SOIL GROUP DESCRIPTIONS FOR IRRIGATION DESIGN GROUPS

IRRIGATION DESIGN GROUP 1 INTAKE FAMILY 0.1

These are very deep and deep, moderately well, and well-drained soils that have silty clay or clay surface layers and clay subsoils. The underlying material is clay or clayey shale. Available water capacity is low or moderate. Permeability is slow or very slow. These soils are on uplands. Cracks form readily in these soils when they dry out.

Special treatment is needed to improve health and fertility where the dense clay subsoil is exposed by land leveling. These soils are subject to compaction if farmed when wet.

Generally, these soils are suitable for surface irrigation with low salinity and low sodium water. Water quality testing should be conducted before irrigation is planned. Use of higher hazard water will require the use of internal drainage and salt tolerant crops.

These soils are generally not suited to sprinkler irrigation. Basic allowable sprinkler intake rates are usually less than 0.2 inches per hour. This low application rate is very difficult to achieve with any type of sprinkler system. If sprinkler irrigation is applied, slopes should be level or nearly level, 0 to 2 percent, to minimize water erosion. High levels of soil organic matter and surface residues should be maintained. Special soil/site investigations should be conducted to determine feasibility of sprinkler irrigation on these soils due to potential salinity issues. Severe trafficability problems can be expected under center pivot irrigation though it may be possible to use a low application-continuous move system.

Some of these soils are on slopes that are too steep for surface irrigation.

Depth	Available Water Capacity
1.0’	1.6”
2.0’	3.1”
3.0’	4.6”
4.0’	6.0”
5.0’	7.3”

Soils

Artesian (SIC)
Cactusflat
Corson
Cromack (CL,SICL)
Denby
Kyle
Lane (C)
Lawther
Millboro (SIC)
Ottumwa
Promise
Ridgeview
Wildrose
Witten

IRRIGATION DESIGN GROUP 2 INTAKE FAMILY 0.1

These are very deep and deep, moderately well-drained to poorly drained soils that have silty clay loam or silty clay surface layers. The underlying material is stratified silty clay, silty clay loam, and silt loam. Available water capacity is moderate or high. Permeability is moderately slow to very slow. Most of these soils are on flood plains of major drainages and rivers. Runoff is slow. Some of these soils are subject to seasonal flooding and have a seasonal water table that fluctuates between depths of two and six feet. Special site investigations should be made to determine feasibility of irrigation on these soils because of the water table.

Special fertilizer treatment with trace elements may be needed where the underlying alluvium is exposed by land leveling. These soils are subject to compaction if farmed when wet.

Generally, these soils are suitable for surface irrigation with low salinity and low sodium water. Use of higher hazard water will require the use of internal drainage and salt tolerant crops.

These soils are generally not suited to sprinkler irrigation. Basic allowable sprinkler intake rates are usually less than 0.2 inches per hour. This low application rate is very difficult to achieve with any type of sprinkler system. If sprinkler irrigation is applied, slopes should be level or nearly level, to minimize water erosion. High levels of organic matter should be maintained. Severe trafficability problems can be expected under center pivot irrigation though it may be possible to use a low application-continuous move system.

Depth	Available Water Capacity
1.0’	1.9”
2.0’	3.7”
3.0’	5.4”
4.0’	7.1”
5.0’	8.8”

Soils

Albaton
Baltic (drained)
Blencoe (SIC)
Doran
Forney
Hilmoe (C, SIC)
Lohler (C, SIC)
Lohmiller (SIC)
Lossing
Onawa (SIC)
Owego
Percival
Scroll
Stetter
Wendte

IRRIGATION DESIGN GROUP 3 INTAKE FAMILY 0.1

These are very deep and deep, moderately well-drained, and well-drained soils that have loam, silt loam, clay loam, and silty clay loam surface layers and have clayey, compact subsoils. The underlying material is clay loam glacial till, lacustrine sediments, or alluvial deposits. Available water capacity is moderate or high. Permeability is slow in the subsoil. These soils are on nearly level or slightly depressed parts of the landscape. Salts have accumulated in the lower subsoil in sufficient amount to affect soil structure and crop growth. Runoff is slow.

Special treatment may be needed to improve tilth and fertility where the subsoil is exposed by land leveling. These soils are subject to compaction if farmed when wet.

Generally, these soils are suited to surface irrigation with low salinity and low sodium water. Use of higher hazard waters will require the use of salt tolerant crops. Internal drainage is required under any type of irrigation.

These soils are usually not adapted to sprinkler irrigation. Because of the clayey compact subsoils, basic allowable sprinkler intake rates are usually less than 0.2 inches per hour. This low application rate is very difficult to achieve with any type of sprinkler system. Severe trafficability problems can be expected under center pivot irrigation though it may be possible to use a low application-continuous move-winch cable system.

Depth	Available Water Capacity
1.0’	2.3”
2.0’	4.3”
3.0’	6.1”
4.0’	8.0”
5.0’	9.8”

Soils

Aberdeen
Belfield
Camtown
Cresbard
Demky
Minot
Moorhead
Niobell
Northville
Nunnston
Stickney
Walke

IRRIGATION DESIGN GROUP 4 INTAKE FAMILY 0.1

These are very deep and deep, moderately well-drained, and well-drained upland soils that have silty clay and silty clay loam surface layers and clay or silty clay subsoils. The underlying material is silty clay, clay, or silty clay loam glaciolacustrine sediments. Available water capacity is moderate or high. Permeability is slow. These soils are on uplands.

Generally, these soils are suited to surface irrigation with medium salinity and low sodium water. Use of higher hazard waters will require the use of salt tolerant crops. Internal drainage is required under any type of irrigation.

These soils are generally not suited to sprinkler irrigation. Basic allowable sprinkler intake rates are usually less than 0.2 inches per hour. This low application rate is very difficult to achieve with any type of sprinkler system. If sprinkler irrigation is applied, slopes should be level or nearly level, to minimize water erosion. High levels of organic matter should be maintained. Severe trafficability problems can be expected under center pivot irrigation though it may be possible to use a low application-continuous move system.

