Suitability ratings or interpretations for various land use applications are intended to serve as guides for planners and managers.

The management of soil and landscape data using GIS technology enables rapid and more quantitative analysis of natural soil variability than is possible using manual techniques. The areal distribution of various soil components and properties that occur in complex landscapes can be highlighted in a mapped form to help plan and manage the soil resource. Such single factor maps and interpretative maps illustrate the distribution of individual soil properties and indicate the degree of soil limitation or potential for agricultural use and environmental applications.

A series of derived and interpretive maps are included in this section to assist in the interpretation of the soil resource information for the study area. The GIS uses the 1:20,000 scale soil map and related soil analysis and landscape information to generate these colour thematic maps.

The maps portray a selection of individual soil properties or landscape conditions for map unit delineations. Combinations of soil properties or landscape features affecting land use and management are derived as specific interpretations. Derived maps portray specific interpretations, based on the dominant condition in each map polygon.

Soil properties determine to a great extent the potential and limitations for both dryland and irrigation agriculture. In this section, interpretive soil information is provided for agricultural land use evaluations, such as soil capability for agriculture and irrigation suitability.

4.2 Soil Capability for Agriculture

The soil capability rating for agriculture is based on an evaluation of both the soil characteristics and landscape conditions that influence the soil suitability and limitations for agricultural use (Anon, 1965) (Appendix 1, Section A).

The class indicates the general suitability of the soils for agriculture. The first three classes are considered capable of sustained production of common field crops. The fourth is marginal for sustained arable agriculture. The fifth is suitable only for improved permanent pasture. The sixth is capable of use only for native pasture, while the seventh class is for soils and land types considered incapable of use for arable agriculture or permanent pasture.

Soil capability subclasses identify the soil properties or landscape conditions that may limit use or be a hazard. The various kinds of limitations recognized at the subclass level are defined in Section B of Appendix 1.

Class 1 soils in the map area have level to very gently sloping topography. They are deep, well to moderately well-drained, have moderate water holding capacity and have no major limitations for crop use.

Class 2 soils have moderate limitations that reduce the choice of crops or require moderate conservation practice. They include the imperfectly drained soils with a wetness limitation (2W), and the well-drained and imperfectly drained soils having a topographic limitation (2T). The two to five per cent slopes associated with the 2T soils may increase cultivation costs over that of a

smooth landscape and increase the risk of water erosion.

Class 3 soils have moderately severe limitations that restrict the range of crops or require moderate conservation practices. These soils usually associate with gently sloping topography (five to nine per cent) resulting in a moderate risk of water erosion.

Class 4 soils have significant limitations that restrict the choice of crops or require special conservation practices. Most Gleysols with improved drainage are generally grouped in this class. The timing of cultivation or choice of crops is severely limited because of the wetness limitation.

Class 5 soils have very severe limitations that restrict their capability to produce perennial forage crops. This class of soils usually has excess water (5W) or lack of moisture limitation (5M), including the lower, depressional areas of the poorly drained soils.

Class 6 soils have an extremely severe limitation due to excess wetness (6W), limited moisture (6M), or soil erosion (6E), which restricts their capability to produce perennial forage crops.

Class 7 soils have no capability for arable agriculture. However, these soils may have high capability for native vegetation species and habitat for waterfowl and wildlife.

A guideline table of dryland agricultural capability, as affected by soil characteristics and landscape, is listed in Table A1 of Appendix 1.

The dryland agricultural capability of lands in the RM of Riverdale is summarized in Table 4 and displayed in Map 2. Almost all of the land within the study area is suitable for dryland agriculture (Classes 1 – 5) (Table 4). Approximately 56 per cent of the land is considered to be prime agricultural land (Class 1 – 3) suitable for annual crop production.

Small pockets of class 1 lands occur in low lying, nearly level areas that are developed from lacustrine materials and are fine to moderately fine in texture. Class 2 (35 per cent) and 3 (20 per cent) lands mainly occur surrounding the incised streams that flow into the Assiniboine and Little Saskatchewan Rivers (Map 2). Major limitations within these two groups can be attributed to topography (2T, 3T), excess water and flooding (2W, 2WT, 3I). Areas with salinity (3N) and lack of moisture (3M) are also major limitations seen within these classes (Table 4).

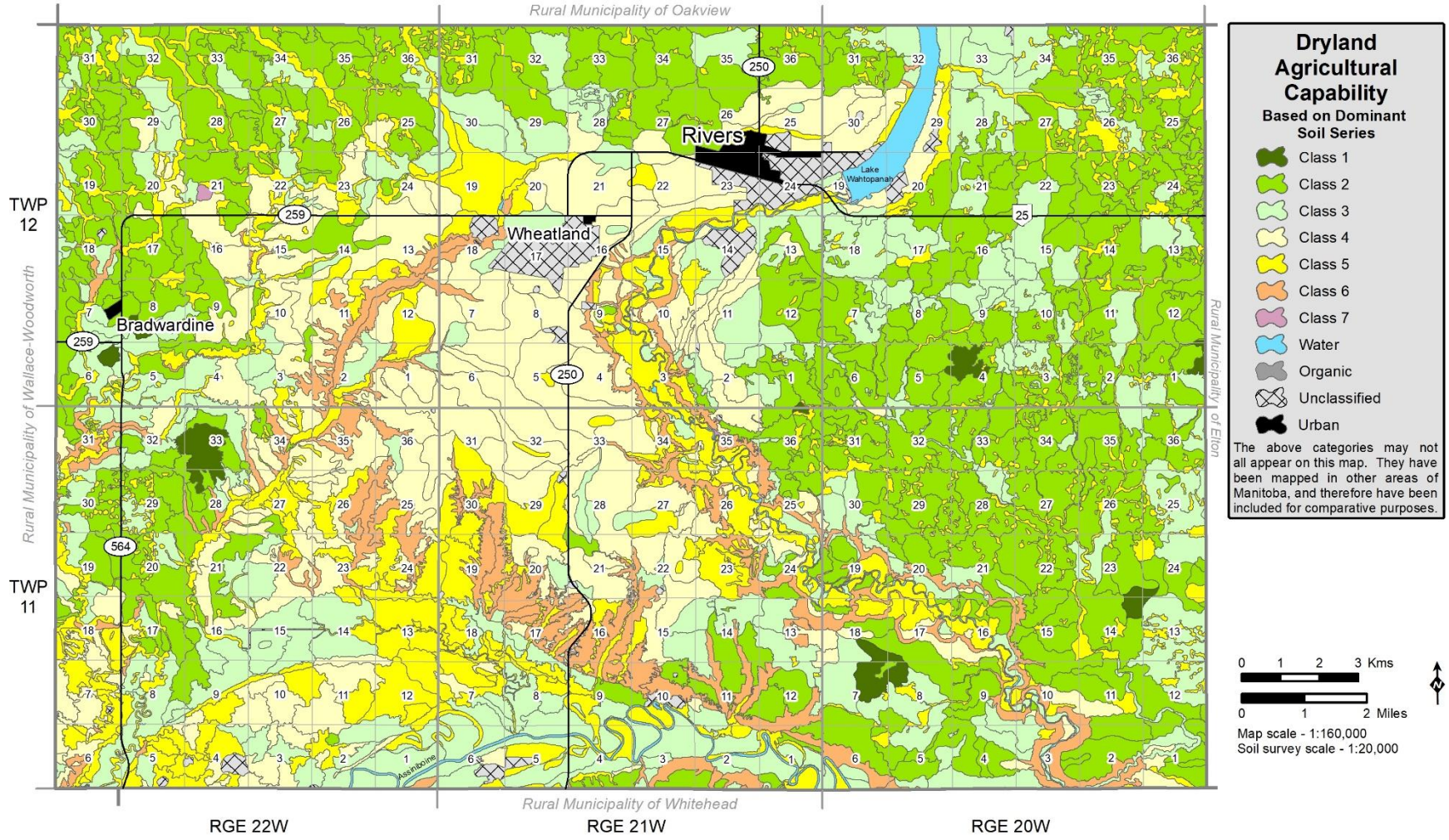
Lands designated with a class 4 rating are considered marginal for annual crop production and make up 16 per cent of the study area. The major limitation for Class 4 soils is moisture limiting, mainly due to coarse texture deposits (4M) within the study area. These lands occur mainly in the outwash area between the Assiniboine and Little Saskatchewan Rivers (Map 2).

Class 5 and 6 land are considered suitable for perennial and forage crops with improvement practice feasible for Class 5 lands only and make up 24 per cent of the study area. Major limitations within these classes are lack of moisture (5M) - occurring in river and stream outwash areas, excess water (5W) - occurring in low lying areas along the Assiniboine and Little Saskatchewan Rivers, and risk of erosion (6E and 6TE) - occurring mainly around the incised streams of the Assiniboine and Little Saskatchewan Rivers (Map 2).

An interpretative map (Map 2) depicts the rating of the dominant soil series and landscape features for each polygon. The nature of the subclass limitations and the rating of subdominant soil and landscape components are not shown at the scale of this map, but they are presented in detail in Table A2 of Appendix 1.

Table 4. Dryland Agricultural Capability of Land in the RM of Riverdale

Agricultural Capability Class		Total area		% of RM
		ha	ac	
1		464	1,146	0.80
2	2D	78	193	0.13
	2I	2	4	0.00
	2M	462	1,142	0.79
	2MT	617	1,524	1.06
	2T	8,720	21,548	14.98
	2TD	188	464	0.32
	2TE	529	1,306	0.91
	2W	4,596	11,357	7.90
	2WE	2	6	0.00
	2WT	4,183	10,337	7.19
	2X	905	2,235	1.55
Subtotal		20,282	50,116	34.84
3	3E	127	314	0.22
	3I	2,306	5,699	3.96
	3IN	122	302	0.21
	3M	2,432	6,009	4.18
	3ME	66	163	0.11
	3MN	30	74	0.05
	3MT	441	1,091	0.76
	3MW	35	87	0.06
	3N	2,006	4,956	3.45
	3T	4,011	9,912	6.89
	3TE	119	294	0.20
	3TN	9	23	0.02
Subtotal		11,704	28,924	20.11
4	4M	7,649	18,900	13.14
	4ME	86	213	0.15
	4MT	190	469	0.33
	4N	163	402	0.28
	4T	1,310	3,237	2.25
	4TE	116	286	0.20
Subtotal		9,514	23,507	16.35
5	5M	3,472	8,579	5.96
	5ME	202	499	0.35
	5MT	72	178	0.12
	5T	111	273	0.19
	5TE	104	257	0.18
	5W	4,796	11,851	8.24
	5WI	1,954	4,829	3.36
Subtotal		10,711	26,466	18.39
6	6E	3,000	7,413	5.15
	6T	443	1,096	0.76
	6TE	2	4	<0.01
Subtotal		3,445	8,513	5.92
7	7T	4	9	0.01
	7W	314	775	0.54
Subtotal		318	784	0.55
Urban		193	477	0.33
Unclassified		995	2,458	1.71
Water		587	1,452	1.01
Grand Total		**58,211**	**143,843**	**100**



Map 2. Dryland Agricultural Capability Map of the RM of Riverdale

4.3 Irrigation Suitability

The rating guidelines in this section are derived from *An Irrigation Suitability Classification System for the Canadian Prairies* (ISC, 1987). The irrigation suitability rating of the soils is based on soil and landscape characteristics. It does not consider factors such as method of water application, water availability, water quality or the economics of this type of land use.

Soil properties considered important for evaluating irrigation suitability are texture, soil drainage, depth to water table, salinity and geological uniformity.

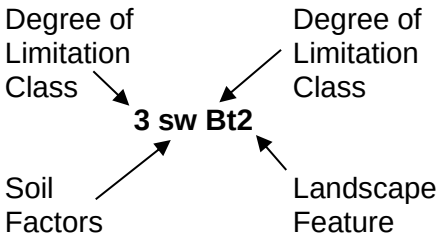
Landscape features considered important for rating irrigation suitability are topography and stoniness.

The irrigation suitability of the soil and landscape characteristics in the study area assists in making initial irrigation plans. The next step involves on site field investigation to examine the depth to water table, salinity and geological uniformity to a depth of three metres. Drainability, drainage outlet requirement, organic matter status and potential for surface crusting are other factors to consider. This assessment also considers potential impact of irrigation on non-irrigated areas, as well as on the irrigated area.

The most limiting soil property and landscape features are combined to determine the placement of a land area in one of 16 classes of irrigation suitability, which are grouped and described by four ratings: **Excellent, Good, Fair** and **Poor** (Table A3 of Appendix 1). The guidelines of assessing irrigation suitability are listed in Table A4 and A5 of Appendix 1, respectively.

A maximum of three codes is used to identify the subclass rating. Salinity (s) and drainage class (w) are soil factors that contribute to the soil rating of 3 or Moderate. The landscape limitation due to complex topography (t2) is Slight or (B). As the soil factor (3 or Moderate) is more limiting than the landscape feature (B or Slight), the general rating for this land area (3B) is fair (Appendix 1, Table A3 to A5).

An example of an irrigation suitability class rating with subclass limitations is shown as:



A summary of soils and their interpretive classification for irrigation suitability in the RM of Riverdale is presented in Table 5. The subdominant soil series and phases are considered when analyzing the data. Majority (73 per cent) of the soils in the RM of Riverdale is rated excellent, good or fair for irrigation suitability. The major limitations for "Good" class are soil permeability (2k) and the soils available water holding capacity (2m). Topography (Bt2) with slopes < 5 per cent also plays a large roll for the lands rated as "Good". For lands rated as "Fair" the major limiting factor is having imperfect drainage (3w).

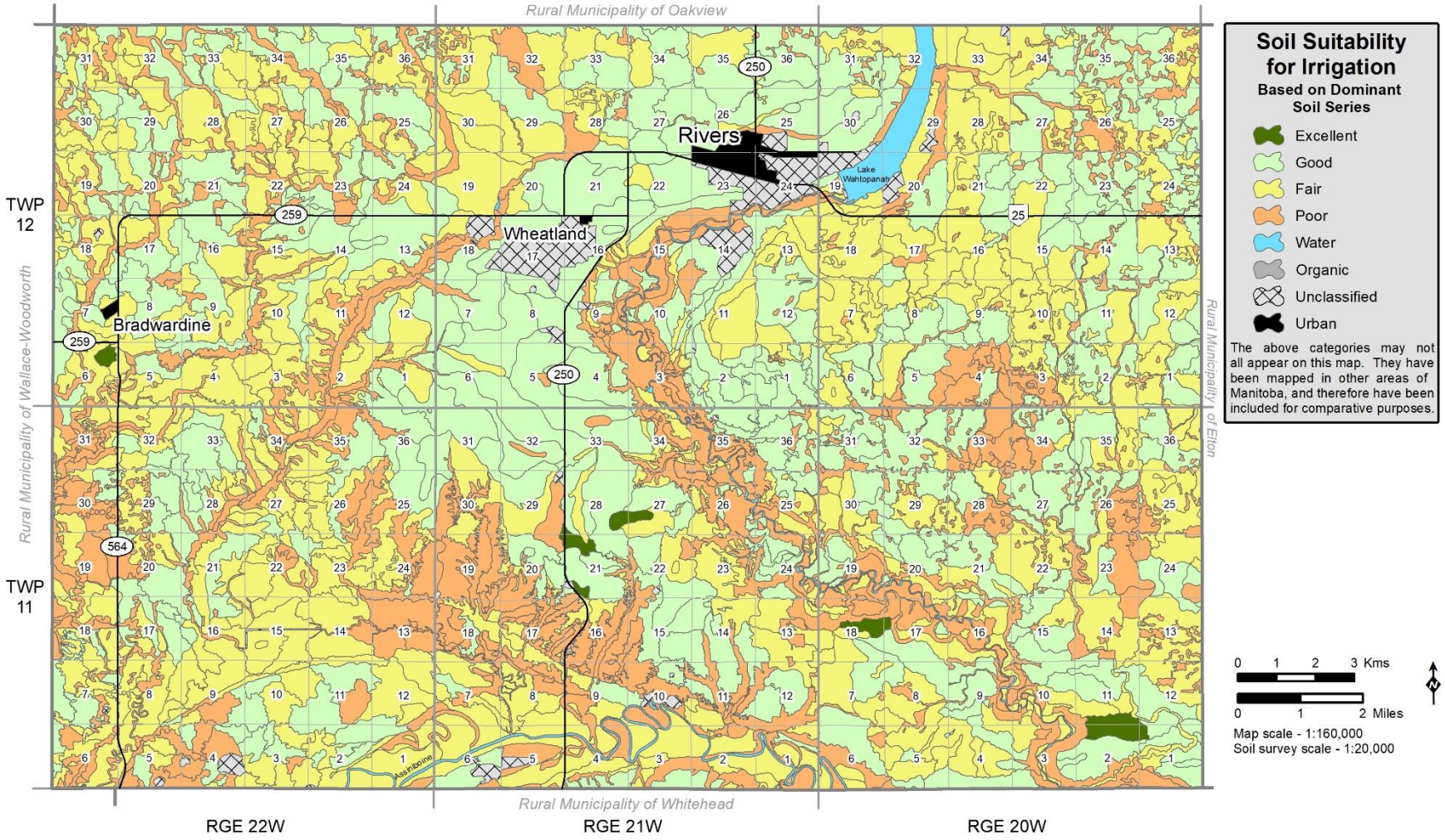
Topography, poor water holding capacity and poor / rapid drainage are the major limiting factors for lands rated as "Poor", accounting for 24 per cent of the study area.

Map 3 shows the largest connected area of land suitable for irrigation occurs in the outwash area between the Assiniboine and Little Saskatchewan Rivers in TWP 12 and 11 RGE 21. Irrigation development has already occurred in areas of the RM.

Irrigation suitability classes shown on Map 3 are based on the dominant soil for each polygon.

Table 5. Soil Irrigation Suitability in the RM of Riverdale

Class (%)	Soil & landscape features	Total area		% of RM
		ha	ac	
Excellent (0.43%)	1 A	250	617	0.43
Good (35.32%)	1 Bt2	1,957	4,836	3.36
	2gm A	455	1,125	0.78
	2gm Bt2	338	835	0.58
	2k A	403	997	0.69
	2k Bt2	1,902	4,699	3.27
	2kx A	753	1,860	1.29
	2kx Bt2	5,946	14,692	10.21
	2m A	2,837	7,011	4.87
	2m Bt2	3,477	8,592	5.97
	2mw A	765	1,890	1.31
	2mw Bt2	437	1,081	0.75
	2w A	397	982	0.68
	2w Bt2	910	2,248	1.56
Fair (37.37%)	1 Ct2	1,988	4,911	3.41
	2gm Ct2	90	223	0.16
	2k Ct2	1,030	2,544	1.77
	2kx Ct2	2,120	5,238	3.64
	2m Ct2	1,400	3,460	2.41
	2mw Ct2	16	40	0.03
	2w Ct2	71	175	0.12
	2x Ct2	11	26	0.02
	3kw A	11	28	0.02
	3kw Bi	1,055	2,606	1.81
	3kw Bt2i	262	647	0.45
	3kx A	2	4	0.00
	3m A	278	688	0.48
	3m Bt2	1,392	3,441	2.39
	3m Ct2	729	1,801	1.25
	3mw A	121	298	0.21
	3mw Bt2	199	492	0.34
	3mw Ct2	26	65	0.05
	3mx A	30	75	0.05
	3mx Bt2	25	61	0.04
	3s A	30	74	0.05
	3s Bt2	61	151	0.11
	3sw A	927	2,290	1.59
	3sw Bt2	822	2,031	1.41
	3sw Ct2	9	23	0.02
	3w A	3,927	9,703	6.75
	3w Bi	426	1,052	0.73
	3w Bt2	3,477	8,591	5.97
	3w Bt2i	687	1,696	1.18
	3w Ct2	484	1,195	0.83
	3wx Bt2	44	108	0.08
Poor (23.84%)	1 Dt2	43	106	0.07
	2k Dt2	8	20	0.01
	2kx Dt2	48	118	0.08
	2m Dt2	61	151	0.11
	3m Dt2	12	30	0.02
	4gm Bt2	10	24	0.02
	4gm Ct2	39	96	0.07
	4k A	362	895	0.62
	4k Bt2	34	84	0.06
	4ks A	66	163	0.11
	4kw A	367	906	0.63
	4kw Bi	159	393	0.27
	4kw Bt2	21	51	0.04
	4kw Ci	504	1,245	0.87
	4kx A	587	1,451	1.01
	4kx Bt2	423	1,045	0.73
	4kx Ct2	69	170	0.12
	4m A	371	917	0.64
	4m Bt2	422	1,042	0.72
	4m Ct2	2,199	5,433	3.78
	4m Dt2	1,947	4,811	3.34
	4s A	53	131	0.09
	4s Bt2	97	240	0.17
	4sw A	335	829	0.58
	4sw Bt2	38	94	0.07
	4w A	3,127	7,727	5.37
	4w Bt2	709	1,751	1.22
	4w Ci	1,302	3,217	2.24
	4w Ct2	135	335	0.23
	4wx Di	314	775	0.54
Unclassified land, urban and water		1,775	4,387	3
Total		58,211	143,843	100



Map 3. Irrigation Suitability of the RM of Riverdale

4.4 Soil Suitability for Irrigated Potato Production

An evaluation of soil properties and landscape features was used to generate a five-class rating of land for irrigated potato production. Soil properties considered were texture, soil drainage, salinity and sodicity. Landscape features considered were topography and stoniness. The most suitable soil and landscape conditions occur in **Class 1** and the least desirable conditions occur in **Class 5**. Details regarding the criteria applied in the suitability rating are described in Tables A6 and A7 of Appendix 1.

Assumptions:

This evaluation examines soil and landscape factors that are important for irrigated production of potatoes for processing. Production of seed and table potatoes with irrigation may not be affected to the same degree by soil conditions such as stoniness and texture.

Stoniness hinders soil preparation, interferes with harvesting, and increases the chances of potato bruising during harvest.

Deep, well-drained sandy loam to loam soils exhibit favorable properties for the production of high-quality potatoes. Clay soils with impeded internal soil drainage have a severe limitation to potato production because of reduced oxygen supply and increased incidence of fungal diseases. An increased risk of delayed spring tillage, planting and crop harvesting due to wet conditions can occur on fine textured soils.

Slope or topography reduces uniform water infiltration and increases the potential for soil erosion and nutrient loss.

This evaluation of soil and landscape properties does not incorporate additional factors that must be assessed for sustainable irrigated production of potatoes.

The environmental impact of intensive management practices on soil and water quality, the supply of good quality water, and the suitability of climatic conditions for optimum potato production must all be evaluated.

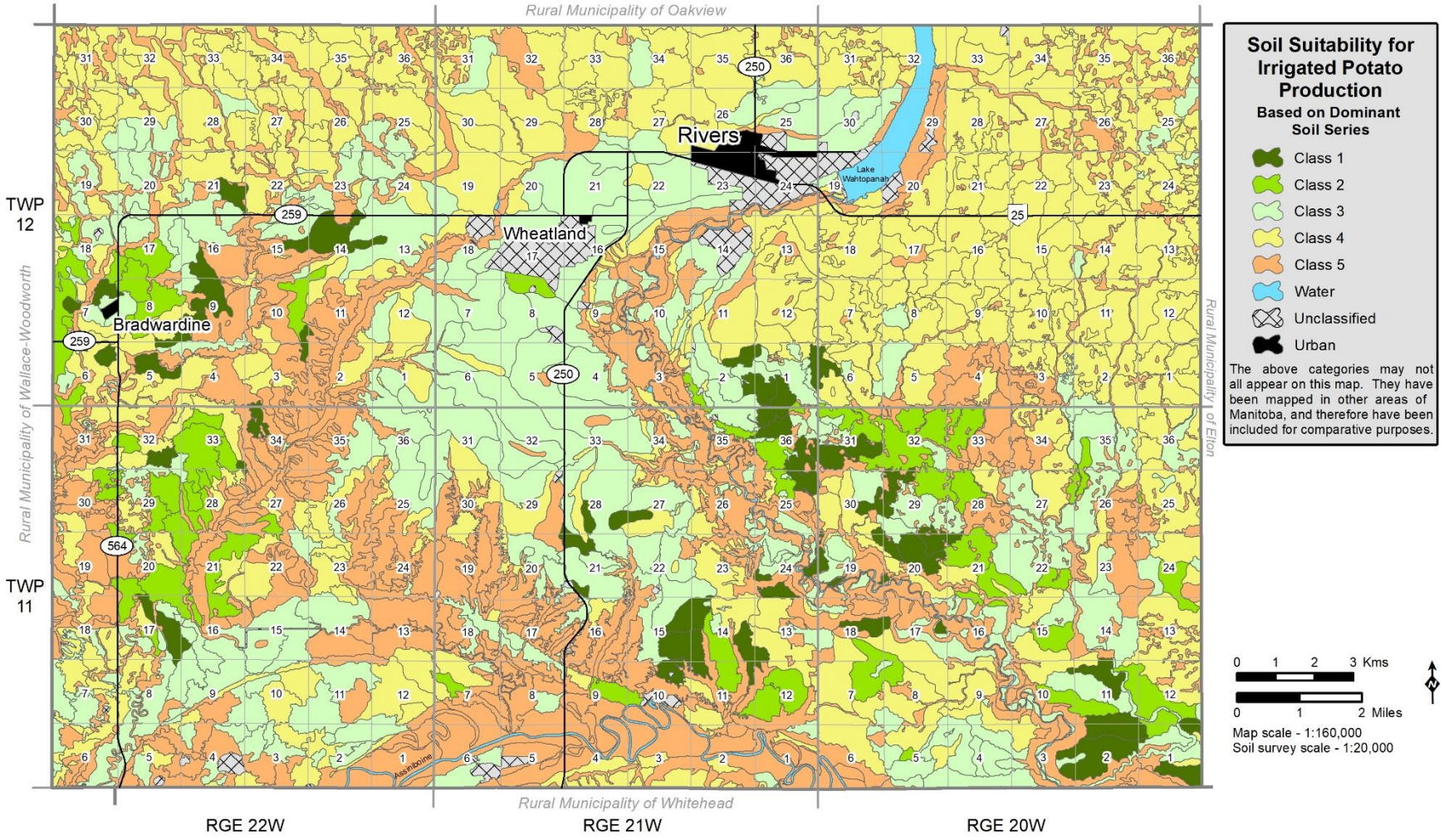
Integration of related databases in a GIS environment can be used to create a map that depicts the rating of the dominant soil and landscape feature for each soil polygon. The nature of the subclass limitations and the rating of subdominant soil and landscape components are not shown at this scale, but are indicated in Table A2 of Appendix 1.

Majority (63 per cent) of the land in the RM of Riverdale is not suitable for irrigated potato production (Class 4 and 5) and is primarily due to soil texture, moisture and topography. Only eight per cent of soils in the RM of Riverdale are suitable for irrigated potato production (Class 1 and 2). Approximately, 26 per cent of the study area is rated as Class 3 and would be considered borderline suitable for irrigated potato production (Table 6).

Table 6. Soil Irrigation Suitability for Potato Production in the RM of Riverdale

Potato Suitability Class	Total area		% of RM
	ha	ac	
Class 1	2,192	5,417	3.77
Class 2	2,502	6,182	4.30
Class 3	15,082	37,267	25.91
Class 4	19,604	48,442	33.68
Class 5	17,057	42,148	29.30
Water	587	1,452	1.01
Unclassified	1,188	2,935	2.04
Total	58,211	143,843	100

An interpretative map (Map 4) illustrates the rating of the dominant soil series and landscape features for each polygon.



Map 4. Soil Suitability for Irrigated Potato Production in the RM of Riverdale

4.5 Soil Texture

Mineral particles in soil are grouped according to size into sand (two to <0.15 mm in diameter), silt (<0.15 to <0.002 mm) and clay (less than <0.002 mm). The proportion of individual mineral particles present in a soil is referred to as texture. Soil texture is described by means of 13 textural classes, defined according to the relative proportions of sand, silt and clay (Figure 9). The presence of larger particles (diameter is greater than two mm) in soil is recognized as:

Gravelly – particles ranging from 0.2 to 7.5 cm in diameter

Cobbly – rock fragments ranging from 7.5 to 25 cm in diameter

Stony – rock fragments ranging from 25 to 60 cm in diameter, or if flat, 38 to 60 cm long

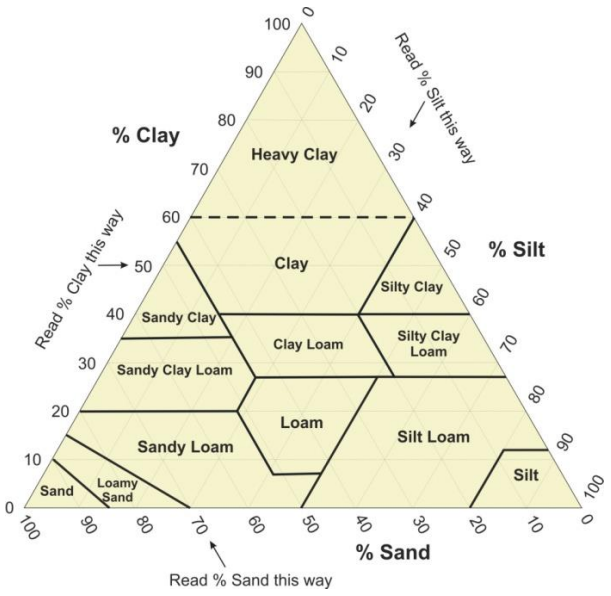


Figure 9. Soil Texture Triangle

Soil texture strongly influences the soil's ability to retain moisture, its fertility and its ease or difficulty of cultivation. Water moves easily through coarse-textured (sandy) soils, so little moisture is retained and they dry out more quickly than fine textured (clay) soils. Sandy soils do not retain plant nutrients as well as clay soils and are lower in natural fertility. Sandy soils often are characterized by loose or single grained structure, which is very susceptible to wind erosion. Clay soils have a high proportion of very small pore spaces that hold moisture tightly. They are usually fertile, because they are able to retain plant nutrients. Clay soils transmit water very slowly, so these soils are susceptible to excess soil moisture conditions. Textural classes are grouped as coarse, medium and fine with sub groups and classes (Table 7).

Table 7. Soil Texture Groups

Texture group		Texture	
		Class	Symbol
Coarse	Very coarse	Very coarse sand	VCoS
		Coarse sand	CoS
		Medium sand	S or MS
	Coarse	Fine sand	FS
		Loamy coarse sand	LCoS
		Loamy sand	LS or LMS
		Loamy fine sand	LFS
	Mod. coarse	Very fine sand	VFS
		Loamy very fine sand	LVFS
		Coarse sandy loam	CoSL
		Sandy loam	SL or MSL
		Fine sandy loam	FSL
Medium	Medium	Very fine sandy loam	VFSL
		Loam	L
		Silt loam	SiL
		Silt	Si
Fine	Mod. fine	Sandy clay loam	SCL
		Clay loam	CL
		Silty clay loam	SiCL
	Fine	Sandy clay	SC
		Silty clay	SiC
		Clay	C
	Very fine	Heavy clay	HC

Table 8. Lab Results of Soil Surface Texture in the RM of Riverdale

Texture	# of samples	% of total
Heavy Clay	8	2.0
Clay	14	3.5
Silty Clay	34	8.5
Clay Loam	87	21.6
Silty Clay Loam	26	6.5
Sandy Clay Loam	35	8.7
Silt	1	0.2
Silt Loam	10	2.5
Loam	37	9.2
Very Fine Sandy Loam	4	1.0
Fine Sandy Loam	26	6.5
Medium Sandy Loam	54	13.4
Coarse Sandy Loam	30	7.5
Loamy Fine Sand	3	0.7
Loamy Medium Sand	27	6.7
Loamy Coarse Sand	3	0.7
Medium Sand	3	0.7
Total	**402**	**100**

A total of 402 surface soil samples (A horizon) were analysed for particle size. The study area is dominated by clay loam (22 per cent) and medium sandy loam (13 per cent) surface soil textures. The third dominant soil texture in the RM of Riverdale is sandy clay loam (eight per cent) (Table 8).

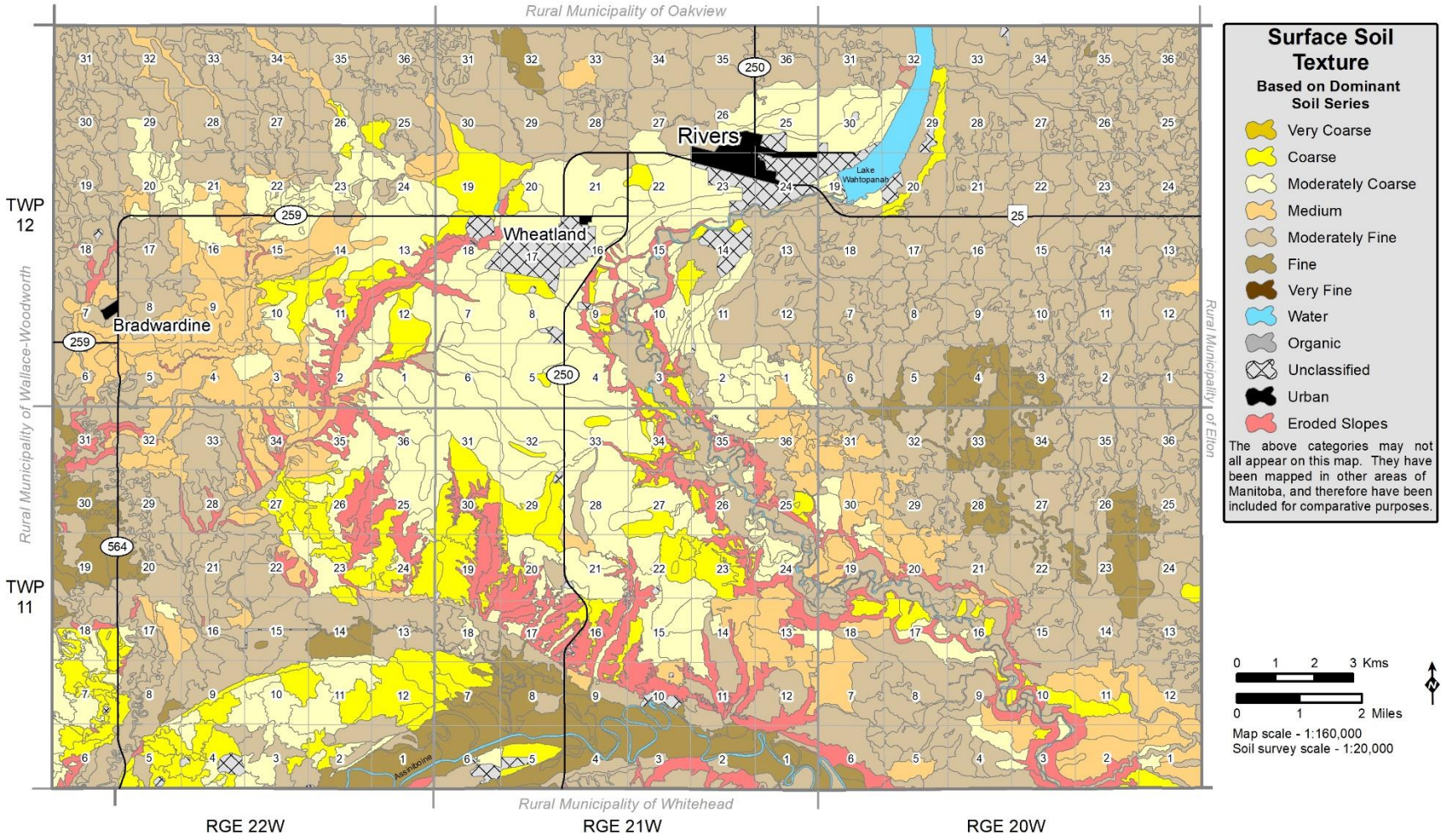
Based on the dominant soil in the soil polygons, the different soil textures and their texture groups are summarized in Table 9 and displayed in Map 5. Lab determined soil texture and surface texture based on soil polygons show similar patterns. The dominant surface soil texture in the RM of Riverdale is clay loam (44 per cent) which was observed within the Lake Souris Basin and Newdale Till Plain followed by (Medium) sandy loam (13 per cent), mainly observed in the outwash areas surrounding the Assiniboine and Little Saskatchewan Rivers.

Table 9. Soil Surface Texture and their Proportions in the RM of Riverdale

Texture group	Texture	Total area		% of RM
		ha	ac	
Very coarse	GRSL*	1,173	2,899	2.02
Coarse	LCoS	2,546	6,291	4.37
	LFS	667	1,649	1.15
	LS	308	761	0.53
Mod. coarse	FSL	2,266	5,600	3.89
	LVFS	280	692	0.48
	SL	7,351	18,164	12.63
Medium	VFSL	942	2,328	1.62
	L	2,496	6,167	4.29
	SiL	2,521	6,228	4.33
Mod. fine	CL	25,756	63,644	44.25
	SCL	1,345	3,324	2.31
	SiCL	1,432	3,540	2.46
Fine	C	1,217	3,007	2.09
	SiC	2,692	6,652	4.62
Unclassified, eroded slope, urban & water		5,219	12,896	9
Total		58,211	143,843	100

* GRSL = gravelly sandy loam.

Surface soil texture, shown in Map 5, illustrates the textural group of the dominant soil for each polygon.



Map 5. Soil Surface Texture in the RM of Riverdale

4.6 Soil Drainage

Soil drainage refers to the frequency and duration of periods when the soil is free of saturation. Excessive water content in soil limits the free movement of oxygen and decreases the efficiency of nutrient uptake. Delays in spring tillage and planting are more frequent in depressional and imperfectly to poorly drained areas of a field. Improved surface drainage and underground tile drainage are management considerations that can reduce excessive moisture conditions in soils. The majority of poorly drained soils remain in the native state, supporting vegetation associated with wetlands and marsh. Five soil drainage classes are described below.

Rapidly drained - Water is removed from the soil rapidly in relation to supply. Excess water flows downward if underlying material is pervious. Subsurface flow can occur on steep slopes during heavy rainfall. Soils have low water storage capacity and are usually coarse in texture.

Well-drained - Excess water is removed from the soil, readily flowing downward into underlying pervious material or laterally as subsurface flow.

Imperfectly drained - Water is removed from the soil sufficiently slowly in relation to supply to keep the soil wet for a significant part of the growing season. The sources of moisture include precipitation and groundwater.

Poorly drained - Water is removed so slowly in relation to supply that the soil remains wet for a comparatively long part of the time when the soil is not frozen. The main water source is subsurface flow and groundwater, in addition to precipitation.

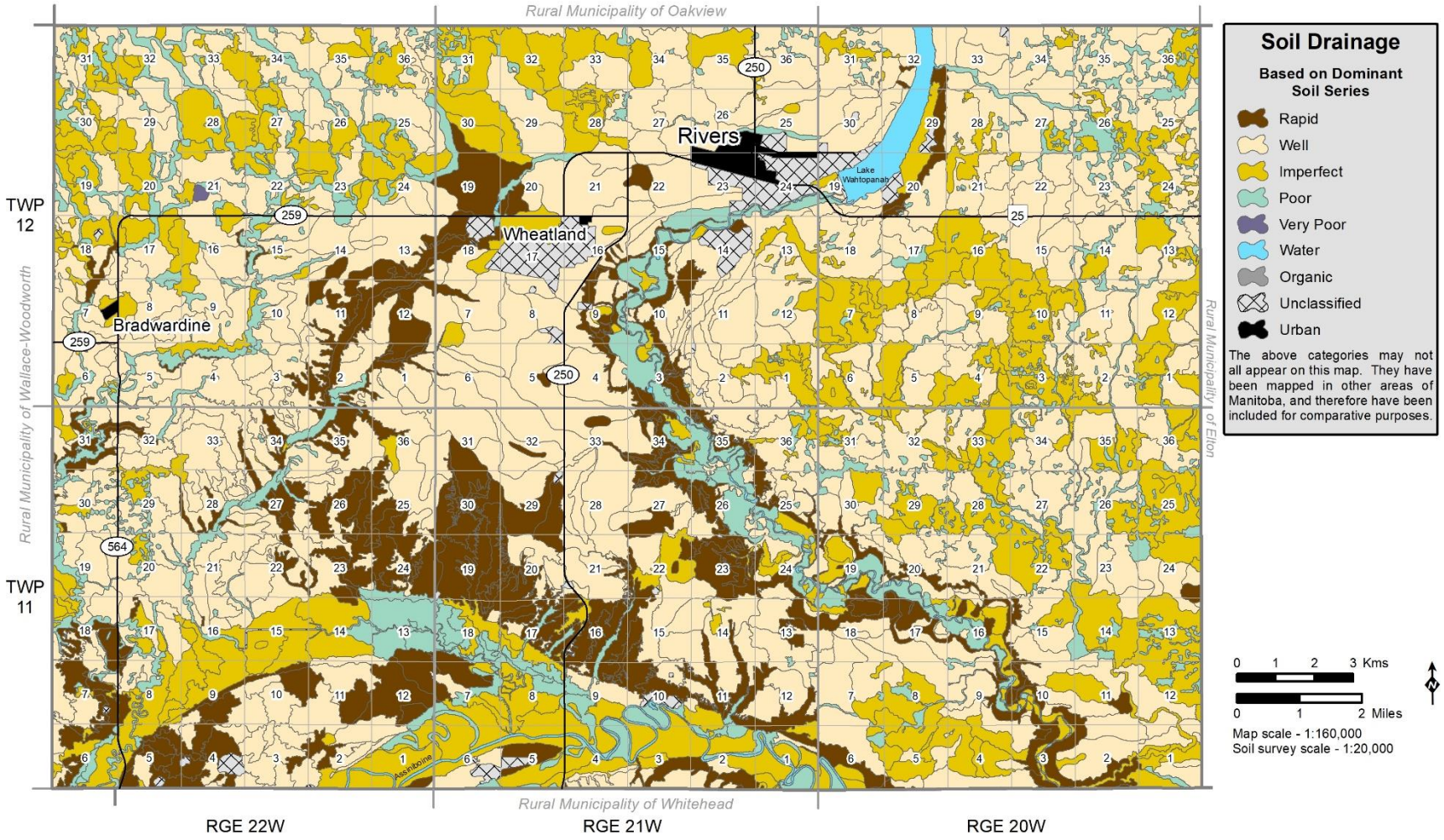
Very poorly drained - Water is removed from the soil so slowly that the water table remains at, or on, the surface for the greater part of the time that the soil is not frozen. Excess water is present in the soil throughout most of the year.

Soil drainage is affected by factors such as landscape, surface texture and land use practices. Table 10 indicates the majority of the soils in the study area are well-drained (44 per cent) followed by imperfect drainage (28 per cent). Rapidly drained soils cover approximately 12 per cent of the land area, mainly located along the eroded slopes and outwash areas with coarse textures surrounding the Assiniboine and Little Saskatchewan Rivers and their tributaries (Map 6). Poorly and very poorly drained soils account for 12 per cent of the land area and are confined to low lying areas within the study area (Table 10).

Table 10. Soil Drainage Classes in the RM of Riverdale

Drainage Class	Total area		% of RM
	ha	ac	
Rapid	7,237	17,883	12.43
Well	25,809	63,774	44.34
Imperfect	16,327	40,344	28.05
Poor	6,750	16,680	11.60
Very Poor	314	775	0.54
Water	587	1,452	1.01
Unclassified / Urban	1,188	2,935	2.04
Total	58,211	143,843	100

Soil Drainage classes shown on Map 6 are based on the dominant soil for each polygon.



Map 6. Soil Drainage in the RM of Riverdale

4.7 Soil Erosion

Erosion is defined as the detachment and movement of soil particles by water, wind, ice or gravity. Soil erosion by water is the main concern on undulating and hummocky soil landscapes in the agricultural region of Manitoba. Soil loss resulting from rainfall-runoff is usually due to combinations of raindrop splash, sheet, rill, gully and channel bank erosion. Sheet and rill erosion are usually least apparent in the landscape, but often the most damaging, since it causes gradual thinning of the soil profile over the entire slope. Sheet erosion tends to occur on upper slopes and ridges, whereas the more visible rills form in the area of concentrated runoff on mid and lower slopes. The deposition of eroded soil at the base of slopes or in ditches constitutes additional losses and costs attributed to erosion.

Wind erosion has its largest influence on sandy (coarse) textured, cultivated soils on relatively level landscapes. However, all soils are subject to wind erosion if vegetation or crop residues do not cover the soil surface. Continuous cropping and minimum or zero tillage to maximize residue cover will reduce the risk of erosion. Row crops, such as potatoes, produce low amounts of residue. Therefore, seeding annual crops, such as fall rye and winter wheat, will help to protect the soil surface during the critical post-harvest period, until the establishment of groundcover the following spring.

The impact of soil erosion on soil loss and productivity is not easily measured. In addition to nutrient loss from soil erosion, there is physical deterioration of the soil, resulting in lower water holding and infiltration capacity, and poorer surface structure. Crops are then susceptible to more frequent and severe water stress and lower crop yields occur.

The ratings of soil erosion are generally classified into three categories:

Slightly eroded – soil with a sufficient amount of the A horizon removed that ordinary tillage will bring up and mix the B-horizon or lower horizons.

Moderately eroded – soil with the entire A horizon and a part of the B or lower horizons removed.

Severely eroded – soils that have practically all of the original surface soil removed and the tilled layer consists mainly of C-horizon material. This condition occurs on knolls and steep upper slope positions.