Some of these soils are on slopes that are too steep for irrigation.

Depth	Available Water Capacity
1.0’	1.9”
2.0’	3.8”
3.0’	5.6”
4.0’	7.4”
5.0’	9.2”

Soils

Gwinner
Hetland
Huntimer
Mondamin
Nutley
Sinai

IRRIGATION DESIGN GROUP 5 INTAKE FAMILY 0.3

These are very deep and deep, well-drained soils that have silt loam or silty clay loam subsoils. The underlying material is loam or clay loam glacial till. It is clay in the Dorna soil. Available water capacity is high. Permeability is moderate in the upper part of the soil and moderately slow or slow in the lower part.

Irrigation water of high quality should be used to avoid a salt buildup above the glacial till or clay. Enough water needs to be applied to leach the salts derived from the underlying glacial till or clay below the rooting depth of the crops.

Special treatment is needed to improve tilth and fertility where the underlying glacial till is exposed by land leveling. Trace elements may be needed.

These soils react similar to those in the .5 Intake Family until the silty mantle above the glacial till or clay is saturated when irrigated with a continuous move system. The more sloping soils are subject to erosion if water is applied too fast with any sprinkler system. Gullies can form in the wheel tracks of continuous move systems.

Generally, these soils are suitable for irrigation with low salinity and low sodium water. Water of medium salinity may be used when additional quantities are applied for leaching purposes. With center pivot irrigation, the additional water would be very difficult to apply. If the soil profile is full of irrigation water before periods of expected rainfall, natural leaching can be expected.

These soils are not suited to sprinkler irrigation on slopes greater than nine percent. Some of these soils are on slopes too steep for surface irrigation.

Depth	Available Water Capacity
1.0’	2.5”
2.0’	4.8”
3.0’	6.9”
4.0’	8.9”
5.0’	10.9”

Soils

Dorna
Eakin
Egan
Fairlo
Homme
Kranzburg
Splitrock
Temvik

IRRIGATION DESIGN GROUP 6 INTAKE FAMILY 0.3

These are very deep and deep, well-drained soils that have loam or silt loam surface layers and loam or light clay loam subsoils. The underlying material is loam or clay loam glacial till. Available water capacity is high. Permeability is moderate in the upper part of the soil and moderately slow in the lower part. These soils are on uplands.

Special treatment is needed to improve tilth and fertility where the underlying glacial till is exposed by land leveling. Trace elements may be needed. The more sloping soils are subject to erosion if water is applied too fast. Gullies could form in the wheel tracks of continuous move systems.

The use of center pivot irrigation systems on these soils will usually result in trafficability and runoff problems.

Generally, these soils are suitable for irrigation with low salinity and low sodium water. Water of medium salinity may be used when additional quantities of water are applied for leaching purposes. Use of higher hazard water will require additional internal drainage and the use of salt tolerant crops.

These soils are not suited to sprinkler irrigation on slopes greater than nine percent. Some of these soils are on slopes too steep for surface irrigation.

Depth	Available Water Capacity
1.0’	2.3”
2.0’	4.5”
3.0’	6.6”
4.0’	8.7”
5.0’	10.8”

Soils

Barnes (L)
Betts
Buse (L)
Clarno (L)
Ethan (L)
Forman (L)
Glenham
Greenway
Houdek
Java
Max
Oak Lake
Shindler
Singsaas
Vida (L)
Vienna
Williams (L)
Zahl

SOIL GROUP DESCRIPTIONS FOR IRRIGATION DESIGN GROUPS

IRRIGATION DESIGN GROUP 7 INTAKE FAMILY 0.3

These are very deep and deep, well-drained, and moderately well-drained soils that have loam or silt loam surface layers and heavy clay loam or heavy silty clay loam subsoils. The underlying material is heavy clay loam glacial till, slightly cemented bedrock, or fine textured loess. Available water capacity is high. Permeability is moderately slow or slow. These soils are characterized by compact subsoils. They are on uplands.

Special treatment is needed to improve tilth and fertility where the underlying glacial till is exposed by land leveling. Trace elements may be needed. The more sloping soils are subject to erosion if water is applied too fast. Gullies could form in the wheel tracks of continuous move systems. Trafficability and runoff problems will usually result from the use of center pivot systems on these soils.

The heavy underlying material restricts the use of irrigation water to that with low salinity and low sodium. The use of higher hazard water will require installation of internal drainage systems and possible use of salt tolerant crops.

These soils are not suited to sprinkler irrigation on slopes greater than nine percent. Some of these soils are on slopes too steep for surface irrigation.

Depth	Available Water Capacity
1.0’	2.3”
2.0’	4.2”
3.0’	6.1”
4.0’	8.0”
5.0’	9.9”

Soils

Baca
Barnes (CL)
Beadle
Bearpaw
Bidman
Buse (CL)
Dawes
Ethan (CL)
Gettys (CL)
Harmony
Hattie
Kube
Mehurin
Peever
Peno
Raber

IRRIGATION DESIGN GROUP 8 INTAKE FAMILY 0.3

These are very deep and deep, well-drained, and moderately well-drained soils that have silt loam, loam, clay loam, or silty clay loam surface layers and clay loam, silty clay loam, or silty clay subsoils. The underlying material is loess, alluvium, or clay. Available water capacity is high except in the McClure soils where it is moderate or high. Permeability is moderately slow in all soils except McClure where it is moderately slow in the upper part of the soil and slow in the lower part. These soils are on uplands and in swales of the uplands.

Grail and Onita are in swales and occur as inclusions in some map units and as minor components in some complex map units.

Caution should be used when leveling the McClure soils to avoid exposing the underlying clay. Continuous move irrigation systems could have trafficability problems. The more sloping soils are subject to erosion if water is applied too fast. Gullies could form in the wheel tracks of continuous move systems.

Generally, these soils are suitable for irrigation with low salinity and low sodium water. Water of medium salinity may be used when additional quantities of water are applied for leaching purposes. Use of higher hazard water will require additional internal drainage and the use of salt tolerant crops.

These soils are not suited to sprinkler irrigation on slopes greater than nine percent. Some of these soils are on slopes too steep for surface irrigation.

Depth	Available Water Capacity
1.0’	2.2”
2.0’	4.1”
3.0’	5.9”
4.0’	7.7”
5.0’	9.5”

Soils

Artesian (SICL)
Belfore
Benclare
Boneek
Bufton
Cedarpass
Echeta
Grail
Kirley
Lakeport
Lane (L, SIL, SICL)
Loburn
Manzanola
McClure
Millboro (SIL, SICL)
Nuncho
Nunn
Oak Lake
Oko
Onita
Owanka
Reliance
Richfield
Savage
Savo

IRRIGATION DESIGN GROUP 9 INTAKE FAMILY 0.3

These are very deep and deep, poorly drained, and somewhat poorly drained bottom land soils that have silty clay loam surface layers. The underlying material is silty clay loam alluvium. Available water capacity is high. Permeability is moderately slow. Runoff is slow. A seasonal water table fluctuates between depths of three and six feet in most years. These soils are occasionally flooded.

Careful management is needed to prevent waterlogging of the soils. Ponding could be a problem in wet years. Center pivot irrigation will normally result in trafficability problems. Special site investigations should be made to determine feasibility of irrigation on this soil, because of the water table.

The high water table restricts the use of irrigation water to that with low salinity and low sodium. The use of higher hazard water will require the use of internal drainage systems and salt tolerant crops.

Depth	Available Water Capacity
1.0’	2.6”
2.0’	5.1”
3.0’	7.5”
4.0’	9.8”
5.0’	12.1”

Soils

Lamo
Lamoure

IRRIGATION DESIGN GROUP 10 INTAKE FAMILY 0.3

These are moderately deep, well-drained upland soils that have silt loam, silty clay loam, loam, or clay loam surface layers and silty clay loam, silty clay, clay loam, or clay subsoils. The underlying material at depths of 20 to 40 inches is siltstone or shale. Available water capacity is low. Permeability is moderately slow above the siltstone or shale. The bedrock is relatively impervious to water.

Caution should be used when land leveling to avoid exposing the bedrock. Seepage is possible in some areas if careful water management is not practiced. The use of center pivot systems will usually result in runoff and trafficability problems. Special site investigation should be made to determine feasibility of irrigation on these soils because of the bedrock.

The more sloping areas are subject to erosion if water is applied too fast. Gullies could form in the wheel tracks of continuous move systems. The bedrock at moderate depths, usually limits the use of irrigation water to that with low salinity and low sodium. The use of water of higher hazard will require the use of internal drainage systems and possible salt tolerant crops.

These soils are not suited to sprinkler irrigation on slopes greater than nine percent. Some of these soils are on slopes too steep for surface irrigation.

Depth	Available Water Capacity
1.0’	2.0”
2.0’	3.9”
3.0’	4.7”

Soils

Blackpipe
Emigrant
Huggins
Ihlen
Leiter
Moreau
Norrest
Oldwolf
Razor (SICL)
Regent
Tanna

IRRIGATION DESIGN GROUP 11 INTAKE FAMILY 0.3

These are very deep and deep, well-drained, moderately well-drained, or somewhat poorly drained soils that have silt loam, clay loam, silty clay loam, or silty clay surface layers underlain by stratified silty clay loam, loam, or silt loam. Available water capacity is high. Permeability is moderately slow or slow. These soils are on flood plains. Runoff is slow. They are subject to flooding from snow melt in the spring.

Special treatment is needed to improve tilth and fertility, where the underlying alluvium is exposed by land leveling. Trace elements may be needed. Soil blowing could be a problem where coarser layers of the substratum are exposed.

Generally, these soils are suited to irrigation with low salinity and low sodium water. Water of medium salinity may be used when additional quantities of water are applied for leaching purposes. Use of higher hazard water required internal drainage systems and the use of salt tolerant crops.

Depth	Available Water Capacity
1.0’	1.9”
2.0’	3.7”
3.0’	5.5”
4.0’	7.3”
5.0’	9.1”

Soils

Blencoe (L)
Buffington
Harlake
Haverson (SICL)
Haynie (SICL)
Hilmoe (SICL, SIL)
Lohler (SICL)
Lohmiller (SICL)
Onawa (FSL)

SOIL GROUP DESCRIPTIONS FOR IRRIGATION DESIGN GROUPS

IRRIGATION DESIGN GROUP 12 **INTAKE FAMILY 0.5**

These are very deep and deep, well-drained, and moderately well-drained soils that have thick, dark colored surface layers of loam, silt loam, silty clay loam, or very fine sandy loam. The underlying material is stratified loam, silty clay loam, silt loam, or fine sandy loam. Available water capacity is high. Permeability is moderate or moderately slow. These soils are on flood plains. They are subject to occasional flooding from snow melt in the spring. Runoff is slow.

The soils that have silty clay loam surface layers could cause trafficability problems for continuous move systems. Ponding could result from high application rates. These soils are subject to soil blowing, where sandy material is exposed during land leveling.

Generally, these soils are suitable for irrigation with medium salinity and low sodium water. If water of high salinity or medium sodium is used, extra water should be applied for leaching purposes and salt tolerant crops may be required.

Depth	Available Water Capacity
1.0’	2.4”
2.0’	4.7”
3.0’	6.9”
4.0’	9.1”
5.0’	11.2”

Soils

Barnum
Bigbend (SICL)
Blake
Bon
Bridgeport
Davis
Dovecreek
Kennebec
Korchea
La Prairie
LaDelle
Nimbro
Omadi
Roxbury
Salix
Shell
St. Onge
Straw

IRRIGATION DESIGN GROUP 13 INTAKE FAMILY 0.5

These are very deep and deep, well-drained, and moderately well-drained soils that have thick dark colored surface layers of loam, silt loam, or silty clay loam. The subsoil is silt loam, loam, clay loam, or silty clay loam. The underlying material is silt loam, silty clay loam, loam, or clay loam. Available water capacity is high. Permeability is moderate or moderately slow. These soils are in swales or on long plane slopes.