Erosion in the RM of Riverdale is not severe with 81 per cent of the soils having no or minimal erosion and 10 per cent having only slight erosion (Table 11). Approximately six per cent of the study area has moderate or severe erosion and generally is isolated to the areas classified as eroded slopes that surround the Assiniboine and Little Saskatchewan River valleys.

Table 11. Soil Erosion Classes in the RM of Riverdale

Observed Erosion Class	Total area		% of RM
	ha	ac	
Non-eroded or minimal	47,232	116,712	81.14
Slightly	5,791	14,310	9.95
Moderately	1,500	3,707	2.58
Severely	1,913	4,727	3.29
Water	587	1,452	1.01
Unclassified / Urban	1,188	2,935	2.04
Total	58,211	143,843	100

Soil erosion classes shown on Map 7 are based on the dominant soil for each polygon.

Map 7. Degree of Erosion Observed in the RM of Riverdale

4.8 Topography

Slope describes the steepness of the landscape surface. The degree and length of slope are important topographic factors affecting the potential for surface runoff and infiltration of precipitation.

Ten slope classes are used to denote the dominant, but not necessarily the most severe slopes within a mapping unit (Table 12).

Table 12. Slope Classes Used in Soil Map

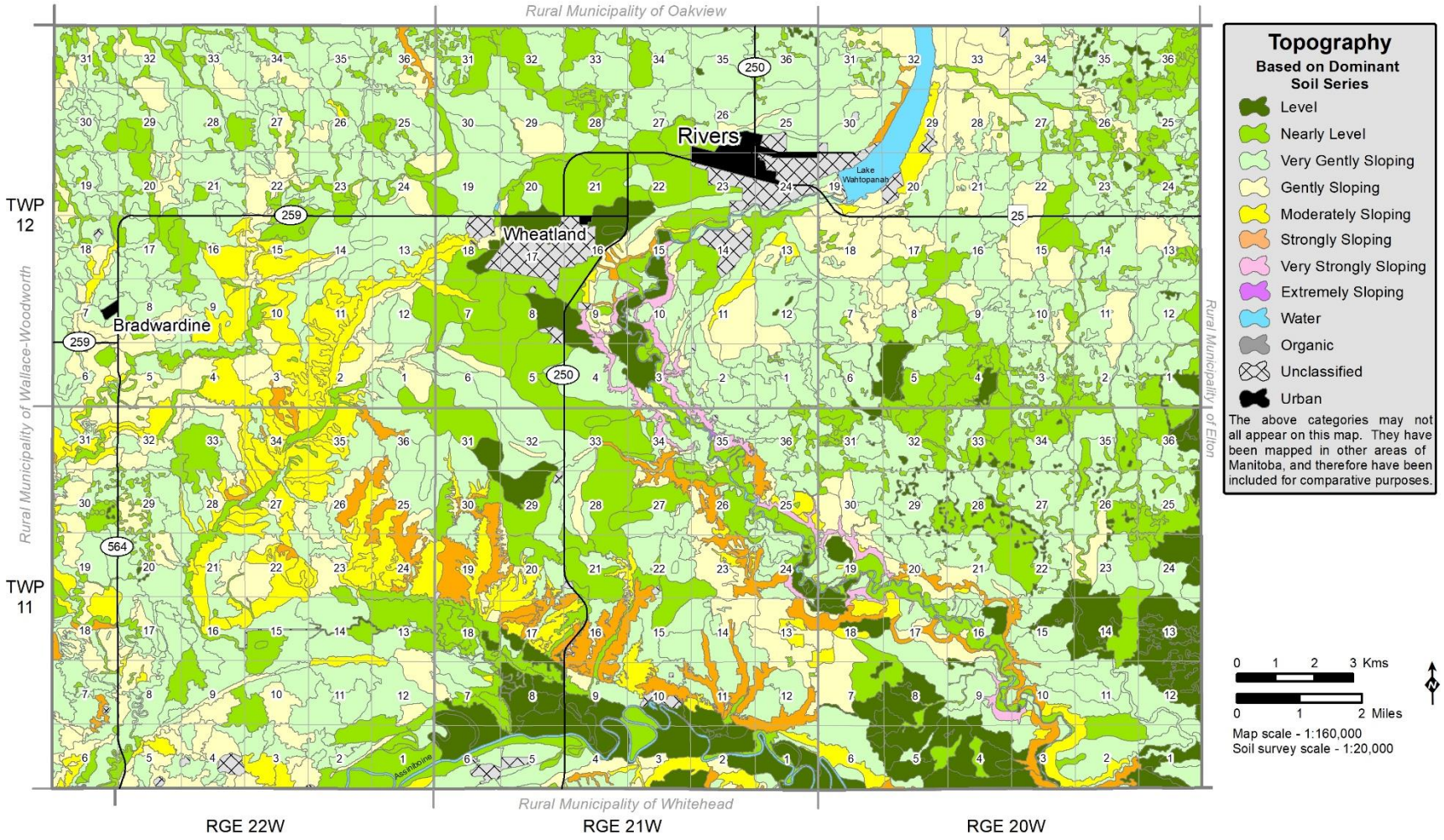
Slope Class	Slope Description	% Slope
x	Level	0 - 0.5
b	Nearly level	>0.5 - 2.0
c	Very gently sloping	>2.0 - 5.0
d	Gently sloping	>5.0 - 9.0
e	Moderately sloping	>9.0 - 15
f	Strongly sloping	>15 - 30
g	Very strongly sloping	>30 - 45
h	Extremely sloping	>45 - 70
i	Steeply sloping	>70 - 100
j	Very steeply sloping	>100

Being located in the transitional area between the Lake Souris Basin (Stockton and Shilo Ecodistrict) and the Newdale Till Plain (Hamiota Ecodistrict) (Figure 2) and the influence of the Assiniboine and Little Saskatchewan River incising steep valleys into the landscape, topography in the RM of Riverdale is quite variable in some areas. Majority of the land area in the RM of Riverdale are very gently sloping (42 per cent) to gently sloping (12 per cent) land generally occurring in the Newdale Till Plain (Hamiota Ecodistrict). Nearly level (24 per cent) and level (8.5 per cent) slopes account for one-third of the land area and generally occur in the Lake Souris Basin (Stockton and Shilo Ecodistrict). Steep slopes (slopes greater than 15 per cent) make up the remaining land areas and are mainly isolated to the incised streams, tributaries and valleys along the Assiniboine and Little Saskatchewan River.

Table 13. Topography observed in the RM of Riverdale

Topography (Slope Class)	Total area		% of RM
	ha	ac	
Level	4,960	12,256	8.52
Nearly level	14,005	34,607	24.06
Very gently sloping	25,024	61,836	42.99
Gently sloping	6,887	17,018	11.83
Moderately sloping	3,448	8,520	5.92
Strongly sloping	1,663	4,111	2.86
Very strongly sloping	445	1,100	0.76
Extremely sloping	4	9	0.01
Water	587	1,452	1.01
Unclassified / Urban	1,188	2,935	2.04
Total	58,211	143,843	100

Topography slope description and classes are shown on Map 8 and are based on the dominant soil for each polygon.



Map 8. Topography of the RM of Riverdale

4.9 Stoniness

Soils with stones can hinder tillage, planting and harvesting operations. The degree of stoniness is described by five classes. Class 1 stoniness is not considered a limitation for soil capability, since there is little or no hindrance to cultivation and clearing is generally not required. Although stone clearing can be a mechanized procedure, it presents a management cost that does not occur in non-stony soils.

As aforementioned, stones are 25 to 60 cm in diameter, or if flat, 38 to 60 cm long. The classes of stoniness are defined as follows:

Stones 0 or x. (Non-stony) - land having less than <0.01 per cent of surface occupied by stones.

Stones 1. (Slightly stony) - land having <0.01 to 0.1 per cent of surface occupied by stones. Stones are 15 to 30 cm in diameter, 10 to 30 metres apart. The stones offer only slight to no hindrance to cultivation.

Stones 2. (Moderately stony) - land having 0.1 to three per cent of surface occupied by stones. Stones are 15 to 30 cm in diameter, two to 10 metres apart. Stones cause some interference with cultivation.

Stones 3. (Very stony) - Land having three to 15 per cent of surface occupied by stones. Stones are 15 to 30 cm in diameter, one to two metres apart. There are sufficient stones to constitute a serious hindrance to cultivation.

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

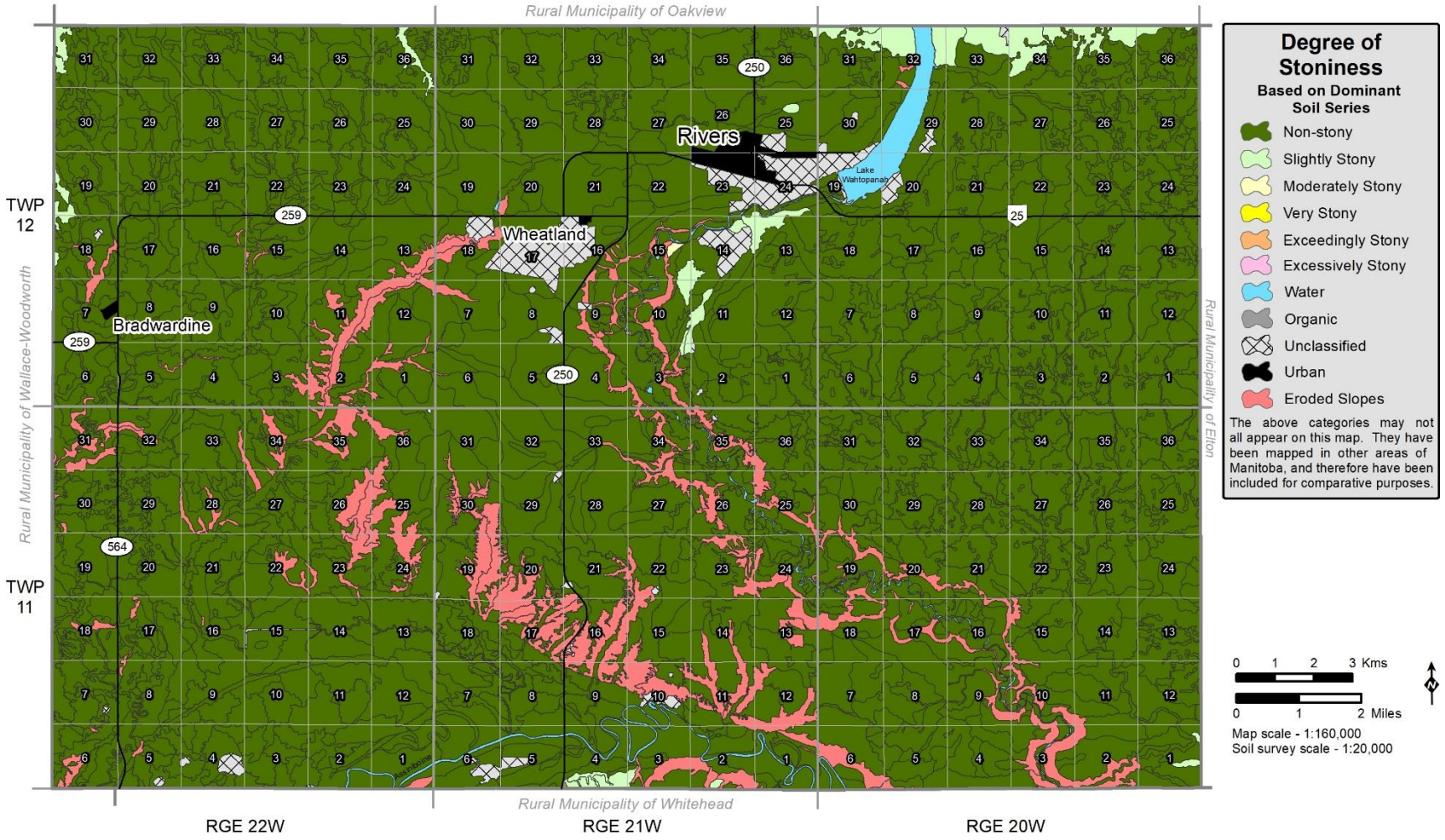
Stones 5. (Excessively stony) - Land having more than 50 per cent of surface occupied by stones. Stones are 15 to 30 cm in diameter, less than 0.7 metres apart. The land is too stony to permit cultivation until considerable clearing has occurred.

Stoniness in the RM of Riverdale is minimal with 90 per cent of the land area being non-stony (Table 14). Some previous stony fields have been improved as producers have been removing stones from their fields since the early 1970's. Small pockets of slightly stony areas occur along the edges of the study area (Map 9). Small pockets of slightly and moderately stony areas also occur south west of Lake Wahtopanah.

Table 14. Stoniness Classes in the RM of Riverdale

Degree of Stoniness	Total area		% of RM
	ha	ac	
Non-stony	52,286	129,202	89.82
Slightly stony	698	1,724	1.20
Moderately stony	8	21	0.01
Eroded Slopes	3,443	8,509	5.92
Water	587	1,452	1.01
Unclassified / Urban	1,188	2,935	2.04
Total	58,211	143,843	100

The degree of stoniness shown on Map 9 is based on the dominant condition for each polygon.



Map 9. Degree of Stoniness in the RM of Riverdale

4.10 Soil Chemical Properties

4.10.1 Salinity

Saline soils have a high concentration of soluble salts. The salts include sodium sulphate, magnesium sulphate, calcium sulphate, sodium chloride, magnesium chloride and calcium chloride.

The primary effect of salts in soils is the deprivation of water to plants. If the soil solution becomes too high in salts, the plants slowly starve, though the supply of water and dissolved nutrients in the soil may be sufficient.

In saline soils, crops usually grow poorly or not at all. At certain times of the year, the salts may precipitate out on the surface of the soil, leaving a white crust. Generally, plants which are affected by soil salinity have a bluish-green appearance. Common field weeds such as Russian thistle, kochia, wild barley, and foxtail often occur in areas of high salt concentration. In uncultivated areas, plants such as samphire, desert salt grass and greasewood are frequently dominant species (Henry et al, 1987).

Soil salinity is difficult to manage, because it is influenced by soil moisture conditions. In wet years, there is sufficient leaching and dissolving of salts so that salts are not visible on the surface and some crop growth may be possible. In dry years, increased evaporation dries out the soil and draws salts up to the soil surface, producing a white crust.

Field instrumentation, using a non-contacting terrain conductivity meter (EM-38 or a Dual EM), can determine if soluble salts are present.

Identification of salt affected areas and the selection of a salt tolerant crop are the most important management practices available to farmers.

A saline soil is defined as a soil with an electrical conductivity (EC) of the saturation extract greater than four milli-Siemens/cm (mS/cm), the exchangeable sodium percentage is less than 15, and the pH is usually less than 8.5.

Approximate limits of salinity classes are:

Class	EC mS/cm
Non-saline (x)	0 to 4
Weakly saline (s)	> 4 to 8
Moderately saline (t)	> 8 to 16
Strongly saline (u)	> 16

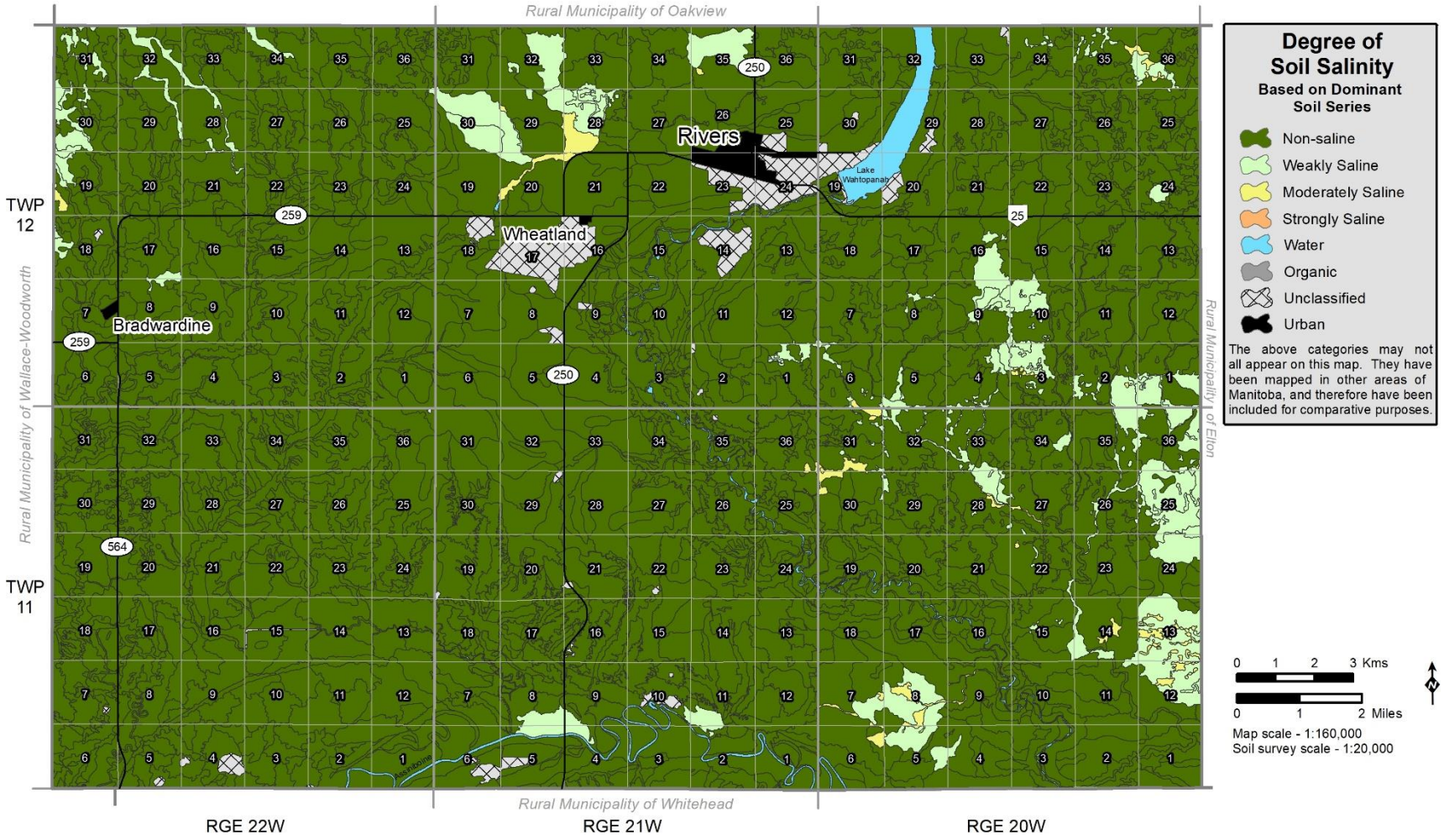
Note: mS/cm is equivalent to dS/m

Salinity in the RM of Riverdale is minimal as 90 per cent of the soils are non-saline (Table 15). Areas of weakly to moderately saline areas occur along the northern part of the study area. Greater areas are affected by salinity in the south east corner of the RM in the southern edge of TWP 12 - RGE 20W and TWP 11- RGE 21W with majority occurring in TWP 11- RGE 20W (Map 10).

Table 15. Soil Salinity Classes in the RM of Riverdale

Salinity Class	Total area		% of RM
	ha	ac	
Non-saline	52,709	130,245	90.55
Weakly saline	3,129	7,732	5.38
Moderately saline	598	1,479	1.03
Water	587	1,452	1.01
Unclassified / Urban	1,188	2,935	2.04
Total	58,211	143,843	100

Map 10 is based on the dominant soil for each polygon.



Map 10. Degree of Salinity in the RM of Riverdale

4.10.2 Soil Organic Carbon, pH and $CaCO_3$

Selected soil chemical properties are summarized based on 388 soil organic carbon (SOC), 123 calcium carbonate and 289 pH determinations. Soil organic carbon in the A horizon is affected by many factors such as soil texture. Data analysis from 359 samples analyzed for SOC in the A horizon shows a general trend of an increase in SOC as the finer particle fraction increases (Table 16). For example, the coarse textured Stockton soil resulted in an average of 23.30 g/kg of SOC whereas the moderately fine textured Ramada soil resulted in 38.11 g/kg of soil organic carbon (Table 17). Soil analysis conducted for other soil surveys in nearby municipalities of Cornwallis and Whitehead have also showed the same trend (Manitoba Agriculture 2017, Manitoba Agriculture and Resource Development 2020).

Another trend seen from the analysis of SOC in the surface (A) horizon was the effect of the internal drainage of the soil. Changes in SOC on average for all texture groups were greater for imperfectly drained soils compared to well or moderately well-drained soils (Table 16).

Analysis of soil pH in the A horizon was conducted for 289 samples. In the RM of Riverdale soil pH in the A horizon ranged from 4.82 to 8.37 (Table 17). Large variations occur due to different chemical processes that occur in the A horizon in conjunction with internal drainage, texture and parent material. Carbonates are prone to leach out of the A horizons in rapidly to moderately well-drained soils. A horizons in rapidly to moderately well-drained soils will then on average have a lower soil pH compared to imperfectly or poorly drained soils. For example the moderately well-drained Orthic Black Chernozem soils of Newdale, Fairland, and Croyon resulted in an average soil pH of 6.99, 6.69 and 6.29, respectively. Where in comparison to the poorly drained Rego Humic Gleysol soils, Drokan, Vordas, and Carvey resulted in an average soil pH of 7.60, 7.52, and 7.56, respectively (Table 17).

Soil carbonate content in A horizons is dependent on parent material, internal drainage and chemical processes. Well and moderately well-drained Rego Black Chernozem soils such as Duran and Carroll can have high amounts of carbonate levels due to the mineralogy of parent material and lack of soil profile development and downward movement of carbonates compared to Orthic Black Chernozem soils that show greater profile development (presence of B horizon) such as Ramada and Fairland (Table 17). Imperfect and poorly drained soils are more likely to have carbonates in A horizons due to lack of downward movement of water.

Table 16. Soil Organic Carbon in the A Horizon Affected by Soil Texture and drainage in the RM of Riverdale

Drainage	Soil texture	# of samples	SOC
			g/kg
Well or Moderately well	Coarse	25	28.29
	Moderately coarse	83	38.30
	Medium	28	31.52
	Moderately fine	82	40.60
	Fine	16	32.71
Imperfect	Coarse	5	35.52
	Moderately coarse	24	44.61
	Medium	16	45.17
	Moderately fine	50	45.22
	Fine	27	38.42

Table 17. Soil Chemical Properties in the A horizon from Soils in the RM of Riverdale

Soil name	Soil code	Organic C (g/kg)		Soil pH		Ca carbonate (g/kg)	
		#	Avg	#	Avg	#	Avg
Angusville	ANL	1	50.40	1	6.95	--	--
Ashmore	AHO	4	25.75	4	7.23	4	98.38
Assiniboine	ASB	9	34.09	9	7.38	1	323.70
Bankton	BAO	6	33.47	3	7.09	2	123.75
Basker	BKR	3	60.70	3	7.32	3	222.17
Beresford	BSF	9	48.99	8	7.81	4	69.23
Cactus	CCS	6	27.00	5	7.06	3	279.60
Capell	CXT	6	44.82	3	7.13	1	34.10
Carroll	CXF	17	28.65	11	7.33	10	182.46
Carvey	CAV	1	54.10	1	7.36	1	153.90
Chambers	CBS	4	42.38	2	7.28	1	118.70
Charman	CXV	9	39.18	5	7.41	--	--
Chater	CXW	2	26.40	1	7.22	1	381.20
Clementi	CLN	6	40.62	4	7.01	--	--
Cobfield	CBF	6	47.68	4	7.70	2	77.70
Cordova	CVA	5	47.66	3	7.35	--	--
Croyon	CYN	7	46.67	6	6.29	--	--
Drokan	DRO	3	58.20	2	7.60	1	214.10
Druxman	DXM	1	53.60	1	6.32	--	--
Durnan	DRN	20	24.43	16	7.32	14	200.42
Everton	EVO	1	46.60	1	7.30	--	--
Fairland	FND	9	44.50	5	6.69	--	--
Floors	FLS	3	22.63	3	7.28	4	257.93
Forrest	FRT	1	58.60	1	6.17	--	--
Gendzel	GDZ	1	31.50	1	7.13	1	253.40
Glenboro	GBO	20	27.57	12	7.05	10	146.12
Gregg	GRG	3	30.43	3	7.09	--	--
Grover	GRO	2	32.20	2	7.26	--	--
Harding	HRG	2	49.05	2	7.65	--	--
Hughes	HGH	3	40.13	3	6.14	--	--
Hummerston	HMO	1	51.10	1	7.32	--	--
Janick	JIK	5	44.76	5	6.78	1	35.00
Jaymar	JAY	5	36.14	1	5.86	--	--
Justice	JUC	4	54.00	4	7.38	1	97.50
Kerran	KRN	1	31.50	1	7.40	--	--
Kilmury	KUY	5	43.40	5	7.08	2	131.95
Lavinia	LAV	3	50.47	3	7.16	--	--
Levine	LEI	3	56.37	3	7.78	--	--
Lowton	LWN	2	34.70	--	--	--	--
Marringhurst	MRH	1	29.00	1	7.17	--	--
Marsden	MDN	1	47.00	1	7.48	1	50.70
Melland	MXT	1	59.20	1	7.35	--	--
Miniota	MXI	42	43.06	29	6.40	--	--
Moore Park	MPK	4	43.53	3	7.39	--	--
Newdale	NDL	9	41.20	6	6.99	--	--
Porple	POR	5	21.86	5	7.33	4	129.80
Prodan	PDA	17	39.64	16	7.51	10	142.26
Prosser	PSE	6	39.42	5	6.47	2	35.75
Ramada	RAM	13	38.11	8	6.77	--	--
Rempel	RMP	7	37.69	5	7.33	4	64.53
Rufford	RUF	11	46.25	7	7.42	4	143.45
Shilox	SHX	1	32.00	1	7.37	--	--
Sigmund	SGO	7	38.87	5	7.74	3	177.60
Stockton	SCK	1	23.30	1	7.12	--	--
Tadpole	TDP	1	33.80	1	7.51	1	23.90
Taggart	TGR	10	40.53	5	7.29	4	76.98
Torcan	TOC	8	43.80	6	7.15	2	135.55
Traverse	TAV	2	33.30	2	7.28	2	71.90
Varcoe	VRC	7	42.50	7	7.61	6	139.83
Vodroff	VFF	2	29.30	2	7.79	2	164.50
Vordas	VDS	3	53.60	3	7.52	3	267.87
Wellwood	WWD	6	34.12	3	6.98	2	114.70
Wheatland	WHL	15	42.36	11	6.59	3	114.67
Wytonville	WVI	5	40.58	4	6.31	1	89.70
Zarnet	ZRT	3	34.67	3	6.88	2	165.85

Part 5 Soil Suitability for Selected Engineering and Recreational Uses

5.1 Introduction

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

5.2 Soil Suitability for Selected Engineering Uses

The criteria used to evaluate soil suitability for selected engineering and related recreational uses are adopted from guides outlined by Coen et al (1977), and from guidelines developed by the Soil Conservation Service, United States Department of Agriculture (USDA, 1971), and the Canada Soil Survey Committee (CSSC, 1973).

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

The four suitability class ratings are defined as follows:

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

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

(P) Poor – Soils in their present state have one or more severe limitations that can severely affect the proposed use. Removal of these limitations would be difficult or costly.

(V) Very Poor – Soils have one or more unfavourable features for the proposed use and the limitation is very difficult and expensive to overcome, or the soil would require such extreme alteration that the proposed use is economically impractical.

The basic soil properties that alone or in combination with others affect soil suitability for selected engineering and recreation uses are provided in Table 18. These subclass designations serve to identify the kind of limitation or hazard for a particular use.

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

The suitability ratings of soils for 10 selected engineering uses are shown in Table A8 of Appendix 1. When using these interpretations, consideration must be given to the following assumptions:

1. Soil ratings do not include site factors, such as proximity to towns and highways, water supply or aesthetic values.

2. Soil ratings are based on natural, undisturbed conditions.

3. Soil suitability ratings are usually given for the entire soil depth, but for some uses, they may be based on the limitations of an individual soil horizon or layer, because of its overriding importance. Ratings rarely apply to soil depths greater than one to two metres, but in some soils, reasonable estimates can be given for soil material at greater depths.

4. Poor and very poor soil ratings do not imply that a site cannot be changed to remove, correct or modify the limitations.

5. Interpretations of map units do not eliminate the need for on-site evaluation by qualified professionals. Due to the variable nature of soils and the scale of mapping, small, unmappable inclusions of soils with different properties may be present in an area where a development is planned.

Guides for evaluating soil suitability for engineering uses are presented in Tables of A9 to A18 of Appendix 1.

Table 18. Codes Used to Identify Subclass Limitations in Evaluating Soil Suitability for Selected Engineering Uses in Table A8 of Appendix 1

Code	Description
a	sub-grade properties
b	thickness of topsoil
c	coarse fragments on surface
d	depth to bedrock
e	erosion or erodibility
f	susceptibility to frost hazard
g	contamination hazard of groundwater
h	depth to seasonal water table
i	flooding or inundation
j	thickness of slowly permeable material
k	permeability or hydraulic conductivity
l	shrink-swell properties
m	moisture limitations or deficit
n	salinity or sulphate hazard
o	organic matter
p	stoniness
q	depth to sand or gravel
r	rockiness
s	surface texture
t	topographic slope class
u	moist consistence
w	wetness or soil drainage class
z	permafrost

5.3 Soil Suitability for Selected Recreational Uses

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

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

The suitability of the various soil series and phases for selected recreational uses is shown in Table A8 of Appendix 1. The four classes, Good, Fair, Poor and Very Poor are defined in the section on Engineering Uses. Subclasses are the same as described in Table 18. Guides for evaluating soil suitability for recreational uses are presented in Tables A19 to A22 of Appendix 1.

Appendix 1

A: Definitions of the Agricultural Capability Classes

Class 1

Soils in this class have no important limitations for crop use. The soils have level or gently sloping topography, as well as being deep, well to imperfectly drained, and have moderate water holding capacity. The soils are naturally well supplied with plant nutrients, easily maintained in good tilth and fertility. Soils are moderately high to high in productivity for a wide range of cereal and special crops.

Class 2

Soils in this class have moderate limitations that reduce the choice of crops or require moderate conservation practices. The soils have good water holding capacity and are either naturally well supplied with plant nutrients or are highly responsive to the addition of fertilizer. They are moderate to high in productivity for a wide range of crops. The limitations are not severe and good soil management and cropping practices can be applied without serious difficulty.

Class 3

Soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practices. The limitations in Class 3 are more severe than those in Class 2, and conservation practices are more difficult to apply and maintain. The limitations affect the timing and ease of tillage, planting and harvesting, the choice of crops and maintenance of conservation practices. The limitations include one or more of the following: moderate climatic limitation, erosion, structure or permeability, low fertility, topography, overflow, wetness, low water-holding capacity or slowness in release of water to plants, stoniness and depth of soil to consolidated bedrock. Under good management, these soils are fair to moderately high in productivity for a wide range of field crops.

Class 4

Soils in this class have severe limitations that restrict the choice of crops or require special conservation practices or both. These soils have such limitations that they are only suited for a few crops or the yield for a range of crops may be low, or the risk of crop failure is high. The limitations may seriously affect such farm practices as the timing and ease of tillage, planting and harvesting, and the application and maintenance of conservation practices. These soils are low to medium in productivity for a narrow range of crops, but may have higher productivity for a specially adapted crop. The limitations include the adverse effects of one or more of the following: climate, accumulative undesirable soil characteristics, low fertility, reduced storage capacity or release of soil moisture to plants, structure or permeability, salinity, erosion, topography, overflow, wetness, stoniness, and depth of soil to consolidated bedrock.

Class 5

Soils in this class have very severe limitations that restrict their capability to producing perennial forage crops, and improvement practices are feasible. These soils have severe soil, climatic or other limitations, and are not capable of sustained production of annual field crops. However, they may be improved by the use of farm machinery for the production of native or tame perennial forage species. Feasible improvement practices include clearing of bush, cultivation, seeding, fertilization and water control. Some soils in Class 5 can be used for cultivated field crops, provided intensive management is used. Some of these soils are also adapted to special crops requiring soil conditions unlike those needed by the common crops.

Class 6

Soils in this class are capable only of producing perennial forage crops, and improvement practices are not feasible. Class 6 soils have some natural sustained grazing capacity for farm animals, but have such serious soil, climatic or other limitations as to make impractical the application of improvement practices that can be carried out on Class 5 soils. Soils may be placed in this class because their physical nature prevents the use of farm machinery, or because the soils are not responsive to improvement practices, or because stock watering facilities are inadequate.

Class 7

Soils in this class have no capability for arable culture or permanent pasture, because of extremely severe limitations. Bodies of water too small to delineate on the map are included in this class. These soils may or may not have a high capability for forestry, wildlife and recreation.

B: Agricultural Capability Subclass Limitations

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

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

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

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

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

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

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

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

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

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

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

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

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

Table A1. Dryland Agriculture Capability Guidelines for Manitoba*

	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7
Subclass Limitations	No significant limitations in use for crops.	Moderate limitations that restrict the range of crops or require moderate conservation practices.	Moderately severe limitation that restrict the range of crops or require special conservation practices.	Severe limitations that restrict the range of crops or require special conservation practices or both.	Very severe limitations that restrict soil capability to produce perennial forage crops, and improvement prac-tices are feasible.	Soils are capable only of producing perennial forage crops, and improvement practices are not feasible.	No capability for arable culture or permanent pasture.
Climate (C)	All Ecodistricts[1] within ARDA boundary not explicitly listed under 2C and 3C.	Ecodistricts: 664, 666, 668, 670, 671, 672, 674, 675, 676, 677, 714, 715, 716	Ecodistricts: 356, 357, 358, 359, 363, 366, 663, 665	None within ARDA boundary			
Consolidated Bedrock (R)				> 50 -100 cm	20 - 50 cm	< 20 cm	Surface bedrock Fragmental over bedrock
Moisture limitation[2] (M)		Stratified loams Moderate moisture holding capacity	Loamy sands Low moisture holding capacity	Sands Very low moisture holding capacity	Skeletal sands Very severe moisture deficiency	Stabilized sand dunes	Active sand dunes
Topography[3] (T)	a, b (0 - 2%)	c (> 2 - 5%)	d (> 5 - 9%)	e (> 9 - 15%)	f (> 15 - 30%)	g (> 30 - 45%) Eroded slope complex	h (> 45 - 70%) i (> 70 - 100%)
Structure and/or Permeability (D)	Granular clay	Massive clay or till soils[4] Slow permeability	Solonetzic intergrades Very slow permeability	Black Solonetz Extremely slow permeability			
Salinity[5] (N) 0 - 60 cm depth 60 - 120 cm depth	NONE < 2 dS/m < 4 dS/m	WEAK 2 - 4 dS/m 4 - 8 dS/m	MODERATE (s) > 4 - 8 dS/m > 8 - 16 dS/m	STRONG (t) > 8 - 16 dS/m > 16 - 24 dS/m	VERY STRONG (u) [6] > 16 - 24 dS/m > 24 dS/m		Salt Flats
Inundation[7] (I)	No overflow during growing season	Occasional overflow (1 in 10 years)	Frequent overflow (1 in 5 years) Some crop damage	Frequent overflow (1 in 5 years) Severe crop damage	Very frequent (1 in 3 years) Grazing > 10 weeks	Very frequent Grazing 5 - 10 weeks	Land is inundated for most of the season
Excess Water (W)	Well and Imperfectly drained		Loamy to fine textured Gleysols with improved drainage	Coarse textured Gleysols with improved drainage	Poorly drained, no improvements	Very Poorly drained	Open water, marsh
Stoniness (P)	Nonstony (0) and Slightly Stony (1)	Moderately Stony (2)	Very Stony (3) [8]	Exceedingly Stony (4) [9]		Excessively Stony (5)	Cobbly Beach Fragmental
Erosion[10] (E)		Moderate erosion (2)	Severe wind or water erosion (3) lowers the basic rating by one class to a maximum rating of Class 6 [11].				
Cumulative minor adverse Characteristics[12] (X)							

* Based on the Canada Land Inventory Soil Capability Classification for Agriculture (1965), with modifications made for soil application at larger mapping scales.

1 Smith, R.E., H. Veldhuis, G.F. Mills, R.G. Eilers, W.R. Fraser, M. Santry, 1996. Terrestrial Ecoregions and Ecodistricts of Manitoba, An Ecological Stratification of Manitoba's Natural Landscapes. Agriculture and Agri-Food Canada, Research Branch, Brandon Research Centre, Manitoba Land Resource Unit, Winnipeg, MB. Report and Provincial Map at scale of 1:1.5m.

2 With the exception of Class 2, ratings as indicated are based on the assumption of a single parent material, using the most readily drained representative of each textural class. Prevailing climatic conditions within the Ecodistrict, soil drainage and stratification will affect the moisture limitation accordingly.

3 Topographic classes are based on the most limiting slope covering a significant portion of an area of complex, variable slopes. Map units with long, unidirectional slopes may be considered equivalent or one class worse due to an increased erosion hazard.

4 Extremely calcareous, loamy till soils with a high bulk density (>1.7 g/cm^3) are rated 3D.

5 Soil Salinity is reported in DeciSiemens/metre (dS/m). Soil will be classed according the most saline depth. For example, if a soil is non-saline from zero to 60 cm, but moderately saline from 60 to 120 cm, the soil will be classed as moderately saline (3N).

6 Strongly saline (u) soils are rated 5N, with the exception of poorly and very poorly drained soils, which are rated 6NW.

7 Inundation may be listed as a secondary subclass for some fluvial soils. In this case, inundation is not class determining, but may become a limitation if the soil is otherwise improved.

8 Extremely calcareous, loamy till soils with a high bulk density (>1.7 g/cm^3) and stony 3 are rated 4DP (4RP if depth to bedrock is 50 - 100 cm).

9 Stony 4 soils will be rated 4P, unless their primary physical composition is sandy skeletal or their parent material is till. In either or both of these cases, the soil will be rated 5P.

10 If erosion is moderate, a subclass of E is assigned as a secondary limitation, but the basic rating is not lowered. If erosion is severe, the basic soil rating is downgraded by one class, and E becomes the primary limitation. For example, if a soil has a basic rating of 4T, the presence of moderate erosion will result in a rating of 4TE. If erosion is severe, the rating will be lowered to 5ET. Erosion will be the sole limitation, only if the basic rating has a subclass of X. For example, a soil with a rating of 3X will be assigned a rating of 3E if moderate erosion is present.

11 The rating is not lowered from Class 6 based on erosion. A rating of 6TE indicates a soil with g topography and either moderate or severe erosion.

12 Use only for soils with no other limitation except climate. The subclass represents soils with a moderate limitation caused by the cumulative effect of two or more adverse characteristics that are singly not serious enough to affect the rating. Because the limitation is moderate, soils may only be downgraded by one class from their initial climate limitation. Therefore, a soil with a climate limitation of 2C and two or more minor adverse characteristics will be rated as 3X. This symbol is always used alone.