Water could collect in some of the swales and cause drainage problems. These soils occur as inclusions in many map units. Leaching operations will be difficult to carry out with center pivot systems.

Generally, these soils are suitable for irrigation with medium salinity and low sodium water. If water of high salinity or medium sodium is used, extra water should be applied for leaching purposes and salt tolerant crops may be required.

Some of these soils are on slopes too steep for surface irrigation.

Depth	Available Water Capacity
1.0’	2.5”
2.0’	5.0”
3.0’	7.2”
4.0’	9.4”
5.0’	11.5”

Soils

Aastad
Alcester
Arnegard
Athelwold
Bonilla
Bowbells
Brookings
Cordeston
Darnen
Duroc
Eltree
Falkirk
Forestville
Gardena
Goshen
Graceland
Graceville
Grassna
Keya
Lankin
Makoti
Mandan
Mobridge
Overly
Prosper
Renner
Roseglen
Svea
Trent
Viborg
Waubay
Wilton
Winship
Yankton
Zeeland

SOIL GROUP DESCRIPTIONS FOR IRRIGATION DESIGN GROUPS

IRRIGATION DESIGN GROUP 14 INTAKE FAMILY 0.5

These are well-drained to somewhat poorly drained soils that are moderately deep over sand and gravel. They have loam or silt loam surface layers. The subsoil is loam, silt loam, sandy loam, silty clay loam, or clay loam. The underlying material at depths of 20 to 40 inches is sand or sand and gravel.

These soils have low available water capacity where the sand and gravel is about 20 to 25 inches in depth. Water will not enter the gravelly substratum until the soil above the gravel is saturated. Permeability is moderate above the sand and gravel and rapid or very rapid in the sand and gravel. These soils are on upland terraces.

Dimo and Spottswood soils have a seasonal water table that fluctuates from three to six feet or more. Specific site investigation should be made to determine feasibility of irrigation because of the underlying gravel and possible water table. Caution should be used when land leveling to avoid exposing the underlying gravelly material.

Generally, these soils are suitable for irrigation with medium salinity and low sodium water. If water of high salinity or medium sodium is used, extra water should be applied for leaching purposes and salt tolerant crops may be required.

Some of these soils are on slopes too steep for surface irrigation.

Depth	Available Water Capacity
1.0’	2.4”
2.0’	4.7”
3.0’	6.1”
4.0’	6.8”
5.0’	7.5”

Soils

Akaska
Altvan (L, SIL)
Attewan
Bowdle
Brandt
Brocksburg
Bullflat
Canning
Dempster
Dimo
Enet
Estelline
Fordtown
Fordville
Goldsmith
Grable
Jansen
Kampeska
Kensal
Lex
Mahoney
Oahe
Spottswood
Stady
Strayhoss
Sugakool
Vang
Vore
Warsing
Weber

SOIL GROUP DESCRIPTIONS FOR IRRIGATION DESIGN GROUPS

IRRIGATION DESIGN GROUP 15 INTAKE FAMILY 0.5

These are moderately deep, well-drained soils that have loam, silt loam, clay loam, or silty clay loam surface layers. The subsoil is silt loam, clay loam, or silty clay loam. The underlying material at depths of 20 to 40 inches is siltstone, shale, or fine grained sandstone. Available water capacity is low. Permeability is moderate above the bedrock. These soils are on uplands.

Caution should be used when land leveling to avoid exposing the bedrock. Seepage is possible in some areas if careful water management is not practiced. Continuous move sprinkler systems could have traction problems on those soils having silty clay loam surface layers. The more sloping soils are subject to runoff and erosion if water is applied too fast. Gullies could form in wheel tracks of continuous move systems. Special site investigation should be made to determine feasibility of irrigation on these soils, because of the bedrock.

The depth to bedrock usually limits the use of irrigation water to that with low salinity and low sodium. The use of water of higher hazard requires the use of internal drainage systems and possibly salt tolerant crops.

These soils are not suited to sprinkler irrigation on slopes greater than nine percent. Some of these soils are on slopes too steep for surface irrigation.

Depth	Available Water Capacity
1.0’	2.3”
2.0’	4.3”
3.0’	5.2”

Soils

Amor
Boxwell
Chama
Cushman
Delridge
Edgeley
Felor
Gurney
Kadoka
Keota
Marmath (L)
Minnequa
Morton
Ralph
Redstoe
Reeder
Rosebud
Spangler
Ucross
Watrous
Yegen (L)

SOIL GROUP DESCRIPTIONS FOR IRRIGATION DESIGN GROUPS

IRRIGATION DESIGN GROUP 16 INTAKE FAMILY 0.5

These are very deep and deep, well-drained soils that have loam, silt loam, or light silty clay loam surface layers and loam, clay loam, silt loam, or silty clay loam subsoils. Available water capacity is high. Permeability is moderate. These soils are on uplands.

Special treatment is needed to improve tilth and fertility in areas where the subsoil is exposed by land leveling. Trace elements may be needed in those areas. Continuous move sprinkler systems could have traction problems on those soils having silty clay loam surface layers. The more sloping soils are subject to runoff and erosion if water is applied too fast. Gullies could form in wheel tracks of continuous move systems.

Generally, these soils are suitable for irrigation with medium salinity and low sodium water. If water of high salinity or medium sodium if used, extra water should be applied for leaching purposes and salt tolerant crops may be required.

Leaching operations will be difficult to carry out with center pivot systems.

These soils are not suited to sprinkler irrigation on slopes greater than nine percent. Some of these soils are on slopes too steep for surface irrigation.

Depth	Available Water Capacity
1.0’	2.4”
2.0’	4.7”
3.0’	6.8”
4.0’	8.8”
5.0’	10.9”

Soils

Agar
Bend
Beotia
Bryant
Deekay
Dobalt
Doburg
Doland
Eapa
Farland
Farnuf
Flandreau
Great Bend
Grovena
Hand (L)
Highmore
Hokans
Iwait
Keith
Kings Lake
Kremlin
Loretto
Moody
Nora
Norka
Norkoo
Paka
Poinsett
Putney
Recluse (L)
Ree
Reicess
Satanta (L)
Shambo
Sisseton
Still Lake
Tansem
Thirtynine
Tilford (SIL)
Tuthill (SIL)
Uly
Vale
Vassett
Venagro
Wages
Wentworth
Ziggy
Zigweid

IRRIGATION DESIGN GROUP 17 INTAKE FAMILY 0.5

These are moderately deep, deep, and very deep, moderately well-drained and somewhat poorly drained soils. They have fine sandy loam, loam, silt loam, silty clay loam, or clay loam surface layers that are calcareous. The next layer is fine sandy loam, loam, silt loam, or silty clay loam that is calcareous. The underlying material is loamy alluvium, lacustrine deposits, glacial till, sand and gravel, or siltstone bedrock. Some soils are not calcareous in the upper part of the soil. Available water capacity is moderate or high. There is a fluctuating water table that ranges from two feet to more than five feet during the year. Permeability is slow, moderately slow, and moderate. These soils are on nearly level or slightly depressed landscapes. Runoff is slow. Special site investigations should be made to determine feasibility of irrigation on these soils because of the water table.

Special fertilizer treatment is necessary because of the calcareous surface layers. Drainage may be necessary in some areas. Those soils having fine sandy loam surface layers will react similar to those in the 1.0 Intake Family when irrigated with continuous move systems.

The high water table usually limits the use of irrigation water to that with low salinity and low sodium. The use of higher hazard waters will require the use of internal drainage systems and possible salt tolerant crops.

Depth	Available Water Capacity
1.0’	2.4”
2.0’	4.5”
3.0’	6.4”
4.0’	8.1”
5.0’	9.9”

Soils

Antler
Balaton
Bearden
Bhonsack
Cubden
Davison (L, SIL, CL)
Divide
Firesteel
Fram
Gibbon
Gilby
Glyndon
Hamerly
Kindred
Mantador
Mauvais
McIntosh
McKranz
Moritz
Ord
Rondell
Storla
Tolna
Wakonda
Wyard
Wyndmere

IRRIGATION DESIGN GROUP 18 INTAKE FAMILY 1.0

These are very deep and deep, well, and excessively drained soils that have loam or silt loam surface layers and subsoils. The surface layer is calcareous in most of these soils. The underlying material is silt loam or silty clay loam. Available water capacity is high. Permeability is moderate. These soils are on uplands.

Special treatment with fertilizer is necessary where the underlying material is exposed during land leveling or where surface layers are calcareous. The more sloping soils are subject to erosion if water is applied too fast. Gullies could form in wheel tracks of continuous move systems. Trace elements are needed.

Generally, these soils are suitable for irrigation with medium salinity and low sodium water. If water of high salinity or medium sodium is used, extra water should be applied for leaching purposes and salt tolerant crops may be required.

These soils are not suited to sprinkler irrigation on slopes greater than nine percent. Some of these soils are on slopes too steep for surface irrigation.

Depth	Available Water Capacity
1.0’	2.4”
2.0’	4.7”
3.0’	6.8”
4.0’	8.8”
5.0’	10.5”

Soils

Bridget
Colby
Colnevee
Coly
Crofton
Eckman
Edwin
Esmond
Heimdal
Huffton
Lantry
Linton
Lowry
Manvel
Mitchell
Nevee
Oglala
Rusklyn
Sakakawea
Sully
Sutley
Ulysses
Zell

SOIL GROUP DESCRIPTIONS FOR IRRIGATION DESIGN GROUPS

IRRIGATION DESIGN GROUP 19 INTAKE FAMILY 1.0

These are very deep and deep, well, and moderately well-drained soils that have loam, silt loam or very fine sandy loam surface layers. The surface layer is light colored and is calcareous in most of these soils. The underlying material is stratified fine sandy loam, very fine sandy loam, silt loam, and loam. Available water capacity is high. Permeability is moderate. These soils are on flood plains of the major drainages. Unprotected areas may flood during snow melt in the spring. Dams constructed on the major rivers in recent years protect many of these soils from flooding. Runoff is slow.

Special treatment with fertilizer and organic matter is needed on those soils having light colored surface layers and in areas where the underlying material is exposed by land leveling. Soil blowing is a problem where sandy material is exposed during land leveling. Where the Havre soils have silty clay loam surface layers, continuous move sprinkler systems could have traction problems.

Generally, these soils are suitable for irrigation with medium salinity and low sodium water. If water of high salinity or medium sodium is used, extra water should be applied for leaching purposes and salt. Tolerant crops may be required.

Depth	Available Water Capacity
1.0’	2.3”
2.0’	4.5”
3.0’	6.6”
4.0’	8.7”
5.0’	10.8”

Soils

Aowa
Bigbend (SIL, VFSL)
Blyburg
Coliams
Columbo
Craft
Fairdale
Haverson (L,SICL, SIL)
Havre
Havrelon
Haynie (SIL, VFSL)
Interior
McPaul
Modale
Rocky Point
Swint
Yockey

IRRIGATION DESIGN GROUP 20 INTAKE FAMILY 1.0

These are well-drained soils that have sand and gravel at depths of 10 to 20 inches. The surface layer is fine sandy loam or loam. The subsoil is fine sandy loam, loam, or clay loam. The underlying material is sand and gravel. Available water capacity is low. Permeability is moderate above the gravel and rapid in the gravel. These soils are on uplands.

These soils are droughty because of low available water capacity. The more sloping soils are subject to erosion if water is applied too fast. Gullies could form in wheel tracks of continuous move systems. The shallow depth to gravel makes these soils unsuited to land leveling without specific site investigation to determine depth to gravel.

Generally, these soils are suitable for irrigation with medium salinity and medium sodium water. Water with high salinity can be used when extra water is applied for leaching purposes.