Table A2. Ag Capability and Irrigation Suitability of Soils in the RM of Riverdale

Soil name (Soil code)	Soil phase	Agricultural capability	Irrigation suitability			Total area		% of RM
			Class	General rating	Rating for potato production	ha	ac	
Eroded Slope ($ER)	1dxx	6E	4m Ct2	Poor	5	95	235	0.16
	1e1x	6E	4m Ct2	Poor	5	5	13	0.01
	1exx	6E	4m Ct2	Poor	5	634	1,567	1.09
	1fxx	6E	4m Dt2	Poor	5	626	1,547	1.08
	2exx	6E	4m Ct2	Poor	5	58	144	0.10
	2fxx	6E	4m Dt2	Poor	5	107	265	0.18
	2gxx	6TE	4m Dt2	Poor	5	1	2	<0.01
	2hxx	7T	4m Dt2	Poor	5	4	9	0.01
	3g1x	6TE	4m Dt2	Poor	5	1	2	0.00
	xdxx	6E	4m Ct2	Poor	5	82	203	0.14
	xexx	6E	4m Ct2	Poor	5	739	1,825	1.27
	xfxx	6E	4m Dt2	Poor	5	653	1,614	1.12
	xgxx	6T	4m Dt2	Poor	5	438	1,083	0.75
Marsh ($MH)	xbxx	7W	4wx Di	Poor	5	269	664	0.46
	xxxt	7W	4wx Di	Poor	5	0	1	0.00
	xxxx	7W	4wx Di	Poor	5	45	110	0.08
Unclassified ($UL)	xxxx	--	--	--	--	995	2,458	1.71
Urban ($UR)	xxxx	--	--	--	--	193	477	0.33
Water ($ZZ)	xxxx	--	--	--	--	587	1,452	1.01
Angusville (ANL)	xbxx	2W	3kw A	Fair	4	11	28	0.02
Arizona (AIZ)	xcxx	5ME	3m Bt2	Fair	3	35	87	0.06
Ashmore (AHO)	1dxx	4M	2m Ct2	Fair	4	34	84	0.06
	1exx	4T	2m Ct2	Fair	5	6	15	0.01
	xcxx	4M	2m A	Good	3	52	129	0.09
	xdxx	4M	2m Ct2	Fair	4	42	103	0.07
	xfxx	5T	2m Dt2	Poor	5	7	17	0.01
Assiniboine (ASB)	xbxx	3I	3kw Bi	Fair	5	402	993	0.69
	xcxx	3I	3kw Bt2i	Fair	5	262	647	0.45
	xxxs	3IN	3kw Bi	Fair	5	102	253	0.18
	xxxx	3I	3kw Bi	Fair	5	550	1,359	0.95
Axford (AXF)	2dxx	5ME	4gm Ct2	Poor	5	12	29	0.02
	xcxx	5M	4gm Bt2	Poor	5	10	24	0.02
	xexx	5M	4gm Ct2	Poor	5	18	44	0.03
Bankton (BAO)	xbxx	2D	4kx A	Poor	5	78	193	0.13
	xcxx	2TD	4kx Bt2	Poor	5	188	464	0.32
	xdxx	3T	4kx Ct2	Poor	5	50	123	0.09
Barren (BAE)	xcxx	3E	2k Bt2	Good	4	113	278	0.19
	xdxx	4TE	2k Ct2	Fair	4	9	21	0.01
	xexx	5TE	2k Ct2	Fair	5	9	23	0.02
Barwood (BWO)	xcxx	2WT	3w Bt2	Fair	4	20	50	0.03
Basker (BKR)	xbxx	5IW	4w Ci	Poor	5	711	1,756	1.22

Table A2. Ag Capability and Irrigation Suitability of Soils in the RM of Riverdale (cont'd)

Soil name (Soil code)	Soil phase	Agricultural capability	Irrigation suitability			Total area		% of RM
			Class	General rating	Rating for potato production	ha	ac	
Basker (BKR)	xcxx	5IW	4w Ci	Poor	5	326	806	0.56
	xxxx	5IW	4w Ci	Poor	5	265	655	0.46
Beresford (BSF)	1xxs	3N	3sw A	Fair	4	109	269	0.19
	xbxs	3N	3sw A	Fair	4	78	192	0.13
	xbxt	4N	4s A	Poor	5	35	87	0.06
	xbxx	2W	3w A	Fair	3	538	1,330	0.92
	xcxs	3N	3sw Bt2	Fair	4	104	257	0.18
	xcxt	4N	4s Bt2	Poor	5	58	144	0.10
	xcxx	2WT	3w Bt2	Fair	3	382	945	0.66
	xdxs	3TN	3sw Ct2	Fair	4	9	23	0.02
	xdxx	3T	3w Ct2	Fair	4	58	144	0.10
	xxxx	2W	3w A	Fair	3	111	275	0.19
Bermont (BMN)	xcxx	2T	2kx Bt2	Good	4	10	24	0.02
	xdxx	3T	2kx Ct2	Fair	4	10	24	0.02
Bornet (BOR)	xbxx	5W	4w A	Poor	5	157	389	0.27
	xcxx	5W	4w Bt2	Poor	5	87	215	0.15
	xdxx	5W	4w Ct2	Poor	5	23	57	0.04
Boswell (BSW)	xbxx	4M	3mx A	Fair	5	8	21	0.01
	xcxx	4M	3mx Bt2	Fair	5	25	61	0.04
	xxxx	4M	3mx A	Fair	5	22	54	0.04
Brownridge (BWD)	xdxx	4ME	1 Ct2	Fair	3	86	213	0.15
	xfxx	5T	1 Dt2	Poor	5	3	7	0.00
Cactus (CCS)	2cxx	4M	2m Bt2	Good	2	39	96	0.07
	2exx	4MT	2m Ct2	Fair	5	17	43	0.03
	xcxx	4M	2m Bt2	Good	2	12	29	0.02
	xdxx	4M	2m Ct2	Fair	4	47	116	0.08
	xexx	4MT	2m Ct2	Fair	5	14	36	0.02
Capell (CXT)	xbxx	2M	3w A	Fair	3	99	243	0.17
	xcxx	2MT	3w Bt2	Fair	3	42	103	0.07
	xexx	4T	3w Ct2	Fair	5	59	147	0.10
	xxxx	2M	3w A	Fair	3	187	462	0.32
Carroll (CXF)	1cxx	2T	2k Bt2	Good	2	142	350	0.24
	1dxx	3T	2k Ct2	Fair	4	188	464	0.32
	1exx	4T	2k Ct2	Fair	5	122	301	0.21
	2cxx	2TE	2k Bt2	Good	3	14	34	0.02
	2exx	4T	2k Ct2	Fair	5	29	72	0.05
	2fxx	5T	2k Dt2	Poor	5	8	20	0.01
	xbxx	2X	2k A	Good	2	142	351	0.24
	xcxx	2T	2k Bt2	Good	2	714	1,765	1.23
	xdxx	3T	2k Ct2	Fair	4	257	634	0.44
	xexx	4T	2k Ct2	Fair	5	60	147	0.10
Carvey (CAV)	1cxx	5W	4w Bt2	Poor	5	17	42	0.03
	xbxx	5W	4w A	Poor	5	40	98	0.07
	xcxx	5W	4w Bt2	Poor	5	5	12	0.01

Table A2. Ag Capability and Irrigation Suitability of Soils in the RM of Riverdale (cont'd)

Soil name (Soil code)	Soil phase	Agricultural capability	Irrigation suitability			Total area		% of RM
			Class	General rating	Rating for potato production	ha	ac	
Carvey (CAV)	xxxx	5W	4w A	Poor	5	22	55	0.04
Chambers (CBS)	1c1x	2T	2kx Bt2	Good	4	11	27	0.02
	1cxx	2T	2kx Bt2	Good	4	51	127	0.09
	1dxx	3T	2kx Ct2	Fair	4	32	80	0.06
	xbxx	2X	2kx A	Good	4	216	535	0.37
	xcxs	3N	3s Bt2	Fair	4	53	130	0.09
	xcxx	2T	2kx Bt2	Good	4	438	1,083	0.75
	xdxx	3T	2kx Ct2	Fair	4	40	99	0.07
Charman (CXV)	xbxx	2X	2k A	Good	2	272	672	0.47
	xcxs	2T	2k Bt2	Good	2	25	63	0.04
	xcxx	4T	2k Ct2	Fair	5	339	839	0.58
	xdxx	3T	3w Ct2	Fair	4	13	32	0.02
	xxxs	3N	3sw A	Fair	4	3	8	0.01
	xxxx	2W	3w A	Fair	3	18	44	0.03
Chater (CXW)	xexx	5M	4gm Ct2	Poor	5	9	23	0.02
Clementi (CLN)	1cxx	2T	2kx Bt2	Good	4	12	30	0.02
	1xxx	2X	2kx A	Good	4	15	36	0.03
	2cxx	2TE	2kx Bt2	Good	4	406	1,003	0.70
	xbxx	1	2kx A	Good	4	35	86	0.06
	xcxx	2T	2kx Bt2	Good	4	263	650	0.45
	xdxx	3T	2kx Ct2	Fair	4	62	153	0.11
	xexx	4T	2kx Ct2	Fair	5	12	30	0.02
Cobfield (CBF)	xbxs	3N	3sw A	Fair	4	35	86	0.06
	xbxt	4N	4s Bt2	Poor	5	10	24	0.02
	xbxx	2W	3w A	Fair	4	164	405	0.28
	xcxs	3N	3sw Bt2	Fair	4	137	339	0.24
	xcxx	2WT	3w Bt2	Fair	4	206	509	0.35
Cordova (CVA)	1c1x	2T	2kx Bt2	Good	4	24	59	0.04
	1cxx	2T	2kx Bt2	Good	4	26	64	0.04
	1dxx	3T	2kx Ct2	Fair	4	35	86	0.06
	xc1x	2T	2kx Bt2	Good	4	12	30	0.02
	xcxx	2T	2kx Bt2	Good	4	447	1,105	0.77
	xdxx	3T	2kx Ct2	Fair	4	52	128	0.09
	xxxx	2X	2kx A	Good	4	28	69	0.05
Crookdale (CKD)	xexx	4T	3w Ct2	Fair	5	5	13	0.01
	xxxx	2W	3w A	Fair	3	37	91	0.06
Croyon (CYN)	1cxx	3M	2gm Bt2	Good	3	21	51	0.04
	xb1x	3M	2gm A	Good	4	44	108	0.08
	xbxs	3MN	3s A	Fair	4	30	74	0.05
	xbxx	3M	2gm A	Good	3	265	655	0.46
	xcxx	3M	2gm Bt2	Good	3	317	785	0.55
	xdxx	3MT	2gm Ct2	Fair	4	73	180	0.13

Table A2. Ag Capability and Irrigation Suitability of Soils in the RM of Riverdale (cont'd)

Soil name (Soil code)	Soil phase	Agricultural capability	Irrigation suitability			Total area		% of RM
			Class	General rating	Rating for potato production	ha	ac	
Croyon (CYN)	xexx	4T	2gm Ct2	Fair	5	14	36	0.02
	xxxx	3M	2gm A	Good	3	146	362	0.25
Dexter (DXT)	xbxx	4M	4m A	Poor	5	31	77	0.05
	xcxx	4M	4m Bt2	Poor	5	11	26	0.02
Dogand (DGA)	xcxx	3M	2m Ct2	Fair	4	48	119	0.08
Dorset (DOT)	1c1x	5M	4m Bt2	Poor	5	41	101	0.07
	1dxx	5M	4m Ct2	Poor	5	32	78	0.05
	xbxx	5M	4m A	Poor	5	7	17	0.01
	xcxx	5M	4m Bt2	Poor	5	107	264	0.18
	xdxx	5M	4m Ct2	Poor	5	23	57	0.04
	xexx	5M	4m Ct2	Poor	5	6	14	0.01
	xfxx	5MT	4m Dt2	Poor	5	20	49	0.03
Drokan (DRO)	xbxs	5W	4w A	Poor	5	105	259	0.18
	xbxt	5W	4sw A	Poor	5	42	105	0.07
	xbxx	5W	4w A	Poor	5	804	1,988	1.38
	xcxs	5W	4w Bt2	Poor	5	57	140	0.10
	xcxt	5W	4sw Bt2	Poor	5	38	94	0.07
	xcxx	5W	4w Bt2	Poor	5	246	609	0.42
	xxxs	5W	4w A	Poor	5	46	114	0.08
	xxxt	5W	4sw A	Poor	5	8	20	0.01
	xxxx	5W	4w A	Poor	5	86	213	0.15
Druxman (DXM)	1xxx	2M	3w A	Fair	3	26	64	0.04
	xbxx	2M	3w A	Fair	3	21	52	0.04
	xcxx	2MT	3w Bt2	Fair	3	82	204	0.14
	xdxx	3T	3w Ct2	Fair	4	43	106	0.07
	xxxx	2M	3w A	Fair	3	19	46	0.03
Durnan (DRN)	1cxx	2T	1 Bt2	Good	1	84	209	0.15
	1dxx	3T	1 Ct2	Fair	4	348	860	0.60
	1exx	4T	1 Ct2	Fair	5	359	888	0.62
	1fxx	5T	1 Dt2	Poor	5	4	9	0.01
	2cxx	2TE	1 Bt2	Good	2	14	36	0.02
	2dxx	3TE	1 Ct2	Fair	4	21	51	0.04
	2exx	4TE	1 Ct2	fair	5	67	166	0.12
	2fxx	5T	1 Dt2	Poor	5	17	42	0.03
	xbxx	2X	1 A	Excellent	1	13	33	0.02
	xcxx	2T	1 Bt2	Good	1	390	963	0.67
	xdxx	3T	1 Ct2	Fair	4	274	677	0.47
	xexx	4T	1 Ct2	Fair	5	167	414	0.29
	xfxx	5T	1 Dt2	Poor	5	10	25	0.02
Everton (EVO)	xbxx	1	4k A	Poor	5	45	111	0.08
Fairland (FND)	1cxx	2T	1 Bt2	Good	1	86	211	0.15
	1dxx	3T	1 Ct2	Fair	4	29	71	0.05
	xbxx	1	1 A	Excellent	1	59	147	0.10
	xcxx	2T	1 Bt2	Good	1	540	1,333	0.93

Table A2. Ag Capability and Irrigation Suitability of Soils in the RM of Riverdale (cont'd)

Soil name (Soil code)	Soil phase	Agricultural capability	Irrigation suitability			Total area		% of RM
			Class	General rating	Rating for potato production	ha	ac	
Fairland (FND)	xdxx	3T	1 Ct2	Fair	4	49	120	0.08
Fenton (FET)	xbxs	5W	4kw A	Poor	5	23	56	0.04
	xbxt	5W	4kw A	Poor	5	9	21	0.01
	xbxx	5W	4kw A	Poor	5	26	63	0.04
	xxxs	5W	4kw A	Poor	5	8	21	0.01
Floors (FLS)	1cxx	5M	4m Bt2	Poor	5	10	24	0.02
	1d1x	5M	4m Ct2	Poor	5	7	17	0.01
	1dxx	5M	4m Ct2	Poor	5	59	146	0.10
	1exx	5M	4m Ct2	Poor	5	51	125	0.09
	1fxx	5MT	4m Dt2	Poor	5	40	98	0.07
	2dxx	5ME	4m Ct2	Poor	5	8	21	0.01
	2exx	5M	4m Ct2	Poor	5	75	186	0.13
	xbxx	5M	4m A	Poor	5	47	116	0.08
	xcxx	5M	4m A	Poor	5	202	499	0.35
	xdxx	5M	4m Ct2	Poor	5	244	603	0.42
Forrest (FRT)	xbxs	3N	4k A	Poor	5	29	72	0.05
	xbxx	2W	4k A	Poor	5	167	412	0.29
	xcxx	2WT	4k Bt2	Poor	5	34	84	0.06
Gateside (GTD)	xbxx	2M	2w A	Good	3	6	16	0.01
	xcxx	2MT	2w Bt2	Good	3	31	77	0.05
Gendzel (GDZ)	xbxx	4M	3mw A	Fair	3	35	87	0.06
	xcxx	4M	3mw Bt2	Fair	3	112	276	0.19
	xdxx	4M	3mw Ct2	Fair	4	26	65	0.05
Glenboro (GBO)	1bxx	2M	1 A	Excellent	1	63	155	0.11
	1cxx	2MT	1 Bt2	Good	1	19	47	0.03
	1dxx	3T	1 Ct2	Fair	4	11	27	0.02
	1exx	4T	2m Ct2	Fair	5	33	81	0.06
	2exx	4TE	2m Ct2	Fair	5	6	15	0.01
	2fxx	5TE	2m Dt2	Poor	5	12	30	0.02
	xbxx	2M	1 A	Excellent	1	33	82	0.06
	xcxx	2MT	1 Bt2	Good	1	185	458	0.32
	xdxx	3T	1 Ct2	Fair	4	30	74	0.05
	xexx	4T	2m Ct2	Fair	5	5	13	0.01
Glenboro$_{Classiffication}$ (GBOcl)	1exx	4T	2m Ct2	Fair	5	14	35	0.02
Grayson (GYS)	xbxx	5W	4w A	Poor	5	50	124	0.09
	xdxx	5W	4w Ct2	Poor	5	52	129	0.09
	xxxx	5W	4w A	Poor	5	16	40	0.03
Gregg1* (GRG1)	xcxx	2WT	2w Bt2	Good	3	2	4	<0.01
Grover (GRO)	1bxx	2W	2w A	Good	3	27	66	0.05
	xbxx	2W	2w A	Good	3	97	240	0.17
	xcxx	2WT	2w Bt2	Good	3	106	262	0.18
	xdxx	3T	2w Ct2	Fair	4	4	11	0.01
	xxxx	2W	2w A	Good	3	45	112	0.08

* Loam substrate variant

Table A2. Ag Capability and Irrigation Suitability of Soils in the RM of Riverdale (cont'd)

Soil name (Soil code)	Soil phase	Agricultural capability	Irrigation suitability			Total area		% of RM
			Class	General rating	Rating for potato production	ha	ac	
Hamiota (HMI)	xbxx	5W	4w A	Poor	5	7	18	0.01
Harding (HRG)	xbxs	3N	4kx A	Poor	5	6	14	0.01
	xbxx	2W	4kx A	Poor	5	139	343	0.24
	xcxx	2WT	4kx Bt2	Poor	5	49	121	0.08
	xexx	4T	4kx Ct2	Poor	5	9	22	0.02
Hilton (HIT)	xcxx	2T	2kx Bt2	Good	4	37	91	0.06
Hughes (HGH)	xbxx	4M	3mw A	Fair	3	51	127	0.09
	xcxx	4M	3mw Bt2	Fair	3	88	216	0.15
	xxxx	4M	3mw A	Fair	3	34	84	0.06
Hummerston (HMO)	xxxx	3MW	2mw A	Good	3	23	56	0.04
Janick (JIK)	xbxx	1	4kx A	Poor	5	44	109	0.08
	xcxx	2T	4kx Bt2	Poor	5	101	249	0.17
	xxxx	1	4kx A	Poor	5	19	48	0.03
Jaymar (JAY)	xd1x	3MT	2m Ct2	Fair	4	34	85	0.06
	xdxx	3MT	2m Ct2	Fair	4	14	34	0.02
Justice (JUC)	xbxx	2W	4k A	Poor	5	109	269	0.19
	xxxs	3N	4k A	Poor	5	13	31	0.02
Kerran (KRN)	xbxx	5IW	4kw Ci	Poor	5	226	557	0.39
	xcxx	5IW	4kw Ci	Poor	5	10	26	0.02
	xxxx	5IW	4kw Ci	Poor	5	268	662	0.46
Kilmury (KUY)	xbxx	3M	2mw A	Good	3	114	283	0.20
	xcxx	3M	2mw Bt2	Good	3	244	604	0.42
	xdxx	3MT	2mw Ct2	Fair	4	8	19	0.01
	xxxx	3M	2mw A	Good	3	60	149	0.10
Kleysen (KYS)	xbxx	2X	2kx A	Good	4	55	136	0.09
	xcxs	3N	3s Bt2	Fair	4	9	21	0.01
	xcxx	2T	2kx Bt2	Good	4	122	302	0.21
Knolls (KLS)	1exx	4T	2m Ct2	Fair	5	16	40	0.03
	xcxx	3E	2m Bt2	Good	3	14	36	0.02
	xdxx	3TE	2m Ct2	Fair	4	80	198	0.14
Kornell (KOL)	xbxx	5WI	4kw Bi	Poor	5	124	306	0.21
	xxxx	5WI	4kw Bi	Poor	5	35	87	0.06
Lavenham (LVH)	xbxx	3MW	2mw A	Good	3	3	8	0.01
	xcxx	3MW	2mw Bt2	Good	3	9	23	0.02
Lavinia (LAV)	xbxs	3N	3sw A	Fair	4	88	217	0.15
	xbxx	2W	3w A	Fair	3	138	342	0.24
	xcxs	3N	3sw Bt2	Fair	4	123	303	0.21
	xcxx	2WT	3w Bt2	Fair	4	163	402	0.28
Levine (LEI)	xbxs	3IN	3w Bi	Fair	3	20	49	0.03
	xbxx	3I	3w Bi	Fair	3	299	738	0.51
	xcxx	3I	3w Bt2i	Fair	3	687	1,696	1.18
	xxxx	3I	3w Bi	Fair	3	107	265	0.18
Lindstrom (LDM)	xcxx	2WT	3wx Bt2	Fair	4	44	108	0.08

Table A2. Ag Capability and Irrigation Suitability of Soils in the RM of Riverdale (cont'd)

Soil name (Soil code)	Soil phase	Agricultural capability	Irrigation suitability			Total area		% of RM
			Class	General rating	Rating for potato production	ha	ac	
Lockhart (LKH)	xdxx	3T	2x Ct2	Fair	4	11	26	0.02
Lonery (LOE)	xbxx	5W	4w A	Poor	5	7	16	0.01
Lowroy (LOW)	xbxs	5W	4w A	Poor	5	4	11	0.01
	xbxx	5W	4w A	Poor	5	30	75	0.05
	xcxx	5W	4w Bt2	Poor	5	22	53	0.04
	xdxx	5W	4w Ct2	Poor	5	10	24	0.02
Lowton (LWN)	xbxs	5W	4kw A	Poor	5	40	98	0.07
	xbxt	5W	4ks A	Poor	5	3	7	<0.01
	xbxx	5W	4kw A	Poor	5	169	418	0.29
	xcxx	5W	4kw Bt2	Poor	5	21	51	0.04
	xxxs	5W	4kw A	Poor	5	45	111	0.08
	xxxt	5W	4ks A	Poor	5	51	125	0.09
	xxxx	5W	4kw A	Poor	5	48	119	0.08
Mansfield (MFI)	xbxx	4M	4m A	Poor	5	12	29	0.02
	xcxx	4M	4m Bt2	Poor	5	3	8	0.01
	xxxx	4M	4m A	Poor	5	30	73	0.05
Manson (MXD)	xbxx	2I	3kx A	Fair	5	2	4	<0.01
Marringhurst (MRH)	1cxx	5M	4m Bt2	Poor	5	130	321	0.22
	1dxx	5M	4m Ct2	Poor	5	6	15	0.01
	1xxx	5M	4m A	Poor	5	8	19	0.01
	2cxx	5ME	4m Bt2	Poor	5	26	63	0.04
	2exx	5ME	4m Ct2	Poor	5	6	15	0.01
	2fxx	5TE	4m Dt2	Poor	5	57	142	0.10
	xbxx	5M	4m A	Poor	5	11	28	0.02
	xcxx	5M	4m Bt2	Poor	5	95	234	0.16
	xdxx	5M	4m Ct2	Poor	5	52	129	0.09
	xexx	5M	4m Ct2	Poor	5	16	40	0.03
	xxxx	5M	4m A	Poor	5	24	58	0.04
Marsden (MDN)	xbxs	5W	4w A	Poor	5	63	155	0.11
	xbxx	5W	4w A	Poor	5	44	109	0.08
	xcxs	5W	4w Bt2	Poor	5	12	29	0.02
	xcxx	5W	4w Bt2	Poor	5	27	66	0.05
	xdxx	5W	4w Ct2	Poor	5	15	38	0.03
Melland (MXT)	xbxx	2M	3w A	Fair	4	9	21	0.01
	xcxx	2MT	3w Bt2	Fair	4	103	254	0.18
Miniota (MXI)	1cxx	4M	2m Bt2	Good	3	5	13	0.01
	1dxx	4M	2m Ct2	Fair	4	194	479	0.33
	1exx	4MT	2m Ct2	Fair	5	35	86	0.06
	xbxx	4M	2m A	Good	3	2,334	5,769	4.01
	xc1x	4M	2m Bt2	Good	4	36	88	0.06
	xc2x	4M	2m Bt2	Good	5	8	21	0.01
	xcxx	4M	2m Bt2	Good	3	3,210	7,931	5.51
	xd1x	4M	2m Ct2	Fair	4	52	129	0.09

Table A2. Ag Capability and Irrigation Suitability of Soils in the RM of Riverdale (cont'd)

Soil name (Soil code)	Soil phase	Agricultural capability	Irrigation suitability			Total area		% of RM
			Class	General rating	Rating for potato production	ha	ac	
Miniota (MXI)	xdxx	4M	2m Ct2	Fair	4	546	1,350	0.94
	xexx	4MT	2m Ct2	Fair	5	76	188	0.13
	xfxx	5T	2m Dt2	Poor	5	37	92	0.06
	xgxx	6T	2m Dt2	Poor	5	5	13	0.01
	xxxx	4M	2m A	Good	3	377	930	0.65
Miniota$_{Classification}$ (MXIcl)	xbxx	4M	2m A	Good	3	8	21	0.01
Moore Park (MPK)	xbxs	3N	3sw A	Fair	4	75	184	0.13
	xbxx	2W	3w A	Fair	4	189	466	0.32
	xcxs	3N	3sw Bt2	Fair	4	35	86	0.06
	xcxx	2W	3w A	Fair	4	669	1,653	1.15
	xdxx	3T	3w Ct2	Fair	4	94	232	0.16
Newdale (NDL)	1cxx	2T	2kx Bt2	Good	4	266	657	0.46
	1dxx	3T	2kx Ct2	Fair	4	77	190	0.13
	1exx	4T	2kx Dt2	Fair	5	7	16	0.01
	xb1x	2X	2kx A	Good	4	7	18	0.01
	xbxx	2X	2kx A	Good	4	117	290	0.20
	xc1x	2T	2kx Bt2	Good	4	136	336	0.23
	xcxx	2T	2kx Bt2	Good	4	2,115	5,226	3.63
	xd1x	3T	2kx Ct2	Fair	4	208	514	0.36
	xdxx	3T	2kx Ct2	Fair	4	901	2,227	1.55
Petrel (PTR)	xcxx	2WT	2w Bt2	Good	3	12	29	0.02
Pleasant (PLE)	xcxx	2MT	2w Bt2	Good	3	154	381	0.27
	xdxx	3T	2w Ct2	Fair	4	23	57	0.04
	xxxx	2M	2w A	Good	3	0	0	<0.01
Poolex (POX)	xbxx	5W	4w A	Poor	5	13	31	0.02
	xxxx	5W	4w A	Poor	5	8	20	0.01
Porple (POR)	1cxx	3M	1 Bt2	Good	1	12	30	0.02
	1dxx	3MT	1 Ct2	Fair	4	106	263	0.18
	1exx	4T	1 Ct2	Fair	5	64	157	0.11
	2dxx	3MT	1 Ct2	Fair	4	35	85	0.06
	2exx	4T	1 Ct2	Fair	5	106	262	0.18
	xcxx	3M	1 Bt2	Good	1	12	30	0.02
	xdxx	3MT	1 Ct2	Fair	4	117	289	0.20
	xexx	4T	1 Ct2	Fair	5	34	85	0.06
	xfxx	5T	1 Dt2	Poor	5	9	23	0.02
Prodan (PDA)	1cxx	2W	3w Bt2	Fair	3	0.5	1	0.00
	1xxs	3N	3sw A	Fair	4	360	889	0.62
	1xxx	2W	3w A	Fair	3	57	140	0.10
	2cxx	2WE	3w Bt2	Fair	3	2	6	<0.01
	xbxs	3N	3sw A	Fair	4	64	157	0.11
	xbxx	2W	3w A	Fair	3	413	1,020	0.71
	xcxs	3N	3sw Bt2	Fair	4	49	120	0.08
	xcxx	2WT	3w Bt2	Fair	3	721	1,782	1.24
	xdxx	3T	3w Ct2	Fair	4	31	78	0.05

Table A2. Ag Capability and Irrigation Suitability of Soils in the RM of Riverdale (cont'd)

Soil name (Soil code)	Soil phase	Agricultural capability	Irrigation suitability			Total area		% of RM
			Class	General rating	Rating for potato production	ha	ac	
Prodan (PDA)	xxxs	3N	3sw A	Fair	4	51	125	0.09
	xxxx	2W	3w A	Fair	3	312	770	0.54
Prosser (PSE)	1dxx	3MT	1 Ct2	Fair	4	10	24	0.02
	xbxx	3M	1 A	Excellent	1	50	123	0.09
	xcxx	3M	1 Bt2	Good	1	341	842	0.59
	xdxx	3MT	1 Ct2	Fair	4	37	90	0.06
Prosser$_{Classification}$ (PSEcl)	xcxx	3M	1 Bt2	Good	1	8	21	0.01
Ramada (RAM)	1dxx	3T	2k Ct2	Fair	4	36	90	0.06
	1exx	4T	2k Ct2	Fair	5	33	81	0.06
	xbxx	1	2k A	Good	2	241	596	0.41
	xcxx	2T	2k Bt2	Good	2	794	1,962	1.36
	xdxx	3T	2k Ct2	Fair	4	178	439	0.30
	xexx	4T	2k Ct2	Fair	5	4	9	0.01
Rempel (RMP)	1cxx	2T	2k Bt2	Good	2	50	123	0.09
	1dxx	3T	2k Ct2	Fair	4	23	57	0.04
	xbxx	1	2k A	Good	2	20	50	0.03
	xcxx	2T	2k Bt2	Good	2	55	136	0.09
	xdxx	3T	2k Ct2	Fair	4	51	126	0.09
	xexx	4T	2k Ct2	Fair	5	2	5	<0.01
Rufford (RUF)	1c1x	2T	2kx Bt2	Good	4	31	78	0.05
	1cxx	2T	2kx Bt2	Good	4	221	547	0.38
	1dxx	3T	2kx Ct2	Fair	4	185	457	0.32
	1e1x	4T	2kx Ct2	Fair	5	2	6	<0.01
	1exx	4T	2kx Ct2	Fair	5	49	122	0.08
	1f1x	5T	2kx Dt2	Poor	5	16	39	0.03
	2c1x	2TE	2kx Bt2	Good	4	2	5	<0.01
	2dxx	3TE	2kx Ct2	Fair	4	18	45	0.03
	2exx	4TE	2kx Ct2	Fair	5	34	83	0.06
	2f1x	5TE	2kx Dt2	Poor	5	25	63	0.04
	xbxx	2X	2kx A	Good	4	247	610	0.42
	xcxs	3N	2kx Bt2	Good	4	59	145	0.10
	xcxx	2T	2kx Bt2	Good	4	1,256	3,105	2.16
	xdxx	3T	2kx Ct2	Fair	4	363	896	0.62
	xexx	4T	2kx Ct2	Fair	5	40	98	0.07
	xxxx	2X	2kx A	Good	4	32	80	0.06
Sewell (SEE)	xbxx	5W	4w A	Poor	5	2	4	<0.01
	xcxx	5W	4w Bt2	Poor	5	8	19	0.01
	xdxx	5W	4w Ct2	Poor	5	7	17	0.01
Sigmund (SGO)	xbxs	3N	4kx A	Poor	5	90	222	0.15
	xbxx	2W	4kx A	Poor	5	192	475	0.33
	xcxx	2WT	4kx Bt2	Poor	5	85	211	0.15
	xdxx	3T	4kx Ct2	Poor	5	10	25	0.02
	xxxt	4N	4ks A	Poor	5	13	31	0.02
	xxxx	2W	4kx A	Poor	5	19	48	0.03

Table A2. Ag Capability and Irrigation Suitability of Soils in the RM of Riverdale (cont'd)

Soil name (Soil code)	Soil phase	Agricultural capability	Irrigation suitability			Total area		% of RM
			Class	General rating	Rating for potato production	ha	ac	
Stockton (SCK)	xbxx	4M	2m A	Good	2	66	163	0.11
	xcxx	4M	2m Bt2	Good	2	99	246	0.17
	xexx	4MT	2m Ct2	Fair	5	28	69	0.05
Sutton (SXP)	xxxx	5W	4w A	Poor	5	1	3	<0.01
Tadpole (TDP)	xbxs	5W	4w A	Poor	5	81	200	0.14
	xbxt	5W	4sw A	Poor	5	58	144	0.10
	xbxx	5W	4w A	Poor	5	476	1,176	0.82
	xcxs	5W	4w Bt2	Poor	5	19	47	0.03
	xcxx	5W	4w Bt2	Poor	5	97	240	0.17
	xdxx	5W	4w Ct2	Poor	5	4	10	0.01
	xxxs	5W	4w A	Poor	5	250	618	0.43
	xxxt	5W	4sw A	Poor	5	210	520	0.36
	xxxx	5W	4w A	Poor	5	148	365	0.25
Taggart (TGR)	xbxx	2W	2w A	Good	3	133	330	0.23
	xcxx	2WT	2w Bt2	Good	3	430	1,064	0.74
	xdxx	3T	2w Ct2	Fair	4	32	79	0.05
	xxxx	2W	2w A	Good	3	35	87	0.06
Torcan (TOC)	xbxx	2W	2w A	Good	3	53	131	0.09
	xcxx	2WT	2w Bt2	Good	3	174	431	0.30
	xdxx	3T	2w Ct2	Fair	4	12	29	0.02
Traverse (TAV)	1cxx	2T	1 Bt2	Good	1	84	207	0.14
	1exx	4T	1 Ct2	Fair	5	9	23	0.02
	1xxx	2X	1 A	Excellent	1	31	77	0.05
	2cxx	2TE	2m Bt2	Good	2	93	229	0.16
	xcxx	2T	1 Bt2	Good	1	182	449	0.31
	xdxx	3T	1 Ct2	Fair	4	14	34	0.02
	xexx	4T	1 Ct2	Fair	5	15	38	0.03
Varcoe (VRC)	xbxs	3N	3sw A	Fair	4	66	162	0.11
	xbxt	4N	4s A	Poor	5	18	44	0.03
	xbxx	2W	3w A	Fair	4	645	1,594	1.11
	xcxs	3N	3sw Bt2	Fair	4	349	862	0.60
	xcxt	4N	4s Bt2	Poor	5	29	72	0.05
	xcxx	2WT	3w Bt2	Fair	4	1,415	3,498	2.43
	xdxx	3T	3w Ct2	Fair	4	180	445	0.31
	xxxx	2W	3w A	Fair	4	6	14	0.01
Vodroff (VFF)	xbxs	5W	4w A	Poor	5	114	281	0.20
	xbxx	5W	4w A	Poor	5	179	441	0.31
	xcxs	5W	4w Bt2	Poor	5	4	11	0.01
	xcxx	5W	4w Bt2	Poor	5	25	63	0.04
	xdxx	5W	4w Ct2	Poor	5	13	32	0.02
	xxxs	5W	4w A	Poor	5	86	212	0.15
	xxxt	5W	4sw A	Poor	5	16	39	0.03
	xxxx	5W	4w A	Poor	5	57	142	0.10
Vordas (VDS)	xbxs	5W	4w A	Poor	5	6	15	0.01
	xbxx	5W	4w A	Poor	5	191	473	0.33

Table A2. Ag Capability and Irrigation Suitability of Soils in the RM of Riverdale (cont'd)

Soil name (Soil code)	Soil phase	Agricultural capability	Irrigation suitability			Total area		% of RM
			Class	General rating	Rating for potato production	ha	ac	
Vordas (VDS)	xcxx	5W	4w Bt2	Poor	5	82	203	0.14
	xdxx	5W	4w Ct2	Poor	5	11	27	0.02
	xxxx	5W	4w A	Poor	5W	33	82	0.06
Wellwood (WWD)	1cxx	2T	2k Bt2	Good	2	7	16	0.01
	xcxx	2T	2k Bt2	Good	2	14	34	0.02
	xexx	4T	2k Ct2	Fair	5	30	74	0.05
Wheatland (WHL)	1cxx	5M	3m Bt2	Fair	4	37	91	0.06
	1dxx	5M	3m Ct2	Fair	4	31	77	0.05
	1exx	5M	3m Ct2	Fair	5	17	41	0.03
	2cxx	5ME	3m Bt2	Fair	4	12	29	0.02
	2exx	5ME	3m Ct2	Fair	5	103	255	0.18
	xbxx	5M	3m A	Fair	4	278	688	0.48
	xcxx	5M	3m Bt2	Fair	4	1,242	3,070	2.13
	xdxx	5M	3m Ct2	Fair	4	483	1,194	0.83
	xexx	5M	3m Ct2	Fair	5	87	215	0.15
	xfxx	5MT	3m Dt2	Poor	5	12	30	0.02
$Wheatland_{Classification}$ (WHLcl)	1exx	5M	3m Ct2	Fair	5	7	18	0.01
Wytonville (WVI)	1cxx	3M	2mw Bt2	Good	3	4	10	0.01
	xbxx	3M	2mw A	Good	3	386	955	0.66
	xc1x	3M	2mw Bt2	Good	3	9	22	0.02
	xcxx	3M	2mw Bt2	Good	3	171	422	0.29
	xdxx	3MT	2mw Ct2	Fair	4	9	21	0.01
	xxxx	3M	2mw A	Good	3	178	439	0.31
Zarnet (ZRT)	2cxx	3ME	3m Bt2	Fair	4	66	163	0.11
	xexx	4T	2gm Ct2	Fair	5	3	7	<0.01
Total						**58,211**	**143,843**	**100**

Table A3. Description of Irrigation Suitability Classes

General Rating	Class	Degree of Limitation	Description
Excellent	**1A**	No soil or landscape limitations	These soils are medium textured, well-drained and hold adequate available moisture. Topography is level to nearly level. Gravity irrigation methods may be feasible.
Good	**1B** **2A** **2B**	Slight soil and/or landscape limitations	The range of crops that can be grown may be limited. As well, higher development inputs and management are required. Sprinkler irrigation is usually the only feasible method of water application.
Fair	**1C** **2C** **3A** **3B** **3C**	Moderate soil and/or landscape limitations	Limitations reduce the range of crops that may be grown and increase development and improvement costs. Management may include special conservation techniques to minimize soil erosion, limit salt movement, limit water table build-up or flooding of depressional areas. Sprinkler irrigation is usually the only feasible method of water application.
Poor	**1D** **2D** **3D** **4A** **4B** **4C** **4D**	Severe soil and/or landscape limitations	Limitations generally result in a soil that is unsuitable for sustained irrigation. Some land may have limited potential when special crops, irrigation systems, and soil and water conservation techniques are used.

Table A4. Landscape Features Affecting Irrigation Suitability

Symbol	Landscape Features		Degree of Limitation			
			None (A)	Slight (B)	Moderate (C)	Severe (D)
t1	Slope	Simple %	< 2	2 - 9	> 9 - 20	> 20
t2		Complex %	< 5		> 5 - 15	> 15
E	Relief (m) (Average Local)		< 1	1 - 3	> 3 - 5	> 5
P	Stoniness Class (% Cover)		0, 1 & 2 (0 to 3%)	3 (> 3 to 15%)	4 (> 15 to 50%)	5 (> 50%)
I	Inundation -Frequency of Flooding (period)		1 in 10 years	1 in 5 years	Every year (annual-spring)	Every year (seasonal)

* Suitability interpretations are based on the criteria for complex slopes.

Table A5. Soil Features Affecting Irrigation Suitability

Symbol	Soil Feature	Degree of Limitation			
		None (1)	Slight (2)	Moderate (3)	Severe (4)
d	Structure	Granular, Single Grained, Prismatic, Blocky, Subangular Blocky	Columnar, Platy	Massive	Massive
k	Ksat (mm/hr) (0 - 1.2 m)	> 50	50 - 15	< 15 - 1.5	< 1.5
x	Drainability (mm/hr) (1.2 - 3 m)	> 15	15 - 5	< 5 - 0.5	< 0.5
m	AWHC subhumid (mm/1.2 m) (% by volume) Subarid (mm/1.2 m) (% by volume)	> 120 (> 10) > 150 (> 12)	120 - 100 (10 - 8) 150 - 120 (12 - 10)	< 100 - 75 (< 8 - 6) < 120 - 100 (< 10 - 8)	< 75 (< 6) < 100 (< 8)
q	Intake Rate (mm/hr)	> 15	15 - 1.5	15 - 1.5	< 1.5
s	Salinity (mS/cm or dS/m) 0 - 0.6 m depth 0.6 - 1.2 m depth 1.2 - 3 m depth	 < 2 < 4 < 8	 2 - 4 4 - 8 8 - 16	 > 4 - 8 > 8 - 16 > 16	 > 8 > 16 > 16
n	Sodicity (SAR) 0 - 1.2 m depth 1.2 - 3 m depth	 < 6 < 6	 6 - 9 6 - 9	 > 9 - 12 > 9 - 12	 > 12 > 12
g	Geological (0 - 1.2 m) Uniformity (1.2 – 3 m)	1 Textural Group 2 Textural Groups	2 Textural Groups Coarser below 3 Textural Groups Coarser below	2 Textural Groups Finer below 3 Textural Groups Coarser below 3 Textural Groups Finer below	3 Textural Groups Finer below
r	Depth to Bedrock (m)	> 3	3 - 2	< 2 - 1	< 1
h	Depth to Water Table (m)	> 2	2 - 1.2 (if salinity is a problem)	2 - 1.2 (if salinity is a problem)	< 1.2
w	Drainage Class	Well, Moderately Well	Imperfect	Imperfect	Poor, Very Poor, Excessive, Rapid
	*Texture (Classes) (0 - 1.2 m)	L, SiL, VFSL, FSL	CL, SiCL, SCL, SL, LVFS	C, SC, SiC VFS, FS, LS, CoSL	HC GR, CoS, LCoS, S
	*Organic Matter %	> 2	2 - 1	2 - 1	< 1
	*Surface Crusting Potential	Slight	Low	Low	Moderate

* Other important factors used to interpret type and degree of limitation, but which do not present a limitation to irrigation themselves. No symbol is proposed for these factors since they will not be identified as subclass limitations.

Table A6. Guidelines for Assessing Land Suitability for Irrigated Potato Production under Rapid, Well and Moderately Well-drained Soils

In assessing suitability of land for irrigated potato production, the degree of suitability is determined by the most restrictive or severe rating assigned to any one of the listed characteristics or properties.

Characteristic or Property	Suitability Rating				
	Class 1	**Class 2**	**Class 3**	**Class 4**	**Class 5**
Texture Group*	CL CL/SF CL/SF/SC CL/FL/SF CL/LY LY/SF LY	SY,SY/SC, SY/CL, SY/LY, SY/FL, SY/SS/LY, SF, SY/UD/LY,SF/CS, SF/SC, SF/LY, SF/FL, SC/LY, SC, SF/SS/FL, CL/FL, SC/FL, CL/SS/FL, LY/FL, LY/SC, LY/LS, LY/SS/SF, LY/SS/SC, LY/FL/SF, LY/SS/LY, LY/SS/FL, FL FL/SF, FL/LY, FL/FL, FL/SY/SF, FL/SS/LY, FL/SS/FL, FL/CL	SY/SS, SY/CY/LY, SF/SS, CL/SS, SF/CY, CL/CY, SF/CY/LY, CL/CY/LY, CL/SS/CY, LY/CY, LY/SS, FL/SS	FL/CY, FL/CY/SF	SK, SS, SS/RK, SS/LY, SS/FL, SS/CY, SC/RK, SF/RK, CS, CL/RK, CL/FR, CL/FR/RK, LS/RK, LY/RK, LY/SY/RK, FL/LY/RK, CY, CY/SS, CY/SC, CY/SY, CY/SF, CY/CL, CY/LY, CY/FL, CY, CY/RK, CY/TX, CY/SS/CY, CY/LY/CY, CY/FL/CY, CY/LY/RK, CY/FL/RK, RK, TX, TX/LY, UD, UD/LY
Topography (Slope Class)	0 - 5% (a, b, c)			> 5 - 9% (d)	> 9% (e, f, g, h, i)
Stoniness Class	-			1	2, 3, 4, 5
Salinity (mS/cm)	< 2		2 – 4	> 4 - 8	> 8
Soil Order and / or Subgroup			Orthic Regosol		Organic Order, Solonetzic Order, Solonetzic Subgroups

Topography[1]	**Stoniness[2] (% Surface covered)**		**Salinity[3] (mS/cm)**	
< 5 % level to very gently sloping	x non-stony	(< <0.11 %)	very low	(0 – 2)
5 - 9 % gently sloping	1 slightly stony	(<0.11 - 0.1 %)	low	(> 2 – 4)
> 9 % mod. to extremely sloping	2 moderately stony	(> 0.1 - 3 %)	weakly (s)	(> 4 - 8)
	3 very stony	(> 3 - 15 %)	moderately (t)	(> 8 – 16)
	4 exceedingly stony	(> 15 - 50 %)	strongly (u)	(> 16)
	5 excessively stony	(> 50 %)		

* SK = Skeletal
SS = Sandy Skeletal
LS = Loamy Skeletal
CS = Clayey Skeletal
SC = Sandy Coarse
SY = Sandy
SF = Sandy Fine
CL = Coarse Loamy
LY = Loamy
FL = Fine Loamy
CY = Clayey
RK = Bedrock
FR = Fragmental
UD = Undifferentiated
TX = Texture Complex

Table A7. Guidelines for Assessing Land Suitability for Irrigated Potato Production under Imperfectly, Poorly and Very Poorly Drained Soils

In assessing suitability of land for irrigated potato production, the degree of suitability is determined by the most restrictive or severe rating assigned to any one of the listed characteristics or properties.