These soils are not suited to irrigation on slopes greater than six percent. Some of these soils are on slopes too steep for surface irrigation.

Depth	Available Water Capacity
1.0’	2.0”
2.0’	3.0”
3.0’	3.6”
4.0’	4.2”
5.0’	4.7”

Soils

Allivar
Altvan (SL)
Arvilla
Binford
Brantford
Delmont
Eckley
Lehr
Murdo
Renshaw
Renwash
Suglo

IRRIGATION DESIGN GROUP 21 INTAKE FAMILY 1.5

These are very deep and deep, well-drained soils that have fine sandy loam or sandy loam surfaces and fine sandy loam, sandy clay loam, or light clay loam subsoils. The underlying material is fine sandy loam, sandy loam, or loamy fine sand. Available water capacity is moderate. Permeability is moderately rapid or moderate. These soils are on uplands.

These soils are subject to blowing. Gullies could form in wheel tracks of continuous move irrigation systems on the more sloping areas. Special treatment with fertilizer and organic matter is necessary in areas where the underlying sandy material is exposed by land leveling.

Generally, these soils are suitable for irrigation with medium salinity and medium sodium water. Water with high salinity can be used when extra water is applied for leaching purposes.

These soils are not suited to sprinkler irrigation on slopes greater than nine percent. Some of these soils are on slopes too steep for surface irrigation.

Depth	Available Water Capacity
1.0’	1.8”
2.0’	3.6”
3.0’	5.2”
4.0’	6.5”
5.0’	7.7”

Soils

Alice
Anselmo (FSL, SL)
Ascalon
Assiniboine
Busher
Chinook
Clarno (FSL)
Davison (LFS)
Egeland
Emrick
Ethan (LFS)
Hand
Henkin
Hennings
Jayem
Manter
Moskee
Ortello
Otero
Recluse (FSL, SL)
Satanta (FSL, SL)
Tally
Tuthill (FSL)
Vonalf
Woonsocket
Yegen (SL)

IRRIGATION DESIGN GROUP 22 INTAKE FAMILY 1.5

These are very deep and deep; well drained, moderately well drained, and somewhat poorly drained soils that have fine sandy loam surface layers. The underlying material is stratified fine sandy loam, silt loam, and loamy fine sand. Available water capacity is moderate. Permeability is moderately rapid. These soils are on bottomlands of the major drainages. Unprotected areas may flood during snow melt in the spring. Dams constructed on the major rivers, in recent years, protect many of these soils from flooding. Wann soils have a fluctuating water table that ranges from two to more than five feet in depth. Runoff is slow.

These soils are subject to blowing. Special treatment with fertilizer and organic matter is needed to control soil blowing. Trace elements may be needed on some of these soils. It may be more effective to apply fertilizer with irrigation water. Special treatment with fertilizer and organic matter is necessary in areas where the underlying sandy material is exposed by land leveling.

The water table in the Wann soils usually limits the use of irrigation water to that with low salinity and low sodium. The use of water with higher hazards will require the use of internal drainage systems and possible salt tolerant crops. The other soils are suitable for irrigation with medium salinity and medium sodium water. Water with high salinity can be used when extra water is applied for leaching purposes.

Depth	Available Water Capacity
1.0’	1.9”
2.0’	3.5”
3.0’	5.0”
4.0’	6.5”
5.0’	7.9”

Soils

Cass
Clarkelen
Dalesburg
Glenberg
Glendive
Munjor
Sodawells
Trembles
Velva
Wann
Waubonsie

IRRIGATION DESIGN GROUP 23 INTAKE FAMILY 1.5

These are very deep and deep, moderately well-drained or well-drained soils that have thick dark colored surface layers. The underlying material is loamy fine sand, sandy loam, or fine sand. Some soils have gravelly textured underlying materials. Available water capacity is moderate or high. Permeability is moderately rapid in the upper part of the soil and rapid in the underlying material. Most of these soils are in swales of the uplands.

Generally, these soils are suitable for irrigation with medium salinity and medium sodium water. Water with high salinity can be used when extra water is applied for leaching purposes.

These soils are subject to blowing. Special treatment with fertilizer and organic matter is necessary in areas where the underlying sandy material is exposed by land leveling.

Some of these soils are on slopes too steep for surface irrigation.

Depth	Available Water Capacity
1.0’	1.9”
2.0’	3.8”
3.0’	5.6”
4.0’	7.3”
5.0’	8.8”

Soils

Blendon
Doughboy (FSL)
Embden
Everts
Janude
Osakis
Parshall
Vetal (FSL)
Woodly

IRRIGATION DESIGN GROUP 24 INTAKE FAMILY 1.5

These are very deep and deep, well-drained soils that have fine sandy loam to loamy fine sand surface layers and subsoil. The underlying material is lacustrine silt, glacial till, or clay. Available water capacity is moderate or high. Permeability is moderately rapid above the contrasting material and slow or moderately slow in the contrasting material. These soils are on uplands.

Caution should be used during land leveling to avoid exposing the underlying material. These soils are subject to blowing. Special treatment with fertilizer and organic matter is necessary in areas where deep cuts have been made.

The more sloping soils are subject to erosion if water is applied too fast. Gullies could form in wheel tracks of continuous move systems.

The heavier underlying material usually limits the use of irrigation water to that of low salinity and low sodium. Water of medium salinity may be used when additional quantities of water are applied for leaching purposes. Use of higher hazard water will require additional internal drainage and the use of salt tolerant crops.

Some of these soils are on slopes too steep for surface irrigation.

Depth	Available Water Capacity
1.0’	1.8”
2.0’	3.4”
3.0’	4.8”
4.0’	6.4”
5.0’	7.9”

Soils

Carthage
Dooley
Flaxton
Krem
Lanona
Livona
Swenoda
Wewela (FSL)

IRRIGATION DESIGN GROUP 25 INTAKE FAMILY 1.5

These are moderately deep, well-drained soils that have fine sandy loam or sandy loam surface layers and subsoils. The underlying material is fine grained sandstone or glacial till. Available water capacity is low. Permeability is moderately rapid above the contrasting material. These soils are on uplands.

Caution should be used when land leveling to avoid exposing the bedrock or till. These soils are subject to blowing. Seepage is possible in some areas if careful water management is not practiced. Continuous move sprinkler systems could have traction problems on those soils having silty clay loam surface layers. Gullies could form in wheel tracks of continuous move systems. Specific site investigation should be made to determine feasibility of irrigation on these soils, because of the bedrock.

Generally, these soils are suitable for irrigation with medium salinity and medium sodium water. Water with high salinity can be used when extra water is applied for leaching purposes.

These soils are not suited to sprinkler irrigation on slopes greater than nine percent. Some of these soils are on slopes too steep for surface irrigation.

Depth	Available Water Capacity
1.0’	1.9”
2.0’	3.7”
3.0’	4.5”

Soils

Holt
Lefor
Marmarth (FSL)
Phiferson
Pitchdraw
Rentill
Rhame
Ronson
Turnercrest
Twilight
Vebar
Xema

IRRIGATION DESIGN GROUP 26 INTAKE FAMILY 2.0

These are very deep and deep, moderately well-drained, and somewhat poorly drained soils. The surface layer is fine sandy loam to sand. The underlying material is loamy fine sand to sand. Thin layers of fine textures occur in some profiles. Available water capacity is low. Permeability is rapid. A water table is at two to three feet part of the year. These soils are on flood plains, lake plains, outwash plains, and in swales.

These soils are suited to sprinkler irrigation. These soils are subject to blowing. Fertilizers, especially nitrogen, are more effective if applied with irrigation water because of the rapid leaching that occurs in these soils. Special site investigation should be made to determine feasibility of irrigation on these soils because of the water table.

These soils are marginally suited to surface irrigation due to the high intake rate.

Generally, these soils are suitable for irrigation with medium salinity and medium sodium water. Water with high salinity can be used when extra is applied for leaching purposes.

Depth	Available Water Capacity
1.0’	1.3”
2.0’	2.3”
3.0’	3.4”
4.0’	4.4”
5.0’	5.6”

Soils

Aylmer
Bantry
Bolent
Clontarf
Delamere
Els
Elsmere
Foldahl
Garborg
Hecla
Libory
Meckling
Minnewasta
Nenzel
Shue
Thedford
Thurman (FSL)
Towner (FSL)
Ulen
Walum
Wyrene

IRRIGATION DESIGN GROUP 27 INTAKE FAMILY 2.0

These are well-drained soils that are shallow or moderately deep to sand or sand and gravel. The surface layer is sandy loam or loam and the underlying material to depths of 10 to 20 inches is fine sandy loam, sandy loam, or gravelly loam. The underlying material is sand or sand and gravel. Available water capacity is low. Permeability is moderately rapid above the gravel and very rapid in the gravel. These soils are on high terraces in the uplands.

These soils are subject to blowing. Because these soils have low available water capacity, they are droughty. They require frequent irrigation to prevent stress on plants.

Fertilizer, nitrogen especially, may be more effective if applied with irrigation water because of the rapid leaching that occurs in these soils.

Generally, these soils are suitable for irrigation with medium salinity and medium sodium water. Water with high salinity can be used when extra water is applied for leaching purposes.

These soils are marginally suited to surface irrigation due to the high intake rate.

These soils are not suitable to sprinkler irrigation of row crops or small grain on slopes greater than six percent; however, tame grasses and legumes may be grown on slopes up to nine percent. Some of these soils are on slopes too steep for surface irrigation.

Depth	Available Water Capacity
1.0’	1.7”
2.0’	2.9”
3.0’	3.7”
4.0’	4.4”
5.0’	5.1”

Soils

Alwilda
Appam
Chappell
Coe
Dix
Manning
Mawer
O'Neill
Orton
Rothican
Ruso
Sioux (L,SL)
Talmo (L, SL)
Torning
Wabek (L,SL)

IRRIGATION DESIGN GROUP 28 INTAKE FAMILY 3.0

These are very deep and deep, excessively or somewhat excessively drained soils that have sandy loam, loamy fine sand, loamy sand, or fine sand surface layers. The underlying material is stratified loamy fine sand and fine sand. Thin bands of finer texture material are in most profiles. Available water capacity is low. Permeability is rapid. These soils are on flood plains of the major streams and rivers. They are subject to flooding during heavy rains or snow melt.

These soils are not suited to surface irrigation because the intake rate is too high to get even distribution of water over the field. Runs would be too short to make surface irrigation practical.

These soils are suited to sprinkler irrigation. They require frequent irrigation to prevent stress on plants. They are well suited to center pivot irrigation. These soils require high amounts of organic matter and fertilizers to maintain production and control soil blowing. Many trace elements are needed. Fertilizer, especially nitrogen, is more effective if applied with irrigation water because of the rapid leaching that takes place. Caution should be used to avoid polluting the ground water.

Generally, these soils are suitable for irrigation with medium sodium water. Water with high salinity can be used when extra water is applied for leaching purposes.

Depth	Available Water Capacity
1.0’	1.2”
2.0’	2.2”
3.0’	3.3”
4.0’	4.3”
5.0’	5.3”

Soils

Bankard
Banks
Calamus
Hanly
Inavale
Ipage
Pathfinder
Sardak
Ticonic

IRRIGATION DESIGN GROUP 29 INTAKE FAMILY 3.0

These are very deep, deep, and moderately deep, well-drained and excessively drained soils. The surface layer is loamy fine sand or fine sand that is underlain by fine sand or loamy fine sand. This is underlain by fine sand, loamy materials, or fine grained sandstone. Available water capacity is low. Permeability is rapid in those soils lacking contrasting materials in the substratum. It is rapid in the upper part and moderate in the lower part of those soils having contrasting materials in the substratum. These soils are on uplands.

These soils are not suited to surface irrigation because the intake rate is too high to get even distribution of water over the field. Runs would be too short to make surface irrigation practical.