Characteristic or Property	Suitability Rating				
	Class 1	Class 2	Class 3	Class 4	Class 5
Texture Group*			SY, SY/SS, SY/SC, SY/CL, SY/LY, SC/LY, SY/SS/LY, SY/UD/LY, SC, SF, SF/SS, SF/CS, SF/LY, SF/SC, SF/FL, SY/FL, SF/SS/FL, CL, CL/SS, CL/SF, CL/LY, CL/FL, CL/SF/SC, CL/SS/FL, CL/FL/SF, LY/SS, LY/SC, LY/SF, LY/LS, LY/SS/SF, LY/SF/SC, SC/FL, LY, LY/FL, LY/SS/LY, LY/SS/FL, FL, FL/SF, FL/SS, FL/CL, FL/LY, FL/FL, FL/SY/SF, FL/SS/LY, FL/SS/FL	SF/CY, SY/CY/LYSF/ CY/LY, SF/CY/FL, CL/CY, CL/CY/LY, CL/SS/CY, LY/CY, FL/CY/SF, FL/CY	SK, SS, SS/RK, SS/LY, SS/FL, SS/CY, SC/RK, SF/RK, CS, CL/RK, CL/FR, CL/FR/RK, LS/RK, LY/RK, LY/SY/RK, FL/LY/RK, CY, CY/SS, CY/SC, CY/SY, CY/SF, CY/CL, CY/LY, CY/FL, CY CY/RK, CY/TX, CY/SS/CY, CY/LY/CY, CY/FL/CY, CY/LY/RK, CY/FL/RK, RK, TX, TX/LY, UD, UD/LY
Topography[1] (Slope)			0 - 5%	> 5 - 9%	> 9%
Stoniness[2] Class				St. 1	St. 2, 3, 4, 5
Salinity[3] (mS/cm)			< 4	4 - 8	> 8
Soil Order and / or Subgroup					Organic Order, Gleysolic Order, Solonetzic Order, Solonetzic Subgroups

Topography[1]	Stoniness[2]	(Surface covered)	Salinity[3]	(mS/cm)
< 5 % level to very gently sloping	- non-stony	(< <0.11 %)	very low	(0 – 2)
5 - 9 % gently sloping	1 slightly stony	(<0.11 - 0.1 %)	low	(> 2 – 4)
> 9 % mod. to extremely sloping	2 moderately stony	(> 0.1 - 3 %)	weakly (s)	(> 4 – 8)
	3 very stony	(> 3 - 15 %)	Moderately (t)	(> 8 – 16)
	4 exceedingly stony	(> 15 - 50 %)	Strongly (u)	(> 16)
	5 excessively stony	(> 50 %)		

* SK = Skeletal
SS = Sandy Skeletal
LS = Loamy Skeletal
CS = Clayey Skeletal
SC = Sandy Coarse
SY = Sandy
SF = Sandy Fine
CL = Coarse Loamy
LY = Loamy
FL = Fine Loamy
CY = Clayey
RK = Bedrock
FR = Fragmental
UD = Undifferentiated
TX = Texture Complex

Table A8. Suitability Ratings of Soils for Selected Engineering and Recreational Uses in the RM of Riverdale

Soil name	Soil phases	Top soil	Sand & gravel	Road fill	Building - basement		Local roads/ streets	Sanitary trench	Land-fill area	Cover material	Sewage lagoon	Septic field	Play ground	Picnic area	Camp area	Paths & trails
					with	without										
Eroded Slope ($ER)	1dxx	Vb	Va	--	--	--	--	Vdk	Vk	Pd	Pdt	Pk	Pst	Ps	Ps	Fs
	1e1x	Pbt	Va	--	--	--	--	Vd	Vk	Pd	Vt	Pk	Vt	Ps	Ps	Fs
	1exx	Pbt	Va	--	--	--	--	Vd	Vk	Pd	Vt	Pk	Vt	Ps	Ps	Fs
	1fxx	Vt	Va	Fpt	Pt	Pt	Pt	Vd	Vk	Pt	Vt	Pt	Vt	Pt	Pt	Ft
	2exx	Vb	Va	--	Ft	Ft	Ft	Vdk	Vk	Pd	Vt	Pk	Vt	Ps	Ps	Ps
	2fxx	Vt	Va	Ft	Pt	Pt	Pt	Vdk	Vk	Pdt	Vt	Pkt	Vt	Pst	Pst	Fst
	2gxx	Vt	Va	Pt	Vt	Vt	Vt	Vd	Vkt	Vt	Vt	Vt	Vst	Vt	Vst	Pt
	2hxx	Vt	Va	Vt	Vt	Vt	Vt	Vdt	Vkt	Vt	Vt	Vt	Vt	Vt	Vt	Vt
	3g1x	Vt	Va	Pt	Vt	Vt	Vt	Vd	Vkt	Vt	Vt	Vt	Vst	Vt	Vst	Pt
	xdxx	Vb	Va	--	--	--	--	Vdk	Vk	Pd	Pdt	Pk	Pst	Ps	Ps	Fs
	xexx	Vb	Va	--	--	--	--	Vdk	Vk	Pd	Vt	Pk	Vt	Ps	Ps	Fs
	xfxx	Vt	Va	--	Pt	Pt	Pt	Vdk	Vk	Pdt	Vt	Pkt	Vt	Pst	Pst	Fst
	xgxx	Vt	Va	Pt	Vt	Vt	Vt	Vd	Vkt	Vt	Vt	Vt	Vt	Vt	Vt	Pt
Marsh ($MH)	xbxx	Vw	Vah	Vhw	Vhw	Vhw	Vaw	Vhw	Vhw	Vw	Vhi	Vhi	Vsw	Vsw	Vsw	Vw
	xxxt	Vw	Vah	Vhw	Vhw	Vhw	Vaw	Vhw	Vhw	Vw	Vhi	Vhi	Vsw	Vsw	Vsw	Vw
	xxxx	Vw	Vah	Vhw	Vhw	Vhw	Vaw	Vhw	Vhw	Vw	Vhi	Vhi	Vsw	Vsw	Vsw	Vw
Unclassified ($UL)	xxxx	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Urban ($UR)	xxxx	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Water ($ZZ)	xxxx	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Angusville (ANL)	xbxx	Pb	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fw	Fw	Fw	Fw
Arizona (AIZ)	xcxx	Vb	Fa	G	G	G	G	Vks	Vk	Pq	Vkg	Gg	Fst	Fms	Fs	Ps
Ashmore (AHO)	1dxx	Fbt	Faq	G	G	G	G	Vks	Vkg	Pcq	Vak	Gg	Pt	Fms	G	G
	1exx	Pt	Faq	G	Ft	Ft	Ft	Vks	Vkg	Pcq	Vak	Ft	Vt	Fms	Ft	G
	xcxx	Fb	Faq	G	G	G	G	Vks	Vkg	Pcq	Vak	Gg	Fq	Fms	G	G
	xdxx	Fbt	Faq	G	G	G	G	Vks	Vkg	Pcq	Vak	Gg	Pt	Fms	G	G
	xfxx	Vt	Faq	Ft	Pt	Pt	Pt	Vks	Vkg	Pqt	Vkt	Pt	Vt	Pt	Pt	Fst
Assiniboine (ASB)	xbxx	Ps	Va	Pa	Piw	Pai	Pai	Pis	Pi	Ps	Pi	Vk	Ps	Ps	Pis	Ps
	xcxx	Ps	Va	Pa	Piw	Pai	Pai	Pis	Pi	Ps	Pi	Vk	Ps	Ps	Pis	Ps
	xxxs	Pns	Va	Pa	Piw	Pai	Pai	Pis	Pi	Ps	Pi	Vk	Ps	Ps	Pis	Ps
	xxxx	Ps	Va	Pa	Piw	Pai	Pai	Pis	Pi	Ps	Pi	Vk	Ps	Ps	Pis	Ps
Axford (AXF)	2dxx	Vb	Fx	G	Fa	G	G	Fsg	Gg	Fcs	Pkt	Fk	Pt	Fms	Fs	G
	xcxx	Pbs	Fx	G	Fa	G	G	Fsg	Gg	Fcs	Pk	Fk	Fst	Fms	Fs	G
	xexx	Pst	Fx	G	Fat	Ft	Ft	Fsg	Ftg	Fst	Vt	Fkt	Vt	Fmt	Fst	G
Bankton (BAO)	xbxx	Ps	Va	Pa	Pa	Pa	Pa	Ps	G	Ps	G	Vk	Fks	Fs	Fks	Fs
	xcxx	Ps	Va	Pa	Pa	Pa	Pa	Ps	G	Ps	Ft	Vk	Fkt	Fs	Fks	Fs
	xdxx	Pst	Va	Pa	Pa	Pa	Pa	Ps	G	Ps	Pt	Vk	Pt	Fs	Fks	Fs

Table A8. Suitability Ratings of Soils for Selected Engineering and Recreational Uses in the RM of Riverdale (cont'd)

Soil name	Soil phases	Top soil	Sand & gravel	Road fill	Building - basement		Local roads/ streets	Sanitary trench	Land-fill area	Cover material	Sewage lagoon	Septic field	Play ground	Picnic area	Camp area	Paths & trails
					with	without										
Barren (BAE)	xcxx	Vb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	xdxx	Vb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs
	xexx	Vb	Va	Fa	Fat	Fat	Fat	Fs	Ft	Fst	Vt	Pk	Vt	Fst	Fst	G
Barwood (BWO)	xcxx	Fs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fkt	Phk	Ftw	Fsw	Fsw	Fsw
Basker (BKR)	xbxx	Pi	Va	Pw	Viw	Vi	Vi	Viw	Viw	Pw	Vi	Vhi	Viw	Piw	Viw	Piw
	xcxx	Pi	Va	Pw	Viw	Vi	Vi	Viw	Viw	Pw	Vi	Vhi	Viw	Piw	Viw	Piw
	xxxx	Pi	Va	Pw	Viw	Vi	Vi	Viw	Viw	Pw	Vi	Vhi	Viw	Piw	Viw	Piw
Beresford (BSF)	1xxs	Pbn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fnw	Fnw	Fnw	Fsw
	xbxs	Pn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fnw	Fnw	Fnw	Fsw
	xbxt	Vn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Pn	Pn	Pn	Fsw
	xbxx	Fs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fsw	Fsw	Fsw	Fsw
	xcxs	Pn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fkt	Phk	Fnt	Fnw	Fnw	Fsw
	xcxt	Vn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Pn	Pn	Pn	Fsw
	xcxx	Fs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fkt	Phk	Ftw	Fsw	Fsw	Fsw
	xdxs	Pn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Pt	Phk	Pt	Fnw	Fnw	Fsw
	xdxx	Fst	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Pt	Phk	Pt	Fsw	Fsw	Fsw
	xxxx	Fs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fsw	Fsw	Fsw	Fsw
Bermont (BMN)	xcxx	Fbs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	xdxx	Fbt	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs
Bornet (BOR)	xbxx	Fb	Faq	Pw	Vhw	Phw	Pw	Vwg	Vwg	Pcq	Vak	Vhg	Pw	Pw	Pw	Pw
	xcxx	Fb	Faq	Pw	Vhw	Phw	Pw	Vwg	Vwg	Pcq	Vak	Vhg	Pw	Pw	Pw	Pw
	xdxx	Fbt	Faq	Pw	Vhw	Phw	Pw	Vwg	Vwg	Pcq	Vak	Vhg	Ptw	Pw	Pw	Pw
Boswell (BSW)	xbxx	Pb	Fx	Fw	Pw	Faw	Fw	Pwg	Fwg	Fcs	Pk	Phk	Fs	Fsw	Fsw	Fw
	xcxx	Pb	Fx	Fw	Pw	Faw	Fw	Pwg	Fwg	Fcs	Pk	Phk	Fst	Fsw	Fsw	Fw
	xxxx	Pb	Fx	Fw	Pw	Faw	Fw	Pwg	Fwg	Fcs	Pk	Phk	Fs	Fsw	Fsw	Fw
Brownridge (BWD)	xdxx	Fbt	Va	G	G	G	G	Pk	Pk	G	Pkt	G	Pt	G	G	G
	xfxx	Vb	Va	Ft	Pt	Pt	Pt	Pk	Pkt	Pt	Vt	Pt	Vt	Pt	Pt	Ft
Cactus (CCS)	2cxx	Vb	Pa	G	G	G	G	Vks	Vkg	Pq	Vkg	Gg	Fst	Fms	Fs	G
	2exx	Vb	Pa	G	Ft	Ft	Ft	Vks	Vkg	Pq	Vtk	Ft	Vt	Fts	Fts	G
	xcxx	Pbs	Pa	G	G	G	G	Vks	Vkg	Pq	Vkg	Gg	Fst	Fms	Fs	G
	xdxx	Ps	Pa	G	G	G	G	Vks	Vkg	Pq	Vkg	Gg	Pt	Fms	Fs	G
	xexx	Vb	Pa	G	Ft	Ft	Ft	Vks	Vkg	Pq	Vtk	Ft	Vt	Fts	Fts	G
Capell (CXT)	xbxx	Fbs	Faq	Fw	Pw	Faw	Faw	Vks	Pkg	Pcq	Vak	Phg	Fsw	Fsw	Fsw	Fsw
	xcxx	Fbs	Faq	Fw	Pw	Faw	Faw	Vks	Pkg	Pcq	Vak	Phg	Ftw	Fsw	Fsw	Fsw
	xexx	Pt	Faq	Fw	Pw	Faw	Fat	Vks	Pkg	Pcq	Vkt	Phg	Vt	Ftw	Ftw	Fsw
	xxxx	Fbs	Faq	Fw	Pw	Faw	Faw	Vks	Pkg	Pcq	Vak	Phg	Fsw	Fsw	Fsw	Fsw
Carroll (CXF)	1cxx	Pb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	1dxx	Pb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs
	1exx	Pbt	Va	Fa	Fat	Fat	Fat	Fs	Ft	Fst	Vt	Pk	Vt	Fst	Fst	Fs

Table A8. Suitability Ratings of Soils for Selected Engineering and Recreational Uses in the RM of Riverdale (cont'd)

Soil name	Soil phases	Top soil	Sand & gravel	Road fill	Building - basement		Local roads/ streets	Sanitary trench	Land-fill area	Cover material	Sewage lagoon	Septic field	Play ground	Picnic area	Camp area	Paths & trails
					with	without										
Carroll (CXF)	2cxx	Vb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	2exx	Vb	Va	Fa	Fat	Fat	Fat	Fs	Ft	Fst	Vt	Pk	Vt	Fst	Fst	Fs
	2fxx	Vbt	Va	Fat	Pt	Pt	Pt	Fst	Pt	Pt	Vt	Pkt	Vt	Pt	Pt	Fst
	xbxx	Fbs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fak	Pk	Fs	Fs	Fs	Fs
	xcxx	Fbs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	xdxx	Fst	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs
	xexx	Pt	Va	Fa	Fat	Fat	Fat	Fs	Ft	Fst	Vt	Pk	Vt	Fst	Fst	Fs
Carvey (CAV)	1cxx	Fs	Fhq	Pw	Vhw	Phw	Pw	Vwg	Vhk	Pqw	Vkg	Vhg	Pw	Pw	Pw	Pw
	xbxx	Fs	Fhq	Pw	Vhw	Phw	Pw	Vwg	Vhk	Pqw	Vkg	Vhg	Pw	Pw	Pw	Pw
	xcxx	Fs	Fhq	Pw	Vhw	Phw	Pw	Vwg	Vhk	Pqw	Vkg	Vhg	Pw	Pw	Pw	Pw
	xxxx	Fs	Fhq	Pw	Vhw	Phw	Pw	Vwg	Vhk	Pqw	Vkg	Vhg	Pw	Pw	Pw	Pw
Chambers (CBS)	1c1x	Pb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	1cxx	Pb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	1dxx	Pb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs
	xbxx	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fak	Pk	Fs	Fs	Fs	Fs
	xcxs	Pn	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fsn	Fsn	Fs
	xcxx	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	xdxx	Fst	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	FS
Charman (CXV)	xbxx	Fs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fsw	Fsw	Fsw	Fsw
	xcxs	Pn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fkt	Phk	Fnt	Fnw	Fnw	Fsw
	xcxx	Fs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fkt	Phk	Ftw	Fsw	Fsw	Fsw
	xdxx	Fst	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Pt	Phk	Pt	Fsw	Fsw	Fsw
	xxxs	Pn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fnw	Fnw	Fnw	Fsw
	xxxx	Fs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fsw	Fsw	Fsw	Fsw
Chater (CXW)	xexx	Pbt	Fx	G	Ft	Ft	Ft	Fsg	Ftg	Fst	Vt	Fkt	Vt	Fst	Fst	G
Clementi (CLN)	1cxx	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	1xxx	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fak	Pk	Fs	Fs	Fs	Fs
	2cxx	Pb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	xbxx	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fak	Pk	Fs	Fs	Fs	Fs
	xcxx	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	xdxx	Fst	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs
	xexx	Pt	Va	Fa	Fat	Fat	Fat	Fs	Ft	Fst	Vt	Pk	Vt	Fst	Fst	Fs
Cobfield (CBF)	xbxs	Pn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fnw	Fnw	Fnw	Fsw
	xbxt	Vn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	G	Phk	Pn	Pn	Pn	Fsw
	xbxx	Fs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fsw	Fsw	Fsw	Fsw
	xcxs	Pn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fkt	Phk	Fnt	Fnw	Fnw	Fsw
	xcxx	Fs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fkt	Phk	Ftw	Fsw	Fsw	Fsw
Cordova (CVA)	1c1x	Pb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	1cxx	Pb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	1dxx	Pb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs

Table A8. Suitability Ratings of Soils for Selected Engineering and Recreational Uses in the RM of Riverdale (cont'd)

Soil name	Soil phases	Top soil	Sand & gravel	Road fill	Building - basement		Local roads/ streets	Sanitary trench	Land-fill area	Cover material	Sewage lagoon	Septic field	Play ground	Picnic area	Camp area	Paths & trails
					with	without										
Cordova (CVA)	xc1x	Fbs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	xcxx	Fbs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	xdxx	Fbt	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs
	xxxx	Fbs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fak	Pk	Fs	Fs	Fs	Fs
Crookdale (CKD)	xexx	Pt	Va	Faw	Pw	Ftw	Faw	Vks	Ftw	Pq	Vt	Fht	Vt	Ftw	Ftw	Fsw
	xxxx	Fbs	Va	Faw	Pw	Faw	Faw	Vks	Fwg	Pq	Pkg	Fhg	Fsw	Fsw	Fsw	Fsw
Croyon (CYN)	1cxx	Pb	Faq	G	G	Fa	Fa	Vks	Pkg	Pcq	Vak	Gg	Ft	G	G	G
	xb1x	Fb	Faq	G	G	Fa	Fa	Vks	Pkg	Pcq	Vak	Gg	Fs	Fs	Fs	Fs
	xbxs	Fb	Faq	G	G	Fa	Fa	Vks	Pkg	Pcq	Vak	Gg	Fsn	Fsn	Fsn	Fs
	xbxx	Fb	Faq	G	G	Fa	Fa	Vks	Pkg	Pcq	Vak	Gg	Fs	Fs	FS	Fs
	xcxx	Fb	Faq	G	G	Fa	Fa	Vks	Pkg	Pcq	Vak	Gg	Ft	G	G	G
	xdxx	Fbt	Faq	G	G	Fa	Fa	Vks	Pkg	Pcq	Vak	Gg	Pt	G	G	G
	xexx	Pt	Faq	G	Ft	Fat	Fat	Vks	Pkg	Pcq	Vkt	Ftg	Vt	Fst	Fst	G
	xxxx	Fb	Faq	G	G	Fa	Fa	Vks	Pkg	Pcq	Vak	Gg	Fs	Fs	Fs	Fs
Dexter (DXT)	xbxx	Ps	G	Fw	Pw	Fw	Fw	Vks	Vkg	Vcs	Vck	Fhg	Pq	Fsw	Fsw	Fw
	xcxx	Ps	G	Fw	Pw	Fw	Fw	Vks	Vkg	Vcs	Vck	Fhg	Pq	Fsw	Fsw	Fw
Dogand (DGA)	xcxx	Fbs	Pax	Fa	Fa	Fa	Fa	Fsg	Gg	Fcs	Pkg	Gg	Fst	Fs	Fs	Fs
Dorset (DOT)	1c1x	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pq	Fms	Fs	G
	1dxx	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pqt	Fms	Fs	G
	xbxx	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pq	Fms	Fs	G
	xcxx	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pq	Fms	Fs	G
	xdxx	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pqt	Fms	Fs	G
	xexx	Pbt	G	G	Ft	Ft	Ft	Vks	Vkg	Vcs	Vkt	Ftg	Vqt	Fst	Fst	G
	xfxx	Vt	G	Ft	Pt	Pt	Pt	Vks	Vkg	Vcs	Vkt	Ptg	Vqt	Pt	Pt	Ft
Drokan (DRO)	xbxs	Pn	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xbxt	Vn	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pnw	Pnw	Pnw	Pw
	xbxx	Fs	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xcxs	Pn	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xcxt	Vn	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pwn	Pwn	Pwn	Pw
	xcxx	Fs	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xxxs	Pn	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xxxt	Vn	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pnw	Pnw	Pnw	Pw
	xxxx	Fs	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
Druxman (DXM)	1xxx	Fb	Faq	Faw	Pw	Faw	Faw	Vks	Pkg	Pcq	Vak	Phg	Fw	Fw	Fw	Fw
	xbxx	Fb	Faq	Faw	Pw	Faw	Faw	Vks	Pkg	Pcq	Vak	Phg	Fw	Fw	Fw	Fw
	xcxx	Fb	Faq	Faw	Pw	Faw	Faw	Vks	Pkg	Pcq	Vkg	Phg	Ftw	Fw	Fw	Fw
	xdxx	Fbt	Faq	Faw	Pw	Faw	Faw	Vks	Pkg	Pcq	Vak	Phg	Pt	Fw	Fw	Fw
	xxxx	Fb	Faq	Faw	Pw	Faw	Faw	Vks	Pkg	Pcq	Vak	Phg	Fw	Fw	Fw	Fw

Table A8. Suitability Ratings of Soils for Selected Engineering and Recreational Uses in the RM of Riverdale (cont'd)

Soil name	Soil phases	Top soil	Sand & gravel	Road fill	Building - basement		Local roads/ streets	Sanitary trench	Land-fill area	Cover material	Sewage lagoon	Septic field	Play ground	Picnic area	Camp area	Paths & trails
					with	without										
Durnan (DRN)	1cxx	Pb	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Fkg	Fk	Fst	Fs	Fs	Fs
	1dxx	Pb	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Pt	Fk	Pt	Fs	Fs	Fs
	1exx	Pbt	Va	Fa	Fat	Fat	Fat	Gg	Ftg	Ft	Vt	Fkt	Vt	Fst	Fst	Fs
	1fxx	Vt	Va	Fat	Pt	Fa	Pt	Ftg	Ptg	Pt	Vt	Pt	Vt	Pt	Pt	Fs
	2cxx	Pb	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Fkg	Fk	Fs	Fs	Fs	Fs
	2dxx	Vb	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Fkg	Fk	Fst	Fs	Fs	Fs
	2exx	Vb	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Ptg	Fk	Pt	Fs	Fs	Fs
	2fxx	Vb	Va	Fa	Fat	Fa	Fat	Gg	Ftg	Ft	Vt	Fkt	Vt	Fts	Fts	Fs
	xbxx	Fb	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Fak	Fk	Fs	Fs	Fs	Fs
	xcxx	Fb	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Fkg	Fk	Fst	Fs	Fs	Fs
	xdxx	Fbt	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Pt	Fk	Pt	Fs	Fs	Fs
	xexx	Pt	Va	Fa	Fat	Fat	Fat	Gg	Ftg	Ft	Vt	Fkt	Vt	Fst	Fst	Fs
	xfxx	Vt	Va	Fat	Pt	Pt	Pt	Ftg	Ptg	Pt	Vt	Pt	Vt	Pt	Pt	Fst
Everton (EVO)	xbxx	Ps	Va	Pa	Pa	Pa	Pa	Ps	G	Ps	Fjk	Pk	Fs	Fs	Fs	Fs
Fairland (FND)	1cxx	Fb	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Fkg	Fk	Ft	G	G	G
	1dxx	Fbt	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Ptg	Fk	Pt	G	G	G
	xbxx	G	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Fkg	Fk	G	G	G	G
	xcxx	G	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Fkg	Fk	Ft	G	G	G
	xdxx	Ft	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Ptg	Fk	Pt	G	G	G
Fenton (FET)	xbxs	Pns	Va	Paw	Vw	Paw	Paw	Vhw	Pw	Psw	Ph	Vh	Psw	Psw	Psw	Psw
	xbxt	Vn	Va	Vaw	Vw	Paw	Paw	Vhw	Pw	Psw	Ph	Vh	Pwt	Pwt	Pwt	Psw
	xbxx	Ps	Va	Paw	Vw	Paw	Paw	Vhw	Pw	Psw	Ph	Vh	Psw	Psw	Psw	Psw
	xxxs	Pns	Va	Paw	Vw	Paw	Paw	Vhw	Pw	Psw	Ph	Vh	Psw	Psw	Psw	Psw
Floors (FLS)	1cxx	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pq	Fms	Fs	G
	1d1x	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pqt	Fms	Fs	G
	1dxx	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pqt	Fms	Fs	G
	1exx	Pbs	G	G	Ft	Ft	Ft	Vks	Vkg	Vcs	Vck	Ft	Vt	Fst	Fst	G
	1fxx	Vt	G	Ft	Pt	Pt	Pt	Vks	Vkg	Vcs	Vck	Pt	Vt	Pt	Pt	Ft
	2dxx	Vb	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pqt	Fms	Fs	G
	2exx	Pbs	G	G	Ft	Ft	Ft	Vks	Vkg	Vcs	Vck	Ft	Vt	Fst	Fst	G
	xbxx	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pq	Fms	Fs	G
	xcxx	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pq	Fms	Fs	G
	xdxx	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pqt	Fms	Fs	G
Forrest (FRT)	xbxs	Pns	Va	Pa	Paw	Pa	Pa	Psw	Fw	Ps	Fjk	Pk	Ps	Ps	Ps	Ps
	xbxx	Ps	Va	Pa	Paw	Pa	Pa	Psw	Fw	Ps	Fjk	Pk	Ps	Ps	Ps	Ps
	xcxx	Ps	Va	Pa	Paw	Pa	Pa	Psw	Fw	Ps	Fjt	Pk	Ps	Ps	Ps	Ps
Gateside (GTD)	xbxx	G	Va	Faw	Pw	Faw	Faw	Pkw	Pk	G	Pk	Fh	Fw	Fw	Fw	Fw
	xcxx	G	Va	Faw	Pw	Faw	Faw	Pkw	Pk	G	Pk	Fh	Ftw	Fw	Fw	Fw
Gendzel (GDZ)	xbxx	Ps	G	Fw	Pw	Fw	Fw	Vks	Vkg	Pq	Vkg	Phg	Fsw	Fsw	Fsw	Fw
	xcxx	Ps	G	Fw	Pw	Fw	Fw	Vks	Vkg	Pq	Vkg	Phg	Fst	Fsw	Fsw	Fw

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					with	without										
Gendzel (GDZ)	xdxx	Ps	G	Fw	Pw	Fw	Fw	Vks	Vkg	Pq	Vkg	Phg	Pt	Fsw	Fsw	Fw
Glenboro (GBO)	1bxx	Fb	Pa	G	G	Fa	G	Vks	Gg	Pq	Vkg	Gg	G	G	G	G
	1cxx	Fb	Pa	G	G	Fa	G	Vks	Gg	Pq	Vkg	Gg	Ft	G	G	G
	1dxx	Fbt	Pa	G	G	Fa	G	Vks	Gg	Pq	Vkg	Gg	Pt	G	G	G
	1exx	Pt	Pa	G	Ft	Ft	Fat	Vks	Ftg	Pq	Vkg	Ftg	Vt	Fst	Ft	G
	2exx	Fb	Pa	G	G	Fa	G	Vks	Gg	Pq	Vkg	Gg	G	G	G	G
	2fxx	Vt	Pa	Ft	Pt	Pt	Pt	Vks	Ptg	Pqt	Vtg	Ptg	Vt	Pt	Pt	Fst
	xbxx	G	Pa	G	G	Fa	G	Vks	Gg	Pq	Vkg	Gg	G	G	G	G
	xcxx	G	Pa	G	G	Fa	G	Vks	Gg	Pq	Vkg	Gg	Ft	G	G	G
	xdxx	Ft	Pa	G	G	Fa	G	Vks	Gg	Pq	Vkg	Gg	Pt	G	G	G
	xexx	Pt	Pa	G	Ft	Ft	Fat	Vks	Ftg	Pq	Vkg	Ftg	Vt	Fst	Ft	G
Glenboro$_{Classiffication}$ (GBOcl)	1exx	Pt	Pa	G	Ft	Ft	Fat	Vks	Ftg	Pq	Vkg	Ftg	Vt	Fst	Ft	G
Grayson (GYS)	xbxx	G	Pha	Pw	Vhw	Phw	Pfw	Vwg	Pwg	Pqw	Vhg	Vhg	Pw	Pw	Pw	Pw
	xdxx	Ft	Pha	Pw	Vhw	Phw	Pfw	Vwg	Pwg	Pqw	Vhg	Vhg	Ptw	Pw	Pw	Pw
	xxxx	G	Pha	Pw	Vhw	Phw	Pfw	Vwg	Pwg	Pqw	Vhg	Vhg	Pw	Pw	Pw	Pw
Gregg1* (GRG)	xcxx	G	Va	Faw	Pw	Faw	Faw	Pwg	Fwg	G	Fkg	Ph	Ftw	Fsw	Fw	Fw
Grover (GRO)	1bxx	G	Pa	Faw	Pw	Faw	Faw	Vks	Fwg	Pq	Vkg	Fhg	Fw	Fw	Fw	Fw
	xbxx	G	Pa	Faw	Pw	Faw	Faw	Vks	Fwg	Pq	Vkg	Fhg	Fw	Fw	Fw	Fw
	xcxx	G	Pa	Faw	Pw	Faw	Faw	Vks	Fwg	Pq	Vkg	Fhg	Ftw	Fw	Fw	Fw
	xdxx	Ft	Pa	Faw	Pw	Faw	Faw	Vks	Fwg	Pq	Vkg	Fhg	Pt	Fw	Fw	Fw
	xxxx	G	Pa	Faw	Pw	Faw	Faw	Vks	Fwg	Pq	Vkg	Fhg	Fw	Fw	Fw	Fw
Hamiota (HMI)	xbxx	Fs	Va	Pw	Vw	Pw	Pw	Vw	Vhw	Pw	Ph	Ph	Pw	Pw	Pw	Pw
Harding (HRG)	xbxs	Pn	Va	Pa	Paw	Pa	Pa	Psw	Fw	Ps	G	Vk	Pks	Psw	Pks	Ps
	xbxx	Ps	Va	Pa	Paw	Pa	Pa	Psw	Fw	Ps	G	Vk	Pks	Psw	Pks	Ps
	xcxx	Ps	Va	Pa	Paw	Pa	Pa	Psw	Fw	Ps	Ft	Vk	Pks	Psw	Pks	Ps
	xexx	Pst	Va	Pa	Paw	Pa	Pa	Psw	Ftw	Ps	Vt	Vk	Vt	Psw	Pks	Ps
Hilton (HIT)	xcxx	Fb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Ft	G	G	G
Hughes (HGH)	xbxx	Ps	G	Fw	Pw	Fw	Fw	Vks	Vkg	Pq	Vkg	Phg	Fsw	Fsw	Fsw	Fw
	xcxx	Ps	G	Fw	Pw	Fw	Fw	Vks	Vkg	Pq	Vkg	Phg	Ftw	Fsw	Fsw	Fw
	xxxx	Ps	G	Fw	Pw	Fw	Fw	Vks	Vkg	Pq	Vkg	Phg	Fsw	Fsw	Fsw	Fw
Hummerston (HMO)	xxxx	Ps	Pa	Fw	Pw	Fw	Fw	Vks	Vkg	Pq	Vkg	Fhg	Fsw	Fsw	Fsw	Fw
Janick (JIK)	xbxx	Ps	Va	Pa	Pa	Pa	Pa	Ps	G	Ps	G	Vk	Fks	Fs	Fks	Fs
	xcxx	Ps	Va	Pa	Pa	Pa	Pa	Ps	G	Ps	Ft	Vk	Fst	Fs	Fks	Fs
	xxxx	Ps	Va	Pa	Pa	Pa	Pa	Ps	G	Ps	G	Vk	Fks	Fs	Fks	Fs

* Loam substrate variant

Table A8. Suitability Ratings of Soils for Selected Engineering and Recreational Uses in the RM of Riverdale (cont'd)

Soil name	Soil phases	Top soil	Sand & gravel	Road fill	Building - basement		Local roads/ streets	Sanitary trench	Land-fill area	Cover material	Sewage lagoon	Septic field	Play ground	Picnic area	Camp area	Paths & trails
					with	without										
Jaymar (JAY)	xd1x	Fbt	Pax	Fa	Fa	Fa	Fa	Fsg	Gg	Fcs	Pkt	Gg	Pt	G	G	G
	xdxx	Fbt	Pax	Fa	Fa	Fa	Fa	Fsg	Gg	Fcs	Pkt	Gg	Pt	G	G	G
Justice (JUC)	xbxx	Ps	Va	Pa	Paw	Pa	Pa	Psw	Fw	Ps	Fjk	Pk	Ps	Ps	Ps	Ps
	xxxs	Pns	Va	Pa	Paw	Pa	Pa	Psw	Fw	Ps	Fjk	Pk	Ps	Ps	Ps	Ps
Kerran (KRN)	xbxx	Pis	Va	Paw	Viw	Vi	Vi	Viw	Viw	Psw	Vi	Vhi	Viw	Piw	Viw	Piw
	xcxx	Pis	Va	Paw	Viw	Vi	Vi	Viw	Viw	Psw	Vi	Vhi	Viw	Piw	Viw	Piw
	xxxx	Pis	Va	Paw	Viw	Vi	Vi	Viw	Viw	Psw	Vi	Vhi	Viw	Piw	Viw	Piw
Kilmury (KUY)	xbxx	Fb	Faq	Fw	Pw	Faw	Fw	Vks	Vkg	Pcq	Vak	Phg	Fqw	Fw	Fw	Fw
	xcxx	Fb	Faq	Fw	Pw	Faw	Fw	Vks	Vkg	Pcq	Vak	Phg	Fqt	Fw	Fw	Fw
	xdxx	Fbt	Faq	Fw	Pw	Fw	Fw	Vks	Vkg	Pcq	Vak	Phg	Pt	Fw	Fw	Fw
	xxxx	Fb	Faq	Fw	Pw	Faw	Fw	Vks	Vkg	Pcq	Vak	Phg	Fqw	Fw	Fw	Fw
Kleysen (KYS)	xbxx	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fak	Pk	Fs	Fs	Fs	Fs
	xcxs	Pn	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Ftn	Fsn	Fsn	Fs
	xcxx	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
Knolls (KLS)	1exx	Vb	Va	Fa	Fta	Fta	Fta	Gg	Ftg	Ft	Vtg	Fkt	Vt	Ft	Ft	G
	xcxx	Vb	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Ftg	Fk	Ft	G	G	G
	xdxx	Vb	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Ptg	Fk	Pt	G	G	G
Kornell (KOL)	xbxx	Ps	Va	Paw	Viw	Vi	Vi	Viw	Viw	Psw	Vi	Vhi	Piw	Psw	Vi	Psw
	xxxx	Ps	Va	Paw	Viw	Vi	Vi	Viw	Viw	Psw	Vi	Vhi	Piw	Psw	Vi	Psw
Lavenham (LVH)	xbxx	Ps	Pa	Fw	Pw	Fw	Fw	Vks	Vkg	Pq	Vkg	Fhg	Fsw	Fsw	Fsw	Fw
	xcxx	Ps	Pa	Fw	Pw	Fw	Fw	Vks	Vkg	Pq	Vkg	Fhg	Ftw	Fsw	Fsw	Fw
Lavinia (LAV)	xbxs	Pn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fwn	Fwn	Fwn	Fsw
	xbxx	Fbs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fsw	Fsw	Fsw	Fsw
	xcxs	Pn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fkt	Phk	Ftn	Fwn	Fwn	Fsw
	xcxx	Fbs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fkt	Phk	Fst	Fsw	Fsw	Fsw
Levine (LEI)	xbxs	Pn	Va	Faw	Piw	Pi	Pi	Piw	Pi	Fs	Pi	Phi	Fnw	Fnw	Pi	Fsw
	xbxx	Fis	Va	Faw	Piw	Pi	Pi	Piw	Pi	Fs	Pi	Phi	Fiw	Fsw	Pi	Fsw
	xcxx	Fis	Va	Faw	Piw	Pi	Pi	Piw	Pi	Fs	Pi	Phi	Fit	Fsw	Pi	Fsw
	xxxx	Fis	Va	Faw	Piw	Pi	Pi	Piw	Pi	Fs	Pi	Phi	Fiw	Fsw	Pi	Fsw
Lindstrom (LDM)	xcxx	Fb	Vax	Faw	Pw	Fw	Fw	Pw	Fw	G	Fkt	Ph	Ftw	Fw	Fw	Fw
Lockhart (LKH)	xdxx	Fbt	Vax	Fa	Fa	Fa	G	Fs	G	G	Pt	Pk	Pt	G	G	G
Lonery (LOE)	xbxx	Fb	Vax	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
Lowroy (LOW)	xbxs	Pns	Pa	Pw	Vhw	Phw	Pw	Vwg	Vhk	Vs	Vkg	Vhg	Pw	Pw	Pw	Pw
	xbxx	Ps	Pa	Pw	Vhw	Phw	Pw	Vwg	Vhk	Vs	Vkg	Vhg	Pw	Pw	Pw	Pw
	xcxx	Ps	Pa	Pw	Vhw	Phw	Pw	Vwg	Vhk	Vs	Vkg	Vhg	Pw	Pw	Pw	Pw
	xdxx	Ps	Pa	Pw	Vhw	Phw	Pw	Vwg	Vhk	Vs	Vkg	Vhg	Ptw	Pw	Pw	Pw
Lowton (LWN)	xbxs	Pns	Va	Paw	Vw	Paw	Paw	Vhw	Pw	Psw	G	Vhk	Psw	Psw	Psw	Psw
	xbxt	Vn	Va	Paw	Vw	Paw	Paw	Vhw	Pw	Psw	G	Vhk	Pnw	Pnw	Pnw	Psw
	xbxx	Ps	Va	Paw	Vw	Paw	Paw	Vhw	Pw	Psw	G	Vhk	Psw	Psw	Psw	Psw

Table A8. Suitability Ratings of Soils for Selected Engineering and Recreational Uses in the RM of Riverdale (cont'd)

Soil name	Soil phases	Top soil	Sand & gravel	Road fill	Building - basement		Local roads/ streets	Sanitary trench	Land-fill area	Cover material	Sewage lagoon	Septic field	Play ground	Picnic area	Camp area	Paths & trails
					with	without										
Lowton (LWN)	xcxx	Ps	Va	Paw	Vw	Paw	Paw	Vhw	Pw	Psw	Ft	Vhk	Psw	Psw	Psw	Psw
	xxxs	Pns	Va	Paw	Vw	Paw	Paw	Vhw	Pw	Psw	G	Vhk	Psw	Psw	Psw	Psw
	xxxt	Vn	Va	Paw	Vw	Paw	Paw	Vhw	Pw	Psw	G	Vhk	Pnw	Pnw	Pnw	Psw
	xxxx	Ps	Va	Paw	Vw	Paw	Paw	Vhw	Pw	Psw	G	Vhk	Psw	Psw	Psw	Psw
Mansfield (MFI)	xbxx	Ps	G	Fw	Pw	Fw	Fw	Vks	Vkg	Vcs	Vck	Fhg	Pq	Fsw	Fsw	Fw
	xcxx	Ps	G	Fw	Pw	Fw	Fw	Vks	Vkg	Vcs	Vck	Fhg	Pq	Fsw	Fsw	Fw
	xxxx	Ps	G	Fw	Pw	Fw	Fw	Vks	Vkg	Vcs	Vck	Fhg	Pq	Fsw	Fsw	Fw
Manson (MXD)	xbxx	Ps	Va	Pa	Pa	Pa	Pa	Ps	Fi	Ps	G	Vk	Fks	Fs	Fis	Fs
Marringhurst (MRH)	1cxx	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pq	Fms	Fs	G
	1dxx	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pqt	Fms	Fs	G
	1xxx	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pq	Fms	Fps	G
	2cxx	Vb	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pq	Fms	Fs	G
	2exx	Vb	G	G	Ft	Ft	Ft	Vks	Vkg	Vcs	Vkt	Ftg	Vqt	Fst	Fst	G
	2fxx	Vbt	G	Ft	Pt	Pt	Pt	Vks	Vkg	Vcs	Vkt	Ptg	Vqt	Pt	Pt	Ft
	xbxx	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pq	Fms	Fs	G
	xcxx	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pq	Fms	Fs	G
	xdxx	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pqt	Fms	Fs	G
	xexx	Pst	G	G	Ft	Ft	Ft	Vks	Vkg	Vcs	Vkt	Ftg	Vqt	Fst	Fst	G
	xxxx	Pbs	G	G	G	G	G	Vks	Vkg	Vcs	Vck	Gg	Pq	Fms	Fs	G
Marsden (MDN)	xbxs	Pn	Pax	Pw	Vw	Pw	Pw	Vwg	Phw	Pw	Pkg	Vhg	Pw	Pw	Pw	Pw
	xbxx	Fb	Pax	Pw	Vw	Pw	Pw	Vwg	Phw	Pw	Pkg	Vhg	Pw	Pw	Pw	Pw
	xcxs	Pn	Pax	Pw	Vw	Pw	Pw	Vwg	Phw	Pw	Pkg	Vhg	Pw	Pw	Pw	Pw
	xcxx	Fb	Pax	Pw	Vw	Pw	Pw	Vwg	Phw	Pw	Pkg	Vhg	Pw	Pw	Pw	Pw
	xdxx	Fbt	Pax	Pw	Vw	Pw	Pw	Vwg	Phw	Pw	Pkt	Vhg	Ptw	Pw	Pw	Pw
Melland (MXT)	xbxx	Fb	Pax	Faw	Pw	Faw	Faw	Pwg	Fwg	Fcs	Pkg	Fhg	Fw	Fw	Fw	Fw
	xcxx	Fb	Pax	Faw	Pw	Faw	Faw	Pwg	Fwg	Fcs	Pkg	Fhg	Ftw	Fw	Fw	Fw
Miniota (MXI)	1cxx	Fb	Faq	G	G	G	G	Vks	Vkg	Pcq	Vak	Gg	Fqt	Fms	G	G
	1dxx	Fbt	Faq	G	G	G	G	Vks	Vkg	Pcq	Vak	Gg	Pt	Fms	G	G
	1exx	Pt	Faq	G	Ft	Ft	Ft	Vks	Vkg	Pcq	Vkt	Ftg	Vt	Fmt	Fst	G
	xbxx	Fb	Faq	G	G	G	G	Vks	Vkg	Pcq	Vak	Gg	Fq	Fms	G	G
	xc1x	Fb	Faq	G	G	G	G	Vks	Vkg	Pcq	Vak	Gg	Fqt	Fms	G	G
	xc2x	Fbp	Faq	G	Fp	G	G	Vks	Vkg	Pcq	Vak	Gg	Fpq	Fms	Fp	G
	xcxx	Fb	Faq	G	G	G	G	Vks	Vkg	Pcq	Vak	Gg	Fqt	Fms	G	G
	xd1x	Fbt	Faq	G	G	G	G	Vks	Vkg	Pcq	Vak	Gg	Pt	Fms	G	G
	xdxx	Fbt	Faq	G	G	G	G	Vks	Vkg	Pcq	Vak	Gg	Pt	Fms	G	G
	xexx	Pt	Faq	G	Ft	Ft	Ft	Vks	Vkg	Pcq	Vkt	Ftg	Vt	Fmt	Fst	G
	xfxx	Vt	Faq	Ft	Pt	Pt	Pt	Vks	Vkg	Pqt	Vkt	Ptg	Vt	Pt	Pt	Fst
	xgxx	Vt	Faq	Pt	Vt	Vt	Vt	Vks	Vkt	Vt	Vkt	Vtg	Vt	Vt	Vt	Pt
	xxxx	Fb	Faq	G	G	G	G	Vks	Vkg	Pcq	Vak	Gg	Fq	Fms	G	G
$Miniota_{Classification}$ (MXIcl)	xbxx	Fb	Faq	G	G	G	G	Vks	Vkg	Pcq	Vak	Gg	Fq	Fms	G	G

Table A8. Suitability Ratings of Soils for Selected Engineering and Recreational Uses in the RM of Riverdale (cont'd)

Soil name	Soil phases	Top soil	Sand & gravel	Road fill	Building - basement		Local roads/ streets	Sanitary trench	Land-fill area	Cover material	Sewage lagoon	Septic field	Play ground	Picnic area	Camp area	Paths & trails
					with	without										
Moore Park (MPK)	xbxs	Pn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fwn	Fwn	Fwn	Fsw
	xbxx	Fbs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fsw	Fsw	Fsw	Fsw
	xcxs	Pn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fwn	Fwn	Fwn	Fsw
	xcxx	Fbs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fsw	Fsw	Fsw	Fsw
	xdxx	Fbt	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Pt	Phk	Pt	Fsw	Fsw	Fsw
Newdale (NDL)	1cxx	Fbs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	1dxx	Fst	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs
	1exx	Pt	Va	Fa	Fat	Fat	Fat	Fs	Ft	Fst	Vt	Pk	Vt	Fst	Fst	Fs
	xb1x	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fak	Pk	Fs	Fs	Fs	Fs
	xbxx	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fak	Pk	Fs	Fs	Fs	Fs
	xc1x	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	xcxx	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	xd1x	Fst	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs
	xdxx	Fst	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs
Petrel (PTR)	xcxx	G	Pa	Faw	Pw	Faw	Faw	Vks	Fwg	Pg	Vkg	Fhg	Ftw	Fw	Fw	Fw
Pleasent (PLE)	xcxx	G	Va	Fw	Pw	Faw	Faw	Pkw	Pkg	G	Pk	Fh	Ftw	Fw	Fw	Fw
	xdxx	Fbt	Va	Fw	Pw	Faw	Faw	Pkw	Pkg	G	Pkt	Fh	Pt	Fw	Fw	Fw
	xxxx	G	Va	Fw	Pw	Faw	Faw	Pkw	Pkg	G	Pk	Fh	Fw	Fw	Fw	Fw
Poolex (POX)	xbxx	Fb	Va	Phw	Vw	Pw	Pw	Vhw	Pkw	Pw	Vh	Vh	Pw	Pw	Pw	Pw
	xxxx	Fb	Va	Phw	Vw	Pw	Pw	Vhw	Pkw	Pw	Vh	Vh	Pw	Pw	Pw	Pw
Porple (POR)	1cxx	Pb	Va	G	Fa	Fa	Fa	Pk	Pk	G	Pk	G	Ft	G	G	G
	1dxx	Pb	Va	G	Fa	Fa	Fa	Pk	Pk	G	Pkt	G	Pt	G	G	G
	1exx	Pt	Va	G	Fat	Fat	Fat	Pk	Pk	Ft	Vt	Ft	Vt	Ft	Ft	G
	2dxx	Vb	Va	G	Fa	Fa	Fa	Pk	Pk	G	Pkt	G	Pt	G	G	G
	2exx	Pt	Va	G	Fat	Fat	Fat	Pk	Pk	Ft	Vt	Ft	Vt	Ft	Ft	G
	xcxx	G	Va	G	Fa	Fa	Fa	Pk	Pk	G	Pk	G	Ft	G	G	G
	xdxx	Ft	Va	G	Fa	Fa	Fa	Pk	Pk	G	Pkt	G	Pt	G	G	G
	xexx	Pt	Va	G	Fat	Fat	Fat	Pk	Pk	Ft	Vt	Ft	Vt	Ft	Ft	G
	xfxx	Vt	Va	Ft	Pt	Pt	Pt	Pk	Pkt	Pt	Vt	Pt	Vt	Pt	Pt	Ft
Prodan (PDA)	1cxx	Fs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fkt	Phk	Ftw	Fsw	Fsw	Fsw
	1xxs	Pn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fnw	Fnw	Fnw	Fsw
	1xxx	Fs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fsw	Fsw	Fsw	Fsw
	2cxx	Fs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fkt	Phk	Ftw	Fsw	Fsw	Fsw
	xbxs	Pn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fnw	Fnw	Fnw	Fsw
	xbxx	Fs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fsw	Fsw	Fsw	Fsw
	xcxs	Pn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fkt	Phk	Fnt	Fnw	Fnw	Fsw
	xcxx	Fs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fkt	Phk	Ftw	Fsw	Fsw	Fsw
	xdxx	Fst	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Pt	Phk	Pt	Fsw	Fsw	Fsw
	xxxs	Pn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fnw	Fnw	Fnw	Fsw

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					with	without										
Prodan (PDA)	xxxx	Fs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fsw	Fsw	Fsw	Fsw
Prosser (PSE)	1dxx	Fbt	Va	G	Fa	Fa	Fa	Pk	Pk	G	Pkt	G	Pt	G	G	G
	xbxx	G	Va	G	Fa	Fa	Fa	Pk	Pk	G	Pk	G	G	G	G	G
	xcxx	G	Va	G	Fa	Fa	Fa	Pk	Pk	G	Pk	G	Ft	G	G	G
	xdxx	Ft	Va	G	Fa	Fa	Fa	Pk	Pk	G	Pkt	G	Pt	G	G	G
Prosser$_{Classification}$ (PSEcl)	xcxx	G	Va	G	Fa	Fa	Fa	Pk	Pk	G	Pk	G	Ft	G	G	G
Ramada (RAM)	1dxx	Fst	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs
	1exx	Pt	Va	Fa	Fat	Fat	Fat	Fs	Ft	Fst	Vt	Pk	Vt	Fst	Fst	Fs
	xbxx	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fak	Pk	Fs	Fs	Fs	Fs
	xcxx	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	xdxx	Fst	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs
	xexx	Pt	Va	Fa	Fat	Fat	Fat	Fs	Ft	Fst	Vt	Pk	Vt	Fst	Fst	Fs
Rempel (RMP)	1cxx	Pb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	1dxx	Pb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs
	xbxx	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fak	Pk	Fs	Fs	Fs	Fs
	xcxx	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	xdxx	Fst	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs
	xexx	Pt	Va	Fa	Fat	Fa	Fat	Fs	Ft	Fst	Vt	Pk	Vt	Fst	Fst	Fs
Rufford (RUF)	1c1x	Pb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	1cxx	Pb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	1dxx	Pb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs
	1e1x	Pbt	Va	Fa	Fat	Fat	Fat	Fs	Ft	Fst	Vt	Pk	Vt	Fst	Fst	Fs
	1exx	Pbt	Va	Fa	Fat	Fat	Fat	Fs	Ft	Fst	Vt	Pk	Vt	Fst	Fst	Fs
	1f1x	Vt	Va	Fat	Pt	Pt	Pt	Fst	Pt	Pt	Vt	Pkt	Vt	Pt	Pt	Fst
	2c1x	Vb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	2dxx	Vb	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs
	2exx	Vb	Va	Fa	Fat	Fat	Fat	Fs	Ft	Fst	Vt	Pk	Vt	Fst	Fst	Fs
	2f1x	Vbt	Va	Fat	Pt	Pt	Pt	Fst	Pt	Pt	Vt	Pkt	Vt	Pt	Pt	Fst
	xbxx	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fak	Pk	Fs	Fs	Fs	Fs
	xcxs	Pn	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Ftn	Fsn	Fsn	Fs
	xcxx	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fkt	Pk	Fst	Fs	Fs	Fs
	xdxx	Fbt	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Pt	Pk	Pt	Fs	Fs	Fs
	xexx	Pt	Va	Fa	Fat	Fat	Fat	Fs	Ft	Fst	Vt	Pk	Vt	Fst	Fst	Fs
	xxxx	Fs	Va	Fa	Fa	Fa	Fa	Fs	G	Fs	Fak	Pk	Fs	Fs	Fs	Fs
Sewell (SEE)	xbxx	Ps	Pa	Pw	Vhw	Phw	Pw	Vwg	Vhk	Pqw	Vkg	Vhg	Pw	Pw	Pw	Pw
	xcxx	Ps	Pa	Pw	Vhw	Phw	Pw	Vwg	Vhk	Pqw	Vkg	Vhg	Pw	Pw	Pw	Pw
	xdxx	Ps	Pa	Pw	Vhw	Phw	Pw	Vwg	Vhk	Pqw	Vkg	Vhg	Ptw	Pw	Pw	Pw
Sigmund (SGO)	xbxs	Pn	Va	Pa	Paw	Pa	Pa	Psw	Fw	Ps	G	Vk	Pks	Psw	Pks	Ps

Table A8. Suitability Ratings of Soils for Selected Engineering and Recreational Uses in the RM of Riverdale (cont'd)

Soil name	Soil phases	Top soil	Sand & gravel	Road fill	Building - basement		Local roads/ streets	Sanitary trench	Land-fill area	Cover material	Sewage lagoon	Septic field	Play ground	Picnic area	Camp area	Paths & trails
					with	without										
Sigmund (SGO)	xbxx	Ps	Va	Pa	Paw	Pa	Pa	Psw	Fw	Ps	G	Vk	Pks	Psw	Pks	Ps
	xcxx	Ps	Va	Pa	Paw	Pa	Pa	Psw	Fw	Ps	Ft	Vk	Pks	Psw	Pks	Ps
	xdxx	Ps	Va	Pa	Paw	Pa	Pa	Psw	Fw	Ps	Pt	Vk	Pkt	Psw	Pks	Ps
	xxxt	Vn	Va	Pa	Paw	Pa	Pa	Psw	Fw	Psu	G	Vk	Pns	Pnw	Pns	Ps
	xxxx	Ps	Va	Pa	Paw	Pa	Pa	Psw	Fw	Ps	G	Vk	Pks	Psw	Pks	Ps
Stockton (SCK)	1exx	Pst	Pa	G	Ft	Ft	Ft	Vks	Vkg	Pq	Vkt	Ftg	Vt	Fst	Fst	G
	xbxx	Ps	Pa	G	G	G	G	Vks	Vkg	Pq	Vkg	Gg	Fms	Fms	Fs	G
	xcxx	Ps	Pa	G	G	G	G	Vks	Vkg	Pq	Vkg	Gg	Fst	Fms	Fs	G
	xexx	Pst	Pa	G	Ft	Ft	Ft	Vks	Vkg	Pq	Vkt	Ftg	Vt	Fst	Fst	G
Sutton (SXP)	xxxx	Fs	Fq	Pw	Vhw	Phw	Pw	Vhw	Pwg	Pqw	Vgh	Vhg	Pw	Pw	Pw	Pw
Tadpole (TDP)	xbxs	Pn	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xbxt	Vn	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pnw	Pnw	Pnw	Pw
	xbxx	Fs	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xcxs	Pn	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xcxx	Fs	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xdxx	Fst	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Pht	Vh	Pwt	Pw	Pw	Pw
	xxxs	Pn	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xxxt	Vn	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pnw	Pnw	Pnw	Pw
	xxxx	Fs	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
Taggart (TGR)	xbxx	G	Va	Faw	Pw	Faw	Faw	Pwg	Fwg	G	Fkg	Ph	Fw	Fw	Fw	Fw
	xcxx	G	Va	Faw	Pw	Faw	Faw	Pwg	Fwg	G	Fkg	Ph	Ftw	Fw	Fw	Fw
	xdxx	Ft	Va	Faw	Pw	Faw	Faw	Pwg	Fwg	G	Ptg	Ph	Pt	Fw	Fw	Fw
	xxxx	G	Va	Faw	Pw	Faw	Faw	Pwg	Fwg	G	Fkg	Ph	Fw	Fw	Fw	Fw
Torcan (TOC)	xbxx	G	Va	Faw	Pw	Faw	Faw	Pwg	Fwg	G	Fkg	Ph	Fw	Fw	Fw	Fw
	xcxx	G	Va	Faw	Pw	Faw	Faw	Pwg	Fwg	G	Fkg	Ph	Ftw	Fw	Fw	Fw
	xdxx	Ft	Va	Faw	Pw	Faw	Faw	Pwg	Fwg	G	Pt	Ph	Pt	Fw	Fw	Fw
Traverse (TAV)	1cxx	Pb	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Fkg	Fk	Fs	Fs	Fs	Fs
	1exx	Pt	Va	Fa	Fat	Fat	Fat	Gg	Ftg	Ft	Vtg	Fkt	Vt	Fst	Fst	Fs
	1xxx	Fb	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Fkg	Fk	Fs	Fs	Fs	Fs
	2cxx	Vb	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Fkg	Fk	Fs	Fs	Fs	Fs
	xcxx	G	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Fkg	Fk	Fst	Fs	Fs	Fs
	xdxx	Ft	Va	Fa	Fa	Fa	Fa	Gg	Gg	G	Ptg	Fk	Pt	Fs	Fs	Fs
	xexx	Pt	Va	Fa	Fat	Fat	Fat	Gg	Ftg	Ft	Vtg	Fkt	Vt	Fst	Fst	Fs
Varcoe (VRC)	xbxs	Pn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fnw	Fnw	Fnw	Fsw
	xbxt	Vn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Pn	Pn	Pn	Fsw
	xbxx	Fbs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fsw	Fsw	Fsw	Fsw
	xcxs	Pn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fkt	Phk	Fnt	Fnw	Fnw	Fsw
	xcxt	Vn	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fkt	Phk	Pn	Pn	Pn	Fsw

Table A8. Suitability Ratings of Soils for Selected Engineering and Recreational Uses in the RM of Riverdale (cont'd)

Soil name	Soil phases	Top soil	Sand & gravel	Road fill	Building - basement		Local roads/ streets	Sanitary trench	Land-fill area	Cover material	Sewage lagoon	Septic field	Play ground	Picnic area	Camp area	Paths & trails
					with	without										
Varcoe (VRC)	xcxx	Fbs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fkt	Phk	Ftw	Fsw	Fsw	Fsw
	xdxx	Fst	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Pt	Phk	Pt	Fsw	Fsw	Fsw
	xxxx	Fbs	Va	Faw	Pw	Faw	Faw	Pw	Fw	Fs	Fak	Phk	Fsw	Fsw	Fsw	Fsw
Vodroff (VFF)	xbxs	Pn	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xbxx	Fs	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xcxs	Pn	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xcxx	Fs	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xdxx	Fst	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Pht	Vh	Ptw	Pw	Pw	Pw
	xxxs	Pn	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xxxt	Vn	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pnw	Pnw	Pnw	Pw
	xxxx	Fs	Va	Pw	Vw	Pw	Pw	Vhw	Pw	Pw	Ph	Vh	Pw	Pw	Pw	Pw
Vordas (VDS)	xbxs	Pn	Va	Pw	Vw	Pw	Pw	Vhw	Pwg	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xbxx	G	Va	Pw	Vw	Pw	Pw	Vhw	Pwg	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xcxx	G	Va	Pw	Vw	Pw	Pw	Vhw	Pwg	Pw	Ph	Vh	Pw	Pw	Pw	Pw
	xdxx	G	Va	Pw	Vw	Pw	Pw	Vhw	Pwg	Pw	Pht	Vh	Ptw	Pw	Pw	Pw
	xxxx	G	Va	Pw	Vw	Pw	Pw	Vhw	Pwg	Pw	Ph	Vh	Pw	Pw	Pw	Pw
Wellwood (WWD)	1cxx	Fbs	Faq	Fa	G	Fa	Fa	Vks	Gg	Fs	Pkg	Fkg	Fst	Fs	Fs	Fs
	xcxx	Fs	Faq	Fa	G	Fa	Fa	Vks	Gg	Fs	Pkg	Fkg	Fst	Fs	Fs	Fs
	xexx	Pt	Faq	Fa	Ft	Fat	Fat	Vks	Ftg	Fst	Vt	Fkt	Vt	Fst	Fst	Fs
Wheatland (WHL)	1cxx	Ps	G	G	G	G	G	Vks	Vkg	Vq	Vkg	Gg	Fst	Fms	Fs	G
	1dxx	Ps	G	G	G	G	G	Vks	Vkg	Vq	Vkg	Gg	Pt	Fms	Fs	G
	1exx	Ps	G	G	Ft	Ft	Ft	Vks	Vkg	Vq	Vkt	Ftg	Vt	Fmt	Fst	G
	2cxx	Vb	G	G	G	G	G	Vks	Vkg	Vq	Vkg	Gg	Fst	Fms	Fs	Fs
	2exx	Vb	G	G	Ft	Ft	Ft	Vks	Vkg	Vq	Vkt	Ftg	Vt	Fmt	Fst	Fs
	xbxx	Ps	G	G	G	G	G	Vks	Vkg	Vq	Vkg	Gg	Fms	Fms	Fs	G
	xcxx	Ps	G	G	G	G	G	Vks	Vkg	Vq	Vkg	Gg	Fst	Fms	Fs	G
	xdxx	Ps	G	G	G	G	G	Vks	Vkg	Vq	Vkg	Gg	Pt	Fms	Fs	G
	xexx	Ps	G	G	Ft	Ft	Ft	Vks	Vkg	Vq	Vkt	Ftg	Vt	Fmt	Fst	G
	xfxx	Vt	G	Ft	Pt	Pt	Pt	Vks	Vkg	Vq	Vkt	Ptg	Vt	Pt	Pt	Fst
Wheatland$_{Classification}$ (WHLcl)	1exx	Ps	G	G	Ft	Ft	Ft	Vks	Vkg	Vq	Vkt	Ftg	Vt	Fmt	Fst	G
Wytonville (WVI)	1cxx	Pb	Faq	Fw	Pw	Faw	Fw	Vks	Vkg	Pcq	Vak	Phg	Fqt	Fw	Fw	Fw
	xbxx	Fb	Faq	Fw	Pw	Faw	Fw	Vks	Vkg	Pcq	Vak	Phg	Fqw	Fw	Fw	Fw
	xc1x	Fb	Faq	Fw	Pw	Faw	Fw	Vks	Vkg	Pcq	Vak	Phg	Fqt	Fw	Fw	Fw
	xcxx	Fb	Faq	Fw	Pw	Faw	Fw	Vks	Vkg	Pcq	Vak	Phg	Fqt	Fw	Fw	Fw
	xdxx	Fbt	Faq	Fw	Pw	Faw	Fw	Vks	Vkg	Pcq	Vak	Phg	Pt	Fw	Fw	Fw
	xxxx	Fb	Faq	Fw	Pw	Faw	Fw	Vks	Vkg	Pcq	Vak	Phg	Fqw	Fw	Fw	Fw
Zarnet (ZRT)	2cxx	Pb	Fq	G	G	Fa	Fa	Vks	Pkg	Pcq	Vak	Gg	Ft	Fms	Fs	Fs
	xexx	Pbt	Fq	G	Ft	Fat	Fat	Vks	Pkg	Pcq	Vkt	Ftg	Vt	Fst	Fst	G

Table A9. Guide for Assessing Soil Suitability as a Source of Topsoil

The term topsoil includes soil materials used to cover barren surfaces exposed during construction, and materials used to improve soil conditions on areas such as lawns, gardens, and flower beds. The factors to be considered include not only the characteristic of the soil itself, but also the ease or difficulty of excavation, and where removal of topsoil is involved, accessibility to the site.

Symbol[1]	Property Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
u	**Moist Consistence[2]**	Very friable, friable	Loose, firm	Very firm	Cemented
i	**Flooding**	None	May flood occasionally for short periods	Frequent flooding (every year)	Constantly flooding
w	**Wetness[2]**	Wetness is not determining if better than very poorly drained.			Very poorly drained and permanently wet soils
t	**Slope**	≤5 % (a, b, c)	> 5 - 9% (d)	> 9 - 15% (e)	> 15% (f, g, h, i)
p	**Stoniness[2]**	Stones > 10 m apart (Class 0 and 1)	Stones > 2 - 10 m apart (Class 2)	Stones 0.1 - 2 m apart (Class 3 and 4)	Stones < 0.1 m apart (Class 5)
c	**Coarse fragments[2] (% by volume)**	≤ 3%	> 3 - 15%	> 15 - 35%	> 35%
s	**Texture[2]**	SL, FSL, VFSL, L, SiL; SC if 1:1 clay is dominant	SCL, CL, SiCL; SC if 2:1 clay is dominant; C and SiC if 1:1 clay is dominant	S, LS; SiC and C if 2:1 clay is dominant. organic soils[3]	Marl, diatomaceous earth
b	**Depth of Topsoil[4]**	> 40 cm	> 15 - 40 cm	8 - 15 cm	< 8 cm
n	**Salinity of Topsoil[5]**	EC < 1	EC 1 - 4	EC > 4 - 8 (s)	EC > 8 (t, u)

1 The symbol is used to indicate the property affecting use.
2 For an explanation of texture, consistence, stoniness, coarse fragments and soil drainage classes, see the Manual for Describing Soils in the Field (Soil and Landscape Management Section, Manitoba Agriculture, Food and Rural Initiatives and Land Resource Unit, Agriculture and Agri-Food Canada, 2007).
3 Non-woody organic materials are assessed as good sources for topsoil if mixed with or incorporated into mineral soil.
4 The remaining soil material (at least 8 cm) must be reclaimable after the uppermost soil is removed.
5 EC = Electrical Conductivity (milliSiemens/cm).

Additional Notes:
Well-drained Till soils with erosion 1, rated as **Fb** for depth of topsoil; erosion 2 rated as **Pb** for depth of topsoil; and erosion 3 rated as **Vb** for depth of topsoil.
Well-drained Luvisols and Dark Gray Chernozems with erosion 2 or 3 rated as **Vb** for depth of topsoil.
Regosols rated as **Vb** for depth of topsoil.
Poorly drained Organic soils rated as **Vw** for topsoil and Organic soils, drained phase, are rated as **Ps** for topsoil.

Table A10. Guide for Assessing Soil Suitability as a Source of Sand and Gravel

The purpose of this table is to provide guidance for assessing the probable supply as well as quality of the sand or gravel for use as road base material and in concrete. The interpretation pertains mainly to the characteristics of substratum to a depth of 150 cm, augmented by observations made in deep cuts, as well as geological knowledge, where available.

Symbol[1]	Property Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
a	**Unified Soil Group** [2]	GW GP SW SP	GW - GM GP - GM SW - SM SP – SM	GM GW - GC GP - GC SM SW - SC SP -SC	All other groups and bedrock (ML, CL, OL, MH, CH, OH, PT)
h	**Depth to Seasonal Water Table**	Not class determining if deeper than 50 cm		< 50 cm	
q	**Depth to Sand and Gravel**	< 25 cm	25 - 75 cm [3]	> 75 cm [3]	
p	**Stoniness**[4]	Not class determining if stones > 0.5 m apart (Class 0, 1, 2 and 3)		Stones 0.1 - 0.5 m apart (Class 4)	Stones < 0.1 m apart (Class 5)
d	**Depth to Bedrock**	> 100 cm	50 - 100 cm	< 50 cm	
x	**Thickness of sand and gravel**	> 100 cm	50 - 100 cm	< 50 cm	

1 The symbol is used to indicate the property affecting use.
2 Shaly gravels rated as Poor (Pa). Meanings of the definition letters can be found at http://en.wikipedia.org/wiki/Unified_Soil_Classification_System
3 Rated good if it is known that the underlying gravel or sand deposit is thick (> 100 cm).
4 For an explanation of stoniness and rockiness, see the Manual for Describing Soils in the Field (Soil and Landscape Management Section, Manitoba Agriculture, Food and Rural Initiatives and Land Resource Unit, Agriculture and Agri-Food Canada, 2007).

Table A11. Guide for Assessing Soil Suitability as a Source of Road fill

Fill material for building or roads are included in this use. The performance of the material when removed from its original location and placed under load at the building site or road bed are to be considered. **Since surface materials are generally removed during road or building construction, their properties are disregarded**. Aside from this layer, **the whole soil to a depth of 150 to 200 cm should be evaluated.** Soil materials that are suitable for fill can be considered equally suited for road subgrade construction.

Symbol[1]	Property Affecting Use[2]	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
a	**Subgrade[3]** **a.) AASHO Group Index[4]**	< 5	5 - 8	> 8	
	b.) Unified Soil Group	GW, GP, SW, SP, SM, GC[5] and SC[5]	CL (with P.I.[6] <15) and ML	CL (with P.I.[6] of 15 or more), CH and MH[7]	OL, OH and PT
l	**Shrink-swell potential**	Low	Moderate	High	
f	**Susceptibility to frost action[8]**	Low	Moderate	High	
t	**Slope**	≤15% (a, b, c, d, e)	> 15 - 30% (f)	> 30 - 45% (g)	> 45% (h, i)
p	**Stoniness[9]**	Stones > 2 m apart (Class 0, 1 and 2)	Stones > 0.5 - 2 m apart (Class 3)	Stones 0.1 - 0.5 m apart (Class 4)	Stones < 0.1 m apart (Class 5)
r	**Rockiness[9]**	Rock exposures > 35 m apart and cover < 10% of the surface	Rock exposure > 10 - 35 m apart and cover 10 - 25% of the surface	Rock exposure 3.5 - 10 m apart and cover > 25 - 50% of the surface	Rock exposure < 3.5 m apart and cover > 50 - 90% of the surface
w	**Wetness[9]**	Excessively drained to moderately well-drained	Imperfectly drained	Poorly drained	Very poorly drained or permanently wet soils
d	**Depth to Bedrock**	> 100 cm	> 50 - 100 cm	20 - 50 cm	< 20 cm
h	**Depth to Seasonal Water Table**	> 150 cm	> 75 - 150 cm	50 - 75 cm	< 50 cm

1 The symbol is used to indicate the property affecting use.
2 The first, three properties pertain to soil after it is placed in a fill; the last six properties pertain to soil in its natural condition before excavation for road fill.
3 This property estimates the strength of the soil material, that is, its ability to withstand applied loads.
4 Use AASHO group index only where laboratory data are available for the kind of soil being rated; otherwise, use Unified Soil Groups.
5 Downgrade suitability rating to fair if content of fines is more than about 30%.
6 P.I. means plasticity index.
7 Upgrade suitability rating to fair if MH is largely kaolinitic, friable, and free of mica.
8 Use this property only where frost penetrates below the paved or hardened surface layer and where moisture transportable by capillary movement is sufficient to form ice lenses at the freezing front.
9 For an explanation of stoniness, rockiness and soil drainage classes, see the Manual for Describing Soils in the Field (Soil and Landscape Management Section, Manitoba Agriculture, Food and Rural Initiatives and Land Resource Unit, Agriculture and Agri-Food Canada, 2007).

Table A12. Guide for Assessing Soil Suitability for Permanent Buildings[1]

This guide applies to undisturbed soils to be evaluated for single-family dwellings and other structures with similar foundation requirements. The emphasis for rating soils for buildings is on foundation requirements. However, soil slope, susceptibility to flooding and other hydrologic conditions, such as wetness, that have effects beyond those related exclusively to foundations, are considered as well. Also considered are soil properties, particularly depth to bedrock, which influence excavation, landscaping and septic tank absorption fields.

Symbol[2]	Property Affecting Use	Degree of Soil Suitability[3]			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	**Wetness[4]**	With Basements: Very rapidly, rapidly and well-drained Without Basements: Very rapidly, rapidly well and moderately well-drained	With Basements: Moderately well-drained Without Basements: Imperfectly drained	With Basements: Imperfectly drained Without Basements: Poorly drained	With Basements: Poorly, and very poorly drained Permanently wet soils Without Basements: Very poorly drained Permanently wet soils.
h	**Depth to Seasonal Water Table**	With Basements: > 150 cm Without Basements: > 75 cm	With Basements: > 75 - 150 cm Without Basements: > 50 - 75 cm	With Basements: 25 - 75 cm Without Basements: 25 - 50 cm	With Basements: < 25 cm Without Basements: < 25 cm
i	**Flooding**	None	None	Occasional flooding or ponding (once in 5 years)	Frequent flooding or ponding (every year)
t	**Slope[5]**	≤ 9% (a, b, c, d)	> 9 - 15% (e)	> 15 - 30% (f)	> 30% (g, h, i)
a	**Subgrade[6]** **a.) AASHO Group Index[7]** **b.) Unified Soil Group**	< 5 GW, GP, SW, SP, GC, SM and SC	5 - 8 CL (with P.I.[8] < 15)and ML	> 8 CL (with P.I.[8] of 15 or more), CH and MH	 OH, OL and PT
f	**Potential Frost Action[9, 13]**	Low (F1, F2)	Moderate (F3)	High (F4)	
p	**Stoniness[4]**	Stones > 10 m apart (Class 0 to 1)	Stones > 2 - 10 m apart (Class 2[10])	Stones 0.1 - 2 m apart (Class 3[10] to 4)	Stones < 0.1 m apart (Class 5[10])
r	**Rockiness[4,11]**	Rock exposure > 100 m apart and cover < 2% of the surface	Rock exposure 30 - 100 m apart and cover 2 - 10% of the surface	Rock exposure < 30 m apart and cover > 10% of the surface	Rock exposure too frequent to allow location of permanent buildings
d	**Depth to Bedrock[11]**	With Basements: > 150 cm Without Basements: > 100 cm	With Basements: > 100 - 150 cm Without Basements: 50 - 100 cm	With Basements: 50 - 100 cm Without Basements: < 50 cm	With Basements: < 50 cm

1 By halving the slope limits, this table can be used for evaluating soil suitability for buildings with large floor areas, but with foundation requirements not exceeding those of ordinary three-storey dwellings.

2 The symbol is used to indicate the property affecting use.

3 Some soils are assessed as fair or poor sites from an aesthetic or use standpoint, but they will require more site preparation and/or maintenance.

4 For an explanation of rockiness, stoniness and soil drainage classes, see the Manual for Describing Soils in the Field (Soil and Landscape Management Section, Manitoba Agriculture, Food and Rural Initiatives and Land Resource Unit, Agriculture and Agri-Food Canada, 2007).

5 Reduce the slope limits by one half for those soils subject to hillside slippage.

6 This property estimates the strength of the soil, that is, its ability to withstand applied loads. When available, AASHO Group Index values from laboratory tests were used; otherwise the estimated Unified Soil Groups were used.

7 Group Index values were estimated from information published by the Portland Cement Association (PCA, 1962), pp. 23 - 25.

8 P.I. means plasticity index.

9 Frost heave only applies where frost penetrates to the assumed depth of the footings and the soil is moist. The potential frost action classes are taken from the United States Army Corps of Engineers (1962), pp. 5 - 8. Use **z** for permanently frozen soils.

10 Rate one class better for building without basements.

11 Rate one class better if the bedrock is soft enough so that it can be dug with light power equipment such as backhoes.

Table A13. Guide for Assessing Soil Suitability for Local Roads and Streets[1]

This guide applies to soils to be evaluated for construction and maintenance of local roads and streets. These are improved roads and streets, having some kind of all-weather surfacing, commonly asphalt or concrete, and that are expected to carry automobile traffic all year. They consist of: (1) the underlying local soil material (either cut or fill) called the subgrade; (2) the base material of gravel, crushed rock, lime or soil cement, stabilized soil called the subbase; and (3) the actual road surface or pavement, either flexible or rigid. They are also graded to shed water and have ordinary provisions for drainage. With the probable exception of the hardened surface layer, the roads and streets are built mainly from the soil at hand, and cuts and fills are limited, usually less than two metres. Excluded from consideration in this guide are highways designed for fast moving, heavy trucks.

Properties that affect design and construction of roads and streets are: (1) those that affect the load supporting capacity and stability of the subgrade, and (2) those that affect the workability and amount of cut and fill. The AASHO and Unified Classification give an indication of the traffic supporting capacity. Wetness and flooding affect stability. Slope, depth of bedrock, stoniness, rockiness, and wetness affect the ease of excavation, and the amount of cut and fill to reach an even grade.

Symbol[2]	Property Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	**Wetness[3]**	Very rapidly, rapidly, well and moderately well-drained	Imperfectly drained	Poorly and very poorly drained	Permanently wet soils
i	**Flooding**	None	Infrequent (once in 5 years)	Occasional (once in 2 - 4 years)	Frequent (every year)
t	**Slope**	≤ 9% (a, b, c, d)	> 9 - 15% (e)	> 15 - 30% (f)	> 30% (g, h, i)
d	**Depth to Bedrock[4]**	> 100 cm	50 - 100 cm	< 50 cm	
a	**Subgrade[5]** **a.) AASHO Group Index[6]**	< 5	5 – 8	> 8	
	b.) Unified Soil Group	GW, GP, GC[7], SW, SP, SM, and SC[7]	CL (with P.I.[8] < 15) and ML	CL (with P.I.[8] of 15 or more), CH and MH	OH, OL and PT and loose sand with high organic matter
f	**Susceptibility to Frost Heave[9]**	Low (F1, F2)	Moderate (F3)	High (F4)	
p	**Stoniness[3]**	Stones > 2 m apart (Class 0 to 2)	Stones > 0.5 - 2 m apart (Class 3)	Stones 0.1 - 0.5 m apart (Class 4)	Stones < 0.1 m apart (Class 5)
r	**Rockiness[3]**	Rock exposures > 100 m apart and cover < 2% of the surface	Rock exposures 30 -100 m apart and cover 2 - 10% of the surface	Rock exposures < 30 m apart and cover >10% of the surface	Rock exposures too frequent to permit location of roads and streets

1 These guidelines, with some adjustment of slope and rockiness limits, will also be useful for assessing soils for use as parking lots.
2 The symbol is used to indicate the property affecting use.
3 For an explanation of stoniness, rockiness and soil drainage classes, see the Manual for Describing Soils in the Field (Soil and Landscape Management Section, Manitoba Agriculture, Food and Rural Initiatives and Land Resource Unit, Agriculture and Agri-Food Canada, 2007).
4 Rate one class better if the bedrock is soft enough so that it can be dug with light power equipment and is rippable by machinery.
5 This property estimates the strength of soil materials as it applies to roadbeds. When available, AASHO Group Index values from laboratory tests were used; otherwise, the estimated Unified Soil Groups were used. The limitations were estimated assuming that the roads would be surfaced. On unsurfaced roads, rapidly drained, very sandy, poorly graded soils may cause washboard or rough roads.
6 Group index values were estimated from information published by the Portland Cement Association (PCA, 1962) pp. 23 - 25.
7 Downgrade to moderate if content of fines (less than 200 mesh) is greater than about 30%.
8 P.I. means plasticity index.
9 Frost heave is important where frost penetrates below the paved or hardened surface and moisture movement by capillary action sufficient to form ice lenses at the freezing point. The susceptibility classes are taken from the United States Army Corps of Engineers (1962) pp. 5 - 8.

Table A14. Guide for Assessing Soil Suitability for Trench-type Sanitary Landfills[1]

The trench-type sanitary landfill, involves the daily burial of dry garbage and trash in an open trench that is covered with a layer of soil material. Suitability of the site is dependent upon the potential for pollution of water sources through groundwater contact with the refuse, or leachate arising from the site. Those properties affecting ease of excavation of the site must be supplemented with geological and hydrological knowledge to provide subsurface soil and groundwater data to a depth of at least three to 4.5 metres, a common depth of landfills.

Symbol[2]	Property Affecting Use	Degree of Soil Suitability			
		Good - G[3]	Fair - F	Poor - P	Very Poor - V
h	**Depth to Seasonal High Water Table**	Not class determining if deeper than 180 cm		100 - 180 cm	< 100 cm
w	**Wetness**[4]	Not class determining if better than imperfectly drained		Imperfectly drained	Poorly and very poorly drained or permanently wet soils
i	**Flooding**	None	Rare	Occasional (Once in 2 - 4 years)	Frequent (Every year)
k	**Permeability**[4,5,8]	< 5 cm/hr	< 5 cm/hr	5 - 15 cm/hr	> 15 cm/hr
t	**Slope**	≤ 15% (a, b, c, d, e)	> 15 - 30% (f)	> 30 - 45% (g)	> 45% (h, i)
s	**Soil Texture**[4,6] **(dominant to a depth of 150 cm)**	Si, SiL, L, SCL, VFSL, SL, LVFS, LFS, VFS	SiCL[7], CL, SC, LS	SiC, C	Muck, peat, sand (CoS, MS, FS) and gravel
d	**Depth to Hard Bedrock**	> 150 cm	> 150 cm	100 - 150 cm	< 100 cm
	Rippable Bedrock	> 150 cm	100 - 150 cm	100 - 150 cm	< 100 cm
p	**Stoniness**[4]	Stones > 10 m apart (Class 0 and 1)	Stones > 2 - 10 m apart (Class 2)	Stones 0.1 - 2 m apart (Class 3 and 4)	Stones < 0.1 m apart (Class 5)
r	**Nature of Bedrock**	Impermeable			Highly permeable, fractured, easily soluble.

1 Based on soil depth (120 cm) commonly investigated in making soil surveys.
2 The symbol is used to indicate the property affecting use.
3 If probability is high that the soil material to a depth of three to 4.5 m will not alter a rating of good or fair, indicate this by an appropriate footnote, such as "Probably good to a depth of 3.5 m," or "Probably fair to a depth of 3.5 m."
4 For an explanation of stoniness, texture and soil drainage classes, see the Manual for Describing Soils in the Field (Soil and Landscape Management Section, Manitoba Agriculture, Food and Rural Initiatives and Land Resource Unit, Agriculture and Agri-Food Canada, 2007).
5 Reflects ability of soil to retard movement of leachate from the landfills; may not reflect a limitation in arid and semiarid areas.
6 Reflects ease of digging, moving (workability) and trafficability in the immediate area of the trench where there may not be surfaced roads.
7 Soil high in expansive clays may need to be given a suitability rating of poor.
8 Contamination hazard (**g**) may apply at high permeability.

Table A15. Guide for Assessing Soil Suitability for Area-type Sanitary Landfills

In the area-type sanitary landfill, refuse is placed on the surface of the soil in successive layers. The daily and final cover material is generally imported. A final cover of soil material at least 60 cm thick is placed over the fill when it is completed.

The soil under the proposed site should be investigated to determine the probability that leachates from the landfill may penetrate the soil, and thereby, pollute water supplies.

Symbol[1]	Property Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
h	**Depth to Seasonal Water Table[2]**	> 150 cm	> 100 - 150 cm	50 - 100 cm	< 50 cm
w	**Wetness[2,3]**	Rapid to moderately well-drained	Imperfectly drained	Poorly drained	Very poorly drained or permanently wet soils
i	**Flooding**	None	Rare	Occasional (Once in 2 - 4 years)	Frequent (Every year)
k	**Permeability[4,5,6]**	Not class determining if less than 5 cm/hr		5 - 15 cm/hr	> 15 cm/hr
t	**Slope**	≤ 9% (a, b, c, d)	> 9 - 15% (e)	> 15 - 30% (f)	> 30% (g, h, i)

1 The symbol is used to indicate the property affecting use.
2 Reflects influence of wetness on operation of equipment.
3 For an explanation of drainage, see the Manual for Describing Soils in the Field (Soil and Landscape Management Section, Manitoba Agriculture, Food and Rural Initiatives and Land Resource Unit, Agriculture and Agri-Food Canada, 2007).
4 Reflects ability of the soil to retard movement of leachate from landfills; may not reflect a limitation in arid and semiarid areas.
5 Due to possible groundwater contamination, impermeable bedrock is considered poor and permeable bedrock is rated very poor.
6 Contamination hazard (**g**) may apply at high permeability and/or proximity of the site to water supplies.

Table A16. Guide for Assessing Soil Suitability as Cover Material for Area-type Sanitary Landfills

The term *cover material* includes soil materials used to put a daily and final covering layer in area-type sanitary landfills. This cover material may be derived from the area of the landfill or may be brought in from surrounding areas.

Symbol[1]	Property Affecting Use	Degree of Soil Suitability			
		Good - G	**Fair - F**	**Poor - P**	**Very Poor - V**
u	**Moist Consistence[2]**	Very friable, friable	Loose, firm	Very firm	Cemented
s	**Texture[2,3]**	Si, SiL, SCL, L, VFSL, FSL, LVFS, VFS	SiCL, CL, SC, LFS, LS	SiC, C	Muck, peat, sand, gravel
d	**Depth to bedrock[4]**	> 150 cm	> 100 - 150 cm	50 - 100 cm	< 50 cm
c	**Coarse fragments[2] (% by volume)**	≤ 15%	> 15 - 35%	> 35%	
p	**Stoniness[2]**	Stones > 10 m apart (Class 0 and 1)	Stones > 2 - 10 m apart (Class 2)	Stones 0.1 - 2 m apart (Class 3 and 4)	Stones < 0.1 m apart (Class 5)
t	**Slope**	≤ 9% (a, b, c, d)	> 9 - 15% (e)	> 15 - 30% (f)	> 30% (g, h, i)
w	**Wetness[2]**	Not class determining if better than poorly drained.		Poorly drained	Very poorly drained or permanently wet soils.
q	**Depth to Sand and Gravel**	> 1.5 m	1 - 1.5 m	< 1 m	

1 The symbol is used to indicate the property affecting use.
2 For an explanation of consistence, texture, coarse fragments, stoniness and soil drainage classes, see the Manual for Describing Soils in the Field (Soil and Landscape Management Section, Manitoba Agriculture, Food and Rural Initiatives and Land Resource Unit, Agriculture and Agri-Food Canada, 2007).
3 Soils having a high proportion of non-expansive clays may be given a suitability rating one class better than is shown for them in this table.
4 Thickness of material, excluding topsoil, which will be stockpiled (see guide for topsoil).

Table A17. Guide for Assessing Soil Suitability for Reservoirs and Sewage Lagoons

Factors affecting the ability of undisturbed soils to impound water or sewage and prevent seepage, are considered for evaluating the suitability of soils for reservoir and lagoon areas. This evaluation considers soil both as a vessel for the impounded area and as material for the enclosing embankment. As the impounded liquids could be **potential sources of contamination of nearby water supplies** (e.g. sewage lagoons), the landscape position of the reservoir as it affects risk of flooding must also be considered.

Symbol[1]	Property Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
h	**Depth to Water Table[2]**	> 150 cm	> 100 - 150 cm	50 - 100 cm	< 50 cm
i	**Flooding[3]**	None	None	Subject to infrequent flooding (once in 50 years)	Subject to frequent high level flooding
k	**Soil Permeability[4]**	< <0.15 cm/hr	<0.15 - 0.5 cm/hr	> 0.5 - 5 cm/hr	> 5 cm/hr
t	**Slope**	≤ 2% (a, b)	> 2 - 5% (c)	> 5 - 9% (d)	> 9% (e, f, g, h, i)
o	**Organic Matter**	≤ 2 %	> 2 - 10%	> 10 - 30%	> 30%
c	**Coarse Fragments[5] < 25 cm in diameter, (% by volume)**	≤ 20%	> 20 - 35%	> 35%	
p	**Stoniness[5], >25 cm diameter, (% of surface area)**	≤ 3% (Class 0, 1 and 2)	> 3 - 15% (Class 3)	> 15 - 50% (Class 4)	> 50% (Class 5)
d	**Depth to Bedrock[6]**	> 150 cm	> 100 - 150 cm	50 - 100 cm	< 50 cm
j	**Thickness of Slowly Permeable Layer**	> 100 cm	> 50 - 100 cm	50 - 25 cm	< 25 cm
a	**Sub-grade Unified Soil Group**	CH	GC, SC and CL	GM, SM, ML & MH	GW, GP, SW & SP, OL, OH & PT

1 The symbol is used to indicate the property affecting use.
2 If the floor of the lagoon has nearly impermeable material at least 50 cm thick, disregard depth to water table.
3 Disregard flooding if it is not likely to enter or damage the lagoon (flood waters have low velocity and depth less than 150 cm).
4 Contamination hazard (**g**) may apply at high permeability and/or proximity of the site to water supplies.
5 For an explanation of coarse fragments and stoniness classes, see the Manual for Describing Soils in the Field (Soil and Landscape Management Section, Manitoba Agriculture, Food and Rural Initiatives and Land Resource Unit, Agriculture and Agri-Food Canada, 2007).
6 Surface exposures of non rippable rock are rated poor. If underlying bedrock is impermeable, rating should be one class better.
7 Material must be capable of compaction to 10^{-7} m/sec (<0.14 cm/hr) for use as liner or embankment.

Table A18. Guide for Assessing Soil Suitability for Septic Tank Absorption Fields

This guide applies to soils to be used as an absorption and filtering medium for effluent from septic tank systems. A subsurface tile system laid in such a way that effluent from the septic tank is distributed reasonably and uniformly into the natural soil is assumed when applying this guide. A rating of poor need not mean that a septic system should not be installed in the given soil, but rather, may suggest the difficulty, in terms of installation and maintenance, that can be expected.

Symbol[1]	Property Affecting Use	Degree of Soil Suitability			
		Good - G	**Fair - F**	**Poor - P**	**Very Poor - V**
k	**Permeability**[2,7] **Percolation Rate**[3] **(Auger hole method)**	Rapid to moderately rapid ≤ 8 - 18 min/cm (> 3.3 - 7.5 cm/hr)	Moderate > 18 - 24 min/cm (2.5 - 3.3 cm/hr)	Slow > 24 min/cm (< 2.5 cm/hr)	Very Slow
h	**Depth to Seasonal Water Table**[4]	> 150 cm [5]	> 100 - 150 cm	50 - 100 cm	< 50 cm
i	**Flooding**	Not subject to flooding	Not subject to flooding	Subject to occasional flooding (once in 5 years)	Floods every year
t	**Slope**	≤ 9% (a, b, c, d)	> 9 - 15% (e)	> 15 - 30% (f)	> 30% (g, h, i)
d	**Depth to Hard Rock, bedrock or other impervious materials**	> 150 cm	> 100 - 150 cm[6]	50 - 100 cm	< 50 cm

1 The symbol is used to indicate the property affecting use.
2 The suitability ratings should be related to the permeability of soil layers at and below depth of the graded filter bed (50 to 75 cm depth).
3 Soils having a percolating rate less than about 8 min/cm are likely to present a pollution hazard to adjacent waters. This hazard must be noted, but the degree of hazard must, in each case, be assessed by examining the proximity of the proposed installation to water bodies, water table and related features**. The symbol g is used to indicate this condition.** Refer to U.S. Dept. of Health, Education and Welfare (1969) for details of this procedure.
4 Seasonal means for more than one month. It may, with caution, be possible to make some adjustment for the severity of a water table limitation in those cases where seasonal use of the facility does not coincide with the period of high water table.
5 A seasonal water table should be at least 100 cm below the bottom of the trench at all times for soils rated Good (U.S. Dept. of Health, Education and Welfare, 1969). The depths used to water table are based on an assumed tile depth of 50 cm. Where relief permits, the effective depth above a water table or rock can be increased by adding appropriate amounts of fill.
6 Where the slope is greater than nine per cent, a depth to bedrock of 100 to 150 cm is assessed as Poor.
7 Contamination hazard (**g**) may apply at high permeability (e.g. (Gg)).

Table A19. Guide for Assessing Soil Suitability for Playgrounds

This guide applies to soils to be used intensively for playgrounds, football, badminton, and other similar activities. These areas are subject to intensive foot traffic. A nearly level surface, good drainage, and a soil texture and consistence that provide a firm surface generally are required. The most desirable soils are free of rock outcrops and coarse fragments. Soil suitability for growing and maintaining vegetation is not a part of this guide, except as influenced by moisture. However, it is an important consideration in the final evaluation of site.

Symbol[1]	Property Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	**Wetness**[2]	Rapidly, well and moderately well-drained soils with no ponding or seepage. Water table below 75 cm during season of use.	Moderately well-drained soils subject to occasional ponding or seepage for short duration and imperfectly drained soils. Water table below 50 cm during season use.	Imperfectly drained soils subject to ponding or seepage, and poorly drained soils. Water table above 50 cm during season of use.	Very poorly drained and permanently wet soils.
i	**Flooding**	None during season of use.	Occasional flooding. May flood once every 2 - 3 years during season of use.	Floods every year during season of use.	Prolonged flooding during season of use.
k	**Permeability**	Very rapid to moderate	Moderately slow and slow	Very slow	
t	**Slope**	≤ 2% (a, b)	> 2 - 5% (c)	> 5 - 9% (d)	> 9% (e, f, g, h, i)
d	**Depth to Bedrock**	> 100 cm	50 - 100 cm[3]	< 50 cm[3]	
c	**Coarse fragments on surface**[2]	Relatively free of coarse fragments	≤ 20% coarse fragments	> 20% coarse fragments	
p	**Stoniness**[2]	Stones > 10 m apart (Class 0 to 1)	Stones > 2 - 10 m apart (Class 2)	Stones 0.1 - 2 m apart (Class 3, 4)	Stones < 0.1 m apart (Class 5)
r	**Rockiness**[2]	Rock exposures > 100 m apart and cover < 2% of the surface	Rock exposures 30 - 100 m apart and cover about 2 - 10% of the surface	Rock exposures < 30 m apart and cover > 10% of the surface	Rock outcrops too frequent to permit playground location
s	**Surface Soil Texture**[2,4]	L, VFSL, FSL, SL, LVFS, VFS	SiL, CL, SiCL, SCL, LFS, LS, FS	SiC, C, SC[5], Si, S	Peaty soils; S and LS subject to blowing
q	**Depth to Sand or Gravel**[6]	> 100 cm	50 - 100 cm	< 50 cm	
m	**Useful Moisture**[7]	Water storage capacity[8] >15.0 cm and/or adequate rainfall and/or low evapotranspiration	Water storage capacity[8] 7.5 - 15 cm and/or moderate rainfall and/or moderate evapotranspiration	Water storage capacity[8] < 7.5 cm and/or low rainfall and/or high evapotranspiration	
n	**Salinity**[9]	EC < 4 mS/cm	EC 4 - 8 mS/cm (s)	EC > 8 - 16 mS/cm (t)	EC > 16 mS/cm (u)

1 The symbol is used to indicate the property affecting use.
2 See also definitions for coarse fragments, rockiness, stoniness, textural and soil drainage classes in the Manual for Describing Soils in the Field (Soil and Landscape Management Section, Manitoba Agriculture, Food and Rural Initiatives and Land Resource Unit, Agriculture and Agri-Food Canada 2007).
3 Downgrade to a very poor suitability rating if the slope is greater than five per cent.
4 Surface soil texture influences soil ratings as it affects foot trafficability, surface wetness, dust and maintenance. Adverse soil textures may be partially or completely overcome with the addition of topsoil.
5 Moderately well and well-drained SiC, C and SC soils may be rated fair.
6 Depth to sand or gravel is considered a limitation if the levelling operations expose sand or gravel, thereby bringing about adverse surface textures and undesirable amounts of coarse fragments. The addition of topsoil after the levelling process would overcome this limitation.
7 This property attempts to evaluate the adequacy of moisture for vegetative growth. It incorporates the concept of supply through rainfall, loss through evapotranspiration, and storage within the rooting zone. In soils where the water table is within rooting depth for a significant portion of the year, water storage capacity may not significantly influence vegetation growth.
8 Consult glossary for definitions of terms used.
9 EC = Electrical conductivity (milliSiemens/cm, mS/cm or deciSiemens/m, or dS/m).

Table A20. Guide for Assessing Soil Suitability for Picnic Areas

This guide applies to soils considered for intensive use as park-type picnic areas. It is assumed that most vehicular traffic will be confined to the access roads. Soil suitability for growing and maintaining vegetation is not a part of this guide, except as influenced by moisture. However, it is an important consideration in the final evaluation of site.