These soils are suited to sprinkler irrigation. They require frequent irrigation to prevent stress on plants. They are well suited to center pivot irrigation. These soils require high amounts of organic matter and fertilizers to maintain production and control soil blowing. Many trace elements are needed. Fertilizer, especially nitrogen, is more effective if applied with irrigation water because of the rapid leaching that takes place. They are subject to blowing. Caution should be used to avoid polluting the ground water.

Generally, these soils are suitable for irrigation with medium salinity and medium sodium water. Water with high salinity can be used when extra water is applied for leaching purposes.

These soils are not suitable to sprinkler irrigation of row crops or small grain on slopes greater than six percent; however, tame grasses and legumes may be grown on slopes up to nine percent.

Depth	Available Water Capacity
1.0’	1.3”
2.0’	2.4”
3.0’	3.4”
4.0’	4.4”
5.0’	5.4”

Soils

Anselmo (LFS)
Dailey
Beisigl
Dickey
Doger
Doughboy (LFS)
Duda
Dunday
Forestburg
Lihen
Maddock
Mullen
Sandose
Serden
Sverdrup
Telfer
Thurman (LFS, LS)
Towner (LFS)
Trey
Vetal (LFS)
Wewela (LFS)

IRRIGATION DESIGN GROUP 30 INTAKE FAMILY 3.0

These are very deep and deep, excessively drained soils having thin, loamy fine sand, loamy sand, fine sand, or sand surface layers. The underlying material is fine to coarse sand. Available water capacity is low. Permeability is rapid. These soils are on uplands.

These soils are not suited to surface irrigation because the intake rate is too high to get even distribution of water over the field. Runs would be too short to make surface irrigation practical.

These soils are suited to sprinkler irrigation. They require frequent irrigation to prevent stress on plants. They are well suited to center pivot irrigation. These soils require high amounts of organic matter and fertilizers to maintain production and control soil blowing. Many trace elements are needed. Fertilizer, especially nitrogen, is more effective if applied with irrigation water because of the rapid leaching that takes place. They are subject to blowing. Caution should be used to avoid polluting the ground water.

Generally, these soils are suitable for irrigation with medium salinity and medium sodium water. Water with high salinity can be used when extra water is applied for leaching purposes.

These soils are not suitable to sprinkler irrigation of row crops or small grain on slopes greater than six percent; however, tame grasses and legumes may be grown on slopes up to nine percent.

Depth	Available Water Capacity
1.0’	1.1”
2.0’	2.1”
3.0’	3.0”
4.0’	3.9”
5.0’	4.8”

Soils

Claire
Dwyer
Lohnes
McKelvie
Orpha
Seroco
Simeon
Valent
Valentine
Yecross
Zeona

SOIL GROUP DESCRIPTIONS FOR IRRIGATION DESIGN GROUPS

GROUP A

SOILS USUALLY PONDED

These are poorly or very poorly drained soils in closed depressions or broad flat areas. Some of the depressional soils have dense claypan subsoils and contain an excess amount of sodium. They are usually ponded during wet seasons and would become ponded under irrigation. Continuous move irrigation systems are likely to get stuck in these soils.

Many of these soils are near irrigable soils and small areas may be irrigated along with irrigable soils. These areas will cause traction problems for continuous move irrigation systems and farm implements. Crops are likely to drown out or be very restricted in growth because of poor aeration in the root zone or an excess amount of sodium.

GROUP B

SOILS WITH A HIGH WATER TABLE AND THOSE SUBJECT TO FLOODING

These are poorly drained and very poorly drained soils. A water table is near the surface most of the season unless drained. Some have calcareous surface layers. These soils are usually in slightly depressed parts of the landscape or on flood plains. Soils of the flood plains flood frequently.

These soils would become waterlogged under irrigation.

GROUP C

STEEP SOILS

These soils are generally too steep for irrigation. Some of these soils, usually on lower slopes, occur as inclusions in map units of irrigable soils. Many of these soils have calcareous surface layers.

Gullies are likely to form in wheel tracks of continuous move irrigation systems. Soil loss because of erosion would be excessive. Stony soils and soils on mountainous slopes in the Black Hills are in this group.

GROUP D

SHALLOW SOILS, USUALLY STEEP

These are shallow soils that have bedrock at depths of less than 20 inches. They have very low or low available water capacity. The underlying bedrock is shale, chalkrock, sandstone, siltstone, and limestone.

Soils having sand and gravel at depths less than 10 inches are in this group.

Most of these soils are on steep slopes so they have a combination of limitations for irrigation. Small areas of these soils may occur as inclusions with irrigable soils.

SOIL GROUP DESCRIPTIONS FOR IRRIGATION DESIGN GROUPS

GROUP E

VERY CLAYEY SOILS AND CLAYEY SOILS ON SLOPES GREATER THAN TWO PERCENT

These soils have very fine surface layers and very dense clayey subsoils. They formed in materials weathered from clayey shales. Some of the soils contain concentrations of salts. Permeability is very slow.

Soils have extremely firm, dense, clayey subsoils that have an abrupt upper boundary are also in this group. Clayey soils that are on slopes too steep for irrigation (over two percent) are in this group. These soils are not suited for any type of sprinkler irrigation under present methods.

GROUP F

SOILS HAVING CLAYPAN SUBSOILS

These soils are characterized by having dense compact subsoils. They contain an excessive amount of sodium. These soils are on broad flat areas usually characterized by small pits and mounds (micro-relief). Most areas are in native vegetation.

Many of these soils are near irrigable soils or are small areas that may be irrigated along with irrigable soils. These areas will cause severe traction problems for continuous move irrigation systems and farm implements. Poor stands are likely because of poor germination due to the high amount of sodium. Crop growth is very suppressed in these areas.

Some of these soils have fine sandy loam surface layers and columnar structured sandy clay loam subsoils.

Intake rates are so low that it is not possible to apply water with sprinkler systems without ponding or runoff. These soils may be irrigable by some surface application methods.