Symbol[1]	Property affecting use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	**Wetness**[2]	Very rapidly, rapidly, well and moderately well-drained soils, not subject to seepage or ponding. Water table below 50 cm during season of use.	Moderately well-drained soils, subject to occasional seepage or ponding and imperfectly drained soils not subject to seepage or ponding. Water Table above 50 cm for short periods during season of use	Imperfectly drained soils subject to seepage or ponding. Poorly drained soil. Water table above 50 cm and often near surface for a month or more during season of use.	Very poorly drained and permanently wet soils.
i	**Flooding**	None during season of use.	May flood 1 or 2 times per year for short periods during season of use.	Floods more than 2 times during season of use.	Prolonged flooding during season of use.
t	**Slope**	≤ 9% (a, b, c, d)	> 9 - 15% (e)	> 15 - 30% (f)	> 30% (g, h, i)
s	**Surface Soil Texture**[2,3]	L, VFSL, FSL, SL, LVFS, VFS	SiL, CL, SiCL, SCL, LFS, LS, FS and sand other than loose sand.	SiC, C, SC[4], Si	Peaty soils; loose sand subject to blowing.
c	**Coarse Fragments on Surface**[2]	< 20%	20 - 50%	> 50%	
p	**Stoniness**[2]	Stones > 2 m apart (Class 0 to 2)	Stones > 1 - 2 m apart (Class 3)	Stones 0.1 - 1 m apart (Class 4)	Stones < 0.1 m apart (Class 5)
r	**Rockiness**[2,5,6]	Rock exposure roughly > 30 - 100 m or more apart and cover < 10% of the surface.	Rock exposure roughly 10 - 30 m apart and cover 10 - 25 % of the surface.	Rock exposure < 10 m apart and cover > 25% of the surface.	Rock exposure too frequent to permit location of picnic areas.
m	**Useful Moisture**[7]	Water storage capacity[8] > 15 cm and/or adequate rainfall and/or low evapotranspiration.	Water storage capacity[8] 7.5 - 15 cm and/or moderate rainfall and/or moderate evapotranspiration.	Water storage capacity[8] < 7.5 cm and/or low rainfall and/or high evapotranspiration.	
n	**Salinity**[9]	EC < 4 mS/cm	EC 4 - 8 mS/cm (s)	EC > 8 - 16 mS/cm (t)	EC > 16 mS/cm (u)

1 The symbol is used to indicate the property affecting use.

2 See also definitions for coarse fragments, rockiness, stoniness, textural and soil drainage classes in the Manual for Describing Soils in the Field (Soil and Landscape Management Section, Manitoba Agriculture, Food and Rural Initiatives and Land Resource Unit, Agriculture and Agri-Food Canada 2007). Coarse fragments for the purpose of this rating include gravel and cobbles. Some gravelly soils may be rated as having a slight limitation if the content of gravel exceeds 20% by only a small margin, providing (a) the gravel is embedded in the soil matrix, or (b) the fragments are less than two cm in size.

3 Surface soil texture influences soil ratings as it affects foot trafficability, dust and soil permeability.

4 Moderately well and well-drained SiC, C and SC soils may be rated fair.

5 Very shallow soils are rated as having severe or very severe limitations for stoniness or rockiness.

6 The nature and topography of the bedrock exposures may significantly alter these ratings. As such, on-site investigations will be necessary in map units containing bedrock, when these are considered as possible sites.

7 This property attempts to evaluate the adequacy of moisture for vegetative growth. It incorporates the concept of supply through rainfall, loss through evapotranspiration, and storage within the rooting zone. In soils where the water table is within rooting depth for a significant portion of the year, water storage capacity may not significantly influence vegetation growth.

8 Consult glossary for definitions of terms used.

9 EC = Electrical conductivity (milliSiemens/cm, mS/cm or deciSiemens/m, or dS/m).

Table A21. Guide for Assessing Soil Suitability for Camp Areas

This guide applies to soils to be used intensively for tents and camp trailers, and the accompanying activities of outdoor living. It is assumed that little site preparation will be done, other than shaping and levelling for campsites and parking areas. The soil should be suitable for heavy foot traffic by humans, as well as limited vehicular traffic. Soil suitability for growing and maintaining vegetation is not a part of this guide. However, it is an important consideration in the final evaluation of site.

Back country campsites differ in design, setting and management, but require similar soil attributes. These guides should apply to evaluations for back country campsites, but depending on the nature of the facility, the interpreter may wish to adjust the criteria, defining a given degree of limitation to reflect the changed requirement. For example, small tent sites may allow rock exposures greater than 10 metres apart to be considered slight limitations.

Symbol[1]	Property Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
w	**Wetness[2]**	Very rapidly, rapidly, well and moderately well-drained soils, with no seepage or ponding. Water table below 75 cm during season of use.	Moderately well-drained soils, subject to occasional seepage or ponding and imperfectly drained soils with no seepage or ponding. Water table below 50 cm during season of use	Imperfectly drained soils subject to seepage or ponding and poorly drained soils. Water table above 50 cm during season of use.	Very poorly drained and permanently wet soils.
l	**Flooding**	None	Very occasional flooding during season of use. (Once in 5 - 10 years)	Occasional flooding during season of use. (Once in 2 - 4 years)	Flooding during every season of use.
k	**Permeability**	Very rapid to moderate	Moderately slow and slow	Very slow	
t	**Slope**	≤ 9% (a, b, c, d)	> 9 - 15% (e)	> 15 - 30% (f)	> 30% (g, h, i)
s	**Surface Soil Texture[2,3]**	L, VFSL, FSL, SL, LVFS, VFS	SiL, CL, SiCL, SCL, LFS, LS, FS and sand other than loose sand.	SiC, C, SC[4], Si	Peaty soils: loose sand subject to blowing.
c	**Coarse Fragments on Surface[2,5]**	< 20%	20 - 50%	> 50%	
p	**Stoniness[2,6]**	Stones > 10 m apart (Class 0 and 1)	Stones > 2 - 10 m apart (Class 2)	Stones 0.1 - 2 m apart (Class 3 and 4)	Stones < 0.1 m apart (Class 5)
r	**Rockiness[2,6]**	No rock exposures	Rock exposures 10 m apart and cover 25% or less of the area.	Rock exposures < 10 m apart and cover > 25% of the area.	Rock exposures too frequent to permit campground location.
n	**Salinity[7]**	EC < 4 mS/cm	EC 4 - 8 mS/cm (s)	EC > 8 - 16 mS/cm (t)	EC > 16 mS/cm (u)

1 The symbol is used to indicate the property affecting use.
2 See also definitions for coarse fragments, rockiness, stoniness, textural and soil drainage classes in the Manual for Describing Soils in the Field (Soil and Landscape Management Section, Manitoba Agriculture, Food and Rural Initiatives and Land Resource Unit, Agriculture and Agri-Food Canada, 2007).
3 Surface soil texture influences soil rating as it affects foot trafficability, dust and soil permeability.
4 Moderately well and well-drained SiC, C and SC soils may be rated fair.
5 Coarse fragments for the purpose of this table include gravels and cobbles. Some gravelly soils may be rated as having slight limitations if the content of gravel exceeds 20% by only a small margin, providing (a) the gravel is embedded in the soil matrix, or (b) the fragments are less than 2 cm in size.
6 Very shallow soils are rated as having a limitation for rockiness and/or stoniness.
7 EC = Electrical conductivity (milliSiemens/cm, mS/cm or deciSiemens/m, or dS/m).

Table A22. Guide for Assessing Soil Suitability for Paths and Trails

It is assumed that the trails will be built at least 45 cm wide and that obstructions, such as cobbles and stones, will be removed during construction. It is also assumed that a dry, stable tread is desirable and that muddy, dusty, worn or eroded trail treads are undesirable. Hiking and riding trails are not treated separately, but as the design requirements for riding trails are more stringent, a given limitation will be more difficult to overcome. Poor or very poor suitability does not indicate that a trail cannot or should not be built. It does, however, suggest higher design requirements and maintenance to overcome the limitations.

Symbol[1]	Property Affecting Use	Degree of Soil Suitability			
		Good - G	Fair - F	Poor - P	Very Poor - V
s	**Texture**[3,4]	L, VFSL, FSL, SL, LVFS, LFS, LS, VFS	CL, SiCL, SiL, SCL	SiC, C, SC[5], Si, FS, S	Peaty soils; loose sand subject to blowing
c	**Coarse Fragment Content**[4,6]	< 20%	20 - 50%	> 50%	
p	**Stoniness**[4]	Stones > 2 m apart (Class 0 to 2)	Stones > 1 - 2 m apart (Class 3)	Stones 0.1 - 1 m apart (Class 4)	Stones < 0.1 m apart (Class 5)
w	**Wetness**[4]	Very rapidly, rapidly well, and moderately well-drained soils. Water table below 50 cm during season of use.	Moderately well-drained soils, subject to occasional seepage and ponding and imperfectly drained soils. Water table may be above 50 cm for short periods during season of use.	Poorly and very poorly drained soils. Water table above 50 cm and often near surface for a month or more during season of use.	Permanently wet soils.
r	**Rockiness**[4,7]	Rock exposures > 30 m apart and cover < 10% of the surface.	Rock exposures 10 - 30 m apart and cover 10 - 25% of the surface.	Rock exposures < 10 m apart and cover > 25% of the surface.	Rock exposures too frequent to permit location of paths and trials.
t	**Slope**[8]	≤ 15% (a, b, c, d, e)	> 15 - 30% (f)	> 30 - 45% (g)	> 45% (h, i)
i	**Flooding**	Not subject to flooding during season of use.	Floods 1 or 2 times during season of use.	Floods more than 2 times during season of use.	Subject to prolonged flooding during season of use.

1 The symbol is used to indicate the property affecting use.

2 The properties affecting use listed in this table are those which have been shown to cause significant differences in trail response. Elevation, aspect, position on slope, and snow avalanching may have slight affects or influence trail management and should be considered in the final site evaluation. Items such as vegetation, fauna and scenic value are not considered in the guidelines.

3 Texture refers to the soil texture, which will form the tread texture. This is the surface texture on level areas, but may be a subsurface texture on slopes. Textural classes are based on the less than two mm soil fraction. Texture influences soil ratings as it influences foot trafficability, dust, design or maintenance of trails, and erosion hazards.

4 See also definitions for coarse fragments, rockiness, stoniness, textural and soil drainage classes in the Manual for Describing Soils in the Field (Soil and Landscape Management Section, Manitoba Agriculture, Food and Rural Initiatives and Land Resource Unit, Agriculture and Agri-Food Canada, 2007).

5 Moderately well and well-drained SiC, C and SC soils may be rated fair.

6 Coarse fragments for the purpose of this table, include gravels and cobbles. Gravels tend to cause unstable footing when present in high amounts, and are also associated with increased erosion. Cobbles (and stones) must be removed from the trail tread, increasing construction and maintenance difficulties. Some gravelly soils may be rated as having a slight limitation if the content of gravel exceeds 20% by only a small margin, providing (a) the gravel is embedded in the soil matrix or (b) the fragments are less than two cm in size.

7 The type of rock outcrop (flat lying vs cliffs), and the orientation of the structure (linear cliffs vs massive blocks) can greatly alter the degree of the limitation. Each site with a Rockiness limitation based on the per cent rock outcrop above should be evaluated on its own merits and the degree of limitation should then be modified appropriately, if necessary.

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

Appendix 2 Soil Series Descriptions

Angusville Series (ANL)

The Angusville series is characterized by a Gleyed Eluviated Black Chernozem soil profile developed on moderately to strongly calcareous, fine loamy (L, CL, SCL) morainal till of limestone, granitic and shale bedrock origin. These soils are imperfectly drained and occur in lower to mid slope positions of undulating to hummocky landscapes, in close association with the well-drained Newdale, Rufford and Cordova soils, the imperfectly drained Varcoe series, and the poorly drained Drokan and Penrith series. Surface runoff is slow to moderately slow; permeability is moderately slow to slow within the solum and moderately slow in the subsoil. Vegetation on non-cultivated lands consists of trembling aspen.

The A horizon has a thickness of 32 cm and ranges from 20 to 50 cm. The very dark gray to gray Ap horizon is 15 to 20 cm thick, and the dark gray to gray Ahe horizon, 5 to 30 cm thick. The dark brown to dark yellowish brown Btjgj or Btgj horizon is 25 to 35 cm thick. A carbonate enriched layer of 10 to 20 cm is usually present. The Ckg horizon is light olive brown with yellowish brown mottles. The Angusville soil profile is more strongly developed, deeper and free of carbonate as compared to the closely associated, shallower, carbonated Gleyed Rego Black Chernozem, Varcoe series.

Arizona Series (AIZ)

The Arizona series consists of moderately well to well-drained Orthic Regosol soils developed on weakly to moderately calcareous, sandy (FS, LS, LFS), lacustrine and deltaic deposits. These soils occur in upper slope and knoll positions of gentle slopes on hummocky landscapes and have rapid permeability, low surface runoff, and a low water table during the growing season. Arizona soils are severely wind eroded, nonstony, and non-saline. They have low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes scrub oak, black spruce and prairie grasses. The majority of these soils are currently wooded or used for natural grazing.

In a representative profile of Arizona soil there is no solum. The profile is characterized by a gray to light gray Ah horizon, five to 15 cm thick, and a brown to very pale brown Ck horizon, with faint reddish brown mottles.

Arizona soils occur in close association with Cactus soils and are similar to Shilox soils by having a Regosolic profile in sand deposits, but differ from them by having deposits of lacustrine origin while Shilox soils are eolian. Arizona soils were previously mapped as eroded phases of the Stockton Association in the Carberry soil report (1957).

Ashmore Series (AHO)

The Ashmore series consists of moderately well to well-drained Rego Black Chernozem soils developed on a thin mantle (25 to 50 cm) of moderately to strongly calcareous sediments of VFS, LVFS, FSL and SL texture overlying moderately to strongly calcareous medium sand to gravelly; glaciofluvial deposits. These soils occur in irregularly sloping terrain ranging from gently undulating to strongly rolling. They have moderately rapid permeability in the upper sediments and very rapid permeability in the gravelly deposits; runoff is moderate to rapid depending on the degree of slope. The stoniness varies from few to very stony land. The native vegetation consists of bur oak and aspen.

A very dark gray Ahk horizon 10 to 17 cm thick and a thin ACk horizon characterize the soil. A lime accumulation layer (Cca) may be present. Cultivated soils on the gently undulating and undulating slopes may be slightly eroded.

Assiniboine Series (ASB)

The Assiniboine series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on moderately to strongly calcareous, stratified, clayey (SiC, C) alluvium deposits. These soils occur in lower slope positions of very gentle slopes on flood plain landscapes and have moderately slow permeability, slow surface runoff, and a medium water table during the growing season. Assiniboine soils are slightly water eroded, non-stony, and non-saline. They have high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes ash, elm, tall prairie and meadow grasses. The majority of these soils are currently cultivated.

In a representative profile of Assiniboine soil there is no solum. The profile is characterized by a dark gray to gray Ap or Ah horizon, 5 to 20 cm thick, and a dark gray Ckgj horizon, many prominent mottles. The parent material is typically stratified and may contain dark strata representing former surfaces.

Assiniboine soils have a similar profile as the Levine soils, but differ from them by having finer textured deposits. These soils were mapped as inclusions of the Assiniboine Complex in the Carberry soil report (1957).

Axford Series (AXF)

The Axford series consists of well to moderately well-drained Orthic Regosol soils (that have weak profile development) on a variable depth (50 to 90 cm) of calcareous stratified sand and gravel (glaciofluvial) overlying strongly calcareous silty glaciolacustrine (dominantly SiL to SiCL) sediments. The surface texture is loamy fine sand to fine sand. These soils occur adjacent to the Minnedosa River near the junction to the Assiniboine River. These soils occur in the upper slope positions of undulating topography; the native vegetation consists of trembling aspen, bur oak, chokecherry, rose and grasses.

The soil is characterized by dark gray to gray Ah or Ahk horizons of six to 10 cm thick, a thin Cca four to six cm thick; the depth is usually dependent on the depth of loamy sand to sand over the coarser sand and gravel. The depth of gravel varies from 50 to 90 cm. The underlying sediments consists of stratified pale brown to very pale brown silt loam to silty clay loam textured lacustrine sediments.

They occur as a complex with Boswell and Marringhurst soils in gently to moderately rolling (hummocky) topography. These soils occupy the intermediate slope positions while the Marringhurst soils occupy the upper slope and apex position.

Bankton Series (BAO)

The Bankton Series consists of well to moderately well-drained Rego Black Chernozem soils developed on moderately to strongly calcareous silty clay to clay lacustrine deposits. They occur adjacent to the creeks in a level to very gently sloping topography. Permeability is slow; runoff is moderately slow. The natural vegetation consists of tall prairie grasses.

The soil is characterized by a very dark gray to black Ah horizon 16 to 22 cm thick and a calcareous, dark gray ACk horizon of irregular thickness (due to past cracking and in-filling) grading to the grayish brown Ck horizon. Some mottles and duller colors occur below the 75 cm depth.

Barren Series (BAE)

The Barren series is an Orthic Regosol soil found on well to rapidly drained, strongly to very strongly calcareous, fine loamy (SCL, SiCL, CL), lacustrine sediments. This soil occurs above the escarpment in association with Ramada, Carroll, Charman, Prodan and Tadpole soils in the upper slope and knoll positions of gently undulating to moderately rolling topography. Surface runoff is moderate to rapid,

and permeability is moderate to moderately slow. Originally, Barren soils had a dark surface horizon and a weak B horizon, but erosion has removed virtually all of the original solum. Wind and water erosion continues to be a problem for these soils.

The Barren soil profile has a gray to light gray, calcareous Apk horizon, 10 to 15 cm thick, and a light yellowish brown to pale brown Ck horizon.

Barwood Series (BWO)

The Barwood series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on strongly to extremely calcareous (~40 per cent $CaCO_3$), deep uniform, fine loamy (L, CL, SiCL), boulder till of limestone and granitic origin. These soils occur in toe and lower slope positions of strong slopes on hummocky landscapes and have moderately slow permeability, moderately slow surface runoff and a medium water table during the growing season. Barwood soils are non-eroded, slightly stony and occasionally slightly saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses. The majority of these soils are currently used for improved pasture and grain crop production.

In a representative profile of Barwood soil the solum is approximately 20 cm thick. The profile is characterized by a very dark gray to black Ap or Ah horizon, 10 to 15 cm thick, a thin transitional, calcareous AC horizon, 15 to 20 cm thick and a very pale brown extremely calcareous Ck horizon, with iron stains. A typical profile also contains lime and manganese concretions at depth.

Barwood soils occur in close association with Hilton and Tiger Hills soils. They are similar to Ferris soils by having a Gleyed Rego Black profile developed in calcareous till but differ from Ferris soils because of the extreme calcareous nature of Hilton till material and its relatively shallow profile. Barwood soils were previously mapped as imperfectly drained inclusions of the Hilton Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Basker Series (BKR)

The Basker series consists of poorly to very poorly drained Rego Humic Gleysol soils developed on moderately to strongly calcareous, stratified, loamy (FSL, VFSL, L, SiL, CL, SiCL), recent alluvial deposits. These soils occur in depressional positions of nearly level slopes on flood plain landscapes and have slow permeability, very slow surface runoff, and a high water table during the growing season. Basker soils are slightly water eroded, non-stony, and occasionally slightly saline. They have a high available water holding capacity, medium organic matter content, and low natural fertility. Native vegetation includes sedges, rushes and willows. The majority of these soils are currently in native vegetation because they are subject to flooding and saturated conditions in the spring.

In a representative profile of Basker soil there is no soil solum. The profile is characterized by light grayish brown Ahk horizon, five to 20 cm thick, with iron stains, and a stratified, olive brown Ckg horizon, with prominent iron mottles in the sandy strata. A typical profile also contains thin organic layers indicating former surfaces.

Basker soils occur in close association with Levine soils. They are similar to Kerran soils by having a poorly drained profile developed in recent alluvium but differ from them in having mostly loam rather than clay textures. Basker soils were previously mapped as Meadow associates of the Assiniboine Complex in the South-Central (1943) and Carberry (1957) reports.

Beresford Series (BSF)

The Beresford series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on a thin mantle (<1 metre) of fine loamy (SiL, CL, SiCL) lacustrine sediments over strongly to very strongly calcareous, clay loam glacial till of shale, limestone and granitic origin. These soils occur on

near level to undulating topographic landscapes in association with the Clementi (Orthic Black Chernozem) soils. They occur in landscapes which are considered to be in a discharge to weak recharge (groundwater) area and may have soluble salts within the rooting zone or subsoil. The runoff is slow, and permeability is moderately slow to slow.

The Beresford soils are characterized by a very dark gray to black Ah horizon 20 to 30 cm, a dark gray ACk horizon of six to 12 cm thick. A lime accumulation zone may occur in the loamy lacustrine sediments if the overlay is thick; the underlying strongly calcareous till of shale limestone and granitic origin is generally more compact.

The Berefosford, texture variant, BSF1, has similar solum properties as the normal Beresford, but differes in texture of the lacustrine deposit. The lacustrine deposit is medium texture, rathan than moderately fine material.

Bermont Series (BMN)

The Bermont series consists of well-drained Rego Black Chernozem soils developed on a thin mantle (50 to 75 cm) of very strongly to extremely calcareous loamy glacial till of limestone and granitic origin overlying strongly calcareous loam to clay loam glacial till of shale, limestone and granitic origin. These soils occur in the upper slope and knoll positions of gently undulating to moderately rolling topography. Runoff is rapid; permeability is moderate to moderately slow in the upper till and slow in the lower till, which generally is more compact and weakly fissile.

The Bermont soil is characterized by a shallow Ah or a Ahk horizon 10 to 16 cm thick and an ACk horizon of four to eight cm. This soil profile is similar to the Stewart series. It is associated with the well-drained, Hilton and Tiger Hills series; the imperfectly drained, Barwood series and the poorly drained Hickson series.

Bornett Series (BOR)

The Bornett series consists of poorly drained, carbonated, Rego Humic Gleysol soils developed on a thin mantle (25 to 90 cm) of moderately to strongly calcareous very fine sand to sandy loam sediments overlying moderately to strongly calcareous medium sand to gravelly textured deposits. These soils occur in a level to depressional topographic landscape and are closely associated with the imperfectly drained Wytonville and Kilmury series and the well-drained Miniota series. Runoff is slow to negligible; permeability is rapid, but restricted by a high water table throughout the growing season.

The soil is characterized by a thin, moderately decomposed organic layer of two to three cm thick, a very dark gray to black Ahk horizon of 15 to 24 cm thick, a dark gray ACkg four to six cm thick, and lime accumulation layer. The subsoil is light olive brown to olive with yellowish brown mottles of iron. Bornett soils are more permeable than the similar, finer textured Carvey series.

Boswell Series (BSW)

The Boswell series consists of imperfectly drained, carbonated, Gleyed Rego Black Chernozem soils developed on a thin mantle (30 to 90 cm) of moderately to strongly calcareous outwash and glaciofluvial sediments of sand to gravel texture overlying very strongly calcareous clay loam to silty clay loam lacustrine sediments. These soils occurr in the lower positions of undulating to moderately rolling topography in association with the Marringhurst, Oxford or Barren soils. Runoff is moderately rapid; permeability is rapid in the surface coarser sediments and moderately slow in the lower fine sediments. These soils are subject to perched water conditions above the more slowly permeable subsoil and to a lateral flow and seepage from the adjacent upland areas.

The soil is characterized by a variable Ah horizon 10 to 20 cm thick, depending on the thickness of sand and occurrence of the coarser gravelly particles. A thin ACk may be present at this contact.

Yellowish brown iron mottles are present in the coarser sediments above the silty clay loam lacustrine sediments.

Brownridge Series (BWD)

The Brownridge series consists of well to moderately well-drained Orthic Regosol soils on weakly to moderately calcareous, moderately coarse textured (VFS, LVFS, FSL) lacustrine and deltaic sediments. These soils occur in association with the Halstead (Orthic Dark Gray Chernozem) or Pleasant (Gleyed Rego Black Chernozem, carbonated) soils and occupy the upper slope and knoll positions. Originally, these soils had a dark surface and profile development, but have been sufficiently eroded that little of the original horizons remain.These soils have moderately rapid permeability; runoff is moderately rapid to rapid depending on the slope gradient. The topography is undulating to moderately rolling.

The soil is characterized by a Apk horizon 10 to 15 cm light gray to light brownish gray calcareous plow layer and a light yellowish brown to very pale brown Ck horizon.

Cactus Series (CCS)

The Cactus series consists of well-drained Rego Black Chernozem soils developed on moderately calcareous, deep, stratified, coarse (FS, LFS, LS), lacustrine and deltaic deposits. These soils occur in upper slope and crest positions of gentle slopes on undulating duned landscapes and have moderately rapid to rapid permeability, minimal surface runoff, and a low water table during the growing season. Cactus soils are highly prone to wind erosion, and are non-stony, and non-saline. They have a low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen, bur oak and tall prairie grasses. The majority of these soils are currently used for natural grazing.

In a representative profile of Cactus soil the solum is approximately 15 cm thick. The profile is characterized by a very dark gray Ah horizon, 12 to 16 cm thick, a dark gray calcareous ACk horizon, four to eight cm thick, a thin Cca horizon, five to 10 cm thick with lime accumulation and a light gray to pale brown Ck horizon.

Cactus soils occur in close association with Stockton, Arizona and Sewell soils. They are similar to Stockton soils by having a well-drained profile developed in sandy deposits but differ from them in having no Bm horizon. Cactus soils were previously mapped as minor Blackearth associates of the Stockton Association in the Carberry soil report (1957).

Capell Series (CXT)

The Capell series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, stratified, loamy (SiL, L, CL, SiCL), lacustrine sediments over moderately to strongly calcareous, deep stratified, sandy to sandy-skeletal (GrS, GrLS), glaciofluvial deposits. These soils occur in lower slope positions of gentle to moderate slopes on hummocky landscapes and have moderate to rapid permeability, moderate surface runoff and a medium water table during the growing season. Capell soils are occasionally slightly saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie and meadow grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Capell soil the solum is approximately 25 cm thick. The profile is characterized by a very dark gray to black Apk or Ahk horizon, 15 to 25 cm thick, a dark gray to gray, calcareous ACk horizon, five to 15 cm thick, a light gray IICca horizon, five to 10 cm thick with secondary carbonate accumulation and a light yellowish brown IICkgj horizon with common, distinct iron mottles.

The Capell Shaly Variant (CXT1) series is characterized by a Gleyed Rego Black Chernozem (carbonated) solum on an imperfectly drained thin mantle (25 to 90 cm) of moderately to strongly calcareous loamy (L, CL, SiCL, SCL) sediments overlying moderately to strongly calcareous sand and gravel deposits intermixed with varying amounts of shaly fragments.

Capell soils occur in close association with Croyon and Carvey soils. Capell soils were mapped as an imperfectly drained associate of the Agassiz Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Carroll Series (CXF)

The Carroll series is a Rego Black Chernozem soil developed on moderately well to well-drained, strongly to very strongly calcareous, moderately fine (SCL, CL, SiCL), lacustrine deposits. These soils occur in the Upper Assiniboine Delta and Brandon Lakes Plain on very gently sloping to undulating topography, in association with Ramada, Charman, Prodan and Tadpole soils. Surface runoff is moderately slow, and permeability is moderate. Careful management is required to reduce water and/or wind erosion, especially in undulating topography.

The Carroll soil profile has a very dark gray to black Ah (Ahk) or Ap (Apk) horizon, 15 to 20 cm thick; a dark gray AC (ACk) horizon, 10 to 15 cm thick and a Cca horizon of lime carbonate accumulation, eight to 14 cm thick. The silty textured, pale brown Ck horizon is very erosive. This soil differs only slightly from the Ramada soil in not having a prominent Bm horizon. Carroll soils were previously mapped as the well-drained associate of the Carroll Association in both the South-Central soil report (1943) and Carberry soil report (1957).

Carvey Series (CAV)

The Carvey series consists of poorly drained Rego Humic Gleysol soils developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, loamy (SiL, L, SL) lacustrine sediments over moderately to strongly calcareous, sandy to sandy skeletal glaciofluvial deposits. These soils occur in depressional positions of nearly level slopes on level landscapes and have moderate permeability slow surface runoff and a high water table during the growing season. Carvey soils are occasionally slightly saline. They have medium over low available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation often includes sedges and meadow grasses. The majority of these soils are currently used for natural grazing.

In a representative profile of Carvey soil the solum is approximately 20 cm thick. The profile is characterized by a thin (two to five cm) moderately decomposed LFH horizon a very dark gray, calcareous Ahk horizon, seven to 15 cm thick and a dark gray, calcareous, transition ACkg horizon, 10 to 20 cm thick, and a pale brown, calcareous II Ckg horizon with yellowish brown mottles. A typical profile also contains manganese concretions in the subsoil and shells at the surface.

Carvey soils occur in close association with Capell, and Croyon soils. They are similar to Tadpole soils by having a Rego Humic Gleysol profile developed in loamy lacustrine deposits, but differ from Tadpole soils by having a sandy to sandy-skeletal substrate within a metre of the mineral surface. Carvey soils were previously mapped as a Meadow associate with a loamy veneer of the Agassiz Association in the Carberry soil report (1957).

The Carvey shaly variant, CAV1, series is characterized by a Rego Humic Gleysol (carbonated) solum on poorly drained thin mantle (25 to 90 cm) of moderately to strongly calcareous loamy (L, CL, SiCL, SCL) overlying moderately to strongly calcareous sand and gravel deposits intermixed with varying amounts of shaly fragments. They occur in level to depressional sites which have a water table at or near the surface for part of the year. Runoff is negligible; permeability of the loamy sediments is moderately slow above the saturation zone. In areas where the seepage water contains soluble salts,

a sufficient concentration of slats may occur in the soil to inhibit the growth of the normal sedge and meadow grasses. The solum has a moderately decomposed organic layer, two to five cm thick, a very dark gray carbonated Ahk horizon, seven to 15 cm thick, and a thin dark gray transitional ACkg horizon. A lime accumulation layer (Cca) is commonly present. Yellowish brown mottles are common in the transitional ACkg, the Ccag horizon and the subsoil.

Chambers Series (CBS)

The Chambers series consists of Rego Black Chernozem soils developed on moderately well to well-drained fine loamy (CL, SiCL) lacustrine sediments, less than one metre in depth, overlying moderately to strongly calcareous fine loamy (L, CL) glacial till deposits. These soils occur in the upper slope positions of gently sloping to hummocky, moderately rolling topography. Surface runoff is moderately rapid to rapid depending on the slope gradient. Permeability is moderate in the lacustrine sediments and moderately slow to slow in the glacial till deposit.

The Chambers soil profile is characterized by a very dark gray to black Ah (Ahk) or Ap (Apk) horizon of 10 to 15 cm thick, a thin dark gray to grayish brown ACk horizon of three to eight cm thick and a thin lime accumulation zone. The underlying till is a light yellowish brown color. Chambers soil series tend to be less stony than the very similar Rufford soils.

Charman Series (CXV)

The Charman series consists of imperfectly drained Gleyed Black Chernozem soils developed on strongly to very strongly calcareous, fine loamy (CL, SiCL), lacustrine deposits. In areas of seepage or discharge, soluble salts in the subsoil can be translocated near the surface in sufficient quantities to affect crop growth. These soils occur in middle positions of very gentle slopes on undulating landscapes and have moderate permeability, slow surface runoff, and a medium high water table during the growing season. Charman soils are non-eroded, non-stony, and frequently slightly saline. They have a moderately high available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation includes aspen, willows, shrubs and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile of Charman soil the solum is approximately 40 cm thick. The profile is characterized by very dark gray to black Ap or Ah horizon, 15 to 25 cm thick, a dark grayish brown Bmgj horizon, 12 to 30 cm thick, a transitional BCgj horizon, five to eight cm thick and a pale brown, silty textured Ckgj horizon, with iron mottles and frequently gypsum crystals.

Charman soils occur in close association with Ramada, Carroll and Tadpole soils. They are similar to Prodan soils by having an imperfectly drained profile and fine loamy deposits but differ from them in having a Bmgj horizon. Charman soils were previously mapped as Black-Meadow associates of the Holland Association in the Carberry soil report (1957).

Chater Series (CXW)

The Chater series consists of Calcareous Black Chernozem soils developed on moderately well to well-drained, moderately to strongly calcareous, sandy (S, CoS) to sandy-skeletal (GrS, GrCoS) outwash and glaciofluvial deposits, less than one metre in depth, overlying moderately to strongly calcareous loamy (L, CL) glacial till deposits. These soils occur in gently undulating to moderately rolling topography. Surface runoff is low, while permeability is rapid in the coarser deposits and moderate to moderately slow in the underlying till material. These soils are in favorable topographic positions to allow excess water above the till to flow laterally to downslope positions.

The Chater soil profile is characterized by a 12 to 18 cm thick, very dark gray Ah horizon and a grayish brown to brown Bmk horizon eight to 15 cm thick, with a lime accumulation horizon (Cca) in the coarser stratum. Chater soils are coarser textured and tend to be droughtier than glacial till soils like

Kleysen series.

Clementi Series (CLN)

The Clementi series is characterized by an Orthic Black Chernozem profile developed on a thin mantle (25 to 90 cm) of fine loamy lacustrine sediments over moderately to very strongly calcareous morainal till of limestone, granitic, and shale origin. These soils are moderately well-drained and occur in mid to upper slope positions of very gently undulating or rolling topography. Runoff is moderate; permeability is moderate in the fine loamy overlay, and moderately slow to slow in the underlying till.

The solum has a very dark gray to black Ah horizon, 10 to 20 cm thick and a dark brown to brown Bm horizon, eight to 12 cm thick. The solum is developed dominantly within the overlay, and may extend into the till material.

Cobfield Series (CBF)

The Cobfield series consists of Gleyed Black Chernozem soils developed on imperfectly drained fine loamy (CL, SiCL) lacustrine sediments, less than one metre in depth, overlying moderately to strongly calcareous fine loamy (L, CL) glacial till deposits. These soils occur in the mid to lower slope position of gently sloping to undulating topography of dominantly weak recharge areas. The runoff is moderately slow with permeability being moderate in the upper lacustrine sediments and moderately slow to slow in the underlying glacial till.

The Cobfield soil profile is characterized by a very dark gray to black Ap or Ah horizon 10 to 18 cm thick, a brown to dark yellowish Bmgj horizon of 8 to 12 cm thick, with few, yellowish brown to strong brown mottles, and a lime accumulation horizon (Ccagj). The underlying till is olive brown to light olive brown, which is indicative of periodic saturation and reducing conditions.

Cordova Series (CVA)

The Cordova series consists of Calcareous Black Chernozem soils developed on moderately to strongly calcareous, fine loamy (L, CL, SiCL) morainal till of mixed limestone, granitic and shale rock origin. These soils are well to rapidly drained and occur in the upper slope and crest positions of undulating to hummocky landscapes, in close association with the well-drained Rufford and Newdale series. Surface runoff is moderately rapid to rapid, depending upon slope. Permeability is moderately slow. Native vegetation consists of mixed tall prairie grasses and herbs.

The Cordova soil profile has a thin, very dark gray Ap(k) horizon, 12 to 18 cm thick, a calcareous, yellowish brown to dark yellowish brown Bmk horizon, five to 15 cm thick, a thin transitional BCk horizon and a light gray lime carbonate accumulation layer, 25 to 35 cm thick. Secondary carbonates may be found along vertical cracks within the underlying grayish brown (dry) or dark grayish brown (moist) Ck horizon. In many areas, these soils have been altered by wind and water erosion; the crest positions have lost most of the A horizon and part of the B horizon has been cultivated. In a few areas, the Cca horizon has been incorporated into the plow layer, imparting a light gray surface color.

The Cordova series differs from the Rufford series, a carbonated Rego Black, in having a Bmk horizon. Both Cordova and Rufford series differ from the Newdale series, the former having free lime carbonate present in the solum, while the latter has an A and a B horizons free of carbonates.

Crookdale Series (CKD)

The Crookdale series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on a mantle (25 to 100 cm) of strongly calcareous, stratified, fine loamy (CL, SiCL) lacustrine sediments over strongly calcareous, deep uniform sandy (LFS, FS, S) fluvial lacustrine deposits. These soils occur in lower slope positions of level to nearly level slopes on level landscapes and have

moderate permeability, moderately slow surface runoff and a medium water table during the growing season. Crookdale soils are non-eroded, non-stony and slightly saline. They have high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses. The majority of these soils are currently used for grain crop production.

In a representative profile of Crookdale soil the solum is approximately 25 cm thick. The profile is characterized by a black Ap or Ah horizon, 10 to 25 cm thick, a dark grayish brown transitional AC horizon, 10 to 20 cm thick with faint iron mottles, a white Ccagj horizon, five to 10 cm thick of lime accumulation and a light olive brown II Ckgj horizon with prominent iron mottles.

Crookdale soils occur in close association with Wellwood soils. They are similar to Prodan soils by having a Gleyed Rego Black profile developed in fine loamy lacustrine deposits, but differ from Prodan soils which develop in deep fine loamy deposits by grading to sandy deposits at depth. Crookdale soils were previously mapped as an associate of the Glenboro association in the reconnaissance soil survey of South-Central Manitoba (1943).

Croyon Series (CYN)

The Croyon series consists of moderately well to well-drained Orthic Black Chernozem soils developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, uniform, loamy to fine loamy (L, SiL, CL) lacustrine sediments over moderately to strongly calcareous, stratified, deep sandy-skeletal (GrS, GrLS), glacio-fluvial deposits. These soils occur in middle and upper slope positions of very gentle slopes on undulating landscapes and have medium over rapid permeability, moderately rapid surface runoff and a low water table during the growing season. Croyon soils have medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen-oak groves. The majority of these soils are currently used for grain crop production.

In a representative profile of Croyon soil the solum is approximately 35 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon, 10 to 15 cm thick, a dark brown Bm horizon, 10 to 25 cm thick, a yellowish brown IICca horizon, 10 to 20 cm thick with secondary carbonate accumulation and a light yellowish brown IICk horizon. The parent material is typically stratified with thin (< 5 cm) layers of SiL, CoS, GrS and SL textures.

The Croyon series shale gravel variant, (CYN1) occurs in close association with typical Croyon soils and differs in having dominantly shale derived coarse fragments in the sandy-skeletal substrate.

The Croyon series sandy substrate variant, (CYN2) occurs in close association with typical Croyon soils and differs in having dominantly sandy substrate rather than sandy-skeletal substrate deposits.

Croyon soils occur in close association with Capell soils. They are similar to Vandal (Orthic Dark Gray Chernozem) soils by having a coarse-loamy mantle over sandy-skeletal deposits at depth, but differ in having a less strongly developed Orthic Black Chernozem soil profile. Croyon soils were previously mapped as loamy surface associates of the Agassiz association in the reconnaissance soil survey of South-Central Manitoba (1943).

Dexter Series (DXT)

The Dexter series consists of imperfectly drained Gleyed Black Chernozem soils developed on moderately to strongly calcareous, deep, stratified, sandy skeletal (FS, CoS, GrS), glaciofluvial deposits. These soils occur in middle positions of very gentle to gentle slopes on undulating landscapes and have rapid permeability, low surface runoff, and a medium water table during the growing season. Dexter soils are slightly eroded, non-stony, and non-saline. They have a low available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes bur oak, aspen, shrubs and prairie grasses. The majority of these soils are currently used for

forage crops and grazing.

In a representative profile the solum is approximately 40 cm thick. The profile is characterized by very dark gray Ah horizon, 15 to 20 cm thick, a grayish brown to brown Bm horizon, 10 to 25 cm thick, a Cca (lime accumulation) horizon, five to eight cm thick and a mottled and calcareous Ckgj horizon. A typical profile also varies in depth depending on the thickness of finer textured surface layers.

Dexter soils occur in close association with Dorset, Marringhurst and Fortina soils. They are similar to Mansfield soils by having an imperfectly drained profile developed in sandy skeletal deposits in having a Bm horizon.

Dogand Series (DGA)

The Dogand series consists of well to moderately well-drained Calcareous Black Chernozem soils developed on a sequence of soil materials composed of a thin mantle, (25 to 60 cm) of moderately to strongly calcareous loamy lacustrine sediments over thin (10 to 40 cm) medium sand to gravel strata, over a very strongly calcareous loamy textured glacial till. Strongly calcareous loam to clay loam glacial till of shale, limestone and granitic origin usually occurs within a two metre depth. The soils occur on gently sloping topography; runoff is moderate; permeability is moderate to rapid in the upper loamy and coarser strata and moderately slow in the underlying till.

A very dark gray Ahk horizon 10 to 15 cm thick, a brown to dark grayish brown Bmk horizon of eight to 12 cm thick and a thin BCk characterize the soil. A calcium carbonate layer (Cca) occurs at the contact of the loamy sediments and the coarser strata.

Dorset Series (DOT)

The Dorset series consists of moderately well to well-drained Orthic Black Chernozem soils developed on moderately to strongly calcareous, deep, stratified, sandy to sandy skeletal (S, GrS, GrCoS), outwash and glaciofluvial deposits. These soils occur in upper positions of gentle slopes on hummocky landscapes and have very rapid permeability, low rapid surface runoff, and a low water table during the growing season. Dorset soils are non-eroded, non-stony, and non-saline. They have a low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes aspen-oak stands and tall prairie grasses. The majority of these soils are currently used for grazing or are excavated for gravel deposits.

In a representative profile the solum is approximately 30 cm thick. The profile is characterized by a very dark gray Ah horizon, 12 to 18 cm thick, a dark brown Bm horizon, 15 to 22 cm thick, a Cca (lime accumulation) horizon, six to 12 cm thick and a light brown Ck horizon, with stratified sand and gravel.

The Dorset, shaly gravel variant, DOT1, has a high proportion of shale fragments in the gravel.

Dorset soils occur in close association with Mansfield soils. They are similar to Marringhurst soils by having well-drained profile in glaciofluvial deposits but differ from them in having a Bm horizon. Dorset soils were previously mapped as Blackearth associates of the Marringhurst Association in the Carberry Map Sheet Area (1957).

Drokan Series (DRO)

The Drokan series consists of poorly to very poorly drained carbonated Rego Humic Gleysol soils, developed on moderately to strongly calcareous, fine loamy (L, CL, SCL) morainal till of limestone, granitic and shale rock origin. These soils occur in depressional positions of the undulating to hummocky morainal landscape. Surface runoff is negligible and the soils may remain in a ponded condition unless the surface drainage had been improved. Permeability is moderately slow to slow. In some landscapes, these areas are influenced by seepage from adjacent higher lands, and may have a

considerable content of soluble salts. Native vegetation consists of sedges, cattails, rushes and willows. Saline areas have baltic rush, wild barley and saline goosefoot.

The Drokan soil profile has a moderately decomposed organic layer, two to five cm thick, a very dark gray Ah horizon, 10 to 30 cm thick, with a solum that can vary 15 to 70cm, a mottled transitional ACg horizon, four to eight cm thick and a lime accumulation layer, eight to 12 cm thick. The Ckg horizon is olive gray to olive with yellowish brown mottles. Gypsum crystals are common in the lime accumulation layer and Ccasg horizon. In saline areas, white flecks of salt and gypsum are present in the Ah and ACsk horizons; soils with appreciable soluble salt are delineated as Drokan saline phase.

Drokan soils differ from the closely related Penrith soil series in being less well developed and having shallower, less distinct horizons.

Druxman Series (DXM)

The Druxman series consists of imperfectly drained Gleyed Black Chernozem soils developed on a mantle (25 to 100 cm) of moderately to strongly calcareous, stratified, fine loamy (SiL, L, CL, SiCL), lacustrine sediments over moderately to strongly calcareous, deep, sandy-skeletal (GrS, GrLS), glacio-fluvial deposits. These soils occur in lower slope positions of very gentle slopes on undulating landscapes and have medium over rapid permeability, low surface runoff and a medium water table during the growing season. Druxman soils have medium available water holding capacity, medium organic matter content and medium natural fertility. Native vegetation often includes meadow and tall prairie grasses interspersed with willow clumps. The majority of these soils are currently used for grain crop production.

In a representative profile the solum is approximately 50 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon, 15 to 25 cm thick, a dark yellowish brown to olive brown Bmgj horizon, 20 to 30 cm thick with many, fine, distinct, yellowish brown iron mottles, a transitional dark yellowish brown BCgj, five to 10 cm thick, occasionally a yellowish brown II Ccagj horizon, five to 10 cm thick and light yellowish brown IICkgj horizon with many, large prominent iron mottles.

Druxman, shaly variant (DXM1) are underlain by shaly, gravelly deposits. Druxmen soils occur in close association with Croyon and Carvey soils. They are similar to Capell soils by having an imperfectly drained black profile developed in loamy over sandy-skeletal deposits, but differ from Capell soils because Capell soils lack a Bm horizon. Druxman soils were previously mapped as imperfectly drained associates of the Agassiz Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Durnan Series (DRN)

The Durnan series consists of moderately well to well-drained Rego Black Chernozem soils developed on strongly to very strongly calcareous, deep, stratified, medium textured (VFSL, L, SiL), lacustrine deposits. These soils occur in upper slope and crest positions of gentle slopes on hummocky to undulating landscapes and have moderate to moderately rapid permeability, moderate to rapid surface runoff, and a low water table during the growing season. Durnan soils are occasionally slightly eroded, non-stony, and non-saline. They have medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes aspen, oak, prairie grasses and shrubs. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 10 cm thick. The profile is characterized by a very dark gray Ahk or Apk horizon, 10 to 15 cm thick, frequently a Cca horizon, four to seven cm thick and a pale brown, calcareous Ck horizon.

Durnan soils occur in close association with Fairland, Torcan and Vordas soils. They are similar to Traverse soils by having a well-drained profile in coarse loamy deposits, but differ from them in having

no Bmk horizon. Durnan soils were previously mapped as Blackearth associates of the Holland Association in the Carberry Map Sheet Area (1957).

Everton Series (EVO)

The Everton series consists of moderately well to well-drained Orthic Black Chernozem soils developed on a thin mantle (25 to 75 cm) of silty clay, to clay lacustrine sediments over a thin strata (10 to 40 cm) of very strongly calcareous loamy glacial till, over a strongly calcareous till of shale, limestone and granitic origin. The soils occur on gently sloping topography. Runoff is moderate and permeability is moderately slow to slow.

The soil is characterized by a granular, very dark gray to black Ah horizon, 10 to 15 cm thick, a dark grayish brown to brown, fine subangular blocky Bm horizon eight to 14 cm thick, and a pale brown BCk horizon. In areas where the clay overlay is not too deep, the solum extends to the contact of the clay and the very strongly calcareous glacial till which appears as a prominent Cca horizon.

Fairland Series (FND)

The Fairland series consists of moderately well to well-drained Orthic Black Chernozem soils developed on strongly to very strongly calcareous, deep, stratified, medium textured (VFSL, L, SiL), lacustrine deposits. These soils occur in upper positions of gentle slopes on rolling landscapes and have moderate permeability, moderate surface runoff, and a low water table during the growing season. Fairland soils are often slightly eroded, non-stony, and non-saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes aspen, oak, shrubs and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 25 cm thick. The profile is characterized by a very dark gray to very dark grayish brown Ap horizon, 10 to 15 cm thick, a brown to dark brown Bm horizon, 10 to 15 cm thick a pale brown BCk horizon, five to 10 cm thick with carbonates and a light gray Cca horizon, five to 10 cm thick with lime accumulation. The parent material is typically very pale brown and calcareous.

Fairland soils occur in close association with Traverse, Taggart and Vordas soils. They are similar to Durnan soils by having well developed profile in loamy deposits but differ from them in having a strongly developed Bm horizon. Fairland soils were previously mapped as Blackearth associates of the Holland Association in the Carberry Map Sheet Area (1957).

Fenton Series (FET)

The Fenton series consists of poorly drained, carbonated Rego Humic Gleysol soils developed on a thin mantle 25 to 75 cm of silty clay to clay sediments over a moderately to very strongly calcareous loam to clay loam glacial till of shale, limestone and granitic origin. These soils occur in level to depressional topography and are subject to ponding and prolonged wetness. Runoff is very slow; permeability is slow to very slow. Some salts may occur in the soil in areas of seepage or upward movement of groundwater containing appreciable soluble salts toward the surface.

In a representative profile the solum is approximately 50 cm thick. The soil is characterized by a thin, moderately decomposed organic layer two to five cm thick, a very dark gray Ah horizon that is sometimes carbonated (Ahk), eight to 40 cm thick, a thin olive gray, strongly calcareous ACkgj 10 to 50 cm thick horizon, and olive, strongly calcareous Ckg horizons that may have some yellowish brown mottles. Silt sized, pseudomycelium of magnesium sulfate or gypsum may be present in the surface horizon of saline areas.

Floors Series (FLS)

The Floors series consists of well-drained Rego Black Chernozem soils of the Marringhusrt Association, developed on strongly calcareous, deep, coarse textured gravelly deltaic, beach and outwash deposits. This soil has very gentle slopes to moderate slopes with gently undulating topography, good drainage, rapid permeability and very slow surface runoff. The depth to water table is estimated at two to three metres during the growing season. The native vegetation consists of drought resistant herbs, grasses and shrubs. These soils are not usually cultivated; most are used as unimproved pasture. Floors soils are found in close association with Marrginghurst soils.

The soil is characterized by a thin, dark gray Ah horizon zero to 14 cm thick, a dark gray AC horizon, five to 20 cm (average eight cm) thick. Some profiles show a white Cca horizon, 12 to 20 cm thick. The overlying horizon is a pale brown, stratified parent material.

Forrest Series (FRT)

The Forrest series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on a thin mantle (25 to 75 cm) of silty clay to clay sediments over a thin strata (10 to 40 cm) of very strongly calcareous loamy glacial till of shale, limestone and granitic origin. The topography is level to very gently sloping; runoff is moderately slow to slow and permeability is moderately slow to slow. These soils are influenced by a subsoil seepage condition in the very strongly calcareous till and an upward pressure of groundwater. Soluble salts are usually found in the subsoil.

The soil is characterized by an irregular, very dark gray Ah or Ahk horizon, 10 to 15 cm thick, with tongues to 25 cm, and a dark gray to olive gray AC, four to eight cm thick. A weakly mottled, calcareous light olive brown Ckgj horizon is also present.

Gateside Series (GTD)

The Gateside series consists of imperfectly drained Gleyed Black Chernozem soils developed on moderately to strongly calcareous, deep, coarse loamy (VFS, LVFS, FSL, SL), lacustrine deposits. These soils occur in middle positions of very gentle to nearly level slopes on undulating landscapes and have moderately rapid permeability, moderately slow surface runoff, and a high water table during the growing season. Gateside soils are nonstony, and occasionally slightly saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes tall prairie grasses, aspen-oak groves, shrubs and meadow grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 35 cm thick. The profile is characterized by a very dark gray to black Ap or Ah horizon, 12 to 18 cm thick, a brown to olive brown Bmgj horizon, 15 to 30 cm thick with faint iron mottles; a light olive brown BCk horizon, five to 15 cm thick with carbonates and a light olive brown to yellowish brown Ckgj horizon with distinct yellowish brown mottles.

Gateside soils occur in close association with Prosser, Pleasant and Poolex soils. They are similar to Pleasant soils by having imperfect drainage in coarse loamy deposits, but differ from them in having a Bmgj horizon. Gateside soils were previously mapped as Black Meadow associates of the Holland Association in the Carberry Map Sheet Area (1957).

Gendzel Series (GDZ)

The Gendzel series consists of imperfectly drained, carbonated, Gleyed Rego Black Chernozem soils developed on a thin mantle, 25 to 60 cm of moderately to strongly calcareous sandy textured sediments overlying moderately to strongly calcareous medium sand to gravelly textured sediments. The soil occurs in a level to gently sloping topography. Runoff is moderately slow; permeability is

moderately rapid to rapid, but may be restricted in the subsoil during periods when the water table is high.

The soil is characterized by a very dark gray to black Ahk horizon, 10 to 16 cm thick; a dark gray to light gray AC horizon five to nine cm thick; and a lime accumulated Cca horizon six to 12 cm thick. In the soils with a shallow solum, the lime accumulated Cca horizon occurs at the transition of the sandy to gravelly sediments.

Glenboro Series (GBO)

The Glenboro series consists of moderately well to well-drained Orthic Black Chernozem soil developed on a mantle, 25 to 90 cm of moderately to strongly calcareous, shallow, medium textured (VFSL, L, SiL), lacustrine deposits over moderately calcareous, stratified, deep, sandy (FS, LFS, LS) deposits. These soils occur in upper positions of gentle slopes on sloping to undulating landscapes and have moderate over moderately rapid permeability; moderately slow surface runoff; and a low water table during the growing season. Glenboro soils are often slightly eroded, non-stony, and non-saline. They have a medium available water holding capacity, high organic matter content, and high natural fertility. Native vegetation includes tall prairie grasses and aspen oak groves. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 30 cm thick. The profile is characterized by a very dark gray to black Ah or Ap horizon, 12 to 18 cm thick, with granular structure; a dark brown to brown Bm or Btj horizon, 10 to 16 cm thick, with subangular blocky structure; a brown to pale brown BC horizon, 6 to 14 cm thick; and a light gray to very pale brown Cca horizon, five to eight cm thick. The parent material is typically pale brown to light yellowish brown sandy. Some stratified sands to loams may occur in the loam/sand transition.

The Glenboro, clay loam to silty clay loam, variant, (GBO1) contains a clay loam to silty clay loam layer in the subsoil above the sandy deposits.

Glenboro soils occur in close association with Grover and Grayson soils. They are similar to Fairland soils by having an Orthic Black Chernozem profile and loamy surface mantle, but differ from them in having a sandy substrate. Glenboro soils were previously mapped as Blackearth associates of the Glenboro Association in the Carberry Map Sheet Area (1957).

Grayson Series (GYS)

The Grayson series consists of poorly drained Rego Humic Gleysol soils developed on a thin mantle 25 to 95 cm of moderately to strongly calcareous medium-textured (VFSL, L, SiL) sediments grading to moderately calcareous sandy (FS, LFS, LS) deposits. The soils occur in level to depressional topography and have a saturation zone at, or very near, the surface for a considerable time. Runoff is very slow to negligible; permeability of the soil material is moderate, but restricted during periods when the soil is saturated.

The soil is characterized by a thin, moderately decomposed organic layer two to five cm thick; a very dark Ah or Ahk horizon eight to 12 cm thick; and a dark gray AC. In some soils, thin cumulic layers of organic and mineral matter may be present at the surface. A lime carbonate Cca horizon is often present below the AC. The subsoil is light olive brown to olive and may have yellowish brown mottles.

Gregg Series (GRG)

The Gregg series consists of imperfectly drained Gleyed Eluviated Black Chernozem soils developed on fine loamy (CL, SiCL) to clayey (SiC, C) lacustrine sediments underlain by stratified loamy fine sand (LFS) to stratified fine sand (FS) deposits at depths of 1.2 to 1.8 metres. These soils occur in depressional positions in level to nearly level landscapes and have low permeability. A Btgj horizon

(clay accumulation) with a thickness of up to one metre results in slow downward movement of water. They have moderately high available water holding capacity, average organic matter and medium natural fertility. Due to landscape position, these soils will pond water during heavy summer precipitation events resulting in crop drown-outs. Native vegetation includes aspen, willow, shrubs and prairie grass. The majority of these soils are currently cultivated for grains, oilseed, and special crops.

In a representative profile the solum is approximately 100 cm thick. The profile is characterized by a very dark gray to dark gray Ap horizon 15 cm in thickness; a dark gray to gray Aegj horizon 10 to 15 cm thick; a transitional dark grayish brown AB horizon 10 cm thick; a dark brown Btgj horizon 50 to 75 cm in thickness; a transitional BC horizon about 10 cm thick; and a Cgj horizon.

Gregg soils occur in close association with well-drained Ramada and Wellwood soils. They differ by having an imperfectly drained profile and an illuviated Btgj horizon.

Grover Series (GRO)

The Grover series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on a mantle 25 to 75 cm of moderately to strongly calcareous, shallow, medium (VFSL, L, SiL) textured, lacustrine deposits over moderately calcareous, deep, sandy (FS,LFS,LS), lacustrine deposits. These soils occur in middle positions of very gentle slopes on undulating landscapes and have moderate over moderately rapid permeability, moderately slow surface runoff, and a high water table during the growing season. Grover soils are non-eroded, non-stony, and non-saline. They have medium available water holding capacity, high organic matter content, and medium natural fertility. Native vegetation includes aspen oak, ash and tall prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a very dark gray to black Ah, Ap, Apk or Ahk horizon 15 to 25 cm thick; a dark grayish brown ACkgj horizon 15 to 20 cm thick with faint mottles; a Ccagj horizon five to eight cm thick; and a light yellowish brown, sandy Ckgj horizon, with yellowish brown mottles.

Grover soils occur in close association with Glenboro and Grayson soils. They are similar to Crookdale soils by being imperfectly drained with a sandy substrate, but differ from them by having loamy rather than fine loamy surface. Grover soils were previously mapped as Black Meadow associates of the Glenboro Association in the Carberry Map Sheet Area (1957).

Hamiota Series (HMI)

The Hamiota series consists of Orthic Humic Gleysol soils, developed on moderately to strongly calcareous, loamy (L, CL) morainal till of limestone, granitic and shale rock origin. They are poorly to very poorly drained and occur in depressional positions of the undulating to hummocky morainal landscape. Surface runoff is negligible and the soils may remain in a ponded condition unless the surface drainage has been improved. Permeability is moderately slow to slow. In some landscapes, these areas are influenced by seepage from adjacent higher lands, and may have a considerable content of soluble salts. Native vegetation consists of sedges, cattails, rushes and willows.

In a representative profile the solum is approximately 50 cm thick. The soil is characterized by an Ah or Ap horizon 10 to 50 cm thick overlying a mottled Bg horizon 20 to 40 cm thick, that lies over strongly calcareous and mottled Ckg horizons. A thin Om layer may be present over the Ah or Ap horizon that is five to 10 cm thick.

Harding Series (HRG)

The Harding series consists of imperfectly drained Gleyed Black Chernozem soils developed on moderately to strongly calcareous, silty clay to clay lacustrine deposits. These soils occur on level to

very gently sloping topography. Runoff is slow; permeability is moderately slow to slow. Most of these soils occur within a discharge region characterized by an upward pressure of groundwater or a lateral flow of water through the underlying very strongly calcareous till which may occur at a depth of one to two metres. Appreciable soluble salts may be present within the rooting zone and gypsum crystals are common.

The soil is characterized by a very dark gray Ah horizon 12 to 22 cm thick; a dark grayish brown, prismatic to subangular blocky Bmgj horizon 15 to 20 cm thick with fine yellowish brown mottles. A lime accumulation horizon (Ccagj) is common. Salt pseudomycelium and gypsum concretions are common in the olive brown to olive Ckgj or Cksgj horizon.

Hilton Series (HIT)

The Hilton series consists of well-drained Orthic Black Chernozem soils developed on strongly to extremely calcareous, thin, uniform, fine loamy (L, CL, SiCL) glacial till of limestone, shale and granite origin. These soils occur in upper slope positions of moderate slopes on hummocky landscapes and have moderate permeability, rapid surface runoff and a low water table during the growing season. Hilton soils are moderately eroded, moderately stony and non-saline. They have medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation often includes tall prairie grasses interspersed with aspen oak groves. The majority of these soils are currently used for forage crop production and improved pasture.

In a representative profile the solum is approximately 30 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon 10 to 20 cm thick; a dark brown Bm horizon 5 to 15 cm thick; a very pale brown Cca horizon 10 to 40 cm thick; and a yellowish brown Ck horizon. The parent material is typically very stony.

Hilton soils occur in close association with the imperfectly drained Barwood series and the poorly drained Hickson soils. They are similar to Tiger Hills soils by having a well-drained, very thin soil profile developed in strongly to extremely calcareous glacial till, but differ from them in having a less strongly leached soil profile. Tiger Hills soils have Ae or Ahe horizons and Bt horizons, while Hilton soils do not. Hilton soils were previously mapped as dominant associates of the Hilton association in the reconnaissance soil survey of South-Central Manitoba (1943).

Hughes Series (HGH)

The Hughes series consists of imperfectly drained, Gleyed Black Chernozem soils developed on a thin mantle 25 to 60 cm of sandy textured sediments overlying weakly to non calcareous, medium to coarse sand and occasional gravel sediments. The soil occurs in lower position of level to gently sloping topography. Permeability is moderately rapid to rapid, but may be restricted in the subsoil during periods when the water table is high (within one metre of the surface).

The soil is characterized by a very dark gray to black Ah or Ap horizon 10 to 30 cm thick; a brown to dark brown, weakly mottled Bmgj horizon 15 to 22 cm thick; a light yellowish brown BC with strong brown mottles; and a Cgj horizon 30 to 50 cm thick. They occur in close association with the imperfectly drained Gendzel soils, the well-drained Wheatland soils and the poorly drained Lowry series.

Hummerston Series (HMO)

The Hummerston series consists of imperfectly drained Gleyed Rego Black Chernozem soil developed on weakly to moderately calcareous, deep, uniform, coarse-textured (FS, LFS, LS), lacustrine deposits. These soils occur in middle to lower positions of very gentle slopes on undulating landscapes and have moderately rapid permeability, low surface runoff, and a high water table during the growing season. Hummerston soils are often slightly wind eroded, non-stony, and slightly saline.

They have a low available water holding capacity, medium to low organic matter content, and medium to low natural fertility. Native vegetation includes aspen oak groves, shrubs, tall prairie and meadow grasses. The majority of these soils are currently cultivated for forage and grain crops.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon 15 to 20 cm thick; a dark gray ACgj horizon 10 to 18 cm thick with moderate calcareousness; and a yellowish brown Ckgj horizon with prominent yellow mottles.

Hummerston soils occur in close association with Stockton, Lavenham and Sewell soils. They are similar to Lavenham soils by having an imperfectly drained profile in sandy deposits, but differ from them in having no diagnostic Bm Horizon. Hummerston soils were previously mapped as Black Meadow associates of the Stockton Association in the Carberry soil report (1957).

Janick Series (JIK)

The Janick series consists of well to moderately well-drained Orthic Black Chernozem soils developed on moderately to strongly calcareous, deep, uniform, clayey (C, SiC), lacustrine deposits. These soils occur in upper positions of nearly level slopes on undulating landscapes and have slow permeability, moderately slow surface runoff, and a medium water table during the growing season. Janick soils are non-eroded, non-stony, and non-saline. They have a high available water holding capacity, high organic matter content, and high natural fertility. Native vegetation includes prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 30 cm thick. The profile is characterized by a very dark gray to black Ah or Ap horizon 10 to 18 cm thick; a dark grayish brown to brown Bm horizon eihgt to 15 cm thick with fine subangular blocky structure; a pale brown BC horizon five to 10 cm thick, weakly calcareous; and a light grayish brown to pale brown Ck horizon, with a few faint mottles. Janick soils occur in close association with Harding soils.

Jaymar Series (JAY)

The Jaymar series consists of well-drained, Orthic Black Chernozem soils developed on stratified materials composed of a thin mantle 40 to 70 cm of moderately to strongly calcareous, loamy (L, CL, SiCL), lacustrine sediments over a thin 30 to 60 cm, contact zone of sandy skeletal (S, GrS) materials, overlying moderately to strongly calcareous, loamy (L, CL, SiCL), glacial till of shale, limestone and granitic rock origin.The soils occur on very gently to gently sloping topography, runoff is moderate, and permeability is moderate to rapid in the upper loamy and sandy skeletal strata, and moderately slow in the underlying till. These soils are often stony due to the modification of the till.

The soil is characterized by a very dark gray Ah horizon 10 to 15 cm thick; a dark brown to brown Bm horizon eight to 15 cm thick; and a lime accumulation layer (Cca) that occurs at the contact of the loamy sediments and underlying coarser wash zone. Jaymar soils occur as well-drained inclusions of the Heaslip Complex in the South-Central soil report (1943).

Justice Series (JUC)

The Justice series consists of imperfectly drained Gleyed Black Chernozem soils developed on a thin mantle,25 to 75 cm of silty clay to clay sediments over a thin strata 10 to 40 cm of very strongly calcareous loamy glacial till of shale, limestone and granitic origin over a strongly calcareous till of shale, limestone and granitic origin. The topography is level to gently sloping; runoff is slow and permeability is moderately slow to slow. These soils are influenced by a subsoil seepage condition in the very strongly calcareous till and an upward pressure of groundwater. Although these soils are not saline, some of the adjacent soil types have appreciable soluble salts within their solum.

The soil is characterized by a very dark gray Ah or Ap horizon 12 to 22 cm thick; a dark grayish brown,

prismatic to subangular blocky Bm or Bmgj horizon 15 to 20 cm thick, with fine yellowish brown mottles. A calcium carbonate accumulation horizon Ccagj is common. Where the clay overlay is shallow, the depth of solum extends to the contact of the very strongly calcareous till.

Kerran Series (KRN)

The Kerran series consists of poorly to very poorly drained Rego Humic Gleysol soils developed on moderately to strongly calcareous, deep, stratified, clayey (SiC, C), recent alluvial deposits with strata of silty clay loam and clay loam textures. These soils occur in depressional positions of level slopes on flood prone terraced landscapes and have very slow permeability, very slow surface runoff, and a high water table during the growing season. Kerran soils are non-eroded, non-stony, and frequently moderately saline. They have a high available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes reeds, rushes, sedges and willows. The majority of these soils are currently in native vegetation.

In a representative profile the solum is not developed. The profile is characterized by a thin organic horizon two to four cm thick; a weakly developed dark gray Ahk horizon 10 to 15 cm thick; and a pale brown to light gray Ckg horizon, with prominent iron mottles. The parent material is typically stratified, mottled, and may contain buried former Ah horizons. Kerran soils occur in close association with Assiniboine soils. They are similar to Basker soils by having a poorly drained profile in recent alluvium, but differ from them in having finer textures throughout the profile. Kerran soils were previously mapped as associates of the Assiniboine Complex in the Carberry soil report (1957).

Kilmury Series (KUY)

The Kilmury series consists of imperfectly drained carbonated Gleyed Rego Black Chernozem soils developed on a thin mantle (<1 metre) of moderately to strongly calcareous sediments of VFS, LVFS, SL and FSL texture overlying moderately to strongly calcareous stratified medium sands to gravelly textured deposits. The topography is level to very gently sloping; runoff is moderately slow; permeability is moderately rapid in the very fine sandy sediments, and rapid in the subsoil, but restricted by a high water table during spring and early summer.

The soil is characterized by a very dark gray Ah or Ap horizon 20 to 35 cm thick; a dark gray to grayish brown AC horizon 10 to 16 cm thick; and a Cca horizon 10 to 18 cm thick. Yellowish brown mottles are common in the sandy and coarser subsoil (II Ckgj).

They occur in close association with Wytonville series, the well-drained Miniota series and the poorly drained Bornett series Kilmury profiles differ from Wytonville profiles in not having a Bmgj horizon and in having free lime carbonate in their Ah horizons.

Kleysen Series (KYS)

The Kleysen series consists of moderately well to well-drained Calcareous Black Chernozem soils developed on a thin mantle, 25 to 60 cm, of loamy lacustrine sediments over a moderately to very strongly calcareous loam to clay loam till of shale, limestone and granitic origin. These soils in the upper slope positions are of gently sloping, undulating or rolling topography. Runoff is moderate to moderately rapid; permeability is moderate in the lacustrine sediments and in the loose, very strongly calcareous till; and moderately slow to slow in the more compact, somewhat fissile loam to clay loam till.

The soil is characterized by a very dark gray to black Ah horizon 10 to 14 cm thick and a brown to dark brown calcareous Bmk horizon eight to 12 cm thick. The solum usually extends to the contact of the very strongly calcareous till.

A description of a representative Kleysen soil is described below:

Ah - 0 to 17 cm, very dark gray to black (10YR 3/1 dry, 10 YR2.5/1 moist) silty clay loam, weak, fine subangular blocky; very friable when moist; slightly hard when dry; plastic; mildly alkaline; non-calcareous; clear, smooth boundary.
Bmk - 17 to 30 cm, brown to dark brown (10YR 4/3 dry, 10YR 3/3 moist) silty clay loam; weak to moderate, fine subangular blocky; friable when moist; slightly hard when dry; plastic; moderately alkaline; strongly calcareous; clear, wavy boundary.
II Cca - 30 to 45 cm, light gray to very pale brown (10YR 7/2 dry, 10YR 7/3 moist) silty clay loam (till); very weak, fine, pseudo granular; very friable when moist; hard when dry; plastic; strongly alkaline; extremely calcareous; clear, irregular boundary.
II Ck - 45 to 80 cm, very pale brown to yellowish brown (10YR 7/3 dry, 10YR 5/4 moist) silt loam (till); weak, fine to medium, pseudo, subangular blocky; friable when moist; hard when dry; plastic; strongly alkaline; extremely calcareous; abrupt, smooth boundary.
III Ck - 80 to 100 cm, pale brown to dark yellowish brown (10YR 6/3 dry, 10YR 4/4 moist) loam (till); weak to moderate, fine to medium subangular blocky; friable when moist; slightly hard when dry; plastic; moderately alkaline; very strongly calcareous; contains significant amounts of shale fragments.

Knolls Series (KLS)

The Knolls series is an Orthic Regosol soil developed on well to excessively drained, strongly to very strongly calcareous, loamy (VFSL, L, SiL), lacustrine sediments. These soils occur on the Brandon Lakes Plain and Upper Assiniboine Delta in the upper slope and knoll positions, on gently undulating to moderately rolling topography in association with Fairland, Durnan, Torcan, Taggart and Vordas soil series. Surface runoff is moderate to rapid, and permeability is moderate. These soils are severely eroded remnants of Fairland and Durnan soils whose surface horizons have been removed by wind and water erosion. They continue to be very susceptible to both wind and water erosion.

The Knolls soil profile has a gray to light gray, calcareous Ap horizon, 10 to 15 cm thick, that is slightly darker in color than the light yellowish brown to pale brown C horizon.

Kornell Series (KOL)

The Kornell series consists of poorly to very poorly drained Rego Humic Gleysols soils developed on deep (>100 cm), moderately to strongly calcareous (six to 25 % $CaCO_3$), stratified, dominantly clayey (C, SiC), recent alluvial deposits with some shale. They occur on the level to depressional sites in the flood plain of stream channels and are subject to flooding. These soils have slow permeability and little or no surface runoff.

The Kornell series is characterized by a thin LH horizon, one to three cm thick over a black Ahg horizon, 10 to 15 cm thick, and a light gray to pale brown, recently deposited Ckg layer.

Lavenham Series (LVH)

The Lavenham series is a Gleyed Black Chernozem soils developed on imperfectly drained, weakly to moderately calcareous, sandy (FS, LFS, LS), lacustrine sediments. These soils occur in the Upper Assiniboine Delta on level to very gently sloping topography, in association with Stockton, Cactus, Hummerston and Sewell soils. Surface runoff is slow, and permeability is moderately rapid. Downward movement of water is restricted in the subsoil during periods of high water table. The water table ranges from one metre shortly after spring runoff, to three metres below the surface in late fall and winter. These soils are also susceptible to erosion.

The Lavenham soil profile has a very dark gray to very dark brown Ah or Ap horizon, 18 to 25 cm thick; a dark brown to yellowish brown Bmgj horizon, 20 to 40 cm thick, with distinct brown mottles in the lower part of the horizon; a lime carbonate accumulation (Ccagj) horizon, 12 to 20 cm thick, and a pale brown Ckgj horizon with distinct to prominent brown mottles.

This soil profile differs from the very similar Hummerston soil series in having a prominent Bmgj horizon. Lavenham and Hummerston soils are coarser and more permeable than the finer textured Gateside and Pleasant soils. Lavenham soils were mapped as Black Meadow associates of the Stockton Association in the Carberry soil report (1957).

Lavinia Series (LAV)

The Lavinia series is imperfectly drained, Gleyed Calcareous Black Chernozem soils of the Newdale Association, developed on deep, 100 cm moderately to strongly calcareous, fine loamy (L, CL, SCL) morainal till of mixed limestone, granitic and shale rock origin. The topography is gently sloping with either undulating or hummocky landforms. The permeability is moderate, and surface run off is slow. These soils occur in lower slope and depressional positions and are cultivated.

The Lavinia soil profile has a thin, very dark gray Ap(k), or Ah(k) horizon, 10 to 29 cm thick, a calcareous, dark grayish browm Bmkgj horizon, 5 to 34 cm thick, a carbonate accumulation horizon (Ccagj) is commonly present, but may be discontinuous that overlies a Ckgj horizon avarages 38 cm thick, from 15 to 75 cm, and is usually light olive brown in color.

Levine Series (LEl)

The Levine series consists of imperfectly drained Gleyed Cumulic Regosol soils developed on moderately to strongly calcareous, deep, stratified, coarse loamy to fine loamy (VFSL, L, CL) recent alluvial deposits. These soils occur in flood plains, on level slopes, in level landscapes. They have rapid permeability, moderately slow surface runoff and a medium water table during the growing season. Levine soils are occasionally slightly saline and are subject to periodic inundation during spring runoff or after heavy rains. They have a moderate to low available water holding capacity, low organic matter content and medium natural fertility. The majority of these soils are currently used for crop production.

In a representative profile the solum is approximately 15 cm thick and the profile is characterized by a dark gray Apk or Ahk horizon 10 to 20 cm thick and a light yellowish brown Ckgj horizon. The underlying strata may vary in colour from light to dark. The thin, dark colored mineral and organic layers are former surface horizons that have been exposed to soil forming processes for a significant period before burial by alluvial deposits. Medium, distinct yellowish brown iron mottles occur through the soil.

Levine soils were previously mapped as inclusions of Eroded Slope Complexes in the reconnaissance soil survey of South-Central Manitoba (1943).

Lindstrom Series (LDM)

The Lindstrom series consists of imperfectly drained, carbonated, Gleyed Rego Black Chernozem soils developed on a thin mantle, 25 to 60 cm, of moderately coarse sediments (VFS, LVFS, FSL) over a thin strata, 10 to 50 cm, of very strongly calcareous loamy glacial till of limestone and granitic origin over strongly calcareous glacial till of shale, limestone and granitic origin. Topography is level to very gently sloping; runoff is moderately slow; permeability is moderate in the sandy strata and moderately slow in the underlying till.

The soil is characterized by a very dark gray Ahk horizon, 18 to 25 cm thick; a dark gray to grayish brown ACkgj horizon, 10 to 18 cm thick; and a lime accumulation horizon (Ccagj), 6 to 10 cm thick. Where the sandy stratum is shallow, the lime accumulation layer grades to the very strongly calcareous glacial till. A few yellowish brown mottles may be present in the ACkgj and Ccagj horizons.

Lockhart Series (LKH)

The Lockhart series consists of moderately well to well-drained Orthic Black Chernozem soils developed on a thin mantle 25 to 60 cm, of moderately coarse sediments (VFS, LVFS, FSL) over a thin strata, 10 to 50 cm of very strongly calcareous loamy glacial till of limestone and granitic origin, over a strongly calcareous loam to clay loam glacial till of shale, limestone, and granitic origin. These soils occur on gently sloping to undulating topography. Runoff is moderate to moderately rapid; permeability is moderately rapid in the upper sandy strata and moderately slow in the underlying till. These soils have been slightly eroded.

The soil is characterized by a very dark gray Ah horizon 18 to 25 cm thick and a grayish brown to brown Bm horizon 12 to 20 cm thick. The depth of solum varies with the depth of the sandy overlay with the BC terminating at the contact of the sandy surface and very strongly calcareous till II Ck horizon.

Lonery Series (LOE)

The Lonery series consists of poorly drained, carbonated Rego Humic Gleysol soils developed on a thin mantle 25 to 60 cm, of moderately coarse lacustrine sediments (VFS, LVFS, FSL) over a thin strata 10 to 50 cm, of very strongly calcareous loamy glacial till of limestone and granitic origin over a strongly calcareous loam to clay loam glacial till of shale, limestone and granitic origin. These soils occur on level to depressional topography. Runoff is very slow to negligible; permeability is very slow.

The soil is characterized by a thin, moderately decomposed organic layer, two to five cm thick; a very dark gray Ahgj horizon, 10 to 18 cm thick; and a dark gray to olive gray ACg horizon, six to 10 cm thick. A lime accumulation horizon (Ccag) is usually present in the sandy strata and may extend to the very strongly calcareous till II Ckg horizon. Yellowish brown mottles are usually present below the Ahgj horizon.

Lowroy Series (LOW)

The Lowroy series consists of poorly drained, carbonated Rego Humic Gleysol soils developed on a thin mantle (< 1 metre) of moderately to strongly calcareous sandy (FS, LFS, LS) lacustrine sediments overlying moderately to strongly calcareous, medium sand to gravelly textured deposits. They occur in level to depressional sites which have a water table at or near the surface for part of the year. Runoff is negligible; permeability of the sandy sediments is moderate to moderately rapid above the saturation zone. In areas where the seepage water contains soluble salts, a sufficient concentration of salts may occur in the soil to inhibit the growth of the normal sedge and meadow grasses.

The soil is characterized by a moderately decomposed organic layer two to five cm thick; a very dark gray Ahk horizon seven to 15 cm thick; a thin dark gray ACg horizon; and a Ccag horizon. Yellowish brown mottles are common in the ACg and Ccag horizon and subsoil.

Lowton Series (LWN)

The Lowton series consists of poorly drained Rego Humic Gleysol soils developed on moderately to strongly calcareous, clayey, (SiC, C), lacustrine deposits. These soils occur in lower to depressional positions of nearly level landscapes and have very slow permeability, very slow surface runoff, and a high water table during the growing season. Lowton soils are non-eroded, non-stony, and moderately saline. They have a high available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes native grasses, willows and sedges. The majority of these soils are currently under native vegetation.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by moderately decomposed LFH horizon, one to five cm thick; a very dark gray Ahk horizon;,five to 20 cm

thick with carbonates; and a dark gray to olive gray Ckg horizon, with many mottles and carbonate concentrations. A typical profile also contains till at one to 2.5 metres below the surface.

Lowton soils occur in close association with Sigmund and Janick soils. They are similar to Landseer soils by having a Rego Humic Gleysol profile developed in clayey sediments, but differ from them in having uniform textures throughout, while Landseer soils are stratified at depth. Lowton soils were previously mapped as minor inclusions of the Oliver Association in the Reconnaissance South-Central Manitoba soil survey (1943).

Mansfield Series (MFI)

The Mansfield series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, stratified, deep, sandy skeletal (S, GrS, CoS), glaciofluvial deposits. These soils occur in middle positions of nearly level landscapes and have rapid permeability, moderately slow surface runoff, and a high water table during the growing season. Mansfield soils are non-eroded, non-stony, and non-saline. They have a low available water holding capacity, medium organic matter content, and low natural fertility. Native vegetation includes prairie grasses, shrubs, aspen and bur oak. The majority of these soils are currently used for grazing or forage crops.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a very dark gray Ah horizon 15 to 25 cm thick; a dark gray to grayish brown ACk horizon eight to 15 cm thick, moderately calcareous; a Ccagj horizon five to eight cm thick; and a Ckgj horizon, with distinct yellowish brown mottles.

The Mansfield series, shaly variant, MFI1, occurs in close association with Mansfield soils and differs from them in having varying amounts of shaly fragments throughout the profile.

Mansfield soils occur in close association with Dorset and Fortina soils. They are similar to Dexter soils by having an imperfectly drained profile in sandy skeletal deposits, but differ from them in having no Bm horizon. Mansfield soils were mapped as associates of the Marringhurst and Agassiz Associations in the Reconnaissance South-Central (1943) and Carberry (1957) soil reports.

Manson Series (MXD)

The Manson series consists of moderately well-drained Cumulic Regosol soils on moderately to strongly calcareous, stratified dominantly clayey (SiC, C) alluvial deposits with layers of silty clay loam and clay loam. These soils are located in flood plain areas that have been inundated during years of high flood waters. They occur in association with Assiniboine and Kerran soils. Topography is gently sloping to gently undulating; runoff is moderate; permeability is moderately slow to slow.

The soil is characterized by a dark gray to gray Ah or Ap surface horizon eight to 15 cm thick and generally lighter colored C horizon, but some dark stratum consisting of former organic material or Ahb horizon may be present. Weak profile development may occur on the upper terrace positions.

Marringhurst Series (MRH)

The Marringhurst series consists of moderately well to well-drained Calcareous Black Chernozem soils developed on moderately strongly to strongly calcareous, stratified, deep, sandy (CoS, S, LS) and sandy skeletal (GrS, GrCoS) glaciofluvial deposits. These soils occur in upper positions of very gentle slopes on rolling to irregular landscapes and have very rapid permeability, low surface runoff, and a low water table during the growing season. Marringhurst soils are often moderately eroded, non-stony, and non-saline. They have a low available water holding capacity, low organic matter content, and low natural fertility. Native vegetation includes shrubs, bur oak, and prairie grasses. The majority of these soils are currently excavated for gravel or used for grazing.

In a representative profile soil the solum is approximately 25 cm thick. The profile is characterized by a very dark gray to very dark grayish brown Ah horizon, 14 to 18 cm thick, a dark brown to brown Bmk horizon, 10 to 18 cm thick, a Cca horizon, 20 to 30 cm thick with coarser gravelly strata and a Ck horizon.

The Marringhurst, shale gravel variant, MRH1, occurs in close association with normal Marringhurst soils and differs by having a dominantly shale derived gravel.

Marringhurst soils occur in close association with Dorset, Dexter and Fortina soils. They are similar to Dorset soils by having a well-drained profile in sandy skeletal deposits but differ from them in having a Bmk rather than Bm horizon. Marringhurst soils were mapped as the dominant associate of the Marringhurst in the Carberry soil report (1957).

Marsden Series (MDN)

The Marsden series consists of poorly drained, carbonated Rego Humic Gleysol soils developed on a sequence of strata consisting of a thin lacustrine mantle (25 to 60 cm) of moderately to strongly calcareous loamy sediments (VFSL to SiCL) over thin (10 to 40 cm) of medium sand to gravel strata over strongly calcareous loam to clay loam glacial till of shale, limestone and granitic origin. The topography is level to depressional; runoff is negligible, and permeability is restricted during periods when free water is at or near the surface.

The soils are characterized by a thin, moderately decomposed organic layer, 1 to 4 cm, a very dark gray Ah horizon, 12 to 18 cm and an olive brown ACkg frequently developed in the sand strata. The Ckg horizon is olive gray with many prominent mottles and usually occurs at the till contact.

Marsden soils were previously mapped as minor associates of the Heaslip complex in the Reconnaissance soil survey of South-Central Manitoba (1943).

Melland Series (MXT)

The Melland series consists of the imperfectly drained, carbonated Gleyed Rego Black Chernozem, soils developed on a sequence of materials consisting of a thin mantle (25 to 60 cm) of moderately to strongly calcareous loamy (VFSL to SiCL) sediment over a thin (10 to 40 cm) layer of medium sand to gravel strata over strongly calcareous loam to clay loam glacial till of shale, limestone, and granitic origin. Topography is level to gently sloping; runoff is moderately slow; permeability is moderate in the upper strata, but restricted above the till due to perched water conditions. Lateral flow of water occurs through the gravel strata during the spring or following heavy rains.

The soil is characterized by a very dark gray Ah horizon 18 to 25 cm thick, and a dark gray to grayish brown AC horizon, 10 to 15 cm thick. A lime accumulation (Ccagj) horizon is usually present at the transition from loamy to gravel strata. Melland soils are more permeable than the very similar, finer textured Beresford series.

Miniota Series (MXI)

The Miniota series consists of moderately well to well-drained Orthic Black Chernozem soils developed on a thin mantle (<1 m) of moderately to strongly calcareous very fine sand to fine sandy loam textured sediments over moderately to strongly calcareous, medium sand to gravelly textured deposits. The topography varies from gently sloping to irregular, moderately rolling. Runoff is moderate to moderately rapid, and permeability is rapid in the sandy strata and very rapid in the lower coarser strata.

The soil is characterized by a very dark gray to very dark grayish brown Ah horizon, 12 to 20 cm thick, a dark brown to brown Bm horizon, 10 to 18 cm thick, and a pale brown BC horizon. The depth of

solum varies with the depth of the sandy strata; the lime accumulation (Cca) horizon usually occurs at the transition from sandy to coarser sediments.

They occur in close association with the imperfectly drained Wytonville and Kilmury soils and the poorly drained Bornett series. Miniota soils are less permeable and less droughty than the very similar coarser textured Wheatland and Dorset soils. The similar, finer textured Croyon soils are less droughty.

Moore Park Series (MPK)

The Moore Park series consists of imperfectly drained, Gleyed Black Chernozem soils of the Newdale Association, developed on deep (> 100 cm) strongly calcareous, fine loamy (L, CL,, SCL) textured glacial till. The till is composed of mixed materials derived from shale, limestone, and granitic rock. A thin overlay (< 25 cm) may occur on some soils.The topography is gently sloping, permeability is moderate, and surface runoff is slow. These soils occur in lower slope and depressional positions and are cultivated. These soils are occasionally weakly saline and sometimes have a few isolated stones on the surface.

The Moore Park series has a black Ap or Ah horizon 10 to 34 cm thick, a very dark grayish brown Bmgj 5 to 44 cm thick, and a light olive brown Ckgj horizon 45 to 87 cm thick.

Newdale and Angusville soils are commonly found in close association with Moore Park soils.

Newdale Series (NDL)

The Newdale series consists of well to moderately well-drained Orthic Black Chernozem soils of the Newdale Associationdeveloped from moderately to strongly calcareous, fine loamy (L, CL, SCL) morainal till of limestone, granitic and shale origin. These soils are moderately well to well-drained and occur in mid to upper slope positions of undulating to hummocky landscapes. Surface runoff is moderate to moderately rapid; permeability is moderately slow. Most of these soils are presently cultivated; they have formed under intermixed aspen grove and grassland vegetation.

The Newdale solum has a very dark gray Ap or Ah horizon, commonly 25 cm thick and ranging from 15 to 35 cm, a dark brown Bm horizon, 10 to 30 cm thick, and a transitional BC horizon, 3 to 15 cm thick. A lime carbonate horizon, 10 to 15 cm thick is often present in shallower soils but is not evident in deeper profiles. Its solum depth averages 58 cm and ranges from 25 to 90 cm. They have solum thickness ranging from 75 cm to greater than 1 metre. They also have thicker A (combined Ah, Ahe) horizons, 30 to 60 cm and Bt horizons that are 40 cm thick.

The Newdale soils differ from Erickson soils in being less strongly leached and having less distinct and shallower solum. Newdale soils, on the other hand, differ from the very similar Rufford and Cordova soils in being more strongly leached, deeper and free of lime carbonate in the A and B horizons. The Newdale soil was proclaimed Manitoba’s Provincial soil in 2010.

Petrel Series (PTR)

The Petrel series consists of imperfectly drained Gleyed Black Chernozem soils developed on a mantle (25 to 75 cm) of moderately to strongly calcareous, shallow, medium textured (VFSL, L, SiL), deposits over moderately calcareous, uniform, deep, moderately coarse (FS, LFS, LS), lacustrine deposits. These soils occur in middle positions of very gentle slopes on undulating landscapes and have moderate over moderately rapid permeability, moderately slow surface runoff, and a high water table during the growing season. Petrel soils are non-eroded, non-stony, and occasionally slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes prairie grasses, shrubs, aspen and oak. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 40 cm thick. The profile is characterized by a very dark gray Ah horizon, 18 to 25 cm thick, a brown Bm horizon, 14 to 20 cm thick, a BCgj horizon, 20 to 30 cm thick with faint mottles and a light yellowish brown Ckgj horizon, with yellowish brown to strong brown mottles. A typical profile also contains a weak Cca in the upper part of the sandy substrate.

The Petrel, clay loam variant, PTR1 variant differs from the modal Petrel by having a layer of CL, SiCL sediments overlying the sandy materials.

Petrel soils occur in close association with Glenboro, Grover and Grayson soils. They are similar to Torcan soils by having imperfect drainage and a loamy surface but differ from them in having a sandy substrate. Petrel soils were previously mapped as Black Meadow associates of the Glenboro Association in the Carberry soil report (1957).

Pleasant Series (PLE)

The Pleasant series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, deep, uniform, moderately coarse (VFS, LVFS, FSL), lacustrine deposits. These soils occur in middle positions of irregular to undulating landscapes and have moderate permeability, moderately slow surface runoff, and a high water table during the growing season. Pleasant soils are non-eroded, non-stony, and frequently slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes tall prairie grasses, prairie-meadow grasses, shrubs and aspen-oak groves. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon, 15 to 25 cm thick, a dark grayish brown AC horizon, 6 to 10 cm thick, a Ccagj horizon, 10 to 15 cm thick and a light olive brown Ckgj horizon, with yellowish brown mottles. A typical profile also contains gypsum crystals below the Ccagj horizon.

Pleasant soils occur in close association with Prosser, Gateside and Poolex soils. They are similar to Taggart soils by having an imperfectly drained Gleyed Rego Black Chernozem profile but differ from them in having coarse loamy rather than loamy deposits. Pleasant soils were previously mapped as Black Meadow associates of the Holland Association in the Carberry soil report (1957).

Poolex Series (POX)

The Poolex series consists of poorly drained Rego Humic Gleysol soils developed on moderately to strongly calcareous, deep, uniform, coarse loamy (VFS, LVFS, FSL, SL) lacustrine deposits. These soils occur in level to depressional positions on undulating landscapes and have moderate permeability, slow surface runoff, and a high to ponded water table during the growing season. Poolex soils are non-eroded, non-stony, and often slightly saline. They have a medium available water holding capacity, medium organic matter content, and low natural fertility. Native vegetation includes sedges, rushes, seeds and willows. The majority of these soils are currently in native vegetation.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a moderately decomposed organic horizon, 1 to 4 cm thick, a very dark gray Ah horizon, 15 to 22 cm thick, an olive gray to gray ACk horizon, 6 to 12 cm thick, moderately calcareous and a Ccag horizon, 10 to 15 cm thick. Overlying Ckg parent material is typically olive brown to pale olive with yellowish brown mottles.

Poolex soils occur in close association with Porple, Pleasant and Gateside soils. They are similar to Vordas soils by having a poorly drained profile in loamy deposits but differ from them by having slightly coarser textures. Poolex soils were previously mapped as Meadow associates of the Poolex

Association in the Carberry soil report (1957).

Porple Series (POR)

The Porple series is a Rego Black Chernozem soil developed on moderately well to well-drained, moderately to strongly calcareous, moderately coarse (VFS, LVFS, FSL, SL), lacustrine sediments. These soils occur on the upper slope positions of gently undulating topography associated with Prosser and Pleasant soils.Surface runoff is moderately rapid, and permeability is moderate to moderately rapid. These soils have had some erosion and susceptible to both wind or water erosion if not protected. Included with this series are some of the moderately eroded Prosser soils.

The Porple series is characterized by a very dark gray Ap and Ah horizon 15 to 20 cm thick and a calcareous AC horizon 8 to 15 cm thick. A layer of lime carbonate accumulation (Cca horizon) may be present. This soil differs from the similar Prosser soils in not having a prominent Bm horizon. Porple soils are finer textured and less permeable than the sandy Stockton soils, and in turn, are coarser textured and more permeable than the very similar loamy textured Durnan and Fairland soils.

Prodan Series (PDA)

The Prodan series consists of imperfectly drained, carbonated, Gleyed Rego Black Chernozem soils developed on strongly to very strongly calcareous, moderately fine (SCL, CL, SiCL), lacustrine sediments. These soils occur in the Upper Assiniboine Delta and Brandon Lakes Plain on gently sloping topography in association with Ramada, Charman, Carroll and Tadpole soils. Surface runoff is moderately slow, and permeability is moderate to moderately slow. A seasonal water table frequently occurs within 70 cm of the surface.

The Prodan soil profile has a very dark gray Ah horizon, 18 to 25 cm thick; a dark gray to gray AC horizon, 8 to 15 cm thick, and a Ccagj horizon. The Ckgj horizon is light brownish gray with yellowish brown mottles.

This soil differs from the similar Charman series in not having a prominent Bmgj horizon. Prodan soils are finer textured and less permeable than the similar loamy textured Taggart and Torcan soils. The very similar Capell soils have coarse, sandy and gravelly textured subsoils that are very rapidly permeable. Prodan soils were previously mapped as Black Meadow associates of the Holland Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Prosser Series (PSE)

The Prosser series consists of moderately well to well-drained Orthic Black Chernozem soils moderately to strongly calcareous, coarse loamy (VFS, LVFS, FSL, SL), lacustrine sediments. These soils occur in the Upper Assiniboine Delta and Brandon Lakes Plain in association with Porple, Gateside, Pleasant and Poolex soils, on mid and upper slopes of undulating to gently rolling topography. Surface runoff is moderate to rapid, and permeability is moderate to moderately rapid.

The Prosser soil profile has a very dark gray Ah horizon, 18 to 25 cm thick; a dark brown to brown Bm horizon, 12 to 20 cm thick; a pale brown BCk horizon, and usually a Cca horizon, 12 to 18 cm thick.

The Prosser, fine loamy variant, PSE1, is found in association with the normal Prosser soils. It differs from the normal Prosser by having a finer textured (clay loam to silty clay loam) soil at or within a 1 metre depth.

This soil differs from the similar Porple series in having a prominent Bm horizon. The coarse loamy Prosser soils are somewhat finer textured and less permeable than the sandy Stockton and Cactus soils, and in turn, are coarser textured and more permeable than the similar loamy textured Fairland and Durnan soils.

Ramada Series (RAM)

The Ramada series consists of Orthic Black Chernozem soils developed on well to moderately well-drained, strongly to very strongly calcareous, moderately fine (CL, SiCL), lacustrine sediments. These soils occur in the Upper Assiniboine Delta, and Brandon Lakes Plain on very gently sloping topography or on mid and upper slope positions of undulating topography associated with Barren, Carroll, Charman, Prodan and Tadpole soils. Surface runoff is moderately rapid, and permeability is moderate to moderately slow.

The Ramada soil profile has a very dark gray Ah horizon, 10 to 20 cm thick; a dark grayish brown to brown Bm horizon, 8 to 12 cm thick, and a BC horizon, 6 to 10 cm thick. A Cca horizon is usually present. The Ck horizon is pale brown to light yellowish brown.

This soil differs slightly from the Carroll soil in having a prominent Bm horizon. Ramada soils are finer textured and less permeable than the similar coarser textured, loamy Fairland soils, as well as, the Croyon and Zarnet soils which have coarse sandy and gravelly textured subsurface layers and very rapid permeability. Ramada soils were previously mapped as the dominant associate of the Holland Association in the reconnaissance soil survey of South-Central Manitoba (1943).

Rempel Series (RMP)

The Rempel series consists of moderately well to well-drained Calcareous Black Chernozem soils developed on strongly to very strongly calcareous, deep, uniform, moderately fine (CL, SiCL), lacustrine deposits. These soils occur in upper positions of undulating landscapes and have moderate permeability, moderately rapid surface runoff, and a low water table during the growing season. Rempel soils are occasionally slightly eroded, non-stony, and non-saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes tall prairie grasses, meadow grasses and aspen-oak groves. The majority of these soils are cultivated for crop production.

In a representative profile the solum is approximately 20 cm thick. The profile has a weakly calcareous, very dark gray to very dark grayish brown Ah horizon, 15 to 22 cm thick, a dark grayish brown to brown Bmk horizon, 10 to 15 cm thick, a pale brown BCk horizon, 5 to 10 cm thick, moderately calcareous and a light gray to white Cca horizon, 10 to 15 cm thick.

Rempel soils occur in close association with Ramada, Prodan and Tadpole soils. They are similar to Ramada soils by having well-drained, fine loamy soils but differ from them in having a Bmk rather than Bm horizon. Rempel soils were previously mapped as Blackearth associate of the Holland Association in the Carberry soil report (1957).

Rufford Series (RUF)

The Rufford series consists of well-drained Rego Black Chernozem soils of the Newdale Association developed on moderately to strongly calcareous, fine loamy (L, CL, SCL) morainal till of limestone, granite and shale origin. These soils are moderately well to well-drained and occur on the upper slopes and knoll positions in undulating to hummocky landscapes. Runoff is moderately rapid to rapid; permeability is moderately slow.

Rufford profiles have a very dark gray to very dark grayish brown Ah or Ap horizon, 12 to 18 cm thick and a thin ACk horizon, 6 to 10 cm thick. A carbonate accumulation (Cca) layer, 5 to 15 cm thick, is usually present. In the Russell area, the A horizon averages 28 cm and ranges from 10 to 50 cm; the solum depth averages 37 cm and ranges from 20 to 55 cm.

Rufford soils occur in close association with Cordova and Newdale soils, but differ from Cordova soils in being less leached and having thinner, less distinct horizons. Both Rufford and Cordova differ from

Newdale in being less leached and having free lime carbonate in their A and B horizons.

Sewell Series (SEE)

The Sewell series consists of poorly drained Rego Humic Gleysol soils developed on weakly to moderately calcareous, deep, uniform, coarse (FS, LS, LFS) lacustrine deposits. These soils occur in depressional positions of gentle slopes on hummocky landscapes and have moderately rapid permeability, very slow surface runoff, and a high to ponded water table during the growing season. Sewell soils are non-eroded, non-stony, and often slightly saline. They have a low available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes sedges, rushes, reeds and willows. The majority of these soils are currently in native vegetation.

In a representative profile the solum is approximately 15 cm thick. The profile is characterized by moderately decomposed organic horizon, 2 to 5 cm thick, a very dark gray Ah horizon, 10 to 18 cm thick, a dark gray to gray ACkg horizon, 10 to 15 cm thick with carbonates and mottles, and usually a Ccag horizon, 5 to 8 cm thick. A typical profile also contains an olive to pale olive Ckg horizon with yellowish brown mottles and manganese concretions.

Sewell soils occur in close association with Stockton, Lavenham and Hummerston soils. They are similar to Poolex soils by having poor drainage and a Rego Humic Gleysol profile but differ from them in having sandy rather than coarse loamy deposits. Sewell soils were previously mapped as Meadow associates of the Stockton Association in the Carberry soil report (1957).

Sigmund Series (SGO)

The Sigmund series consists of imperfectly drained, Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, deep, uniform clayey (SiC, C), lacustrine deposits. These soils occur in lower slope positions of very gentle slopes on undulating landscapes and have slow permeability, moderately slow surface runoff, and a high water table during the growing season. Sigmund soils are non-eroded, non-stony, and frequently slightly saline. They have a high available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen-oak groves, willow and prairie grasses. The majority of these soils are currently annual crop production.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon, 15 to 25 cm thick, a dark gray ACgj horizon, 5 to 18 cm thick with many faint mottles, a light gray Ccagj horizon, 5 to 15 cm thick with many prominent mottles and a light olive brown Ckgj horizon, with many prominent mottles. A typical profile also contains gypsum crystals in the subsoil.

Sigmund soils occur in close association with Janick, Harding and Lowton soils. They are similar to Harding soils by having an imperfectly drained profile in clayey deposits but differ from them by having no B horizon. Sigmund soils were previously mapped as minor inclusions of the Oliver Association in the soil survey of South-Central Manitoba (1943).

Stockton Series (SCK)

The Stockton series is an Orthic Black Chernozem soil developed on moderately well to well-drained, weakly to moderately calcareous, coarse textured (FS, LFS, LS), lacustrine sediments. These soils occur in the Upper Assiniboine Delta, the Brandon Lakes Plain and a few areas within the Lower Assiniboine Delta on very gently sloping to irregular undulating topography in association with Cactus, Lavenham, Hummerston and Sewell soils. Surface runoff is low, and permeability is rapid. Wind erosion is common if the soil is not protected with adequate surface residue.

The Stockton soil profile has a very dark gray to very dark grayish brown Ah or Ap, 18 to 25 cm thick;

a brown to grayish brown Bm horizon, 12 to 22 cm thick; a pale brown to light yellowish brown BC horizon, 8 to 12 cm thick, and a very pale brown Ck horizon with a few yellowish brown mottles at approximately 70 cm depth. A Cca horizon is also frequently present. This soil differs from the very similar Cactus series by having a prominent Bm horizon.

The Stockton, clay loam variant, SCK1 has a clay loam to silty clay loam substrate and is currently described as the Hallboro series.

The sandy Stockton soils are coarser textured and significantly more rapidly permeable than the finer textured Prosser, Fairland and Ramada soils.

Sutton Series (SXP)

The Sutton series consists of poorly drained Rego Humic Gleysol soils developed on a mantle (25 to 100 cm) of moderately calcareous, moderately fine (CL, SiCL), lacustrine deposits over moderately calcareous, deep, stratified, sandy (FS, LFS, LS), fluvial lacustrine deposits. These soils occur in depressional positions on nearly level landscapes and have restricted permeability, negligible surface runoff, and a near surface water table during the growing season. Sutton soils are non-eroded, non-stony, and frequently weakly saline. They have a moderate available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes sedges, hydrophytic grasses and willows. The majority of these soils are currently in native vegetation.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a moderately decomposed organic horizon, 2 to 4 cm thick, a very dark gray Ah horizon, 10 to 18 cm thick, a dark gray ACk horizon, 4 to 8 cm thick with carbonates and a light gray Ccag horizon, 5 to 8 cm thick with many distinct mottles. The parent material is typically olive brown in colour with many prominent mottles. A typical profile also contains gypsum crystals at depth.

Sutton soils occur in close association with Wellwood soils. They are similar to Tadpole soils by having a poorly drained profile and a fine loamy surface but differ by having a sandy substrate while Tadpole soils are fine loamy throughout. Sutton soils were previously mapped as poorly drained associates of the Wellwood Association in the soil survey of South-Central Manitoba (1943).

Tadpole Series (TDP)

The Tadpole series consists of poorly to very poorly drained, Rego Humic Gleysol soils developed on strongly to very strongly calcareous, moderately fine (CL, SiCL), lacustrine sediments. These soils occur in level to depressional positions of gently sloping to undulating topography in association with Carroll, Firdale, Charman and Danlin soils. Surface runoff is very slow and permeability is restricted. Free water occurs at or near the surface for a considerable part of the year. In areas where seepage water contains appreciable soluble salt; a sufficient salt accumulation can occur to inhibit or retard the growth of normal hydrophytic vegetation.

The Tadpole soil profile has a moderately decomposed organic layer, 2 to 6 cm thick; a very dark gray Ah or Ap horizon, 10 to 18 cm thick; a dark gray AC horizon, 4 to 6 cm thick; a Ccag horizon, 10 to 15 cm thick, and an olive to olive gray Ckg horizon with distinct yellowish brown mottles. In areas affected by salts, white pseudomycelia are common in the surface horizons.

Tadpole soils are finer textured and less permeable than the very similar and coarser textured Vordas, Poolex and sandy Mockry and Sewell soils. The similar Carvey soils have coarser textured sandy to gravelly subsurface layers that are much more rapidly permeable than the Tadpole soils.

Taggart Series (TGR)

The Taggart series consists of imperfectly drained Gleyed Rego Black Chernozem soils developed on strongly to very strongly calcareous, deep, uniform, medium textured (VFSL, L, SiL), lacustrine deposits. These soils occur in middle positions of undulating landscapes and have moderate permeability, slow surface runoff, and a high water table during the growing season. Taggart soils are non-eroded, non-stony, and often slightly saline. They have a medium available water holding capacity, medium organic matter content, and medium natural fertility. Native vegetation includes aspen, oak, willow and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 20 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon, 15 to 24 cm thick, a dark gray ACk horizon, 5 to 15 cm thick, moderately calcareous, a Cca horizon, 8 to 12 cm thick with a carbonate accumulation and an olive brown Ckgj horizon, with yellowish brown mottles. A typical profile also contains gypsum crystals below the Cca horizon.

Taggart soils occur in close association with Fairland, Durnan and Vordas soils. They are similar to Torcan soils by having imperfect drainage and loamy deposits but differ from them by having no prominent Bm horizon. Taggart soils were previously mapped as associates of the Holland Association in the Carberry soil report (1957).

Torcan Series (TOC)

The Torcan series consists of imperfectly drained Gleyed Black Chernozem soils developed on strongly to very strongly calcareous, deep, uniform, medium textured (VFSL, L, SiL), lacustrine deposits. These soils occur in middle to lower positions of undulating to rolling landscapes and have moderate permeability, moderately slow surface runoff, and a medium water table during the growing season. Torcan soils are non-eroded, non-stony, and occasionally slightly saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes aspen, willow, shrubs and meadow grasses. The majority of these soils are cultivated for crop production.

In a representative profile the solum is approximately 45 cm thick. The profile is characterized by a very dark gray Ah or Ap horizon 18 to 25 cm thick, a light brown Bmgj horizon, 10 to 18 cm thick with yellowish brown mottles, a Ccagj horizon, 8 to 12 cm thick, and a light olive brown Ckgj horizon, with yellowish brown mottles.

Torcan soils occur in close association with Fairland, Taggart and Vordas soils. They are similar to Taggart soils by having imperfect drainage and loamy deposits but differ from them by having a prominent Bm horizon. Torcan soils were previously mapped as associates of the Holland Association in the Carberry soil report (1957).

Traverse Series (TAV)

The Traverse series consists of well to moderately well-drained Calcareous Black Chernozem soils developed on strongly to very strongly calcareous, deep, uniform, medium textured (VFSL, L, SiL), lacustrine deposits. These soils occur in middle and upper positions of very gentle slopes on undulating landscapes and have moderate permeability, moderate to rapid surface runoff, and a low water table during the growing season. Traverse soils are often slightly eroded, non-stony, and non-saline. They have a medium available water holding capacity, medium organic matter content, and high natural fertility. Native vegetation includes oak, aspen, shrubs and prairie grasses. The majority of these soils are currently cultivated for crop production.

In a representative profile the solum is approximately 25 cm thick. The profile is characterized by a

very dark gray Ah horizon, 10 to 18 cm thick, a dark grayish brown Bmk horizon, 8 to 15 cm thick, moderately calcareous, a brown to pale brown BC horizon, 10 to 15 cm thick, moderately calcareous and a white Cca horizon, 8 to 12 cm thick with carbonate accumulation. The parent material is typically dark yellowish brown.

Traverse soils occur in close association with Fairland, Taggart and Vordas soils. They are similar to Rempel soils by having a Calcareous Black Chernozem profile but differ from them by having loamy rather than fine loamy deposits. Traverse soils were mapped as Calcareous Black associates of the Holland Association in the Carberry soil report (1957).

Varcoe Series (VRC)

The Varcoe series consists ofimperfectly drained, carbonated Gleyed Rego Black Chernozem soils developed on moderately to strongly calcareous, fine loamy (L, CL, SCL) morainal till of limestone, granite and shale origin. These soils are imperfectly drained and occur in the lower slope positions of undulating to hummocky landscapes in close association with Angusville soils.They receive runoff from the upper slopes, and in some landscapes, may be influenced by seepage. Permeability is slow and may be restricted during periods of subsoil saturation. In areas where upward groundwater or seepage waters contain appreciable salts, accumulation of salts may occur within the soil.

Varcoe profiles average 42 cm in thickness and range from 20 to 60 cm. The Ah or Ap horizon is usually 28 cm thick and ranges from 20 to 50 cm; very dark gray in color and is underlain by a dark gray transitional ACk horizon, 4 to 8 cm thick. A carbonate accumulation horizon (Ccagj) is commonly present, but may be discontinuous. Gypsum crystals are usually present below and within the carbonate accumulation layer. Varcoe soils containing significant soluble salts in the A horizon as well as gypsum, have been identified as the saline phase of the series.

Vodroff Series (VFF)

The Vodroff series consists of poorly drained Rego Humic Gleysol soils developed on a thin mantle (<1 m) of loamy (L, CL, SiCL) lacustrine sediments over a strongly calcareous loam to clay loam glacial till of shale, limestone and granitic origin. These soils have free water at or near the surface for a considerable period of the year. The topography is level to depressional; runoff is negligible; permeability is restricted during periods of free water within a metre. In areas where the inflowing waters contain appreciable soluble salts, the salt may accumulate in the soil in sufficient amount to affect the growth of normal hydrophytic vegetation.

The soil is characterized by a moderately decomposed organic layer, 2 to 5 cm thick, a very dark gray Ah horizon, 10 to 18 cm thick, a mottled dark gray ACg horizon, 4 to 8 cm thick and a carbonate accumulation horizon, 8 to 12 cm thick. The Ckg horizon is olive to pale olive and usually contains yellowish brown mottles.

Vordas Series (VDS)

The Vordas series consists of poorly drained Rego Humic Gleysol soils developed on strongly to very strongly calcareous, deep, uniform, medium textured (VFSL, SiL, L), lacustrine deposits. These soils occur in level to depressional positions of undulating landscapes and have moderate permeability, very slow surface runoff, and a high to ponded water table during the growing season. Vordas soils are non-eroded, non-stony, and often slightly saline. They have a medium available water holding capacity, high organic matter content, and low natural fertility. Native vegetation includes sedges, rushes, reeds and willows. The majority of these soils are currently in native vegetation.

In a representative profile the solum is approximately 15 cm thick. The profile is characterized by a moderately decomposed organic horizon, 2 to 5 cm thick, a very dark gray Ah horizon, 10 to 18 cm thick, a dark gray ACkg horizon, 4 to 6 cm thick with carbonates and mottles, and an olive to pale olive Ckg horizon, with yellowish brown iron mottles. A typical profile also contains white pseudomycelia of salt in the Ah and ACkg horizons in saline areas.

Vordas soils occur in close association with Fairland, Taggart and Torcan soils. They are similar to Tadpole soils by having poor drainage and loamy deposits but differ from them by having slightly coarser textures. Vordas soils were previously mapped as Meadow associates of the Holland Association in the Carberry soil report (1957).

Wellwood Series (WWD)

The Wellwood series consists of well to moderately well-drained Orthic Black Chernozem soils developed on a thin mantle (25 to 75 cm) of strongly calcareous fine loamy (CL, SCL,SiCL) sediments grading to moderately calcareous sandy (FS, LS, LFS) deposits. Topography is nearly level to very gently sloping; runoff is moderate to moderately slow; permeability is moderate in the upper loamy strata and rapid in the sandy strata.

The soil is characterized by a deep black to very dark gray, loam to clay loam, Ah horizon, 18 to 30 cm thick; a dark brown to brown, prismatic to subangular blocky, clay loam to silty clay loam, Bm horizon, 16 to 24 cm thick, and a yellowish brown to pale brown, clay loam to silty clay loam, BC horizon, 8 to 14 cm thick. A Cca horizon may be present, underlain by a IICk that ranges from fine sand to loamy fine sand.

The Wellwood, clay variant, WWD1, differs from the modal Wellwood by having a clay to silty clay textured layer, 10 to 40 cm thick within the solum that often forms part of the Bm horizon. The underlying sandy sediments usually occur at a greater depth than in the modal Wellwood.

Wheatland Series (WHL)

The Wheatland series consists of well to moderately well-drained Orthic Black Chernozem soils developed on a mantle (60 to 95 cm) of moderately to strongly calcareous, shallow sandy (FS, LS), deposits over moderately to strongly calcareous, deep, stratified, sandy-skeletal (CoS, MS), fluvial deposits. These soils occur in upper positions of gentle to very gentle slopes on undulating landscapes and have rapid over very rapid permeability, moderately slow surface runoff, and a low water table during the growing season. Wheatland soils are occasionally slightly eroded, non-stony, and non-saline. They have a low available water holding capacity, medium organic matter content, and low natural fertility. Native vegetation includes oak, aspen, shrubs and prairie grasses. The majority of these soils are currently used for grazing and for some crop production.

In a representative profile the solum is approximately 40 cm thick. The profile is characterized by very dark gray to very dark grayish brown Ah horizon, 18 to 25 cm thick, a brown to yellowish brown Bm horizon, 12 to 24 cm thick, a light yellowish brown BCk horizon, 10 to 15 cm thick with carbonates and a Cca horizon, 5 to 8 cm thick at the sand/gravel contact. They are similar to Dorset soils by having an Orthic Black Chernozem profile and sandy-skeletal substrate but differ from them in having a sandy surface mantle. Wheatland soils were previously mapped as associates of the Agassiz Association in the Carberry soil report (1957).

Wytonville Series (WVI)

The Wytonville series consists of imperfectly drained Gleyed Black Chernozem soils developed on a thin mantle (<1 m) of moderately to strongly calcareous, coarse loamy (VFS, LVFS, SL, FSL) sediments, overlying moderately to strongly calcareous medium sand to gravelly textured deposits. Topography is gently sloping to irregular, undulating. Runoff is moderately slow; permeability is moderately rapid on the upper strata, and very rapid in the lower strata unless restricted by a water table within a metre of the surface during the spring or following heavy rains.

The soil is characterized by a very dark gray to very dark grayish brown Ah horizon, 18 to 25 cm thick, a brown to dark brown, weakly mottled Bmgj horizon, 14 to 22 cm thick and a light yellowish brown BCgj with strong brown mottles. A carbonate accumulation horizon (Ccagj) occurs at the upper boundary of the coarse strata.

Wytonville profiles differ from Kilmury soil profiles in not having the presence of carbonates in their Ah. They are also more permeable than the very similar Druxman soils. They occur in close association with the

Kilmury soils, the well-drained Miniota soils and the poorly drained Bornett series.

Zarnet Series (ZRT)

The Zarnet series consists of moderately well to well-drained Rego Black Chernozem soils, moderately to strongly calcareous, loamy (VFSL, L, SiL, CL, SiCL) lacustrine sediments less than one metre in depth, overlying moderately to strongly calcareous sandy (S, CoS) to sandy skeletal (GrS, GrCoS) fluvial deposits. The soils occur on gently sloping topography or in upper slope and knoll positions of irregular, undulating to gently rolling topography. Surface runoff is moderate to rapid dependent upon the gradient with moderate permeability in the upper sediments as opposed to rapid permeability in the lower deposits.

The Zarnet soil profile is characterized by a very dark gray Ah horizon, 12 to 18 cm thick, a dark gray to dark grayish brown AC horizon, 8 to 14 cm thick and a carbonate accumulation horizon (Cca) of 10 to 18 cm thickness. Zarnet soil profiles are shallower and lack Bm horizons that characterize Croyon soils, a closely related associate.

Appendix 3 Glossary

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

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

Alkali soil - (i) A soil having a high degree of alkalinity (pH of 8.5 or higher), or having a high exchangeable sodium content (15% or more of the exchangeable capacity), or both**.** (ii) A soil that contains enough alkali (sodium) to interfere with the growth of most crop plants.

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

Alluvium - A general term for all deposits of rivers and streams. Sediments can be different sizes depending upon the location in the floodplain of the river.

Arable soil - Soil suitable for plowing and cultivation.

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

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

Atterberg limits - See **liquid limit** and **plastic limit**.

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

Available water - The portion of water in a soil that can be readily absorbed by plant roots. It is generally considered to be that water held in the soil against a pressure of up to approximately 15 atmospheres. See also **field capacity** and **wilting point**.

Bearing capacity - Capacity of soil (in moist to wet conditions) to support loads such as buildings, people, vehicles, and animals. The average load per unit area that is required to rupture a supporting soil mass.

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

Blocky structure - Aggregates arranged with faces rectangular and flattened, vertices sharply angular.

Bog - A peat-covered or peat-filled area, generally nutrient-poor, in which mosses and especially sphagnum are dominant. The water table is at the surface for most of the year.

Boulders - Rock fragments larger than 60 cm (two ft) in diameter.

Brunisolic - An order of soils whose horizons are developed sufficiently to exclude the soils from the Regosolic order, but lack the degrees or kinds of horizon development specified for soils of the other orders.

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

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

Calcareous soil - Soil containing sufficient calcium carbonate (often with magnesium carbonate) to effervesce visibly when treated with (1N) hydrochloric acid.

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

non-calcareous. . . . . .< 1%
weakly calcareous. . . . . one to five per cent
moderately calcareous. . . . . six to 15%

strongly calcareous. . . . . .16 to 25%
very strongly calcareous . . . . 26 to 40%
extremely calcareous . . . . . .> 40%

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

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

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

Channery - A descriptive term used for thin and flat limestone, sandstone, or schist fragments up to 15 cm (six inches) in length.

Chernozemic - An order of soils that have developed under grassland or grassland-forest transition vegetation, in cool to cold, subarid to subhumid climates. The soils have a dark-colored surface horizon and a B or C horizon, or both, of high base saturation.

Clay - As a soil separate, the mineral soil particles less than <0.102 mm in diameter: usually consisting largely of clay minerals. As a soil textural class, soil materials that contain 40% or more clay, less than 45% sand and less than 40% silt.

Clod - A compact, coherent mass of soil produced by digging or plowing. Clods usually slake easily with repeated wetting and drying.

Coarse fragments - Rock or mineral particles greater than two mm in diameter.

Cobbles - Rock fragments eight to 25 cm (three to 10 inches) in diameter.

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

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

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

Concretion - Hard grains, pellets or nodules from concentration of chemical compounds (such as calcium carbonate or iron oxide) in the soil that cement soil grains together.

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

Consistence (soil) - The mutual attraction of the particles in a soil mass, or their resistance to separation or deformation. Terms such as loose, soft, friable, firm, hard, sticky, plastic or cemented are used to describe consistence at various soil moisture contents.

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

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

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

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

(i) Vegetation or other material providing protection; (ii) In forestry, low growing shrubs and herbaceous plants under trees (i.e., ground cover vs. tree cover); (iii) Any vegetation producing a protective mat on or

just above the soil surface.

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

Crotovina - A former animal burrow in one soil horizon that has become filled with organic matter or material from another horizon. It is also spelled krotovina.

Crust - A surface layer of soil, from a few millimetres to 2.5 cm (one inch) thick, that when dry is much more compact, hard and brittle than the soil material below.

Cryic layer - A perennially frozen layer.

Cryosolic - An order of mineral or organic soils that have permafrost, either within one metre of the surface or within two metres if the soil has been strongly cryoturbated laterally within the active layer, as indicated by disrupted, mixed, or broken horizons.

Cryoturbation - Frost action, including frost heaving.

Cultivation - Tillage to prepare land for seeding or transplanting, and later to control weeds and loosen the soil.

Decile portion - A one-tenth portion. As used in the soil map symbol A^7- B^3 means that soil A soil covers seven tenths and soil B covers three tenths of the map unit.

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

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

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

Deposit - Material left in a new position by a natural transporting agent such as water, wind, ice, gravity, or by human activity.

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

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

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

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

Rapidly drained - Water is removed from the soil rapidly in relation to supply. Excess water flows downward if underlying material is pervious. Subsurface flow may occur on steep gradients during heavy rainfall. Soils have low available water storage capacity within the control section, and are usually coarse in texture, or shallow, or both. Water source is precipitation.

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

Moderately well-drained - Water is removed from the soil somewhat slowly in relation to supply. Excess water is removed somewhat slowly due to low perviousness, shallow water table, lack of gradient, or some

combination of these. Soils have intermediate to high water storage capacity within the control section and are usually medium to fine in texture. Soils are commonly mottled in the 50 to 100 cm depth. Colours are dull brown in the subsoil with stains and mottles.

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

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

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

Drained phase - Soils with extensive surface or subsurface (tile) drainage improvements.

Drumlin - An elongate or oval hill of glacial drift, commonly glacial till, deposited by glacier ice and having its long axis parallel to the direction of ice movement.

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

Dunes - Wind-built ridges and hills of sand formed in the same manner as snowdrifts.

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

Eolian - Soil material accumulated through wind action.

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

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

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

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

Esker - A winding ridge of irregularly stratified sand, gravel and cobbles deposited under the ice by a rapidly flowing glacial stream.

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

Exchange acidity - The amount of hydrogen and aluminium that can be replaced from the adsorption complex by a neutral salt solution. It is usually expressed as milliequivalents per 100 g of soil (meq/100 g soil).

Exchangeable sodium percentage - The extent to which the adsorption complex of a soil is occupied by sodium. It is expressed as:

$$\text{ESP} = \frac{\text{exchangeable sodium (meq/100 g soil)}}{\text{cation exchange capacity (meq/100 g soil)}} \times 100.$$

Extract, soil - The solution separated from a soil suspension or from a soil by filtration, centrifugation, suction or pressure.

Fen - A peat-covered or peat-filled area, generally not acidic, in which grasses, sedges, or reeds are dominant. The water table is at the surface for most of the year.

Fibric - The least decomposed of all organic materials. There is a large amount of well preserved fibre that is readily identifiable as to botanical origin. Fibres retain their character upon rubbing.

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

Field capacity - The percentage of water remaining in the soil two or three days after the soil has been saturated and free drainage has practically ceased. It is also defined as the maximum amount of water that will normally be held in the soil and be useful to plants. The percentage may be expressed in terms of weight or volume.

Fifteen - atmosphere percentage - The percentage of water contained in a soil that has been saturated, subjected to, and is in equilibrium with, an applied pressure of 15 atm. Pressure is applied in a pressure membrane or ceramic pressure plate apparatus. This moisture content approximates the permanent wilting point of a soil.

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

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

Fragipan - A natural subsurface horizon having a higher bulk density than the solum above. It is seemingly cemented when dry, but showing moderate to weak brittleness when moist.

Friable - A consistence term pertaining to soil aggregates that are soft and easily crushed between thumb and forefinger.

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

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

Glacial-lacustrine deposits - Silt and clay sediments formed in the quiet waters of lakes that received meltwater from glaciers.

Glacial outwash -Well sorted sand, or sand and gravel, deposited by meltwater from a glacier.

Gleyed soil - An imperfectly or poorly drained soil in which the material has been modified by reduction or alternating reduction and oxidation. These soils have lower chromas or more prominent mottling or both, in some horizons than the associated well-drained soil.

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

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

Granular structure - The arrangement of soil particles into spheroidal aggregates, characterized by rounded vertices.

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

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

Grumic - Very fine textured soils with self-mulching horizons (A and B), that occur in the Chernozemic, Gleysolic, and Solonetzic orders. Redefined as vertic features in 1998, Third Edition of the Canadian System of Soil Classification.

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

Heavy soil - A soil having a high content of fine particles, particularly clay, or a soil having a high drawbar pull and therefore, hard to cultivate.

Horizon (soil) - A layer in the soil profile approximately parallel to the land surface, with more or less well-defined characteristics that have been produced through soil forming processes. It differs from adjacent layers in properties such as colour, structure, texture, consistence, and chemical, biological and mineralogical composition.

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

Distinctness		Form	
abrupt	- less than two cm	smooth	- nearly plain
clear	- two to five cm	wavy	- pockets are wider than deep
gradual	- five to 15 cm	irregular	- pockets are deeper than wide
diffuse	- more than 15 cm	broken	- parts of the horizon are unconnected with other parts

Humic - Highly decomposed organic soil material. Small amounts of fibre are present that can be identified as to their botanical origin. Fibres are easily destroyed by rubbing.

Humus - The fraction of the soil organic matter that remains after most of the added plant and animal residues have decomposed. It is usually dark coloured.

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

High	>15	cm/hr
Medium	0.5 -15	cm/hr
Low	< 0.5	cm/hr

Hydrologic cycle - The conditions through which water naturally passes, from the time of precipitation, until it is returned to the atmosphere by evaporation and is again ready to be precipitated.

Hydromorphic soil - A general term for soils that develop under conditions of poor drainage in marshes, swamps, seepage areas or flats.

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

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

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

Impervious - Resistance to penetration by fluids or roots.

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

Infiltration - The downward entry of water into the soil.

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

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

Kame - An irregular ridge or hill of stratified glacial drift deposited by glacial meltwater.

Kettle - Depression left after the melting of a detached mass of glacier ice buried in drift.

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

Land classification - The arrangement of land units into various categories, based on the properties of the land or its suitability for some particular purpose.

Landforms -The various shapes of the land surface resulting from a variety of actions, such as deposition or sedimentation. Mineral landforms are described by terms such as apron, blanket, fan, hummocky, level, pitted, ridged, rolling, terrace, undulating, veneer, inclined and steep.

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

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

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

Hummocky - A very complex sequence of slopes extending from somewhat rounded depression or kettles of various sizes of irregular or conical knolls or knobs. There is a general lack of concordance between knolls and depressions. Slopes are generally five to 70% (3 to 35°).

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

Pitted - A level to gently undulating surface containing a number of pits or hollows.

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

Rolling - A very regular sequence of moderate slopes, extending from rounded, sometime confined, concave depressions to broad, rounded convexities with a wavelike pattern of moderate relief. Slope length is often 1.6 km or greater and gradients greater than five per cent (3°).

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

Undulating - A very regular sequence of gentle slopes that extend from rounded, sometimes confined concavities to broad, rounded convexities, producing a wavelike pattern of low local relief. Slope length is generally less than 0.8 km and the dominant slope gradient is two to five per cent (1 to 3°).

Veneer - Unconsolidated materials too thin to mask the minor irregularities of the underlying unit surface. A veneer ranges from 10 cm to one metre in thickness and possesses no form typical of the materials' genesis.

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

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

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

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

Lime, agricultural - A soil amendment consisting principally of calcium carbonate, and including magnesium

carbonate and perhaps other materials. It is used to supply calcium and magnesium as essential elements for growth of plants, and to neutralize soil acidity.

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

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

Lithic phase - Soils having a lithic contact (consolidated bedrock) within the control section below a depth of 10 cm.

Luvisolic - An order of soils that have eluvial (Ae) horizons, and illuvial (Bt) horizons, in which silicate clay is the main accumulation product. The soils developed under forest or forest-grassland transition in a moderate to cool climate.

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

Marsh - Periodically flooded or continually wet areas having the surface not deeply submerged. It is covered dominantly with sedges, cattails, rushes or other hydrophytic plants. The waters are rich in nutrients, varying from fresh to highly saline.

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

Mesic - Organic material in an intermediate stage of decomposition. Intermediate amounts of fibre are present that can be identified as to their botanical origin.

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

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

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

Mineral soil - A soil consisting predominantly of, and having its properties by, mineral matter. It contains less than 17% organic carbon, except for an organic layer that may be up to 40 cm (16 inches) thick if formed from mesic and humic peat, or 60 cm (24 inches) if of fibric peat.

Monolith, soil - A vertical section of a soil profile removed from the soil and mounted for display or study.

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

Neutral soil - A soil in which the surface layer, to plow depth, is neither acid nor alkaline in reaction.

Organic carbon - Carbon derived from plant and animal residues.

Organic - An order of soils that have developed dominantly from organic deposits. The majority of organic soils are saturated for most of the year, unless artificially drained. They contain more than 17% organic carbon, and the organic layer must be up to 40 cm (16 inches) if formed from mesic and humic peat, or 60 cm (24 inches) if of fibric peat.

L, F, and H - These organic horizons developed primarily from the accumulation of leaves, twigs and woody materials, with or without a minor component of mosses. They are normally associated with upland forested soils, with imperfect drainage or drier conditions.

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

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

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

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

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

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

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

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

Clayey-skeletal - Particles two mm to 25 cm occupy 35% or more by volum,e with enough fine earth to fill interstices larger than one mm. The fraction finer than two mm is that defined for the clayey particle size class.

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

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

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

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

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

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

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

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

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

Peat - Soil material consisting largely of undecomposed, or slightly decomposed, organic matter.

Peaty phase - Any mineral soil having a surface horizon 15 to 60 cm thick of fibric organic material, or 15 to 40 cm of mesic or humic organic material.

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

Pedology - Those aspects of soil science dealing with the origin, morphology, genesis, distribution, mapping and classification of soils.

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

Permafrost - (i) Perennially frozen material underlying the solum. (ii) A perennially frozen soil horizon.

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

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

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

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

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

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

Platy structure - Consisting of soil aggregates that have developed predominantly along the horizontal axes; laminated; flaky.

Podzolic - An order of soils having B horizons (Bh, Bhf, Bf) in which amorphous combinations of organic matter, Al, and usually Fe are accumulated.

Pore space - The part of the bulk volume of soil not occupied by soil particles, interstices or voids.

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

Prismatic structure - A soil structure type having prism-like aggregates that have vertical axes longer than the horizontal axes.

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

Reaction, soil - The degree of acidity or alkalinity of a soil, usually expressed as a pH value.
Soil reaction classes are characterized as follows:

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

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

Regosolic - An order of soils having no horizon development or development of the A and B horizons insufficient to meet the requirements of the other soil orders.

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

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

Saline soil - A nonalkali soil that contains enough soluble salts to interfere with the growth of most crop plants. The conductivity of the saturation extract is greater than four millisiemens/cm (mS/cm), the

exchangeable-sodium percentage is less than 16, and the pH is usually less than 8.5. Approximate limits of salinity classes are:

non-saline	0 to 4 mS/cm
weakly saline	> 4 to 8 mS/cm
moderately saline	> 8 to 16 mS/cm
strongly saline	>16 mS/cm

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

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

Sand - (i) A soil particle between <0.15 and two mm in diameter. (ii) Any one of five soil separates: very coarse sand, coarse sand, medium sand, fine sand, or very fine sand. The textural class name for any soil containing 85% or more of sand and not more than 10% of clay.

Saturation extract - The extract from a soil sample that has been saturated with water.

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

Seepage - (i) The escape of water downward through the soil. (ii) The emergence of water from the soil along an extensive line of surface, in contrast to a spring, where water emerges from a local spot.

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

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

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

Silt - (i) Individual mineral particles of soil that range in diameter between <0.15 to <0.102 mm. (ii) Soil of the textural class silt contains greater than 80% silt and less than 12% clay.

Single-grained structure - A soil structure in which the soil particles occur almost completely as individual or primary particles. It is usually found in coarse (sandy) textured soils.

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

Sodic soil - (i) A soil containing sufficient sodium to interfere with the growth of most crop plants. (ii) A soil having an exchangeable-sodium percentage of 15 or more.

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

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

Solonetzic - An order of soils thought to have developed from parent materials that were more or less uniformly salinized with salts high in sodium. The soils have a stained brownish solonetzic B (Bnt or Bn) horizon and a saline C horizon.

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

Stones - Rock fragments greater than 25 cm (10 inches) in diameter.

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

Stones 0. nonstony - Land having less than <0.11% of surface occupied by stones.

Stones 1. slightly stony - Land having <0.11 to 0.1 per cent of surface occupied by stones. Stones are 15 to 30 cm in diameter and 10 to 30 m apart. The stones offer only slight to no hindrance to cultivation.

Stones 2. moderately stony - Land having 0.1 to three per cent of surface occupied by stones. Stones are 15 to 30 cm in diameter and two to 10 m apart. Stones cause some interference with cultivation.

Stones 3. very stony - Land having three to 15 per cent of surface occupied by stones. Stones are 15 to 30 cm in diameter and one to two m apart. There are sufficient stones to constitute a serious handicap to cultivation.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Swamp - A mineral wetland or peatland with standing water or water gently flowing, through pools or channels. The water table is usually at or near the surface. The vegetation is characterized by a cover of deciduous or coniferous trees or shrubs, herbs, and some mosses.

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

Name of separate	**Diameter (mm)**
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to <0.15
Silt	<0.15 to <0.102
Clay	< <0.102
Fine clay	< <0.1002

Textural Classes

Sand - Sand is a soil material that contains 85 per cent or more sand. The percentage of silt, plus 1.5 times the percentage of clay, does not exceed 15.

Coarse sand – Twenty five per cent or more very coarse and coarse sand, and less than 50 per cent any other one grade of sand.

(Medium) Sand – Twenty five per cent or more very coarse, coarse, and medium sand (but less that 25 per cent very coarse and coarse sand), and less that 50 per cent of either fine or very fine sand.

Fine sand – Fifty per cent or more fine sand, or less than 25 per cent very coarse, coarse, and medium sand and less that 50 per cent very fine sand.

Very fine sand – Fifty per cent or more very fine sand.

Loamy sand - Loamy sand is a soil material that contains at the upper limit 85 to 90 per cent sand, and the percentage of silt, plus 1.5 times the percentage of clay, is not less than 15. At the lower limit, it contains not less than 70 to 85 per cent sand, and the percentage of silt plus twice the percentage of clay does not exceed 30.

Loamy coarse sand – Twenty five per cent or more very coarse and coarse sand, and less that 50 per cent any other one grade of sand.

Loamy sand – Twenty five per cent or more very coarse, coarse, and medium sand (but less that 25 per cent very coarse and coarse sand), and less that 50 per cent fine or very fine sand.

Loamy fine sand – Fifty per cent or more find sand, or less than 50 per cent very fine sand and less than 25 per cent very coarse, coarse, and medium sand.

Loamy very fine sand – Fifty per cent or more very fine sand.

Sandy loam - Sandy loam is a soil material that contains either 20 per cent clay or less, with the percentage of silt plus twice the percentage of clay exceeding 30, and 52 per cent or more sand, or less than seven per cent clay, less that 50 per cent silt, and 43 to 52 per cent sand.

Coarse sandy loam – Twenty five per cent or more very coarse and coarse sand, and less than 50 per cent any other one grade of sand.

(Medium) Sandy loam – Thirty per cent or more very coarse, coarse, and medium sand (but less than 25% very coarse and coarse sand), and less than 30 per cent of either very fine or fine sand.

Fine sandy loam – Thirty per cent or more fine sand and less than 30 per cent very fine sand, or between 15 to 30 per cent very coarse, coarse, and medium sand, or more than 40 per cent fine and very fine sand, at least half of which is fine sand, and less that 15 per cent very coarse, coarse and medium sand.

Very fine sandy loam – Thirty per cent or more very fine sand, or more than 40 per cent fine and very find sand, at least half of which is very fine sand, and less that 15 per cent very coarse, coarse, and medium sand.

Loam - Loam is a soil material that contains seven to 27 per cent clay, 28 to 50 per cent silt, and less than 52 per cent sand.

Silt loam - Silt is a soil material that contains 50 per cent or more silt and 12 to 27 per cent clay, or 50 to 80 per cent silt and less than 12 per cent clay.

Silt - Silt is a soil material that contains 80% or more silt and less than 12 per cent clay.

Sandy clay loam - Sandy clay loam is a soil material that contains 20 to 35 per cent clay, less than 28 per cent silt, and 45 per cent or more sand.

Clay loam - Clay loam is a soil material that contains 27 to 40 per cent clay and 20 to 45 per cent sand.

Silty clay loam - Silty clay loam is a soil material that contains 27 to 40 per cent clay and less than 20 per cent sand.

Sandy clay - Sandy clay is a soil material that contains 35 per cent or more clay and 45 per cent or more sand.

Silty clay - Silty clay is a soil material that contains 40 per cent or more clay and 40 per cent or more silt.

Clay - Clay is a soil material that contains 40 per cent or more clay, less that 45 per cent sand, and less that 40 per cemt silt.

Heavy clay - Heavy clay is a soil material that contains more that 60 per cent clay.

In addition to these 13 basic soil textural classes, three of which are modified according to the predominant sand fraction, other modifiers are added. The word mucky is used as an adjective modifying the textural class name for horizons of mineral soils, especially of Humic Gleysols that contain 15 to 30 per cent organic matter (nine to 17 per cent organic carbon).

Rock fragments in the soil are also used to modify the textural class name. These are gravel, cobbles, stones, and boulders (see the descriptions of size classes). The adjective form of the rock fragment class name is used as a modifier according to the following rules:

Less than 15 per cent by volume: No special term is used, or non-gravelly and non-stony are used in writing for contrast with soils having more that 15 per cent pebbles, cobbles, stones or boulders.

15 to 35 per cent by volume: The adjective term of the dominant kind of rock fragment is used as a modifier of the textural terms: gravelly loam, stony loam and bouldery loam.

35 to 60 per cent by volume: The adjective term of the dominant kind of rock fragment is used with the word very as a modifier to the textural terms: very gravelly loam, and very bouldery loam.

More than 60 per cent by volume: If enough fine earth is present to determine the texture class (approximately five per cent or more by volume), the adjective term of the dominant kind of rock fragment is used with the word extremely as a modifier of the textural terms: extremely gravelly loam, and extremely bouldery loam. If there is too little fine earth to determine the texture class (less than about five per cent by volume) the terms gravel, cobbles, stones and boulders are used in the place of fine earth texture.

Till, glacial - Unstratified glacial drift deposited by ice and consisting of clay, sand, gravel, and boulders intermingled in any proportion.

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

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

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

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

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

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

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

Varve - A distinct band representing the annual deposit in sedimentary materials, regardless of origin and usually consisting of two layers: one thick light coloured layer of silt and fine sand laid down in the spring and summer, and the other a thin, dark coloured layer of clay laid down in the fall and winter.

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

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

Water table depths	(cm)
Generally High	< 100
Very High	0 - 50
Moderately High	250 - 100
Medium High	100 - 150
Generally Low	> 150
Medium Low	150 - 200
Low	> 200
Moderately Low	200 - 300
Very Low	> 300

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

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

Wilting point - The moisture content of a soil, at which plants wilt and fail to recover their turgidity when placed in a dark, humid atmosphere. The wilting point is commonly estimated by measuring the 15-atmosphere moisture content of a soil.

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

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